

Manawatu District Plan

Proposed Plan Change 51: Growth Precinct 4 and new District Plan Structure

Section 32 Report

April 2019

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Part I – District Plan Review

1 Description of the Proposed Plan Change

Proposed Plan Change 51 – Growth Precinct 4 and new District Plan Structure (PPC51) seeks to rezone land to the north of Feilding to Residential. The area was identified in the Feilding Growth Framework Plan in 2013 as one of four key residential growth locations for the township of Feilding. Precincts 1- 3 were rezoned in 2014. This Plan Change is part of the Manawatū District Plan Sectional Review.

This Plan Change seeks to rezone land to the north of Feilding from predominately Rural to Residential. The land area is located approximately from Port Street, Arnott Street, Reid Line West and Makino Road. The rezoning will include Rimu Park, which is currently zoned Recreation to Residential. The Plan Change also seeks to remove the Feilding Nodal Zone from the District Plan.

As part of this Plan Change the Manawatu District Council (the Council) is also seeking to finalise the new structure of the District Plan that was initially introduced by Plan Change 46. This will enable the font, structure and numbering of the new chapters to be reflected in those parts of the plan that are yet to be reviewed. Part A and Part B will be introduced to differentiate between reviewed and unreviewed parts of the District Plan. Part A will contain ‘chapters’, which have been introduced through the sectional District Plan review. Part B will contain ‘sections’, which are the first-generation parts of the District Plan that have not yet been reviewed as part of the sectional review. Also included is the updating of cross referencing and providing table of content pages for each section to add plan users in navigating the District Plan provisions.

Any provisions deleted by the Plan Change will be referenced as [DELETED PC51] to help plan users to understand the changes made throughout the sectional district plan review process. This approach was used by Plan Change 46 and 55 and provides context for plan users as the Plan is reviewed in a sectional manner.

2 Proposed amendments to the District Plan

Proposed Plan Change 51 – Growth Precinct 4 and new District Plan Structure (PPC51) involves the following amendments to the Manawatu District Plan:

1. Introduction of a new Chapter 8 Subdivision for Growth Precinct 4, including a Structure Plan for the Growth Precinct 4 area.
2. Introduction of a new Chapter 15 Residential Zone for Growth Precinct 4.
3. New definitions for Chapter 2 as follows:

Commercial Activity means, for the purposes of Growth Precinct 4, the use of land and buildings for the display, offering, provision, sale or hireage of goods, equipment or service including restaurants and retail shops and outlets, but excludes service stations and supermarkets.

Essential Infrastructure means the Manawatū District Council reticulated sewage and reticulated water supply systems, stormwater systems, and gas, electrical power and telecommunication (including fibre) networks.

Growth Precinct 4 means the area of Feilding as shown in the Precinct 4 Structure Plan Map in Appendix 8.1.

Home Occupation means, within Growth Precinct 4, an occupation, business, trade, craft or profession performed entirely within a dwelling or accessory building by a member of the household residing permanently on the property which occupation, business, trade, craft or profession is a secondary and lesser use of the property after the primary residential activities. Home occupation does not include any activity involving panel beating, spray painting, motor vehicle repair, heavy trade vehicles, manufacturing, industrial, light industrial, or the boarding, breeding or training of dogs, and catteries.

Multi-unit Residential Development means two or more self-contained dwelling units that are located on one site. A multi-unit residential development includes but is not limited to apartment buildings and terrace housing.

Open construction means, with respect to fencing, able to be viewed through and with not less than 65% openness over the elevation of the fence. Open areas exclude any surface of the fence which is solid, but may include wire mesh, or wrought iron or similar elements with a facing edge not thicker than 12mm and spaced at not less than 80mm centres.

Permeable surface means any part of a site which is grassed or planted in trees or shrubs and/or is capable of absorbing water or is covered by decks which allow water to drain through to a permeable surface. It does not include any area which:

- a. falls within the definition of site coverage except for decks as above
- b. is occupied by swimming pools; or
- c. is paved, concreted or asphalt with a continuous surface.

Retirement village means a comprehensive development which may include housing, recreational, welfare, and medical facilities which is intended principally or solely for retired persons or people with disabilities.

4. Amendment of the definition of Assisted Living Accommodation as follows:

Assisted Living Accommodation means land and buildings used or designed to be used for supervised residential care and accommodation by 5 or more people (exclusive of the manager and the managers family) and includes, without limitation:

- a. Boarding Houses
- b. Nursing homes.
- c. Retirement village

5. Inserting a cross reference in Chapter 3A.1 and 3A.4 to the new Chapter 8 Subdivision proposed Policy 2.7 and Rule 8.4.1.g.i as follows:

Guidance Note: Plan Users are directed to Chapter 8 Residential Zone, Policy 2.7 and Rule 8.4.1.g for additional provisions that apply to Network Utilities with respect to infrastructure being located underground.

6. Removal of the Feilding Locality Nodal Zone – Appendix 5A Diagram 1.
7. Amendment of Planning Maps 11, 26, 28 and 32 to reflect the change of zoning from Rural and Recreation to Residential Zone and where appropriate, Recreation Zone near the Makino (Mangakino) Stream.
8. Introduction of the new District Plan structure introduced in Plan Change 46 throughout the entirety of the District Plan. This includes
 - New headings, sections and page numbering.
 - Introduction of a Part 1 and Part 2 to the District Plan to differentiate between reviewed chapters and unreviewed sections of the Operative District Plan.
 - Updating of all cross referencing from page numbers in the Operative District Plan to chapters (in the new structure of the District Plan) or sections (which is the structure of the old District Plan).
 - Updating the District Plan appendices in Chapters 4, 10 and 16 to be the same style and font as Chapter 3 as follows:

Appendix 4.1 – Schedule 4a Significant Historic Built Heritage – Feilding Town Centre

Appendix 10.1 – Feilding Town Centre Design guidelines

Appendix 16.1 – Preferred Planting Species

9. Minor amendments to Rules 3B.4.3 Access – Standards for Permitted Activities to improve clarity and plan administration as follows:

3B.4.2 Vehicle Crossings Access – Permitted Activity

~~The formation of~~ Vehicle crossings onto roads is a Permitted Activity in all zones provided that they comply with the standards in Rule 3B.4.3 below.

Guidance Note: All vehicle crossings must be constructed according to Council policy and that Council's vehicle crossing application form is completed and submitted for approval.

3B.4.3 Vehicle Crossings Access – Standards for Permitted Activities

For all zones the formation of vehicle crossings onto all roads must comply with the following standards:

- a. All vehicle crossings must be sited in accordance with the minimum sight distances and intersection spacing's as defined in Appendix 3B.3.
- ~~b. Vehicle crossings may only be constructed on **Major Arterial Road** or **Minor Arterial Road** identified in Appendix 3B.1 if there is no alternative legal access from the **site** to another road.~~
- ~~c. In the Outer Business Zone, vehicle access to **sites** from SH54/Aorangi Street, between Gladstone St and Eyre Street, must be left turn in and left turn out only.~~
- ~~b.d.~~ No new vehicle crossings will be located within 30m of any railway level crossing.
- ~~c.e.~~ Existing vehicle crossings that are within 30m of a railway level crossing must be maintained to ensure the sightline standards detailed in Appendix 3B.5 are met.
- ~~d.f.~~ No **dwelling** or **accessory building** will have access via an unformed legal **road** (paper road).
- ~~e.g.~~ Onsite manoeuvring must be provided for vehicles to enter and exit in a forward direction.
- ~~f.h.~~ Vehicle crossing movements must not exceed 100 car equivalent movements per day and the car equivalent movements must be calculated in accordance with Appendix 3B.4.
- ~~g.i.~~ ~~Accessways and~~ Vehicle crossings must comply with the sight distances and minimum spacing identified in Appendix 3B.3 Measurement of Sight Distances and Minimum Spacing.
- h. Vehicle Crossings must comply with Diagram D in Appendix 3B.3 if there is more than one slow, heavy or long vehicle movements per week using the accessway and vehicle crossing.
- i. All vehicle crossings must be constructed or upgraded according to Council's Engineering Standards for Land Development.
- j. In addition to standards a. to k. above, for Major Arterial or Minor Arterial roads the following also apply:
 - i. Vehicle crossings may only be constructed on **Major Arterial Road** or **Minor Arterial Road** identified in Appendix 3B.1 if there is no alternative legal access from the **site** to another road.
 - ii. In the Outer Business Zone, vehicle access to **sites** from SH54/Aorangi Street, between Gladstone St and Eyre Street, must be left turn in and left turn out only.

Guidance Note: All vehicle crossings must be constructed according to Council policy and that Council’s vehicle crossing application form is completed and submitted for approval.

10. Addition of two new notable trees to Appendix 1D Trees with Heritage Value as follows:

15) 54 Roots Street English Oak (2) (Quercus Robur) Planning Map 11.

A corresponding T15 reference is also required on Planning Map 11 (refer Appendix 5).

11. Addition of a new Collector Road Cross Section for Growth Precinct 4 into Appendix 3B.2 in Chapter 3B – Transport. Refer to Appendix 6 for a copy of the proposed Cross Section.

No additional changes to the current Residential or Subdivision provisions in the District Plan are proposed. Rather new specific provisions for this area within Feilding have been prepared.

Please note that these provisions have legal effect once the Council publicly notifies decisions on submissions to Plan Change 51, in accordance with Clause 20, Schedule 1, as set out in Section 86B(1) of the Resource Management Act (1991).

Part II – Assessment Report

1 Introduction

The Manawatu District Council (the Council) has prepared Proposed Plan Change 51 – Growth Precinct 4 and new District Plan Structure (PPC51) to the Operative Manawatu District Plan for notification under the provisions of the Resource Management Act 1991 (the Act).

This report has been prepared in accordance with section 32(5) of the Act and represents a summary of the evaluation of alternatives, costs and benefits undertaken by the Council in respect to the proposed District Plan provisions relating to matters that apply to the area of land to the north of Feilding known as Precinct 4.

In summary, the Council must establish that the Plan Change is the most appropriate way to achieve the purpose of the Act including an assessment that the proposed changes are the most appropriate means available to achieve Councils objectives – when compared against alternative methods available, including doing nothing.

2 Purpose of Proposed Plan Change 51

The primary purpose of Plan Change 51 is to introduce specific provisions for the rezoning of Growth Precinct 4 to Residential Zone. As part of the rezoning of this land, new location specific provisions and new Residential Zone and Subdivision Chapters are proposed for the District Plan.

The rezoning includes approximately 256ha of land and the creation of around 1,800 residential lots. Proposed Growth Precinct 4 is located on an area of greenfield land to the north of Feilding urban area between Makino Road and Reid Line towards the current residential zone along Port Street, Pharazyn Street and Arnott Street. The existing Rimu Park zoning is proposed to change from Recreation to Residential, and strips either side of the Makino (Mangakino) Stream are proposed to become Recreation Zone. The area of Growth Precinct 4 is shown in Figure 1 overleaf.

For Growth Precinct 4 the aim has been to introduce new location specific provisions in a new Subdivision Chapter to ensure that any future development occurs in a coordinated manner, avoids natural hazards and is sensitive to the surrounding existing uses and neighbours.

The provisions proposed for the new Residential Zone chapter seek to recognise the unique activities on the site and to ensure development occurs in an integrated and planned manner with high quality, integrated mixed built form environment. The focus has been on enabling residential use rather than commercial or industrial uses in this area of Feilding.

This Plan change proposes changes to Chapter 2 (Definitions) to reflect the new terms used in the Chapter.

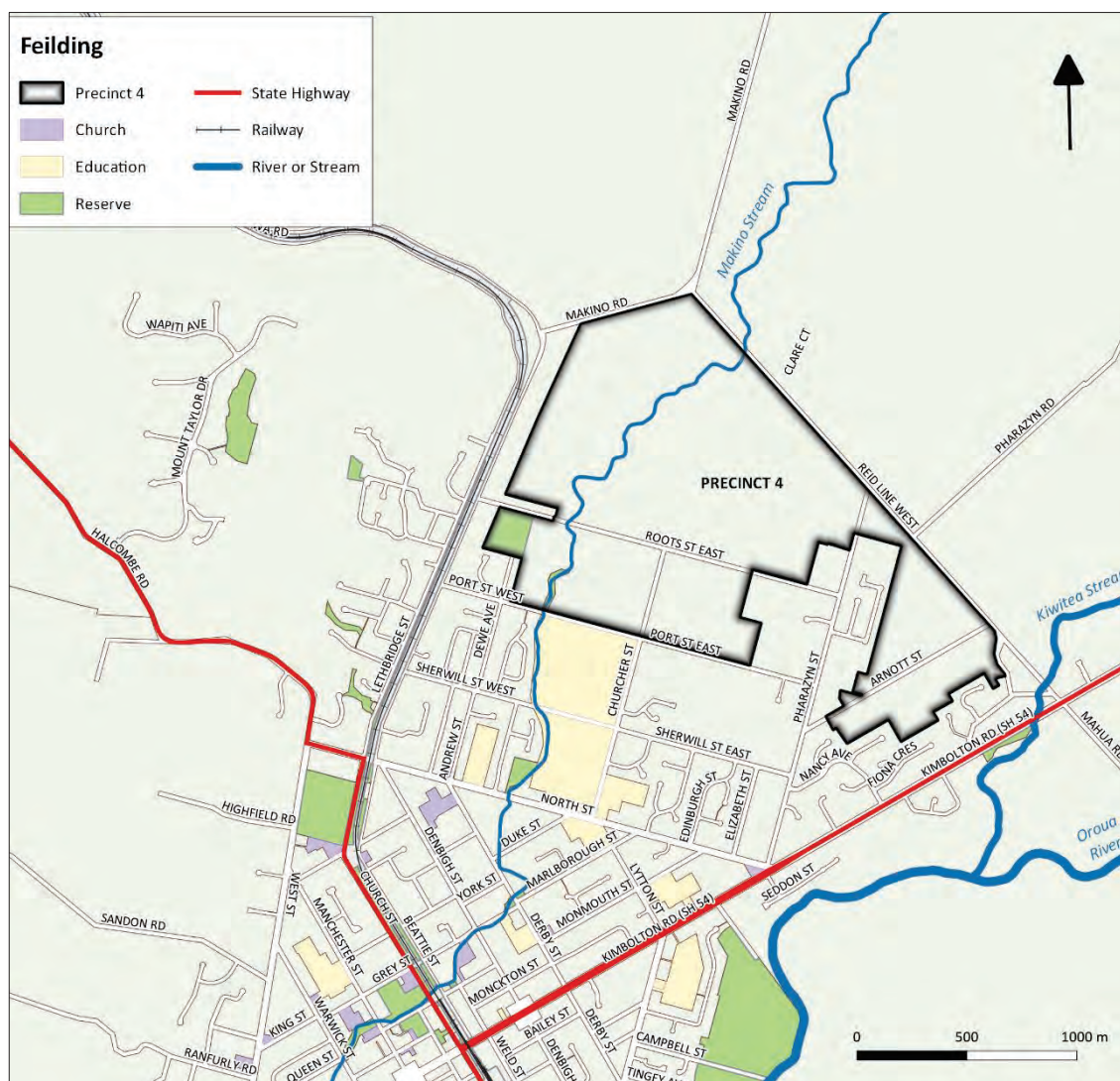


Figure 1: Growth Precinct 4 location.

The deletion of Appendix 5A - Rural Subdivision Nodes, Diagram 1 – Feilding Locality of the operative District Plan is also proposed as part of this plan change. Previous Plan Change 45 - Feilding Growth and this plan change have essentially replaced the need for the nodal areas around Feilding. The new provisions provide greater certainty and direction for residential development than the current provisions of the nodal areas. The Feilding Locality area has essentially been replaced by Growth Precincts 1-4.

The secondary purpose of the PC51 is to reformat the District Plan in its entirety to the format introduced in Plan Change 46. This format change is considered appropriate as it will improve the readability of the Plan as it goes through the ongoing sectional District Plan review.

Some other changes are proposed to Chapter 3B Transport to provide greater clarity for plan users. Namely, minor amendments to Rules 3B.4.3 Access - Standards for Permitted Activities to improve clarity and plan administration, and a new road cross section for Collector Roads. Amendments are required to Rule 3B.4.3 to clarify that the new access standard applies only to Arterial Roads and to include the term 'location' along with new

provisions for all roads. A related amendment is the introduction of a new rule to specify that formation and upgrading of vehicle crossings are to be in accordance with Council engineering standards. A new road cross section has been proposed for Collector Roads to achieve the high amenity sought by the Plan Change. For completeness the guidance note under Rule 3B.4.2 has been included under 3B.4.3 to provide clarity for plan users.

3 Operative District Plan Review

The current District Plan became operative in December 2002. Section 79 of the Act requires Council to commence a review of its District Plan every 10 years. Recent amendments to the Act clarify that whole plans need not be reviewed. A council may choose to review their District Plan in part or in sections.

The Council has decided to undertake the review of the District Plan in sections (i.e. a sectional district plan review). The reason for this approach is to lessen the administrative burden of reviewing the entire District Plan within the statutory timeframes. This approach enables the public to make comment on a topic-specific basis. Council is very conscious of the need to maintain a holistic view of the future to ensure that research and consultation for related components of the Plan still achieve a high level of integration. A key focus for the review process is ensuring local context, a high degree of alignment of regulatory provisions and ensuring that the context and scale of any rules are appropriate to manage the issues raised.

4 Statutory and Legislative Framework for the Review

4.1 Resource Management Act 1991

Section 74 of the Resource Management Act (the Act) requires the Council to change the District Plan in accordance with its functions under section 31, the purpose of the Act in section 5 and the other matters under sections 6, 7 and 8.

Section 32 of the RMA –

“(1) An evaluation report required under this Act must -

- (a) examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and*
- (b) examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by -*
 - (i) identifying other reasonably practicable options for achieving the objectives; and*
 - (ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and*
 - (iii) summarising the reasons for deciding on the provisions; and*
- (c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.*

- (2) An assessment under subsection (1)(b)(ii) must -
- (a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for -
 - (i) economic growth that are anticipated to be provided or reduced; and
 - (ii) employment that are anticipated to be provided or reduced; and
 - (b) if practicable, quantify the benefits and costs referred to in paragraph (a); and
 - (c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.

...

- (5) The person who must have particular regard to the evaluation report must make the report available for public inspection -
- (a) as soon as practicable after the proposal is made (in the case of a standard or regulation); or
 - (b) at the same time as the proposal is notified.

- (6) In this section,–

objectives means, –

- (a) for a proposal that contains or states objectives, those objectives:
- (b) for all other proposals, the purpose of the proposal

proposal means a proposed standard, statement, national planning standard, regulation, plan, or change for which an evaluation report must be prepared under this Act.

provisions means, –

- (a) for a proposed plan or change, the policies, rules, or other methods that implement, or give effect to, the objectives of the proposed plan or change;
- (b) for all other proposals, the policies or provisions of the proposal that implement, or give effect to, the objectives of the proposal.”

Section 32 stipulates the content and evaluation is necessary prior to notification. The evaluation report focuses only on those parts of the District Plan where changes are being proposed. In this instance, the provisions are all new and the site is being rezoned. On that basis a full assessment is included in this report.

Section 32AA requires Council to undertake a further evaluation if any further changes are proposed prior to making a decision on a plan change, for example, in response to submissions received. This further evaluation must be cited at any subsequent hearing.

Functions of District Councils – the Council has statutory functions under section 31 of the Act, which include the establishment, implementation and review of objectives, policies and methods to achieve integrated management of the effects of the use, development, or protection of land and associated natural and physical resources of the district.

Purpose of District Plans – the purpose of a district plan under section 72 of the Act is to assist territorial authorities to carry out their functions in order to achieve the purpose of the Act.

Preparation of District Plans – Section 73 states that there must be at all times one district plan for each district prepared by the Council in a manner set out in the First Schedule of the Act.

Matters to be Considered by Territorial Authorities – the matters to be considered by a district council when preparing or changing its district plan are set out in section 74 of the Act. This requires councils to act in accordance with its functions under section 31, the provisions of Part 2, and its duty under section 32. Section 74(2) also sets out a number of other matters Council shall have regard to including plans and strategies prepared under other acts. Importantly, section 74(3) states that when preparing a change to a district plan a territorial authority must not have regard to trade competition.

4.2 Background to Proposed Plan Change 51

The Council is undertaking a Sectional District Plan Review. To date the Council has reviewed parts of the heritage and business zone provisions, the entire Industrial Zone, new District Wide Rules and a partial review of the Designations within the District Plan.

One of the priority topics for review was the provision for growth in Feilding. This priority was a result of pressure for additional residential and industrial land. Council approved the Feilding Framework Plan in 2013 which identified four areas for future residential growth in Feilding. Growth Precincts 1 -3 have already been introduced into the District Plan for future residential development. Precinct 5 which identified a future industrial growth area was introduced into the District Plan under Plan Change 52. Growth Precinct 4, the subject of this plan change, is the last residential area recommended for residential growth to be rezoned under the Feilding Framework Plan.

The following section of this report sets out information gathered by Council in order to provide context to the resource management matters impacting on Feilding’s urban growth. Investigations and technical reports commissioned by Council have shaped the Plan Change provisions. In particular, the Feilding Framework Plan has provided the information and spatial analysis to produce the individual Structure Plans for the growth precincts.

The performance of the operative District Plan, regulatory best practice framework and whether this has delivered the anticipated environmental results are factors that also set the context to PPC51.

Urban Growth Pressure in Feilding

The Manawatu District has been experiencing high levels of growth. From 1 July 2016 to 30 June 2018, the District’s population increased by 3.3 percent to 30,900 people. This is an increase of 1,000 people living in the District in June 2018 compared with July 2016. Of the 1,000 additional residents, 600 are estimated to have moved to Feilding. This growth is resulting in strong demand for residential property in Feilding. While consent numbers for new dwellings has overall increased in the last five years, there remains concern that demand for residential properties will outstrip supply. This analysis further supports the need for this Plan Change to rezone the land for future residential use.

The philosophy of the Operative District Plan has been to enable growth beyond the extent of the existing Residential or Village Zone by considering new areas for rezoning on a case by case basis. This approach is based on a policy and assessment framework where individual urban growth proposals (either as a private plan change or resource consent application) are considered on their individual merits. This approach has led to ad hoc subdivision and development and potential for inefficient urban form (e.g. road layouts, reticulated services, open space).

In addition, this current approach creates significant uncertainty for landowners, developers and Council on where and when residential development may or may not occur, and creates issues when planning infrastructure and the associated costs.

In response to the uncertainty, Council has undertaken work and investigations to better understand Feilding’s urban growth potential, and the matters created by greater urban development. This was outlined in the Feilding Framework Plan adopted by Council in 2013.

As a result of this work, Council confirmed the location and extent of areas for residential growth. To manage the urban form of these new growth areas and to achieve efficient and good quality urban areas, structure plans have been developed for the five Growth Precincts. These provide the anticipated form and development of the land within the structure plans for Feilding.

The new provisions and chapters are proposed to ensure urban growth areas are integrated, cost effective and designed to avoid, remedy and mitigate adverse effects on the environment.

5 Regulatory and Policy Context

5.1 Operative District Plan Structure and Planning Framework

The operative District Plan uses zones to manage land uses across the District where activities are grouped into similar categories under various headings including Rural, Residential, Industrial, Recreation or Business Zones. Under the operative Manawatu District Plan, all resource management issues are grouped together, as are the objectives and policies. The rules are then divided into the various zones.

The Operative District Plan enables new residential subdivision (greenfield and infill) and development in the Residential Zone. Rural residential subdivision is provided as a discretionary activity in the “Nodal Area” around Feilding, where new lots of 4,000m² in land size area can be created.

The District Plan provisions that guide subdivision design and development within the Residential Zone manage density and require reticulated services. The District Plan is silent on requiring particular urban form outcomes therefore Council officers have not been in a position to direct development towards any strategic urban goals. Consequently, individual developments have been planned and constructed on an ad hoc basis, with no strategic guidance to ensure they are integrated with the existing and future urban areas, or in areas where there is infrastructure capacity.

In addition, the individual developments can create economic, environmental and social costs, due to a lack of an ineffective and inefficient provision of common resources, such as infrastructure, amenities (local shops and reserves), walkways, cycleways and vehicular networks that connect neighbourhoods.

Overall, the Operative District Plan enables residential development and future rezoning of new urban growth areas, but does not have an overall strategic framework to help integrate individual subdivisions and developments to produce sustainable urban outcomes.

Resource Management Issues

The existing Resource Management Issues in Section 2 of the District Plan identifies the following issues that are directly applicable to this Plan Change:

- 1) The District's people need to be able to provide for their social and economic and cultural well-being and for their health and safety, without having extra barriers created by unnecessary restrictions in the District Plan.
- 5) Past land uses, developments, signs and surface water uses have not always fitted into their surroundings without causing problems such as ...
 - f) effects of development pressures upon other natural and physical resources, eg on town centres, the quality or availability of water, energy supplies, the safety and efficiency of roading systems, or the supply of minerals.
 - g) overshadowing by buildings, shelter belts and trees. This can have effects on people's use and enjoyment of adjoining land.
 - h) pressure from newly established 'sensitive' activities, such as residential uses, for established operations which have a level of perceived nuisance to be curtailed or closed down.
 - l) a loss of visual privacy, e.g. homes and outdoor living areas being 'seen into' by neighbours and passers by.
- 7) The fragmentation of land holdings and new housing and other development which results from subdivision is having a cumulative impact upon the rural environment, including upon its rural character and amenities and upon the future options for use of the vulnerable versatile land. While each proposal may have minor effects on its own, the cumulative effects over time can be very significant.
- 9) There are various limitations of the future growth of Feilding and the other townships, e.g. natural hazards, effluent disposal, and urban expansion also has a permanent impact on the rural character and natural environment of the growth areas concerned.
- 12) Public access to the coast and rivers, as well as recreational opportunities generally, need to be maintained and enhanced.

As can be seen above, the issues relating to residential growth are general in nature and not particularly specific to the key issues experienced by Feilding today.

Objectives relating to residential development

The current District Plan collates all objectives and policies within sections 4 – 10. There are specific provisions in section 4.4 – Residential Zones and section 5 – Subdivision.

The existing residential zone objective seeks to maintain or enhance the residential character of Feilding’s residential zones and the amenity of its residents, including a low density appearance, well treed appearance and open streetscape, adequate access to sunlight, a level of privacy, onsite parking, local traffic rather than heavy vehicles, access to open space, impacts of non-residential activities are managed, and a high level of amenity is achieved.

The existing subdivision objectives and policies relevant to the residential zone seek to maintain a distinct difference of landscape appearance and character between urban and rural areas; to provide for urban growth that adjoins existing urban areas and manage growth through design of safe, integrated infrastructure networks and efficient use and development of land; to develop useful, attractive and sustainable urban neighbourhoods; to create urban lots that have a size and shape that enables urban use.

Section Rule B1 – Residential Zone

The rules relating to the Residential Zone permits dwellings, home occupations, housing for the elderly, education facilities, places of assembly, reserves, grazing and horticulture, specialist services, accessory buildings, libraries, signs, vehicle crossings, earthworks and residential care homes subject to a variety of performance standards. Controlled activities include two or more dwellings on a site, accessory buildings, and motor caravan sites. Any permitted or controlled activity not meeting the performance standards is a restricted discretionary activity. There are no discretionary activities listed for the residential zone. Any activity not otherwise provided for by the Plan is a Non-Complying Activity under Rule A2, 2.1.

Section Rule C1 - Subdivision

The District Plan enables the following activities as a controlled activity: boundary adjustments that will not increase the number of titles, subdivisions for utilities such as substations, transformers or pumping stations, any subdivision in the Residential Zone that meets the performance standards in Rules C2 2.1 to 2.3 and Rule 2.5.

The following residential zone subdivisions are classed as Restricted Discretionary Activities: subdivision on Growth Precincts 1 -3 not meeting standards for stormwater neutrality and wastewater disposal, or within the National Grid Corridor.

Subdivision within Growth Precincts 1 -3 not complying with minimum lot sizes and/or minimum lot frontages, or is not in accordance with the requirements specified in the relevant structure plan are a Discretionary Activity.

District Plan Structure

The District Plan is structured in chapters and sections. The chapters are reviewed parts of the plan and the sections are those parts that remain unreviewed in the sectional District Plan review process. The reviewed chapters are specific to a topic and contain information on the significant resource management issues, objectives to resolve the issues, policies to

implement the objectives, and the rules to implement the objectives and policies. Contrasting this is the sections that remain unreviewed where sections separate this information into different sections. For example, the significant resource management issues facing the district, the plan strategy to manage the issues, and the rules are set out in separate sections.

Those parts that have been reviewed as part of the sectional district plan review and are chapters are:

- Chapter 1 – Introduction
- Chapter 2 – Definitions
- Chapter 3 – District Wide Rules – which are for network utilities, transport, noise, earthworks, signage, temporary activities, relocated buildings
- Chapter 4 – Historic Heritage
- Chapter 10 – Business Zones
- Chapter 16 – Industrial Zones

Those sections that remain unreviewed and are still in the old structure of sections are:

- Section 2 – Significant Resource Management Issues Facing the District
- Section 4 – Plan Strategy – Managing Land Use Effects
- Section 5 – Plan Strategy – Subdivision
- Section 6 – Plan Strategy – Esplanade Management
- Section 7 – Plan Strategy – Financial Contributions
- Section 8 – Plan Strategy – Natural Hazards
- Section 9 – Plan Strategy – Energy and Water Use and Air Quality
- Section 11 – Plan Strategy – Cross Boundary Issues
- District Rules
 - Rule A – General
 - Rule A1 – Consent Procedures
 - Rule A2 – Rules Applying Throughout the District
- Rule B – Zoning Standards
 - Rule B1 – Residential Zone
 - Rule B1A – Deferred Residential Zoning
 - Rule B2 – Village Zone
 - Rule B3 – Rural Zones
 - Rule B4 – Business Zone
 - Rule B6 – Recreation Zone
 - Rule B7 – Flood Channel Zones

- Rule B8 – Manfeild Park Zone
- Rule B9 – Special Development Zone
- Rule C – Subdivision
 - Rule C1 – Status of Subdivisions
 - Rule C2 – Zone Standards – Subdivision
 - Rule C3 – Esplanade Management
- Rule D – Financial Contributions
 - Rule D1 – Contributions on Subdivision and Development

5.2 Proposed Changes

PPC51 involves the rezoning of largely rural land to the north of Feilding to residential. A new Residential Zone Chapter and a new Subdivision Zone Chapter are proposed. The provisions in these chapters specifically provide for Growth Precinct 4. It is anticipated that as the wider residential zone review progresses, that the chapter will be expanded to cover all the residential zone in the District (i.e. all of Feilding).

The underlying intent of the existing provisions has been used as the basis for the proposed provisions. However the actual provisions have undergone significant amendment to reflect current issues in the District, changes in legislation and key planning documents, and to ensure they are appropriate for the Manawatu District, and in particular the specific characteristics of Growth Precinct 4.

The planning provisions and the language used has been simplified where possible and the structure of the chapters has been amended to be in keeping with the new structure introduced under Plan Change 46 – Feilding Town Centre.

Section 8: Subdivision

The new proposed Chapter 8 provides for subdivision within Growth Precinct 4. Specific issues, objectives and policies for this area are identified. Overall these provisions seek that development within Growth Precinct 4 achieves high urban design outcomes resulting in a sustainable, integrated and coordinated future suburb of Feilding. The provisions also seek to ensure development is consistent with the Structure Plan that has been developed as part of the Plan Change. The Structure Plan was developed to ensure the area achieves high road integration, and builds on the opportunities for developing an open space network whereby the development looks into, rather than backs, the Makino (Mangakino) Stream. The open space network proposed will enable passive and active recreation for this part of Feilding.

The proposed provisions encourage land to be well managed, to recognise and provide for the overland flow paths and achieve an integrated development that links well with the existing development in the northern areas of Feilding.

There is a new proposed rule that any subdivision of land within Growth Precinct 4 will be a Restricted Discretionary Activity, where discretion is restricted to the size, shape and arrangement of lots, provisions of water supply and disposal of water, connected street network, suitability of lots for subsequent buildings and future use, design, scale and

appearance, safe and efficient operation of the roading network, provisions of a network of cycleways and walkways, and avoidance or mitigation of flood and stormwater hazards.

A key part of the new subdivision provisions is the requirements to prepare a Comprehensive Development Plan. This Plan seeks to ensure development is consistent with the Structure Plan and demonstrates how the development enables future development and integration of the wider area within Growth Precinct 4. The need to supply a Comprehensive Development Plan is a way to demonstrate how the development achieves a high integrated urban development for the future.

A series of assessment criteria are proposed to guide decision making to ensure the resulting development is of high urban design quality, recognising the local characteristics of the site.

A Structure Plan is proposed to be included in the District Plan to guide future development and use within Growth Precinct 4. The Structure Plan outlines where key road linkages and open space are to be located. Along the boundary with the Makino (Mangakino) Stream roads have been included so that houses front the Stream, rather than have their 'backs' to it. The esplanade strip either side of the Stream will be (in the future) Council owned land and will be developed as a recreation area providing community connections through the shared pathway network.

Section 15: Residential Zone

The new proposed Chapter 15 seeks to manage land use activities within Growth Precinct 4. Specific objectives and policies are identified to guide future development and decision making.

Overall these provisions seek to promote development that creates an attractive, healthy and safe place to live. The intention for Growth Precinct 4 is to enable residential development, rather than commercial or industrial activities. The provisions also seek to achieve high amenity for those developments, such as retirement villages, that traditionally have a higher density of built form.

Rules are proposed for dwellings within the Growth Precinct 4 with specific performance standards recognising the unique character of the site, such as minimum floor levels and overland flow paths. There is also a new proposed rule in the Residential Zone for multi-unit residential development on a site as a Restricted Discretionary Activity. The Council is proposing to restrict discretion to effects on surrounding residential environment and streetscape, design, scale and appearance, site layout, onsite landscaping, privacy across boundary and within the development, the safe and efficient operation of the roading networks, and internal circulation, parking, loading and manoeuvring areas, natural hazards.

The proposed chapter also seeks to manage the effects of home occupations and other non-residential development to achieve a high quality urban development.

A copy of the full Subdivision and Residential sections of the District Plan with all proposed changes is included in Appendix 1 and 2.

New District Plan Structure

A component of this plan change is introducing the 2nd generation District Plan structure introduced in Plan Change 46 to the entirety of the District Plan. These are essentially an administrative change and will include:

- Organising the plan into a Part 1 and 2 to differentiate between reviewed chapters (that are 2nd generation District Plan) and not yet reviewed sections (that remain 1st generation District Plan)
- Introducing a table of contents to the front of the District Plan, which will distinguish the Part 1 and Part 2.
- Changing the formatting of the District Plan as outlined in Appendix 3.
- Leaving cross referencing to rules but removing reference to page numbers. The cross references to be page numbers that are to be removed have been listed in Appendix 4.
- Bolding all terms used that are defined in the definitions list throughout the plan
- Introducing a contents page to each section or chapter

Other changes

Since the introduction of Plan Change 55 there have been some confusion over the vehicle crossing provisions and how these relate to Council's Engineering Standards for Land Development. The Council's Engineering Standards for Land Development were introduced after Plan Change 55 was notified and hearing held. To ensure consistency for plan users, changes are proposed to Chapter 3B Transport as part of this plan change to ensure Council documents are consistent and plan users can have certainty for the future on what requirements apply.

A new Road Cross Section for Collector Roads is also proposed. This shows future developers the desired road formation necessary to achieve high residential amenity as required by the Plan Change.

A Tree Assessment has been completed for Growth Precinct 4 area. This identified two mature Oak trees in the area that should be identified and protected under the District Plan. The Oak (*Quercus Robur*) is located at 54 Roots Street. This Plan Change also seeks to protect these trees by listing them in Appendix 1D Trees with Heritage Value. This is to ensure they are protected in the future given their size, even branch distribution and overall healthy condition.

Feilding Locality Nodal Zone – Appendix 5A Diagram 1 is proposed to be removed. The Feilding Framework Plan identified four areas of residential growth for Feilding. This essentially replaces the intent and need for the Feilding Locality Nodal Zone.

Changes to the Planning Maps 11, 26, 28 and 32 are proposed to change the zoning of land within Growth Precinct 4 from Rural and Recreation to Residential Zone and where appropriate, Recreation Zone near the Makino (Mangakino) Stream.

5.3 Chronology

The following outlines the key milestones in preparing the Proposed Plan Change to date:

Date	Activity
2013	<ul style="list-style-type: none"> • Feilding Framework Plan – Boffa Miskell - Council’s 30 year Urban Growth Strategy adopted by Council May 2013 • Feilding Liquefaction Study – Site Investigations Factual Report - Opus (issued 2013) • Feilding Liquefaction Study – Geotechnical Evaluation Interpretation Report – Opus (issued 2013)
2016	<ul style="list-style-type: none"> • Project team for plan change established. • Technical Reports commissioned: <ul style="list-style-type: none"> ○ Geotechnical (Liquefaction) Report - Opus ○ Land Contamination Report - Opus ○ Archaeology Report - Opus ○ Network Infrastructure Report - GHD ○ Economic and Retail Assessment Report - Property Economics ○ Cultural Impact Assessment - Dr April Bennett/Ngāti Kauwhata ○ Traffic Impact Assessment – Opus • Structure Plan workshops • Ngā Manu Taiko Committee meeting in August.
2017	<ul style="list-style-type: none"> • Structure Plan workshop and Stormwater Modelling Workshop • Council workshops in October and December • Ngā Manu Taiko Committee meeting 9 August 2017 • Phase 1 Key stakeholder and Community Consultation commenced December 2017 • Technical Reports completed: <ul style="list-style-type: none"> ○ Geotechnical (Liquefaction) Report - Opus ○ Land Contamination Report - Opus ○ Archaeology Report - Opus ○ Network Infrastructure Report - GHD ○ Economic and Retail Assessment Report - Property Economics
2018	<ul style="list-style-type: none"> • Preparation of draft Proposed Plan Change • Technical Reports completed:

- Cultural Impact Assessment - Dr April Bennett/Ngāti Kauwhata
- Traffic Impact Assessment – Opus
- Phase 2 Plan Change Development consultation
 - Community Consultation commenced April 2018 & ongoing
- Ngā Manu Taiko Committee meeting 12 June 2018
- Consultation with tangata whenua as outlined in Appendix 7.
- Clause 3 Consultation undertaken in November 2018.
- Preparation and finalisation of the Section 32 Report and District Plan Changes.

5.4 Consultation

Clause 3 of the First Schedule of the RMA specifies the people who must be consulted in the preparation of a plan, including plan changes. The provisions relevant to this PPC51 are:

(3) Consultation

(1) *During the preparation of a proposed policy statement or plan, the local authority concerned shall consult—*

- (a) *the Minister for the Environment; and*
- (b) *those other Ministers of the Crown who may be affected by the policy statement or plan; and*
- (c) *local authorities who may be so affected; and*
- (d) *the tangata whenua of the area who may be so affected, through iwi authorities; and*
- (e) *any customary marine title group in the area.*

(2) *A local authority may consult anyone else during the preparation of a proposed policy statement or plan.*

...

(4) *In consulting persons for the purposes of subclause (2), a local authority must undertake the consultation in accordance with section 82 of the Local Government Act 2002.*

4A Further pre-notification requirements concerning iwi authorities

(1) *Before notifying a proposed policy statement or plan, a local authority must—*

- (a) *provide a copy of the relevant draft proposed policy statement or plan to the iwi authorities consulted under clause 3(1)(d); and*

(b) *have particular regard to any advice received on a draft proposed policy statement or plan from those iwi authorities.*

- (2) *When a local authority provides a copy of the relevant draft proposed policy statement or plan in accordance with subclause (1), it must allow adequate time and opportunity for the iwi authorities to consider the draft and provide advice on it.*

In order to achieve the requirements of the Act, a range of consultation and information sharing initiatives have been carried out since the commencement of the District Plan review. These have included items in the local paper, presentations to various community groups and forums, a stand at the Field Days, information on Council's website, etc.

Stakeholder Consultation

A number of meetings have been held specifically about this Plan Change with the following key stakeholders at different times. Meetings have been held with a variety of agencies and individuals, such as residents near Growth Precinct 4, at the Farmers Market, Feilding High School, Powerco, Knox Congregation and Leaders, Feilding Community Committee, Department of Conservation, Transpower, Federated Farmers and Forest and Bird. A full record of consultation undertaken by Council is attached in Appendix 7.

At a high level, feedback from parties during the development of the Plan Change has indicated:

- i. The need for community facilities and public transport.
- ii. Supportive of the inclusion of parks and reserves. Enable more walkways.
- iii. The importance of good roading design. Traffic generated by development will impact the surrounding intersections, especially Kimbolton Road; and access around Feilding High School. Pharazyn Road is no longer a rural road.
- iv. Concern over stormwater and flooding.
- v. Utility companies wanting to ensure no unreasonable constraints on their assets.
- vi. Support for restricting fencing sizes and opposition for having rules on fencing.

Consultation with Tangata Whenua

Oroua River

The Oroua River is a defining feature in the Manawatū region or rohe. It flows from the Ruahine Ranges in the east to the Manawatū River in the south-west at Puketotara. It traverses the upper and lower reaches of rural Manawatū and skirts the eastern borders of Feilding township.

The Oroua River is fed by several puna (aquifers), local streams and rivers, and is a key contributor to many communities located along its river banks.

The Oroua River has cultural, historical, spiritual and traditional significance to many Māori who have interests in the Manawatū region. Over time, the River has formed vast mahinga kai (wild foods) catchment that support Māori communities, their way of life, and their economy. It provided essential travel, food reserves, and communication for those living in the area.

One of the River's most significant qualities is the mauri (life force) that flows from the central Ruahine Range through the rohe, connecting the Range to the wetlands and sand country, and finally to the Manawatū River.

Histories and traditions such as waiata tawhito, mōteatea, pepehā, and whakairo outline the connections of Māori to the River. These histories form a link between generations and the natural world, including Ranginui and Papatūānuku.

Ngāti Kauwhata have been connected with the Feilding area and the Oroua River since 1825, settling on the Oroua River at Te Awahuri around 1832. The River traverses the māna whenua of Ngāti Kauwhata and has been integral to the distinctiveness of Ngāti Kauwhata. Ngāti Kauwhata has long regarded the River as a source of food, a recreational opportunity, a pathway between sites of importance, a place for spiritual revitalisation and a maker of tribal identity. Marae, dwellings and cultivations were established around the Oroua River, providing access to water, wetlands, tributaries, forest and shrub lands.

In December 2015, Ngāti Kauwhata signed the Oroua Declaration with the Manawatū District Council. The aim of the declaration is to restore the Mauri of the river and to preserve the river for future generations. As a result, the Manawatū District Council continues to engage with Ngāti Kauwhata in a manner consistent with the status of māna whenua (authority over tribal boundaries).

The Makino (Mangakino) Stream is a key tributary of the Oroua River that enters at the Awahuri Bridge has its own māna and mauri (life force). There is also a puna or spring (named Maewa) that feeds into the Makino (Mangakino) Stream within the Growth Precinct 4 area. Ngāti Kauwhata have acknowledged the proposed esplanade along the Stream is a green infrastructure that may provide a number of benefits such as:

- enhanced Stream habitat
- buffer between development and the Stream allowing the stream bed to move naturally
- a recreational space that facilitates community access to the Stream
- a space where tangata whenua relationships with the Stream can be acknowledged
- an ecological and recreation corridor connecting the Stream to the Oroua River.

Cultural Impact Assessment

As part of the development of Plan Change 51, Council engaged Ngāti Kauwhata to prepare a Cultural Impact Assessment (CIA) for Growth Precinct 4. Further discussion on the CIA is contained in section 5.5. Council staff have meet with representatives of Ngāti Kauwhata to further discuss the contents of the CIA.

Discussions continue between Ngāti Kauwhata and Manawatu District Council on the implementation of the recommendations raised in the CIA for the wider District Plan Review process. In terms of Growth Precinct 4, there is an opportunity within the open space areas along the Makino (Mangakino) Stream to achieve the intent of Māori Urban Design Principles similar to those contained within the Te Aranga Cultural Landscape Strategy (2006). For example, Taiao where the natural environment is protected or enhanced – this could be achieved by planting locally sourced indigenous flora species along the Makino Stream. Mauri Tu where the environmental health is protected or enhanced – this is achieved by the establishment of the Esplanade Corridor and limiting the amount of land that can be covered by impervious surfaces (concrete) within Growth Precinct 4 thereby reducing the amount of stormwater runoff entering the Makino (Mangakino) Stream. Another example is Mahi Toi whereby hapū narratives are captured and expressed as information boards or sculptures developed by iwi along the future shared pathway along the Makino (Mangakino) Stream. There is also the opportunity to use the planting pods Ngāti Kauwhata used for planting riparian areas near Feilding along the Makino (Mangakino) Stream. Council will continue to kōrero with Ngāti Kauwhata on these matters beyond the extent and timing of this Plan Change.

Ngāti Ruakawa

Council has engaged with Ngāti Ruakawa as another mandated iwi regarding the CIA that has been completed and the overall approach for development of Growth Precinct 4. Council has met with representatives of Ngāti Ruakawa a couple of times regarding Growth Precinct 4.

Ngāti Ruakawa has identified in a letter (attached in Appendix 15) their support for the recommendations of the CIA report and provided additional thoughts and values in regard to the area of Growth Precinct 4. Many of the same opportunities identified above in relation to the CIA area also relevant to the discussions held so far with Ngāti Ruakawa. For instance, Maori Urban Design Principles and opportunities along the Makino (Mangakino) Stream. The intention of Council to purchase and develop the riparian edges of the Makino (Mangakino) Stream will enable hapū to access the stream which is currently not possible under private ownership. The provisions which limit the land covered by impervious surfaces within Growth Precinct 4 seeks to reduce the amount of stormwater (and therefore contaminants) entering the Makino (Mangakino) Stream.

Council will continue to kōrero with Ngāti Raukawa on these matters beyond the extent and timing of this Plan Change.

Statutory Acknowledgments

Statutory Acknowledgements are statements of cultural, spiritual, historic, and traditional associations of an iwi with a site of an area acknowledged by the Crown in Treaty of Waitangi settlements processes. They have legal weight from inclusion in Treaty Claim Settlement Acts. The areas include land, geographical features, lakes, wetlands and coastal marine environments that the iwi is associated with.

These acknowledgements are recognised under the Resource Management Act 1991 and the Heritage New Zealand Pouhere Taonga Act 2014. The Authorities who give resource

consents under these acts – the Manawatu District Council, the Environment Court and Heritage New Zealand Pouhere Taonga – must also have regard to these statements.

There are two Statutory Acknowledgements within the Manawatū District; Ngāti Apa (North Island) Claims Settlement Act 2010 and Rangitāne o Manawatū Claims Settlement Act 2016. Both express statements of association with the Oroua River, which is on the eastern edge of the Growth Precinct 4 area.

5.5 Supporting Technical Evidence

In considering and preparing PPC51, the Council has either completed reports, or commissioned technical reports and supporting documents. These included:

- 1 Liquefaction Report
- 2 Soil Contamination Report
- 3 Archaeology Report
- 4 Feilding Growth Assessment Precinct 4
- 5 Traffic Impact Assessment
- 6 Precinct 4 Servicing Concept Design
- 7 Structure Plan Report
- 8 Cultural Impact Assessment
- 9 Tree and Landscape Assessment

Other supporting reports and studies informing the development of PPC51 include:

- 10 Feilding Urban Growth Framework Plan 2013
- 11 Plan Change 45 – Residential Growth Decision Report 2014, Manawatu District Council
- 12 Plan Change 55 – District Wide Rules Hearing Report 2016, Manawatu District Council
- 13 Internal staff review.

The key findings of these reports are outlined below.

Liquefaction Report, Opus, December 2017

Council engaged Ravi Sunder from Opus to complete a high-level liquefaction risk assessment of the Precinct 4 growth area. This report expanded on work completed in 2013 and can be found in Appendix 8.

Based on the analysis and geotechnical testing results, it was concluded:

- The ground conditions are generally uniform across the site, with clayey silt, silty clay and silty sand layers until typically 1m to 2m thick below ground level, underlain by medium dense to dense gravel layer.

- The ground conditions at the proposed expanded growth area in the Precinct 4 generally have low vulnerability to liquefaction and liquefaction-induced ground damage.
- The ground conditions at the site are more favourable than previously assumed, and the risk of liquefaction is assessed as low.

With regards to liquefaction and earthquake intensity the Report states *“Despite having numerous potential seismic sources capable of producing ground shaking of MM7 or greater and high-water table, the site would appear to have a low risk of liquefaction because of the dense nature of the gravel encountered between 2m and 20m below ground level.”*

The Report also states *“As 2m-3m of vertical slope is present near the Makino [(Mangakino)] Stream, it is considered that building setbacks from the existing crests of slopes would provide appropriate mitigation of the slope stability hazard. We recommend no residential structure be built closer than 10m from the top of the stream slopes”.*

Overall the Report recommended that:

- The less intensive land use restriction (buffer zone) adjacent to the Makino (Mangakino) Stream, to mitigate the liquefaction hazard, (identified in the initial report in 2013) can be removed.
- No residential structure should be built closer than 10m to the top of the Makino (Mangakino) Stream bank, to avoid slope stability hazards.
- The scour and erosion hazard due to Makino (Mangakino) Stream flows have not been assessed as part of this study, and should be considered further.
- Foundation requirements for the buildings should be based on the shallow soil testing such as Scala penetrometer and shear vane test detailed in NZS3604:2011 for timber frame residential structures, or similar appropriate standards during the development of the area.

On that basis, it is considered that the site is suitable for residential development.

Soil Contamination, Detailed Site Investigation Report, Opus, December 2017

This site was shown on Council’s files as having the potential for a HAIL site (as defined under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health). As a result, Council engaged Christopher Bergin of Opus to complete a Detailed Site Investigation (DSI) at Lot 146 DP 3479, 54 Roots Street, Feilding. The DSI was undertaken on 15th November 2017. A full copy of the DSI is contained in Appendix 9.

In terms of site history, the area has been used for agricultural purposes. It is considered that at some time in the sites history sheep dip or spray race has been located on this site. Enquiries with Horizons Regional Council (HRC) indicates that the land does not currently appear on their HAIL database, however the absence of available information does not necessarily mean that the property is uncontaminated, rather that no information exists on the Database.

Samples were taken around the site and analysed for specific chemicals. The chemical analysis revealed concentrations of arsenic and cadmium above a residential (10% produce)

SGV within the test pit site 2. All other sites tested were under the levels for residential use¹.

Mr Bergin considered that residential development in and around test pit site 2 should be avoided or the site remediated. He recommended additional testing be undertaken to investigate the extent of the contamination and whether remediation is feasible. The report outlined potential remediation approaches.

Discussions subsequently took place with the landowner and more extensive testing was undertaken by Mr Bergin following instructions by the landowner. The findings of the additional testing is that the contamination is within the levels for residential development. Based on the additional testing completed the site is considered suitable for residential use and no remedial action is required.

Archaeological Assessment of Effects, Opus, December 2017

Council engaged Emily Cunliffe of WSP Opus to complete an Archaeological Assessment for Growth Precinct 4. The purpose of the report was to identify the probability of archaeological sites being within the Growth Precinct 4 development area and assess the value of these sites and how the values may be affected. A full copy of the Report is contained in Appendix 10.

Ms Cunliffe states that *“Although there are no recorded archaeological sites within the Precinct 4 area, there is one known and one potential historic / archaeological sites that have been identified during the course of this report. These are ‘Awatea’ and the location of the bridge at Port Street.”*

The Awatea House is outside the Precinct 4 rezoning area. There was a bridge at Port Street but was washed away during flooding. Last time a bridge was in this location was 1926. Given the area has experienced a number of floods over time, there may not be any material found in this area in the future.

Ms Cunliffe considers the area at the Port Street bridge site has a low probability of unrecorded sites being present. She has recommended that:

- *An Archaeological Authority from Heritage New Zealand Pouhere Taonga should be sought by any developers undertaking ground modifying activities at the Awatea property at 69 Pharazyn Street.*
- *Development in the remainder of the Precinct 4 area should be undertaken following an Archaeological Discovery Protocol whereby works should cease in the event of the discovery of any archaeological material and an Archaeological Authority should be sought.*
- *In the event of the discovery of archaeological sites of Maori origin, iwi should be engaged with during the Archaeological Authority process.*

¹ This is consistent with the guidelines contained in:

- Appendix B: Soil contaminant standards Users’ Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
- Section 7: Summary of Soil Contaminant Standards and Guideline Values, Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.

Feilding Growth Assessment Update – Precinct 4, 2018

Council engaged Tim Heath of Property Economics to provide an update to the earlier report on the residential market within the Feilding urban area, focusing on quantifying the scale of future demand that Feilding is forecast to be required to accommodate. The report can be found in Appendix 11.

The revised report states that *“the residential movements in and out of Feilding reveal that the majority of Feilding’s growth comes from redistribution within the Region rather than from an influx from beyond the region. The primary catchment currently has a population base of around 16,800 people and 6,700 households. This is forecast to grow to 22,200 and 9,400 respectively over the projection horizon to 2038. This equates to an average growth of around 135 households per annum over the assessed period, or growth of over 40% over the 20-year time horizons.*

This represents an area of approximately 227ha of residential land, after taking into account roading, infrastructure and open space and existing dwellings, around 136ha is available for residential development. Assuming a maximum density of 600m², Precinct 4 can accommodate an estimated 1,788 additional dwellings.”

The report assessed projected growth of an additional 19,000 households by 2038 within the Region, with around 14% of regional growth attributable to the Feilding Urban Area. Based on these projections Feilding urban area, and assuming Growth Precinct 4 maintains its proportional composition (70%) both Precinct 4 and the wider Feilding urban area are forecast to reach full capacity by 2038. This would indicate Growth Precinct 4 is likely to be an important component in Feilding accommodating future residential growth.

Mr Heath considers that the retail market for Growth Precinct 4 will be localised and would consist of a few convenience retail stores only. He notes that *“As localised convenience shops, any development within Precinct 4 would predominately be competing against other convenience activity in Feilding (including the town centre) and essentially allow the localised market to be more efficiently serviced for frequently required goods and service while maintaining the role and function of surrounding centres.”*

Mr Heath also specifically assessed demand for retirement villages and notes that the market has an estimated demand of an additional 660 retirement village dwellings by 2038. This is consistent with data showing that the Manawatu-Whanganui area is experiencing a rapidly aging population, with the population base for people ages 65+ forecast to more than double by 2038.

Traffic Impact Assessment, WSP Opus, March 2018

Council engaged Matthew Evis of WSP Opus to prepare a Traffic Impact Assessment (TIA) to assess future transport network conditions resulting from the development of the proposed Growth Precinct 4. This Report is contained in Appendix 12.

The TIA was based on a staged approach for modelling to anticipate effects. It focused on the effects on additional traffic generation from Growth Precinct 4 on the arterial road network located within the immediate vicinity of the development, focusing on the following sites:

- Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street;
- Site 2: North Street / Churcher Street; and
- Site 3: Kimbolton Road (SH54) / North Street / Pharazyn Street / Seddon Street.

The Report identifies that all sites have been assessed as having a reduction in levels of service as the area is more fully developed. Intersection upgrades are required to avoid excessive queuing and delays, and improve pedestrian safety at these intersections. Changes to traffic patterns will change as the proposed bridge is constructed within Precinct 4 linking Makino Road to the wider growth area. Given the existing priority access provisions at Site 3, intersection improvements will be required earlier to manage increasing traffic generation from Growth Precinct 4.

Mr Evis has recommended that Council:

- Develops an annual traffic monitoring programme on the arterial road network and key interconnecting routes to establish future traffic growth generated from the development of Growth Precinct 4. This will allow MDC to determine the pace of growth against forecast traffic assumptions used.
- Considers accelerating the development of the proposed east-west roading link across the Makino (Mangakino) Stream to reduce congestion at the North Street / Churcher Street intersection, although the impacts of short-term redistribution at the North Street / Makino Road intersection need to be assessed.
- Discuss the findings of the modelling assessment with relevant funding and investment partners within NZTA to identify and confirm preferred options for upgrading the Kimbolton Road(SH54) / Pharazyn Street / North Street intersection to support future network operations. Upgrades to the Kimbolton Road (SH54) corridor are expected to be delivered through NZTA's business case approach.
- Undertake an option assessment for upgrades to the North Street / Lethbridge Street / Makino Road / Denbigh Street / Chamberlain Street and North Street / Churcher Street intersections to identify preferred mitigation options and test the ability of options resolving capacity issues on the network. This will enable solutions to be identified, appraised, costed and suitable protection measures identified (if required).

Overall the report by Mr Evis identifies that the roading network will need to have some improvements over time to accommodate the increased traffic generation from residential development. The report is based on a number of assumptions, including development rates within the site. Regular traffic monitoring by Council will assist in planning for the improvements. There are no intersections that require immediate improvements based on this report. Therefore Council has sufficient time to budget and deliver intersection improvements as Growth Precinct 4 is developed over time.

Precinct 4 Servicing Concept Design, GHD, 2017

Council engaged GHD to investigate the existing stormwater, wastewater and water supply networks and provide concept designs for the three in the Growth Precinct 4 area. A copy of the report is contained in Appendix 13. The conclusions of the report for stormwater, wastewater and water supply are as follows:

Stormwater infrastructure:

- Growth Precinct 4 area would be split into two catchments; a western and eastern catchment. The western and eastern catchments would discharge into the Makino (Mangakino) Stream with the exception of the eastern catchment east of Pharazyn Street, which would drain to the Oroua River.
- Roading within the area would act as overland flow paths and stormwater pipes would be laid in the road reserve.
- Investigation of the section of Pharazyn Street between Sherwill and Arnott Streets is required as the capacity of that section to convey the required overland flows is not sufficient.

Wastewater infrastructure:

- Wastewater infrastructure is not currently present within the Growth Precinct 4 area.
- Growth Precinct 4 would be split into two catchments; a western and eastern catchment. The eastern catchment would drain in a southern direction and tie in with the existing wastewater system at the intersection of Andrew and North Streets via a 300mm diameter trunk main. The eastern catchment would tie into the Awahuri Road trunk main.
- The existing trunk main along Derby Street would have to be upgraded to a 375mm diameter main to convey western catchment flows. Similarly, the Awahuri Road trunk main would also need to be upgraded before the whole of the western catchment is developed so additional flows from the west of Precinct 4 can be conveyed.
- In terms of the eastern catchment the report stated that the existing 375 mm diameter main along Carthew Street and the 450 mm diameter main along Kawakawa Road would require upgrading before the east of Precinct 4 is fully developed.

Water supply:

- Precinct 4 water reticulation would be based around the construction of a 300m diameter trunk main to be installed between Kimbolton Road and Lethbridge Street. Principal mains throughout the network would be 150mm in diameter with the exception of no exit roads which would be 100mm diameter mains.
- The network would have sufficient fire-protection in accordance with SNZ PAS 4509 and will meet the Council's minimum pressure requirement of 250kPa at peak demand.

Precinct 4 Structure Plan Report, Manawatu District Council, (2018)

Council has prepared a report outlining the background to the Structure Plan proposed as part of this Plan Change. This report summaries the multi-disciplinary exercise undertaken in identifying Growth Precinct 4 for future growth, including the urban design and development principles and the infrastructure planning considerations which underpin the Growth Precinct 4 Structure Plan. A full copy of the Report is contained in Appendix 14.

The report summaries the strategic framework for urban development which range from the Feilding Framework Plan, Council's Engineering Standards for Land Development, the Council Infrastructure Strategy and the Council's Development Contributions Policy.

The Report also identifies and assesses the various networks that form the Structure Plan. For instance, the blue network of key overland flow paths, and flooding areas; the green network of existing and future open space / park areas; the movement network of public roads and cycleways and key pedestrian paths; and the community network of schools, and community facilities in the area.

The report also assesses the need for the existing nodal area around Feilding and has concluded that the existing Feilding Locality Nodal Zone (Appendix 5A Diagram 1) is no longer required in the District Plan. The original purpose of the Nodal Zone was to enable future development on the outskirts of Feilding. Since the District Plan was made operative, the Feilding Framework Plan and the rezoning of Growth Precincts 1-4 for future residential growth have essentially replaced the intent and need for the Feilding Locality Nodal Zone. In terms of Growth Precinct 4 the use of the existing roads as the boundary for residential development is more appropriate than an unclear line that does not follow any property boundaries provides plan users with greater clarity. On that basis this Plan Change seeks to remove this area from the District Plan.

A Residential Growth and Demand Report was completed as part of the Structure Plan Report. As outlined earlier in this report, Feilding is experiencing high levels of growth. Rezoning lands for residential purposes is necessary to address the high levels of population growth and subsequent housing demand pressures.

Cultural Impact Assessment (2018)

Council commissioned Ngāti Kauwhata to prepare a Cultural Impact Assessment (CIA) assessing the impacts of the Precinct 4 Growth Area development on Ngāti Kauwhata and their relationships with the lands and waters. A copy of the report is contained in Appendix 15.

The CIA identified the following issues in relation to the development:

- That Growth Precinct 4 is within the centre of three ancestral waterways; being the Mangakino Stream, Oroua River, and the Maewa puna. This poses a risk to the connection Ngāti Kauwhata have with the waters given stormwater is to be discharged into the Mangakino Stream, residential construction materials containing zinc and copper that are unsealed may be used and will runoff, and further volumes of wastewater may be discharged into the Oroua River as a result of the development

- That development is likely to result in higher flood risks, which buffers could address, but these buffers may have an effect on preserving the relationships of the people and the land, providing for the wellbeing of the people, and demonstrating that current generations are being responsible guardians of the land for future generations
- That the Growth Precinct 4 area land has stories and layers, which may become invisible to people once residential development occurs. Naming was proposed as an important part of making visible and honouring these layers and stories. The CIA raised that the Makino Stream is actually named the Mangakino Stream, and Makino Stream likely came from European settlers mispronouncing the correct name
- That housing is an important source of wellbeing for Māori but is often a source of inequality given home ownership rates and average income rates between Māori and Pākehā are disparate. Accordingly, the CIA identifies there is an opportunity in the development of Growth Precinct 4 to provide affordable housing for Māori.
- That no Māori Urban Design Principles have thus been incorporated into the Growth Precinct 4 development.

The CIA made recommendations to respond to the issues including requiring rules in relation to the use of unsealed metal construction materials; engaging iwi in discussions about stormwater and wastewater discharges and treatment; restoring and utilising Makino (Mangakino) Stream; enhancing the Oroua River at the eastern corner of Precinct 4; engaging iwi in discussions around flood risk mitigation; involving iwi in naming of subdivisions and streets; submitting a joint proposal to the New Zealand Geographic Board to rename the Makino Stream to Mangakino Stream; incorporating affordable housing in the Precinct; and including Māori urban design principles in future development and plans.

Council is currently working with Ngāti Kauwhata to address the issues and implement the recommendations where appropriate. As outlined above in section 5.4, some initiatives from the CIA have been incorporated within this Plan Change. Further initiatives will be incorporated as the Sectional District Plan Review progresses.

Tree and Landscape Assessment, Manawatu District Council, (2018)

The Council's Parks and Recreation Team has completed a Tree and Landscape Assessment Report for Growth Precinct 4. The key findings are detailed in the Tree and Landscape Assessment contained in Appendix 17.

The assessment found that the landscape context, characteristics and values for Precinct 4 generally reflects the rural farming practices in the District. The site has a prevalence of pasture and conifers, which are commonly planted for stock shade and shelter.

The assessment concludes that the potential for rural character to change as a consequence of the rezoning is high. However, it is not detrimental as future residential development typically results in a much broader range and extent of plantings. The assessment predicts that people will plant fewer canopy trees on urban properties and therefore over time, a lower visual tree line.

The Report identified a pair of English Oaks (*Quercus robur*) located adjacent to Makino Road that exhibit good form and health and have significant scale and landscape presence. They also have an association with a wider grove of Oaks on the other side of Makino Road. The Report recommends that these trees have formal protection in the District.

Feilding Urban Growth Framework Plan, Boffa Miskell, 2013

Council engaged Boffa Miskell to prepare the Feilding Urban Growth Framework Plan which was adopted by Council in May 2013. This Plan presents the results of a strategic analysis of the needs and challenges for Feilding's urban growth and development. A copy of this report is contained in Appendix 16.

The Feilding Urban Growth Framework Plan recognises that:

- *Although there is existing urban zoned land within the existing urban area that there are a range of factors such as ownership, development feasibility and market desirability that will constrain the availability for urban development.*
- *That projections for housing development demand will vary over time and that establishing a Framework Plan that makes it clear well into the future what the long-term direction and pattern of development of the town will be, but also leaves flexibility for land release, is good urban planning practice.*
- *That Manawatu District Council wishes to attract business, employment and people to live in Feilding and by signalling the opportunities for growth and quality of urban development that this may generate interest from these currently outside the District.*
- *That Feilding has existing urban form that will enable urban intensification that will provide people in smaller household sizes with a living option with smaller properties, easier access to shops, social facilities and less demanding maintenance requirements.*

The Feilding Urban Growth Framework Plan identified four areas for residential growth and one area for industrial growth. Precinct 4 is the last of the areas to be rezoned in the District Plan. With the input of additional technical reports outlined in this report, the structure plan and general development guides within the Feilding Framework Plan have been amended and refined. The Feilding Urban Growth Framework Plan is further discussed in the Precinct 4 Structure Plan Report contained in Appendix 14.

5.6 Evaluation of Alternatives and Preferred Option

A key matter referred to in Section 32(3)(a) is that a proposed plan change must be assessed in terms of whether the objectives are the most appropriate way to achieve the purpose of the Act, and secondly whether the provisions are the most appropriate way to achieve the objectives of the Plan Change. Appropriateness means the suitability of any alternative in achieving the purpose of the RMA.

To assist in determining whether the alternative is appropriate, the effectiveness and efficiency of the alternative should be considered. The assessment must contain a level of detail that corresponds to the scale and significance of the anticipated effects.

The costs and benefits of the environmental, economic, social and cultural effects anticipated should be identified and assessed. Where practicable, these should be quantified. Any opportunities for economic growth and employment (and whether these

are anticipated to be provided or reduced by the change) must also be assessed. In considering the alternative methods, it is necessary to consider different planning methods to achieve the purpose of the Act, including retaining the status quo, non-regulatory methods, and the proposed plan change.

The section of the document considers alternatives to the proposed option of introducing new objectives, policies and rules relating District wide. The following options evaluated are:

- Option One – Retain the status quo
- Option Two – New site-specific provisions

Alternative One: Retain the status quo

Retain Status Quo	
Retain the existing regulatory framework of objectives, policies and methods contained in the operative District Plan for the Residential Zone and Subdivision Chapter. No rezoning of the land would occur. The existing District Plan structure, including the Feilding Locality Nodal Area would be retained.	
Benefits	Costs
<ul style="list-style-type: none"> • Provides a continuation of the existing District Plan approach which has a level of familiarity for Plan users. • Avoids the costs associated with preparing and implementing new District Plan provisions 	<ul style="list-style-type: none"> • Implementation and compliance costs will be higher as development is within the nodal area and larger lot sizes are encouraged. • Does not recognise the information that Council has on the demand for residential land. • Would not enable planned and integrated development to occur. There is likely to be a continuation of ad hoc and poorly connected development in this area. • The objectives of the Rural Zone seek to retain land for productive purposes. Residential development at a greater density is not consistent with this. • Council would not be meeting its function under section 31(1)(a) to review objectives, policies and methods to achieve integrated management of the effects of the use and development of land and physical resources of the District. • Does not recognise information Council has received on the liquefaction risk and the importance of stormwater management design for future development.

	<ul style="list-style-type: none"> • Does not recognise the Council’s Engineering Standards for Land Development that also now apply to development in the District. • Would not enable Council to provide an updated and more user-friendly District Plan structure.
<p>Efficiency:</p> <p>The costs associated with this option significantly outweigh the benefits and therefore the status quo is not considered to be an efficient alternative. Development is occurring in this area and is currently resulting in ad hoc development that is not well integrated due to the reliance of cul-de-sacs. Relying on nodal area provisions also means that larger lot sizes are more common and these often cannot be further subdivided easily in the future. The costs associated with this option focus on not meeting best practice approaches to planning for new development, development not being integrated with a strong urban design outcome, nor facilitate staged development over the next twenty plus years.</p>	
<p>Effectiveness:</p> <p>This option is not effective as any residential development would require Lot sizes of either 4ha or 8ha within the Rural Zone. This is not an effective way to manage land use change of the site, nor recognise Council’s responsibilities under the National Policy Statement on Urban Development Capacity (NPSUD). This area contains relatively flat land and as such is in relatively high demand. Not changing the plan would see further ad hoc development in this area. Retaining the existing structure of the District Plan also creates confusion and Council would lose the opportunity to make the District Plan more legible for plan users. This option does not present an effective alternative.</p>	
<p>Opportunities for Economic Growth and Employment:</p> <p>This option has a negative impact in terms of economic growth and employment. Consenting processes to subdivide and change the land use would be costly and could see development move elsewhere. Changing the zoning of this land will see a greater increase in the development of new homes, likely at a greater as the zoning will enable development.</p>	
<p>Risk of acting or not acting if there is uncertain or insufficient information:</p> <p>There is sufficient information regarding the proposed change in zoning and to the provisions for residential and subdivision to warrant change. To retain the existing provisions would mean that most residential development on this site would require resource consent and higher justification as the Rural Zone focus is on protecting productive land. Retaining the existing District Plan structure is creating confusion for plan users and a lack of understanding for what has been reviewed, verse those provisions that have not been. For these reasons, retaining the status quo is not considered an appropriate planning response.</p>	
<p>Appropriateness:</p> <p>The status quo will not ensure best planning practice for land use of a site that is already being used for and landowners wishing to develop land for residential purposes. Nor does it enable</p>	

Council to ensure appropriate development occurs in a part of Feilding experiencing high levels of subdivision and development. Some of this demand has likely been a result of the Feilding Framework Plan that has been adopted by Council whereby the community knows that this area is identified for future residential growth. To retain the existing provisions would result in Council not giving full effect to the Feilding Framework Plan. This is not considered to be an appropriate response to Council’s functions and responsibilities under the RMA, particularly those to provide appropriate residential growth for future generations in Feilding.

Alternative Two: Proceed with Plan Change as Proposed

New site-specific provisions	
<p>Rezone the proposed area from Rural to Residential Zone. Create new Subdivision and Residential Zone chapters with specific provisions relating to Growth Precinct 4. Removal of the Rural Nodal zone on the Feilding locality plan in the District Plan. Inclusion of a Structure Plan (and supporting policies and rules) to guide development is also proposed. Reformat of the District Plan in its entirety to the structure introduced in PC46, including updating cross referencing and heading numbering and removing page number cross references. A new Part A and B is introduced to distinguish between those chapters that have been reviewed and those sections of the Operative District Plan that have not been reviewed yet as part of the sectional District Plan review. Changes to the Transport Chapter are also proposed to improve clarity and plan administration and to ensure consistency with Council’s Engineering Standards for Land Development.</p>	
Benefits	Costs
<ul style="list-style-type: none"> • Would rezone the last area identified for residential growth under the Feilding Framework Plan to provide for a variety of housing choice and needs in the town. • The rezoning ensures that correct zoning applies to the predominant future activity on the site, rather than a Rural Zone. • Enables development to occur in a manner that is integrated and well planned. • Ensures a high quality urban environment is created, recognising the size of the growth area and that growth will occur over many years. • Rezoning of this land recognises another growth option to provide a variety of housing choice and needs for Feilding, particularly as the area is relatively flat compared with Precinct’s 1-3 already in the District Plan. • Identifies growth while managing the effects of the Makino (Mangakino) Stream and stormwater for the site. 	<ul style="list-style-type: none"> • The costs of formulating and implementing new provisions for the Zone. • The costs of rezoning and preparing a plan change. • Costs associated with an increase in floor levels to mitigate stormwater ponding effects in extreme events. • Costs associated with developing infrastructure networks to service the new residential area of Feilding.

- Maximises yield while still achieving a high urban environment in the future.
- Introduces a consistent format to the entirety of the plan, improving readability and use.
- Introduces correct cross referencing. As it stands cross references throughout the plan are in most cases incorrect due to successive plan changes since the District Plan was originally made operative in 2002.
- Orders the plan so page numbering and headings are up to date.
- Includes cross referencing to Council's Engineering Standards for Land Development which provides greater certainty for plan users of the expectations and requirements Council has for future land development.
- Provides the community with clear expectations of how the area should be developed by the introduction of the Structure Plan for Growth Precinct 4.

Efficiency:

The benefits associated with this option outweigh the costs and therefore the plan change, as proposed, is the preferred option. PPC51 is considered to be an appropriate amendment to rezone the site and introduce specific provisions to ensure future development is integrated, creates a high urban environment for the future, manages the transition from rural activities to residential activities, recognises the site-specific issues relating to stormwater. The change in land use will ensure the wider Growth Precinct 4 area is developed in an integrated manner resulting in a high quality residential environment for the community, compared with the ad hoc development that is currently being experienced in the area. The new provisions will add efficiency as developers will have greater guidance for land development in the objectives and policies than what currently exists for the area.

Introducing the 2nd generation format to the entirety of the District Plan will improve readability for plan users, and will bring page numbering, heading numbers and cross referencing up to date. This will improve the efficiency of the plan as it will address time spent by plan users navigating the plan and following incorrect cross references. Updating provisions in the Transport section will also ensure consistency between Council's policy documents for land development.

Effectiveness:

The provisions of PPC51 are considered to be effective in enabling a change in land use for the site, while recognising the specific constraints of the site. Residential development through a rezoning and new provisions will reduce the need for resource consents which is currently occurring in the area as land is developed under the Rural Zone provisions. The provisions are also specific to

development of a residential environment and will ensure a high quality suburb of Feilding will result in the future as the area is fully developed.

The reformat of the plan will introduce consistency across the entire plan and update cross referencing, page and heading numbering to be up to date. This will improve readability and ensure the plan is effective in directing readers to current chapters/sections, objectives, rules and policies.

Opportunities for Economic Growth and Employment:

This option has a positive impact in terms of significant economic growth and employment. The change in land use will enable residential growth to support the predicted demand for Feilding. Combined with Growth Precincts 1 -3, this area will provide sufficient supply and choice for the foreseeable future. Residential development will also provide additional employment for the town.

Risk of acting or not acting if there is uncertain or insufficient information:

The risk of not acting is that the site could be developed in an ad hoc manner under the Rural Zone provisions whereby the focus of that zone is retaining the productive use of rural land. This would likely result in a piecemeal development lacking integration and connectivity. Rezoning this land also provides additional housing development choice for the town.

Council has information in the form of the various technical reports, that residential development is appropriate, and that effects of stormwater, flooding, and liquefaction can all be managed. The ways to manage these effects does require some costs however, this is considered to be a small cost in relation to the overall land and house package values expected in this area. These costs are likely to be less than developing in Growth Precincts 1-3 given the topography and need for infrastructure in those precincts.

The reformatting and updating changes are essentially administrative. The format introduced in PC46 was always intended to be introduced throughout the plan as the Sectional District Plan review was progressed. At some point during the sectional review it makes sense to introduce the same format throughout to improve readability. Council has received feedback from plan users that the plan format, cross referencing and page numbering is inconsistent. This part of PPC51 responds to this feedback. The proposed changes to Chapter 3B also ensures consistency between Council's key documents for land development and improves clarity and plan administration.

Overall, through the technical reports prepared and for the reasons above, it is considered that there is sufficient information to support this change.

Appropriateness:

The rezoning and new provisions are considered to be the most appropriate way to achieve the purpose of the Act and to fulfil Council's statutory obligation to ensure that a District Plan sustainably manages the natural and physical resources of the District.

Rezoning this land also assists in fulfilling Council's obligations under the NPSUD in ensuring Feilding has sufficient land supply for future residential development.

The updating of the District Plan structure and changes to Chapter 3B are considered an appropriate way to achieve the purpose of the Act as these changes will improve readability and

legibility of the District Plan for plan users, and consistency with key land development policies of Council.

5.7 Implementation of the Preferred Option: Objectives, Policies and Rules

Introduction

Section 32(1)(a) of the RMA requires an assessment of the extent to which each objective is the most appropriate to achieve the purpose of the Act. The RMA has an overarching purpose of sustainable management. The intention of this Plan Change is to ensure the District Plan is consistent with the purpose of the Act.

Under Section 32(1)(b) of the RMA the Council must examine whether, having regard to the efficiency and effectiveness, the policies, rules or other methods are the most appropriate to achieve the objectives of the plan change.

The level of detailed analysis undertaken for the evaluation of the proposed objectives and provisions has been determined by an assessment of the scale and significance of the proposed changes. In making this assessment regard has been had to the following:

- Whether the provisions are a significant variance from the existing baseline.
- Effects on matters of national importance.
- Adverse effects on those in the District with specific interest.
- Involve effects that have been considered implicitly or explicitly by higher order documents.
- Increased costs or restrictions on individuals, communities or businesses.

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5.8 Assessment of Proposed Objectives and Policies

Plan Change 51 seeks to introduce two new chapters with Objectives and Policies, update the structure of the District Plan and make some changes to Chapter 3B to improve plan use and administration. Unless otherwise stated the changes proposed do not change the provisions of the other Objectives and Policies of the Operative District Plan. The other provisions of the Operative District Plan are considered to remain appropriate at this point in the Sectional District Plan Review.

5.8.1 Assessment of Proposed Objectives and Policies – Subdivision Chapter

PCC51 seeks to introduce a new chapter for Subdivision in the District Plan for Growth Precinct 4. New objectives and policies have been proposed as follows:

Objective 1: To ensure subdivision and land development within Growth Precinct 4 achieves the following overall urban design outcomes:

- a. A well-integrated and coordinated development that creates strong connectivity between new and existing development.
- b. Connectivity with existing infrastructure and transportation networks is achieved taking into account infrastructure capacity and requirements to upgrade capacity to meet future demands.
- c. Subdivision design that recognises and responds to the topographical and physical features of the land, including waterbodies.
- d. A range of residential densities.
- e. Efficient utility services are provided including roading, reticulated wastewater, water supply, stormwater networks and power and telecommunication networks.
- f. Neighbourhood focal points which provide meeting points within the precinct.
- g. Open space networks that comprise stormwater attenuation networks, a range of recreation opportunities, and stream side esplanade reserves.
- h. Areas identified as high risk for flooding and stormwater overland flow paths and ponding hazards are avoided or managed to minimise the risk of damage to property or human life.

Objective 2: To ensure subdivision and development within Growth Precinct 4 achieves an attractive and sustainable urban neighbourhood.

Objective 3: To ensure development of Growth Precinct 4 manages the potential risk to people and buildings from natural hazards.

Objective 4: To enable the development of Growth Precinct 4 in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1 and where development delivers an integrated infrastructure network for the entire site.

PPC51 proposes four new objectives to specifically address subdivision within Growth Precinct 4.

Objective 1 outlines the key outcomes any subdivision within the Growth Precinct is to achieve. This objective is modelled on existing provisions in the District Plan, with changes to reflect the new structure of the Sectional District Plan Review.

The objective ensures that the key factors for future subdivision are carefully managed and designed to create a high quality integrated development for the future.

Objective 1 is enabling and provides clear outcome statements for what development in this precinct is to achieve. A key focus is well integrated and coordinated development, responding to the site characteristics, connectivity with existing infrastructure, providing focal points and an open space network for future generations. It also seeks to ensure hazards areas are appropriately managed to reduce future risk.

Objective 2 seeks to ensure development within Growth Precinct 4 achieves an attractive and sustainable neighbourhood. Similar to Objective 1, a planned and integrated development is key to achieving this objective. The Structure Plan which is part of the proposed changes outlines how the development can achieve an attractive and sustainable neighbourhood through key connections and integration. An objective that seeks to achieve a sustainable neighbourhood is an appropriate response to giving effect to the requirements of Part 2 of the Act.

Objective 3 is specific to managing the potential risks from natural hazards within Growth Precinct 4. This is informed by the technical reports prepared as part of this Plan Change and is necessary to ensure risk is appropriately managed. By managing this risk of natural hazards, specifically lateral spread and flooding, the community can enjoy a safe and attractive residential area and avoids the wider costs to the community from hazards. This also gives effect to the directions contained within Horizons Regional Council's One Plan.

Objective 4 focuses on ensuring an integrated infrastructure network for Growth Precinct 4. This includes services as specified in the GHD report that supports the Plan Change and for integrated transport networks to ensure strong connectivity for vehicles, walking and cycling. Many of the recent developments near the site have involved cul-de-sacs, with little thought to overall development within this area of Feilding, the resulting residential neighbourhood and how people will move around the wider area in the future. This objective is also complementary to the provisions introduced in Plan Change 55.

Collectively these objectives provide an effective and efficient platform for achieving the purpose of the Act. Key constraints for Growth Precinct 4 have been identified and can be managed, thereby allowing for residential growth within Feilding. The above objectives are considered to be fit for purpose recognising that they provide for development only within Growth Precinct 4. Therefore, the four objectives are considered to give effect to Part 2 of the Act.

Objective 1: To ensure subdivision and land development within Growth Precinct 4 achieves the following overall urban design outcomes:

- a. A well-integrated and coordinated development that creates strong connectivity between new and existing development.
- b. Connectivity with existing infrastructure and transportation networks is achieved taking into account infrastructure capacity and requirements to upgrade capacity to meet future demands.
- c. Subdivision design that recognises and responds to the topographical and physical features of the land, including waterbodies.
- d. A range of residential densities.
- e. Efficient utility services are provided including roading, reticulated wastewater, water supply, stormwater networks and power and telecommunication networks

- f. Neighbourhood focal points which provide meeting points within the precinct.
- g. Open space networks that comprise stormwater attenuation networks, a range of recreation opportunities, and stream side esplanade reserves.
- h. Areas identified as high risk for flooding and stormwater overland flow paths and ponding hazards are avoided or managed to minimise the risk of damage to property or human life.

- Policies**
- 1.1 Subdivision and development within Growth Precinct 4 is guided by a structure plan that identifies:
 - a. Key transportation connections.
 - b. Open Space and recreational opportunities.
 - c. Shared pathways, including cycleways and walkways.
 - d. Hazard areas, including overland flow paths.
 - 1.2 To ensure all proposed lots are designed to achieve good urban design outcomes with connected outdoor living spaces, sunlight to habitable rooms, and onsite privacy.
 - 1.3 To control intensive residential subdivision and development of land.
 - 1.4 To avoid fragmented patterns of subdivision and development that is inconsistent with the integrated planned development shown in Growth Precinct 4 Structure Plan in Appendix 8.1.
 - 1.5 To ensure that any staged subdivision and development enables overall connectivity within and beyond Growth Precinct 4 in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

The above policies all seek to achieve proposed Objective 1. Collectively they are considered to be efficient and effective to meet Objective 1 by ensuring that development is efficient, avoiding intensive land development where land is subject to natural hazards, avoiding the fragmentation of development so that integrated development is achieved, and ensuring overall connectivity is achieved.

The proposed policies provide specific direction for subdivision, and seeks to achieve a high quality, integrated residential area for Feilding in the future. These policies will also ensure development is consistent with the Structure Plan, which will achieve connectivity and easy wayfinding for the community in the future.

Benefits & Costs

The proposed Policies are necessary to achieve Objective 1 and ensure a high quality of residential development within Growth Precinct 4 in the future. The proposed policies are similar to existing District Plan provisions and are unlikely to generate additional costs for development. The benefits of these policies are that they establish a framework for managing development recognising that the site is large in size and will ultimately be developed over time. Achieving the Structure Plan will result in good urban connectivity and integration with the existing roading network nearby. Development consistent with these policies will achieve an overall urban form that is similar to the wider area of Feilding.

The costs associated with these policies relates to how subdivision and development is planned and undertaken. Overall the balance between benefits and costs is appropriate given the importance of this site to facilitate residential growth in Feilding for the next 20-30 years.

Risk

Sufficient information exists to make the proposed changes which are also an evolution of the operative District Plan approach. The changes are generally enabling in nature and have the purpose of clarifying the direction for the development of the Growth Precinct 4 with regards to subdivision. The risk of hazards is known and can be managed under these provisions.

Alignment with Objective 1

The proposed policies are closely aligned with the intent to enable the sustainable use and development of Growth Precinct 4, while recognising the need for holistic planning to achieve future integration and connectivity. The approach above is considered consistent with achieving the outcomes sought by Objective 1.

Objective 2: To ensure subdivision and development within Growth Precinct 4 achieves an attractive and sustainable urban neighbourhood.

Policies

- 2.1 To require subdivision design to implement the Growth Precinct 4 Structure Plan in Appendix 8.1.
- 2.2 To require the integration of new development with the surrounding environment, whereby lots including those to vest as roads, are positioned to create a logical extension of existing urban areas.
- 2.3 To require that all development is undertaken in a comprehensive manner consistent with a Comprehensive Development Plan where stages are clearly identified and connectivity is shown.

- 2.4 To ensure block layouts within the subdivision proposal have road frontage and rear lots are discouraged.
- 2.5 To avoid the use of cul-de-sacs to enable a high level of accessibility and connectivity in the local street network.
- 2.6 To encourage subdivision designs which create a neighbourhood identity using positive characteristics of established areas reflecting cultural, heritage and natural values of the site and surrounding areas.
- 2.7 To require all power and telecommunication infrastructure to be underground.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

The above policies all seek to achieve proposed Objective 2. Collectively they are considered to be efficient and effective to meet Objective 2 by ensuring residential development over time achieves an attractive and sustainable urban neighbourhood for Feilding. Of key importance to achieve this is the preparation of a Comprehensive Development Plan which requires development and subdivision to demonstrate how the proposal has been designed in general accordance with the structure plan and achieves the matters set out in these policies. Specific reference is made to the integration and connectivity of the whole site whereby the Comprehensive Development Plan must consider linkages over existing property boundaries so that the site avoids multiple cul-de-sacs. While the site is flat there are known historical values of the area and these provisions seek to recognise this.

The requirement for power and telecommunication infrastructure to be underground is consistent with the Council's Engineering Standards which require all services in Residential areas to be underground. This policy ensures efficiency is achieved between Council's strategic documents creating consistency for Plan Users.

Benefits & Costs

The proposed provisions are not that dissimilar from provisions that were introduced for Growth Precincts 1-3 in the District Plan. The benefits of these policies is that development and subdivision of Growth Precinct 4 results in a high quality, attractive and sustainable neighbourhood for Feilding. The provisions have been designed recognising that this site is expected to be fully developed in 2038. The ability for Comprehensive Development Plans to show how different developments at site boundaries are to connect with the next lot will enable a greater level of wayfinding and connectivity than what has been achieved most recently.

The costs associated with these policies relates to ensuring development of a site is not done in isolation of other neighbouring sites. Implementation of these policies may reduce total yield for existing sites to achieve improved roading integration, but this will ultimately produce a residential neighbourhood that has high residential amenity and delivers and integrated and sustainable development.

Risk

Sufficient information exists to make the proposed changes and ensure that they enable a development framework within Growth Precinct 4 that seeks to manage key issues and potential effects from development. Many of the themes contained in these policies were introduced into the District Plan for Growth Precincts 1-3. The inclusion of the requirement for a Comprehensive Development Plan is to reduce the occurrence of poorly planned development that has occurred in Feilding in recent years, and clearly states the expectations of Council for the future. Overall it is considered that Council has sufficient information to propose these changes.

Alignment with Objective 2

The proposed policies are closely aligned to enable the sustainable use and development of Growth Precinct 4. This approach is considered to be consistent with achieving the outcomes identified in Objective 2, and ultimately Part 2 of the Act.

Objective 3: To ensure development of Growth Precinct 4 manages the potential risk to people and buildings from natural hazards.

Policies

- 3.1 To ensure subdivision in hazards areas is undertaken in a manner to manage natural hazard risk.
- 3.2 To require the mitigation of residual risk of inundation outside of flood hazard areas through subdivision design layout.
- 3.3 To ensure development within overland flow paths shown in Appendix 8.2 are managed in an integrated manner recognising the wider development context of Growth Precinct 4 development.
- 3.4 To encourage low impact stormwater design by ensuring adequate pervious surface is available for every residential lot in the subdivision, taking into consideration built and hard surfaces.
- 3.5 To ensure that any stormwater management measures and earthworks are in place and approved to Council's engineering standards at the time of subdivision, with ongoing controls to protect the integrity of stormwater management measures of adjoining landowners.
- 3.6 To ensure that the water supply within Growth Precinct 4 has sufficient capacity and pressure to meet the needs of all development including New Zealand Fire Service requirements
- 3.7 To ensure stormwater risk is mitigated by requiring minimum floor levels for buildings.

3.8 To require an integrated approach to stormwater management that recognises the capacity of existing systems and overland flow paths within Growth Precinct 4.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

The above policies all seek to achieve proposed Objective 3 and are considered to be efficient and effective to enable the future residential use of the site, while managing any potential adverse effects. Technical reports supporting the plan change have identified some risk from natural hazards, but that all risks can be appropriately managed. The policies identified above are considered to be appropriate recognising that development is already occurring in this area and needs to be better managed. Identifying how to manage risk in these policies sends a clear signal to Plan users the Council expectations. These policies also achieve Council's requirements to effectively manage risk. Collectively these policies are considered to be an effective and efficient approach to achieving Objective 3.

Benefits & Costs

The benefit of these policies is that they establish a policy framework for managing development in an area of Feilding that is already growing. Technical reports have identified potential hazards, such as lateral spread and stormwater overland flow paths, and that these can be managed such that development for residential purposes is appropriate. How to manage these risks is identified in the above policies, which ultimately seek to achieve Objective 3.

The cost of these policies is that no build areas are required near the Makino (Mangakino) Stream. These have been included within the proposed open space areas on the Growth Precinct 4 Structure Plan as a way to maximise potential residential yield. While the key connector roads have been designed to manage stormwater and overland flow (by providing the necessary infrastructure), there remains a need to have minimum floor levels as well to manage the residual risk in these areas. This will inevitably increase the cost of development in this Growth Precinct. However, this is a common approach for similar areas throughout the country, including within the neighbouring Palmerston North City. It is anticipated that the costs of development in Growth Precinct 4 will be slightly less than for Growth Precincts 1-3 where land topography is undulating requiring more earthworks to manage risks in that location. The market has recently shown a greater level of development in and around Growth Precinct 4 compared with Growth Precincts 1-3. Council has also planned for the continued growth in Growth Precinct 4 through the Development Contributions Policy, Infrastructure Strategy and Long Term Plan.

Overall the benefits are considered to outweigh the costs. The costs of development in this area are considered to be relatively minor while the benefits of enabling additional land within Feilding to be rezoned for residential use has high benefit in terms of housing choice for the Feilding community.

Risk

The technical reports prepared for this Plan Change identify potential risks to be managed. Stormwater is critical to manage in this area, and the policies send clear direction to Plan Users for how to manage and plan for this in Growth Precinct 4. Managing overland flow paths, requiring low impact stormwater designs and introducing minimum floor levels will reduce the risk of stormwater hazard. These policies are necessary to ensure those risks are appropriately managed to enable residential development. Council has sufficient information to introduce the proposed policies.

Alignment with Objective 3

The proposed policies are necessary to give effect to Objective to 3 by ensuring the potential risks to future buildings from natural hazards are managed appropriately.

Objective 4: To enable the development of Growth Precinct 4 in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1 and where development delivers an integrated infrastructure network for the entire site.

Policies

- 4.1 To ensure the integration of essential infrastructure into the existing Feilding network creating an efficient and orderly development within urban areas.
- 4.2 To ensure that infrastructure and services to Growth Precinct 4 are provided in a way that enables or facilitates future development opportunities while recognising the capacity of existing systems.
- 4.3 To ensure subdivision and development contributes to and does not undermine the integrated and comprehensive spatial layout for Growth Precinct 4.
- 4.4 To restrict subdivision and development within Growth Precinct 4 until essential infrastructure is in place and of sufficient capacity to service the subdivision.
- 4.5 To ensure all road design is consistent with form, function and amenity of roads, including provision for vehicles, walking and cycling, consistent with requirements in Chapter 3B – Transport.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk**Efficiency and Effectiveness**

The above policies all seek to achieve proposed Objective 4. Collectively they are considered to be efficient and effective to meet Objective 4 by ensuring an integrated approach to essential infrastructure (including Council reticulated sewage and water, stormwater and power and telecommunication networks). The policies seek to ensure an effective and efficient approach to development of Growth Precinct 4 recognising that the area is expected to be developed by 2038. Subdivision needs to enable and facilitate

future development while at the same time recognising the existing capacity of Council's infrastructure.

The Growth Precinct 4 Structure Plan has identified an integrated and comprehensive spatial layout for the wider site and these policies will ensure development is efficient in achieving the desired outcomes. This includes a logical and connected roading network for this growth area, that builds on the network layout of the wider Feilding grid-like roading pattern.

Benefits & Costs

The proposed provisions are not that dissimilar from provisions that were introduced for Growth Precincts 1-3. The benefits of these policies is that future development will achieve a high quality residential environment with an integrated infrastructure network for the future. There will also be a roading network that avoids cul-de-sacs and enables greater way finding for network users. The costs associated with these policies relates to development being in general accordance with the Structure Plan and areas developed in a way that achieves a logical and timely extension of existing Council infrastructure. The Development Contributions Policy development by Council further expands on the costs of new residential development, particularly the ability to enter into agreements with Council over infrastructure development.

Risk

Sufficient information exists through the commissioning of various technical reports and the Precinct 4 Structure Plan Report to make the proposed changes. Structure Plans have already been introduced into the District Plan for Growth Precincts 1-3. The provisions also complement the new provisions introduced into the District Plan in Chapter 3 as part of the Plan Change 55 process relating to transportation matters. Overall it is considered that Council has sufficient information to propose these changes.

Alignment with Objective 4

The proposed policies are closely aligned to enable the sustainable use and development of Growth Precinct 4. This approach is considered to be consistent with achieving the outcomes identified in Objective 4, and ultimately Part 2 of the Act.

5.8.2 Assessment of Proposed Objectives and Policies – Residential Zone Chapter

PPC51 introduces a new residential zone chapter and objectives and policies specifically for Growth Precinct 4 as follows:

Objective 1: To maintain or enhance the mixed residential character and amenity of Feilding's Residential Zone, including the neighbourhood amenities for its residents.

Objective 2: To promote development within Growth Precinct 4 that creates an attractive, healthy and safe place to live.

Objective 3: To control the effects of commercial and non-residential activities on the character and amenity of the residential environment within Growth Precinct 4.

Objective 4: To ensure that any multi-unit residential development and retirement living achieves high quality residential amenity.

Objectives 1, 2 and 3 all recognise the importance of growth in the residential area and ensures that development does not impede on residential amenity or the roading network.

Feilding has a mix of residential character and amenity with very few areas demonstrating a particular 'era' or type of house typology. This mix of section sizes and housing types is encouraged by Objective 1.

Objective 2 seeks to ensure that development creates an attractive place to live. One of the situations this Objective is trying to avoid is where houses are behind continuous rows of high fencing or long blank walls that destroy the community and open space feel of the area, compared with many other parts of Feilding. Council seeks to create a healthy and safe place for Feilding's residents to live. This includes having open spaces to enjoy passive and active recreation.

Council has completed economic assessments which have determined there is sufficient space for commercial and non-residential activities in other areas of Feilding. The continued focus for Growth Precinct 4 has been to provide choice for residential development predominately. Any non-residential development needs to be carefully managed to there are no adverse effects on the residential environment.

To enable different types of residential demand, and changing approaches to residential living, the Plan Change is proposing to plan for high density residential development. While this is usually close to the business/commercial heart of towns, Objective 4 seeks to ensure that any high density development is carefully managed so that high quality residential amenity is achieved. Poorly designed higher density development can result in a lack of privacy and sunlight for residents. Council does not want to see this result in Growth Precinct 4.

Overall, the objectives are fit for purpose and provide an effective and efficient platform for achieving the purpose of the Act.

Objective 1: To maintain or enhance the mixed residential character and amenity of Feilding's Residential Zone, including the neighbourhood amenities for its residents.

Policies

- 1.1 To maintain the low density residential development pattern of Feilding.
- 1.2 To achieve a high quality residential streetscape environment through providing for trees on berms and in public areas, and room for planting on residential lots.
- 1.3 To ensure all residential lots have adequate access to sunlight for homes and outdoor living areas without prolonged shading from buildings and structures.

1.4 To ensure vehicle parking is provided onsite, to minimise on street parking in residential areas.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

The above policies all seek to achieve proposed Objective 1. Collectively they are considered to be efficient and effective to meet Objective 1 by ensuring that development is efficient, meets housing needs and choice, recognises the need for high residential amenity, and onsite parking. The proposed policies provide direction as to the purpose of the Residential Zone for the Growth Precinct 4, and to ensure a high quality, integrated development results in the future.

The policies not only seek to continue the predominate residential patterns within Feilding, but also the largely green berms and planting that already occurs along the older streets of Feilding. This coupled with ensuring future homes have adequate sunlight and outdoor living areas will achieve a high level of amenity for future residents.

Overall these policies are considered to be an efficient and effective means to achieve Objective 1.

Benefits & Costs

The benefit of these policies is that they establish a clear framework for ensuring the existing mix of character and amenity within Feilding continues within this new Growth Precinct. Feilding's character is predominately made up of larger lots, with good quality outdoor spaces and sunlight for all homes. These policies are not considered to be dissimilar from existing provisions in the District Plan. Therefore, the costs associated with these policies are not anticipated to be different from development elsewhere in Feilding.

Risk

Sufficient information exists to make the proposed changes which are also an evolution of the operative District Plan approach and recent changes that have been introduced as part of the Sectional District Plan Review. The changes are generally enabling in nature and have the purpose of clarifying the direction for the development of the Growth Precinct 4 within the Residential Zone to ensure a high quality residential environment is created.

Alignment with Objective 1

The proposed policies are closely aligned with the intent to enable the sustainable use and development of the proposed Growth Precinct 4, while recognising the unique characteristics of the site, particularly the high amenity of the surrounding area. The approach above is considered consistent with achieving the outcomes sought by Objective 1.

Objective 2: To promote development within Growth Precinct 4 that creates an attractive, healthy and safe place to live.

Policies

- 2.1 To enable development in general accordance with the Growth Precinct 4 Structure Plan (Map 8.1).
- 2.2 To minimise adverse visual effects on adjoining residential properties through controls on the height and scale of buildings.
- 2.3 To encourage an active street frontage through design controls for new dwellings, garages and fencing, whereby garages do not dominate the streetscape.
- 2.4 To ensure buildings and structures in Growth Precinct 4 are located and designed to manage the risk of natural hazards.
- 2.5 To require development to provide appropriate permeable surface areas to minimise the effects of stormwater flooding.
- 2.6 To encourage good connectivity within and between new and existing residential areas that enables future staged development of adjoining land.
- 2.7 To ensure subdivision and development provides for sustainable and efficient connectivity within Growth Precinct 4 that enables people to easily and effectively move around by driving, walking and cycling.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

Objective 2 and its associated policies establish the core outcomes in regarding to residential character and amenity for Growth Precinct 4. The policies are aimed primarily at general residential amenity and protection against natural hazards.

The proposed policies establish specific direction for the development of Growth Precinct 4. New policy direction incorporates streetscape and neighbourhood character impacts. The amended approach introduces amenity standards that will be important for future development, particularly in regard to achieving the desired high quality urban environment sought by Council.

The policies also seek to manage the amount of land that is built on as a way to manage stormwater and enable low impact stormwater design solutions for Growth Precinct 4. Including clear policy guidance for ensuring development creates high connectivity will achieve an efficient and effective future suburb of Feilding.

Collectively these policies are considered to be effective in achieving Objective 2.

Benefits & Costs

The proposed policies enhance the other provisions of the Residential Zone. The benefit will be a future high quality urban environment that recognises and expands on the pattern of development in the wider Feilding residential areas. The provisions will require careful design of some lots but are unlikely to result in greater costs than

typically experienced for greenfield or brownfield sites. Some additional costs are likely required to manage the risk of natural hazards; however this is a widely accepted approach by Councils through the revision of District Plans.

Risk

Sufficient information exists to make the proposed changes. Some provisions are similar to the subdivision chapter proposals. This is to mitigate the risk of development occurring without a subdivision consent being sought. For instance, multiple houses on a single large lot. The policies are enabling in nature and seek to ensure a high quality residential environment is achieved over the period of time that this site will be developed.

Alignment with Objective 2

The purpose of the policies is to ensure the overall development and use of Growth Precinct 4 achieves a high quality streetscape and neighbourhood character. Therefore the provisions are considered to align with and give effect to Objective 2.

Objective 3: To control the effects of commercial and non-residential activities on the character and amenity of the residential environment within Growth Precinct 4.

Policies

- 3.1 To restrict commercial and non-residential activities in the Residential Zone which are unsightly or otherwise detract from the amenity values and ambience of the Residential Zone.
- 3.2 To control the effects of the scale and character of commercial and non-residential activities and buildings within the Residential Zone.
- 3.3 To avoid the establishment of activities which create adverse effects on the amenity and ambience of the residential environment.
- 3.4 To ensure outdoor storage spaces are screened from public viewpoints.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

The predominant use of Growth Precinct 4 is for residential purposes. The Economic Report prepared for this Plan Change identified that Feilding has sufficient commercial zoning and that this area could sustain a small cluster of shops (like a corner diary). There are already these facilities near the Growth Precinct on North Street. The intention of the area is to provide choice and capacity for residential use with the area not expected to be fully developed until 2038.

Any non-residential activity would need to be carefully managed to ensure adverse effects of the scale and character of those activities did not create adverse effects on amenity and ambience of the Residential Zone. For instance, long hours of operation that resulted in a noisy activity next to houses that could affect night time sleeping, or areas of outdoor storage that detracts from the residential amenity of planting and typically single story homes.

These policies are an efficient and effective way to restrict and manage the development of commercial and non-residential activities occurring in this area.

Benefits & Costs

The benefit of these policies is that the Plan User has the clear expectation that this area is for residential purposes and that any commercial or residential use must avoid adverse effects on residential uses. Should a commercial or non-residential use want to develop in this area then the costs will be higher, compared with the Business Zones whereby these activities would be permitted.

Risk

Council has sufficient information with which to act through the outcomes of the economic report. The purpose of rezoning this land is for residential uses. Council does not want to encourage commercial activities outside of the Business Zones as this could displace those types of activities which can often conflict with residential uses. These policies establish a clear framework which is appropriate for a residential area.

Alignment with Objective 3

The proposed policies are necessary to identify what matters should be controlled to give effect to Objective 3. They seek to protect the intention of this rezoning, which is to enable and provide additional choice and location for future residential use in Feilding. Overall the policies are considered appropriate and align with Objective 3.

Objective 4: To ensure that any multi-unit residential development and retirement living achieves high quality residential amenity.

Policies

- 4.1 To encourage comprehensively designed higher density development that is attractive to residents, responsive to housing demands, achieves high quality urban design and onsite amenity, is integrated and sympathetic with the amenity of the surrounding residential area and provides a positive contribution to Growth Precinct 4.
- 4.2 To ensure dwellings have living areas that are located and orientated to optimise sun exposure, natural lighting and views to public spaces.
- 4.3 To avoid habitable rooms that face south only.
- 4.4 To require private and public areas to be differentiated and defined, while ensuring buildings retain reasonable visual privacy and daylighting for all adjacent residential units and properties.
- 4.5 To ensure higher density development incorporates open space and landscaping that is well planned and designed to deliver high levels of residential amenity and well located, good quality open spaces.
- 4.6 To ensure individual units or multi units on a site are clearly expressed and entrances are signalled and readily visible from the street or entranceways.

Evaluation of Efficiency and Effectiveness Taking Account of Benefits, Costs and Risk

Efficiency and Effectiveness

As this plan change is to enable residential development until 2038 (or beyond) it is important that the District Plan provides for alternative types of development, such as higher density. There are many examples around New Zealand where higher density development has not successfully achieved good urban living outcomes. These policies seek to ensure this does not happen in Growth Precinct 4.

These provisions provide additional land development choices for the future that are currently not offered in the same way in the Operative District Plan. These policies are considered to be an efficient and effective way to enable higher density development and give effect to Objective 4.

Benefits & Costs

The benefits are that higher density development is clearly enabled in Growth Precinct 4 compared with other areas within Feilding. The costs are that a careful design of these types of developments is required in order to achieve a high quality residential environment for the future.

The higher density provisions are not considered to be a traditional affordable housing solution. However, the proposed rules do enable different housing types and price points for the market to use. It is up to developers to provide for affordable housing as enabled by the rules in the District Plan. As Council is not a landowner, nor intends to be a developer, there are limitations on ensuring affordable housing is achieved in this location. It is also noted that in 2008 Council transferred the ownership and management of its 208 Housing for the Elderly and Disabled Units to the Manawatu Community Trust. This reflects Council's position that they are not a developer of affordable housing.

Risk

Council has the ability to enable a different type of development for the future than what the Operative District Plan currently provides. The provisions are similar to the approaches undertaken by other Councils throughout New Zealand. Therefore, the risk associated with these provisions is considered to be low. It is important that Council provides for additional choices for future residential development, should the community desire this type of development.

Alignment with Objective 4

These policies seek to ensure that higher density development achieves a high quality residential amenity and therefore is aligned to the provisions of Objective 4.

5.8.3 Assessment of Proposed Rules – Subdivision Chapter

Key Provisions	Permitted Activity Standards
<p>Restricted Discretionary Activity Rule 8.4.1</p>	<p>The following activity is a Restricted Discretionary Activity in respect to subdivision:</p> <p>a. Any subdivision of land within the areas shown within the Growth Precinct 4 Structure Plan in Appendix 8.1.</p> <p>For this activity, the Council has restricted its discretion to considering the following matters:</p> <ul style="list-style-type: none"> ○ The size, shape and arrangement of lots in relation to road frontages, and location of proposed boundaries. ○ Provision of water supply and disposal of water, wastewater and stormwater where the design and capacity of any reticulated systems reflect the new and anticipated future demand and requirements. ○ The number, location and formation of vehicle crossings. ○ The provision of connected street network, with appropriate use of street hierarchy and design type, including the width, length, drainage and formation of access. ○ Suitability of proposed lots for subsequent buildings and future use. ○ Design and layout of the subdivision, as outlined in the Comprehensive Development Plan submitted as part of the application. ○ Provision of a network of cycleways and walkways to the extent that these service the subdivision and wider Growth Precinct 4 and wider Feilding Residential Area. ○ Avoidance or mitigation of flood and stormwater hazards, including the assessment of the level of flood hazard risk and what mitigation measures are required such as setback distances, minimum floor levels or specified building platforms. ○ The provision of open space networks. ○ How the subdivision provides for a building platform and land free from hazard risks while also achieving a permeable surface for all lots.

	<ul style="list-style-type: none"> ○ Effects on the capacity of Council infrastructure. ○ Staging and timing of subdivision development including the provision of infrastructure. ○ Positive effects of subdivision. <p>Performance Standards</p> <p>a. Lot Size</p> <ul style="list-style-type: none"> i. Any subdivision must comply with an average lot size of 600m². ii. Any subdivision must ensure lot sizes are sufficient in size to achieve site coverage, outdoor space and permeable surface area requirements for the Residential Zone in Rule 15.4.2. <p>b. Access and Road Design</p> <ul style="list-style-type: none"> i. Access and Road Design and construction must comply with Council Engineering Standards for Land Development. Common access to eight or more lots must be provided by road formed to Council standards. ii. Access must comply with the provisions in Rule 3B.4.2 and 3B.4.3. iii. Roads must comply with the design requirements of Appendix 3B.2 Road Cross Sections. <p>c. Shape Factor</p> <p>Each residential lot must be capable of containing an 18m diameter circle.</p> <p>d. Comprehensive Development Plan</p> <p>Any development and subdivision must have a Comprehensive Development Plan that demonstrates how the proposal has been designed in general accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1. The Comprehensive Development Plan must demonstrate how the proposal:</p> <ul style="list-style-type: none"> i. addresses and ensures that design, layout and servicing is in accordance with the Structure Plan in Appendix 8.1 and does not restrict future development opportunities within the area.
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	<ul style="list-style-type: none"> ii. demonstrates a connected internal roading network that facilitates movement demands within the area while also providing a block structure that supports a high quality urban environment. iii. shows the location, width and design of publicly accessible roads, laneways and accessways having regard to vehicles, public transport, pedestrians and cyclists that are intended to use them. iv. outlines the servicing required for the development, and ensures suitable sizing of infrastructure to service the wider Growth Precinct. v. includes a spatial layout plan showing how the development achieves connectivity and integration to the surrounding area. vi. identifies the location and shape of publicly accessible open space areas, and provides indicative landscape concepts recognising the historical values of the area. vii. Identifies the location of natural watercourses and overland flow path and how these will be managed or enhanced. viii. provides clear reference to: <ul style="list-style-type: none"> a. The objectives and policies of the Zone b. Current and anticipated future built form and uses c. Anticipated future capacity of the activity area d. Relationships and connections within Growth Precinct 4. <p>e. Earthworks</p> <ul style="list-style-type: none"> i. All subdivisions must comply with the provisions in Rules 3D.4.1 and 3D.4.2. ii. Existing overland flow paths are maintained and not filled in, dammed or diverted. <p>Guidance Note: Earthworks, damming and diversion are also regulated by the Manawatu-Wanganui Regional Council and a resource consent maybe required under the rules of the One Plan.</p> <p>f. Minimum Floor Levels</p>
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	<p>Building platforms must be identified which are at or above the flood level predicted for a 0.5% annual exceedance probability (AEP) (1 in 200 year) flood event.</p> <p>Guidance Note: Council has a model for stormwater that can be used to predict flood levels for areas within Growth Precinct 4. Liaison with Council’s Land Development Manager is recommended.</p> <p>g. Infrastructure</p> <ul style="list-style-type: none"> i. All cables and pipes, including for gas, power and telecommunications must be placed underground. ii. All essential infrastructure must be available for connection within 30 metres of the nearest point of the land being subdivided. iii. Any subdivision must be connected to reticulated services and be designed and constructed to comply with Council Engineering Standards for Land Development. iv. All new essential infrastructure proposed in a subdivision must be located within road reserve and vested in Council. v. Development must only occur in areas where essential infrastructure is available and of sufficient capacity for the subdivision. <p>Guidance Note: In situations where development is proposed ahead of Council infrastructure investment, Council may enter into agreements with land owners as outlined in the Council Development Contributions Policy around the provision of essential infrastructure.</p> <p>In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of the Subdivision Chapter and the Residential Zone, assess any application within Growth Precinct 4 in terms of the following assessment criteria:</p> <ul style="list-style-type: none"> i. Whether the subdivision design and layout compliments the diverse character and amenity values of Feilding’s residential area. ii. The extent to which the subdivision is designed to provide for the future development of adjoining sites, in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1.
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- iii. How the proposed development and subdivision relates and connects to adjoining sites and areas and whether it enables future staged development and or subdivision of adjoining lots by giving effect to the Growth Precinct 4 Structure Plan in Appendix 8.1.
- iv. The extent to which deviations from the Growth Precinct 4 structure plan will result in an alternative coordinated, comprehensive outcome that will satisfy the objectives and policies for Growth Precinct 4.
- v. The extent to which the proposed layout takes into consideration the shape, orientation and aspects of lots, to create building sites and outdoor amenity areas which have a northward orientation and ability for passive solar gain.
- vi. The extent to which the lot layout will allow new buildings to retain reasonable visual privacy and sunlight.
- vii. The extent to which all lots within the subdivision have safe and adequate vehicle access, taking into account the requirements of the access performance standards of Rules 3B.4.2 and 3B.4.3.
- viii. The extent to which natural hazards are avoided or mitigated.
- ix. The degree to which the subdivision design mitigates any likely increases in peak stormwater run-off and peak stormwater flow.
- x. The consistency of the proposed subdivision with relevant subdivision engineering requirements.
- xi. The extent to which stormwater effects are managed, including overland flow paths.
- xii. The extent to which minimum floor levels are assessed and provided for.
- xiii. The extent to which subdivision design and layout gives effect to the Growth Precinct 4 Structure Plan in Appendix 8.1.
- xiv. The degree to which the subdivision provides for the integration of essential infrastructure into the existing Council network in a manner which is orderly, timely and efficient and that facilitates future development and capacity requirements.
- xv. The extent to which Council has the ability to maintain and access infrastructure and services in the future.

	<p>Guidance Notes:</p> <ol style="list-style-type: none"> 1. Earthworks, damming and diversion are also regulated by the Manawatu-Wanganui Regional Council and a resource consent maybe required under the rules of the One Plan. 2. The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (2011) also applies to subdivision and a consent may be required under those provisions. 3. The provisions of the National Environmental Standard for Telecommunications Facilities (2008) apply and resource consent may be required under those Standards. In the event of a conflict between them the provisions of the National Environmental Standard override the District Plan.
<p>Alignment with Objectives</p>	
<p>Purpose: Managing future subdivision is essential to ensuring Growth Precinct 4 is developed in an integrated manner, ensuring good urban design and landscape requirements to result in a high quality residential environment in the future.</p> <p>Key changes in the Rule, compared with existing subdivision provisions, are requiring:</p> <ul style="list-style-type: none"> • an average lot size of 600m². This is considered appropriate to recognise the constraints of this site relating to stormwater management. • the preparation of a Comprehensive Development Plan that demonstrates how the proposal has been designed in accordance with the Structure Plan. This plan is similar to what is required in the Council’s Engineering Standards for Land Development (adopted by Council in 2017). • A minimum floor level. This is informed by the Stormwater Model Council has developed to identify minimum floor levels for this area of Feilding. This provides landowners with certainty for mitigating the risk of flooding and ponding in the area. <p>These new provisions are necessary to manage the constraints of the site and ensure a high quality residential environment results in the future, consistent with Objectives 1, 2, 3 and 4.</p> <p>Benefits and Costs: The introduction of an average lot size is appropriate given the constraints of the site and the intent to provide landowners with the opportunity to provide flexibility for how land could be developed in the future. Lot sizes in nodal areas are 4000m². Under this proposal an average of 600m² is proposed which enables a greater yield. This also enables a change in housing choice for residents.</p> <p>While changing the zoning and enabling residential uses does see a small loss of productive soils in this location , the proposal is part of the planned and considered growth for</p>	

Feilding. This was shown by the Framework Plan and is consistent with the One Plan policy direction.

The other provisions seek to implement the objectives and policies of the chapter to achieve a high quality residential environment, where site constraints are appropriately managed. Requiring a minimum floor level seeks to mitigate the risk of stormwater flooding and ponding. This is required by Section 106 of the Act. While this may add costs to development, the benefits of mitigating this risk are considered to outweigh the costs.

The Plan Change proposes that all subdivision is a Restricted Discretionary Activity, rather than Controlled Activity which is currently in the District Plan for other parts of Feilding. The reason for this is that it enables Council to better work with landowners and developers to achieve a high quality residential environment in the future. Where subdivisions are proposed that do not achieve the urban design outcomes as outlined in the relevant Objectives and Policies, Council does have the ability to refuse an application. It is Council's intention to work with landowners and developers wherever possible.

With regards to reverse sensitivity, especially in relation to the Feilding High School, this is not expected as a result of this plan change. Land to the south east is already zoned Residential (as is the school itself). The School has consent from Horizons Regional Council for the farming operations that take place currently. The rezoning of land to the north (where properties have largely been developed at a rural residential scale) is not considered to be a reason for not continuing with this plan change.

Overall, the costs of this change are considered to be minor while the benefits of enabling additional land within Feilding to be rezoned for residential use has high benefit in terms of housing choice.

Risks: The changes proposed recognises the site specific characteristics of Growth Precinct 4. There is sufficient information to make the proposed changes.

Efficiency and Effectiveness: The proposed changes are considered to be relatively minor, reflect current practice in development near Growth Precinct 4 now, and will enable the efficient development of land for Feilding. Infrastructure development and management has been considered as part of this Plan Change. A holistic approach has been undertaken for development which is for the next 20-30 years.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Relying on existing provisions for Feilding, which do not manage the site specific constraints or the need to ensure integration and coordination of the wider site. This option does not recognise the information Council has collated as part of this Plan Change process.

Alignment with Objectives: The purpose of Objective 1 and its policies is to enable the sustainable use and development of Growth Precinct 4, while recognising the unique characteristics of the site, encouraging high amenity values. The change aligns with Objective 3 in ensuring development manages the potential risk to future buildings from natural hazards.

Key Provisions		Permitted Activity Standards
<p>Discretionary Activities</p> <p>Rule 8.4.2</p>	<p>The following activity is a Discretionary Activity within Growth Precinct 4:</p> <ol style="list-style-type: none"> a. Any subdivision that does not comply with an average lot size of 600m². b. Any subdivision that is not in general accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1. c. Any subdivision that proposes earthworks to change the ground level that alters the Overland Flow Path or waterbodies shown in Appendix 8.2. d. Any subdivision not specifically provided for in this Plan. <p>In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of the Subdivision Chapter and the Residential Zone, assess any application within Growth Precinct 4 in terms of the assessment criteria in Rule 8.4.3.</p> <p>Guidance Note:</p> <p>The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (2011) also applies to subdivision and a consent may be required under those provisions.</p>	
Alignment with Objectives		
<p>Purpose: Managing future subdivision is essential to ensuring Growth Precinct 4 is developed in an integrated manner, ensuring good urban design and landscape requirements to result in a high quality residential environment in the future.</p> <p>This rule is for specific development that does not meet the average lot size, is not in general accordance with Growth Precinct 4 Structure Plan, that alters the overland flow paths or for any subdivision that is not specifically provided for in the Plan.</p> <p>These new provisions are necessary to manage the constraints of the site and ensure a high quality residential environment results in the future. This is a full Discretionary Activity rule allowing Council to consider a wider range of matters compared with the other Restricted Discretionary Activity rule.</p> <p>Benefits and Costs: Council anticipates that the majority of subdivision applications will be made under the Restricted Discretionary Activity rule. The provisions seek to enable development while managing key site constraints. While there are additional costs associated with this Rule, they are considered to be appropriate given the reason that this rule applies. For instance, having smaller lot sizes, development that removes the integration and coordination sought by the Structure Plan, or where overland flow paths are inhibited meaning new land is prone to flooding in the future compared with now. The</p>		

benefits of mitigating these risks are considered to outweigh the costs. These matters need to be carefully considered as they represent a departure to the parameters needed for development as outlined in the Restricted Discretionary Activity Rule above.

Overall, the costs of this change are considered to be minor while the benefits of enabling additional land within Feilding to be rezoned for residential use has high benefit in terms of housing choice.

Risks: The changes proposed recognises the site specific characteristics of Growth Precinct 4. There is sufficient information to make the proposed changes.

Efficiency and Effectiveness: The proposed changes are considered to be appropriate given the site specific constraints and the fact that the majority of all subdivisions in this area are anticipated to occur as a Restricted Discretionary Activity. The rule is effective for managing those specific areas of concern within Growth Precinct 4 and will enable the efficient development of land for Feilding.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Relying on existing provisions for Feilding, which do not manage the site specific constraints or the need to ensure integration and coordination of the wider site. This option does not recognise the information Council has collated as part of this Plan Change process, particularly around the need for average lot sizes and protecting and carefully managing overland flow paths.

Alignment with Objectives: The purpose of Objective 1 and its policies is to enable the sustainable use and development of Growth Precinct 4, while recognising the unique characteristics of the site. This proposed rule also aligns with Objective 3 in ensuring development manages the potential risk to future buildings from natural hazards.

5.8.4 Assessment of Proposed Rules – Residential Zone Chapter

Key Provisions	Permitted Activity Standards
<p>Permitted Activities – Dwellings and Accessory buildings Rule 15.4.1:</p> <p>The following activities are Permitted Activities within Growth Precinct 4, provided that they comply with the standards in</p>	<p>Standards for Permitted Activities – Dwellings and Accessory Buildings Rule 15.4.2:</p> <p>The permitted activities specified in Rule 15.4.1 above for Growth Precinct 4 must comply with the following standards:</p> <ol style="list-style-type: none"> Site Coverage <p>Maximum building site coverage of 35%.</p> Building Envelope <ol style="list-style-type: none"> Maximum height 9m All parts of a building must be contained within a 45 degree plane commencing at 2.8 metres above ground

<p>Rule 15.4.2 below:</p> <ul style="list-style-type: none"> a. One dwelling on a site. b. Accessory buildings. 	<p>level inclined inwards at right angles in plan. See Figure 15.1 below.</p> <ul style="list-style-type: none"> iii. The height recession plane in condition b.ii above does not apply to: <ul style="list-style-type: none"> a. Eaves b. Solar panels and water heaters c. Antennas, aerials or chimneys d. Gable roof ends, if the total area of that part of the building above the height recession plane does not exceed 1/3 of the gable end height. <div> </div> <p style="text-align: center;"><i>Figure 15.1</i></p> <ul style="list-style-type: none"> c. Minimum Floor Levels <p>Floor levels must be above the flood level predicted for a 0.5% annual exceedance probability (AEP) (1 in 200 year) flood event, plus 500mm freeboard.</p> <p>Guidance Note: Council has a model for stormwater that can be used to predict minimum floor levels for areas within Growth Precinct 4. Liaison with Council’s Land Development Manager is recommended.</p> d. Yards
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	<ul style="list-style-type: none"> i. All dwellings and accessory buildings must be setback 3m from all yard boundaries. ii. No new dwelling or accessory buildings are erected within 10 metres of the landward edge of the Makino Stream. <p>e. Outdoor Living Courts</p> <p>All dwellings shall have an outdoor living court:</p> <ul style="list-style-type: none"> i. At least 36m² in area. ii. That is capable of containing a circle 6m in diameter. iii. Accessible directly from the main living area. iv. Orientated east, north or west of the dwelling. v. The outdoor living court cannot comprise: <ul style="list-style-type: none"> a. part of the outdoor living court of another dwelling; b. driveways, manoeuvring areas, and car parking spaces; or c. accessory buildings. <p>f. Outdoor Service Courts</p> <ul style="list-style-type: none"> i. Each dwelling shall have an outdoor service court adjoining the dwelling or outdoor living court no less than 20m² in area and at least 3m in width. This area must be free of driveways and manoeuvring areas. <p>g. Permeable Surface Area</p> <p>A minimum of 50% of the net site area shall be a permeable surface. This includes decks provided the surface material of the deck allows water to drain through to a permeable surface.</p> <p>h. Access</p> <ul style="list-style-type: none"> i. Compliance with Rule 3B.4.2 and Council's Engineering Standards for Land Development. ii. A side boundary fence must not exceed 1.1 metres in height for a distance of 3 metres into the property
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	<p>from the road boundary when next to the driveway. After 3 metres the fence may be a maximum of 1.8 metres in height.</p> <p>i. Parking Compliance with Rule 3B4.4</p> <p>j. Visual Amenity i. No more than one derelict vehicle shall be kept within view of neighbouring property or a public place.</p> <p>k. Earthworks Compliance with Rules 3D.4.1 and 3D.4.2.</p> <p>l. Fencing Compliance with Rule 15.4.3.</p> <p>m. Garages Any road fronting garage wall that is either partly or wholly within 3m from a road front boundary must be screened along 70% of the frontage of the garage with vegetation capable of growing to a minimum of 1 metre tall. Glazing must be provided for at least 10% of the surface area of the road fronting garage wall.</p> <p>Guidance Note: Earthworks are also regulated by the Manawatū-Whanganui Regional Council and a resource consent maybe required under the rules of the One Plan.</p>
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Alignment with Objectives

Purpose: This rule essentially enables dwellings within Growth Precinct 4. Restricting only one dwelling on a site is a way to achieve permeable surfaces and continue the low density residential development that is common in Feilding.

Many of the performance standards are already in the District Plan for the Residential Zone of Feilding and are proposed to be retained as they continue to be appropriate for residential development in Feilding. New provisions relating to minimum floor levels, yard setbacks, permeable surface area, fencing and garages are proposed.

Imposing a performance standard for minimum floor levels seeks to give effect to Policy 9-2 of Horizons Regional Council’s One Plan. It also reflects Council’s current practice in areas around Growth Precinct 4, whereby Council works with landowners to identify minimum floor levels. Council has recently commissioned the development of a stormwater model

for Growth Precinct 4 and this will be used for confirming floor levels within Growth Precinct 4 in the future.

A new performance standard is proposed to restrict the amount of land that can be covered by buildings, concrete or pavers creating an impermeable surface. That is, where buildings and hard stand areas create additional stormwater runoff and water is not able to penetrate through the ground surface, as currently occurs. Provision like this are being introduced through second generation district plans as a way to manage stormwater rather than solely relying on Council built infrastructure. A new definition to explain this provision is also proposed.

The proposed yard setback, fencing and garage performance standards are intended to avoid streets where houses are placed closed to each other, behind high fences and where garages dominate the front of all houses. Many newer developments are resulting in these neighbourhoods, which inhibit passive surveillance and have the opposite effect of creating a safe and attractive residential environment for those that live in the area. The setback from the Makino (Mangakino) Stream for new dwellings is to avoid the risk of lateral spread.

Benefits and Costs: This permitted activity rule is similar to what currently exists in the District Plan. The new provisions (as discussed above) are intended to achieve Objectives 1 and 2. The other provisions will result in a high quality residential environment that is similar in scale and bulk to the rest of Feilding. The provisions also reflect current best practice and will ensure a high quality urban amenity.

Requiring minimum floor levels may see an increase in the costs of development, however these are currently included on consent decisions for recent development in and around Growth Precinct 4. Minimum floor levels are also a way to give effect to the provisions of the One Plan and are considered to be a benefit for future landowners to manage the risk of flooding and ponding. Therefore the costs are not considered to be significantly different to current practice. The benefits are considered to be greater than the costs.

Risks: The changes proposed recognise current practice and will ensure future development achieves a high quality residential environment. Managing flood and stormwater risk is important for this site and supported by the work completed in developing this Plan Change. There is sufficient information to make the proposed changes.

Efficiency and Effectiveness: The proposed changes are considered to be appropriate given the site specific constraints. The issue of requiring minimum floor levels is already being imposed on consent decisions in Feilding based on the information Council already has. The minimum floor levels are necessary to manage the risk of flooding and stormwater hazards are required under the Act. The inclusion of the provisions in the rule adds clarity and certainty for plan users. The other new provisions are an effective approach to ensure a high quality residential environment is created for the future.

Reasonably Practicable Alternatives: The main alternative option considered include:

- Relying on existing provisions for the Residential Zone in Feilding. These provisions do not manage the site specific constraints or the need to achieve a high quality residential environment. These provisions provide greater certainty and clarity to plan

users for how Council intends that this area development in the future. This does not recognise the information Council has collated as part of this Plan Change process, particularly around the stormwater model and approach to low impact stormwater design through the permeable surface provisions.

Alignment with Objectives: The purpose of Objective 1 and its policies is to maintain or enhance the mixed residential character. Objective 2 seeks to promote development that creates an attractive, healthy and safe place to live. This rule gives effect to the intent of both these Objectives.

Key Provisions	Permitted Activity Standards
<p>Permitted Activities – Fencing Rule 15.4.3</p>	<p>Fencing in Growth Precinct 4 is a permitted activity provided:</p> <ul style="list-style-type: none"> a. Boundaries with public spaces: <p>A fence must not exceed 1.1 metres in height for more than half the property boundary directly adjoining public open space (reserve, walkway or park) with the other half not exceeding 1.8 metres in height, unless the fence is of open construction in which case the fence must not exceed 1.8 metres in height.</p> b. Boundaries with road frontage: <p>A fence must not exceed 1.1 metres in height along the entire property boundary directly adjoining a road frontage, unless the fence is of open construction in which case the fence must not exceed 1.8 metres in height and not over more than 1/3 of the frontage width.</p> c. Side Boundary Fence <p>A side boundary fence must not exceed 1.1 metres in height for a distance of 3 metres into the property from the road boundary when next to the driveway. After 3 metres the fence may be 1.8 metres in height.</p>
<p>Alignment with Objectives</p>	
<p>Purpose: This is a new rule proposed in the District Plan. The Makino (Mangakino) Stream flows through Growth Precinct 4. It is important that future development that borders open space areas is done in a way that achieves high amenity and community use. A long line of high fences where passive surveillance is not occurring would not achieve these outcomes.</p> <p>Benefits and Costs: This new fencing provision will contribute to amenity and neighbourhood character for Growth Precinct 4. This is necessary to ultimately achieve a high quality urban environment whereby the existing open space character of the streets in Feilding are continued in this location. There remains a considerable degree of choice</p>	

over design and placement of fencing, enabling development flexibility. The benefits of avoiding high fences in residential areas is considered to outweigh any perceived costs.

Risks: Introducing fencing controls on front boundaries seeks to ensure a good urban design outcome. In some areas in Feilding, such as Accolade Street and Mount Taylor, developers have included covenants on fencing to achieve a high quality residential environment. Without these provisions there is a risk that high fences on boundaries to roads and open space areas reduce residential amenity. There is sufficient information to make the proposed changes.

Efficiency and Effectiveness: Including this new rule in the District Plan seeks to provide clarity and certainty for plan users. The provisions are only relating to road frontages and open space areas and seek to avoid high fences which limit the ability for passive surveillance. Passive surveillance assists creating a safe and healthy community and residential environment. On that basis the new rule is considered to be efficient and effective.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Having no rule relating to fencing in the District Plan. There is a growing number of high fencing along roads and fronting open space areas. These do not create a high amenity area and create a sense of insecurity for others.

Alignment with Objectives: Objective 2 and its policies seek to promote development that creates an attractive, healthy and safe place to live. This includes encouraging active frontages on the streetscape which this fencing rule is trying to give effect to.

Key Provisions	Permitted Activity Standards
<p>Permitted Activities – Non-Residential Activities Rule 15.4.4</p> <p>The following activities are Permitted Activities within Growth Precinct 4, provided that they comply with the standards in Rule 15.4.5 below:</p> <p>a. Home occupations</p>	<p>Standards for Permitted Activities – Non-Residential Activities Rule 15.4.5</p> <p>The permitted activities specified in Rule 15.4.4 above within Growth Precinct 4 must comply with the following standards:</p> <p>a. Permitted Activity Performance Standards</p> <p>Compliance with Rule 15.4.3.</p> <p>b. Number of staff</p> <p>Home occupations shall only involve people who reside at the house. No staff are permitted.</p> <p>c. Site and Floor Area</p> <p>No more than 40m² of the dwelling or accessory building (including gross floor area and external storage areas) may be used for the activity.</p>

	<p>d. Hours of Operation</p> <p>Non-residential activities within the Residential Zone may only operate between 7am and 7pm (Monday to Saturday).</p> <p>e. Retailing</p> <p>Only goods manufactured and grown on the site may be retailed or distributed from the site.</p> <p>f. Storage and Display</p> <p>No equipment, raw materials, finished or partly processed products or rubbish shall be stored or displayed outdoors, or visible from a public space.</p> <p>g. Noise</p> <p>Compliance with Rule 3C.4.2.</p>
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Alignment with Objectives

Purpose: Home Occupations are currently provided for in the District Plan. This new rule still enables these activities to occur, but amended performance standards are proposed to better manage the effects associated with home occupations. For instance, restricting the number of staff seeks to avoid business operating in the suburbs that could and should be located in the business zones in Feilding. Similarly, the hours of operation are to protect the residential focus of the area and ensure residential enjoyment is the focus for Growth Precinct 4. The hours of operation are also consistent with the daytime hours under the noise rules in Chapter 3C.

Benefits and Costs: This rule still allows home occupations to occur within Growth Precinct 4, but restricts the activity to be small scale. This rule also seeks to protect the business zones and town centre, where commercial activities are promoted and provided for. The rule seeks to control and scale and intensity of home occupations to protect the predominant residential propose of Growth Precinct 4. Any benefits are considered to outweigh the costs of this new rule.

Risks: The District Plan objectives and policies seek to achieve a high level of residential amenity. One of the ways to achieve this is to better manage non-residential activities within Growth Precinct 4. It is important that Council not create provisions that enable commercial activities that potentially displace commercial activities from the Business Zones of Feilding.

Efficiency and Effectiveness: Enabling home occupations, with some controls, is considered to be an efficient and effective approach. The performance standards are an effective way to manage scale of activity and ensure activities that are of a greater scale are located in the Business Zone which is more appropriate and enabling.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Applying the existing rule in the District Plan to Growth Precinct 4. This is not considered to be a most appropriate way to manage commercial activities in an area where the predominate activity is to be residential uses.

Alignment with Objectives: Objective 3 and its policies seek to control the effects of commercial and non-residential activities within Growth Precinct 4 on the character and amenity of the residential environment. This rule gives effect to this objective.

Key Provisions	Permitted Activity Standards
<p>Restricted Discretionary Activities – Activities Not Complying with Relevant Standards Rule 15.4.6</p>	<p>The following activities are Restricted Discretionary Activities within Growth Precinct 4:</p> <p>a. Any permitted activity that does not comply with any of the relevant standards in Rules 15.4.2, 15.4.3 or 15.4.5.</p> <p>For these activities, the Council has restricted its discretion to considering the following matters:</p> <ul style="list-style-type: none"> ○ The safe, efficient and integrated operation of the roading network ○ Location, design and appearance of the dwelling or accessory building ○ Residential character and amenity values including onsite amenity ○ Visual amenity effects on adjoining residential properties and surrounding streetscape ○ Parking ○ Landscaping ○ Access ○ Noise ○ Fencing ○ Essential Infrastructure ○ Natural hazards including stormwater management. <p>In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of Growth Precinct 4 and the Residential Zone and</p>

	<p>Chapter 3 District Wide Rules, assess any application in terms of the following assessment criteria:</p> <ol style="list-style-type: none"> i. The degree of non-compliance with the particular performance standards that the proposal fails to meet. ii. Whether the application will result in any adverse effects on the amenity values of neighbouring properties or the character of the Residential Zone. iii. Whether the proposal contains sufficient onsite parking to meet the needs of the activity. iv. The extent to which noise, hours of operation, and other environmental disturbance on surrounding residential neighbours can be avoided or mitigated. v. The extent to which additional traffic generated impacts on the safe and efficient operation of the roading network. vi. To ensure the activity is in character with or complementary to the surrounding residential neighbourhood. vii. Whether the proposed landscaping maintains or enhances the ambience and amenity values of the surrounding residential area. viii. The extent to which the site and building design mitigates any increase in peak stormwater run-off and peak stormwater flow due to the reduction in permeable surfaces. ix. Whether the existing Council essential infrastructure network has sufficient capacity for the proposed development.
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Alignment with Objectives

Purpose: This rule provides for any activity listed in the chapter as permitted that cannot meet the specific performance standards listed in Rules 15.4.2, 15.4.3 or 15.4.5. In developing this rule, Council has specifically focussed or restricted its discretion to key matters that are important in considering residential uses within Growth Precinct 4.

The assessment criteria are intended to provide plan users with additional certainty and clarity over matters that Council considers are necessary to ensure a high quality residential environment is achieved in the future.

Benefits and Costs: This Restricted Discretionary Rule provides for those activities that would be permitted but are unable to meet the relevant performance standards. This means that rather than being full discretionary, the Council has restricted its discretion to

a few key matters of importance for ensuring a high quality residential environment results in the future. This approach for rules in the Residential Zone is the same as the Operative District Plan. Therefore the benefits and costs are considered to be the same as what currently exists.

Risks: While the approach is similar to the Operative District Plan the proposed rule contains significantly more guidance than currently is the case. The risks are considered to be less as the Council has been clear in what matters are of concern and are to be used when assessing future applications. This improves certainty and clarity for plan users. There is sufficient information to make the proposed changes.

Efficiency and Effectiveness: The proposed changes are considered to be similar to the Operative District Plan and are therefore an appropriate approach. The additional clarity provided by the assessment criteria enable plan users to have a clear understanding of the requirements of the District Plan. This assists in the efficiency and effectiveness of the usability of the District Plan.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Relying on existing provisions for the Residential Zone in Feilding. These provisions do not manage the site specific constraints or the need to achieve a high quality residential environment. These provisions provide greater certainty and clarity to plan users for how Council intends that this area development in the future. This alternative does not provide the level of guidance that is achieved by including the additional assessment criteria listed.

Alignment with Objectives: The purpose of Objective 1 and its policies is to maintain or enhance the mixed residential character. Objective 2 seeks to promote development that creates an attractive, healthy and safe place to live. This rule gives effect to the intent of both these Objectives.

Key Provisions	Permitted Activity Standards
<p>Restricted Discretionary Activities – Retirement Living and Multi-Unit Residential Development Rule 15.4.7</p>	<p>The following activities are Restricted Discretionary Activities:</p> <ol style="list-style-type: none"> a. Development involving 2 or more dwelling units on a site. b. Retirement village. <p>For these activities, the Council has restricted its discretion to considering the following matters:</p> <ul style="list-style-type: none"> o Amenity effects on surrounding residential environment and streetscape o Design, scale and appearance of buildings and structures o Site layout and access arrangements o Onsite landscaping

	<ul style="list-style-type: none"> ○ Privacy across boundaries and within the development ○ The safe and efficient operation of the roading networks, and internal circulation, parking, loading and manoeuvring areas ○ Residential character and amenity values including onsite amenity ○ Lighting ○ Access ○ Natural hazards, including stormwater management <p>Performance Standards</p> <ul style="list-style-type: none"> a. Site coverage <ul style="list-style-type: none"> A maximum site coverage of 40% applies to development of the site. b. Outdoor Living Court <ul style="list-style-type: none"> i. Each unit must be provided with a private outdoor living court within the site which can meet the following requirements: <ul style="list-style-type: none"> a. At least 30m² in area that is free of driveways, parking spaces, buildings and manoeuvring areas. b. Is able to accommodate a circle of 4 metres in diameter c. Is accessible directly from the main living area for a length of not less than 2 metres d. Is orientated to the west, north or east of the unit. c. Separation distances between dwellings and buildings on the same site <ul style="list-style-type: none"> i. 1.8 metres between each accessory building serving separate dwellings, except where the accessory building is joined by a common party wall. ii. 1 metre between an accessory building and a dwelling, except for habitable rooms which must be 3m between an accessory building and a dwelling.
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	<p>iii. 1.5m between a dwelling and right of way or driveway.</p> <p>iv. 3m between dwellings, except where the dwelling is joined by a common party wall.</p> <p>d. Access</p> <p>Compliance with Rule 3B.4.2. and Council's Engineering Standards for Land Development.</p> <p>e. Parking</p> <p>Compliance with Rule 3B.4.4.</p> <p>f. Permeable surface</p> <p>Compliance with Rule 15.4.2.h.</p> <p>g. Lighting</p> <p>All exterior lighting must not result in light spill to neighbouring properties.</p> <p>h. Fencing</p> <p>Compliance with Rule 15.4.2.i.</p> <p>Guidance Note:</p> <p>Refer also to the New Zealand Fire Service firefighting water supplies code of practice SNZ PAS 4509:2008. This Code identifies what is required for the Fire Service to have access to sufficient water for fire fighting purposes.</p> <p>In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of Growth Precinct 4 and the Residential Zone and Chapter 3 District Wide Rules, assess any application in terms of the following assessment criteria:</p> <p>i. How new development relates to the patterns of the height and width of primary building forms, predominant roof types and pitches in the surrounding residential areas.</p> <p>ii. The extent to which building materials are sympathetic to the surrounding residential environment.</p> <p>iii. Whether the development allows views of the street and communal spaces within the development, including views of outdoor carparking spaces from the dwelling.</p>
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	<ul style="list-style-type: none"> iv. The extent to which significant planting and trees are retained, and neighbourhood amenity character is reinforced with the type and species of new planting. v. The degree to which fences are sufficiently low to provide for visual connection between the dwelling and street and allow safe vehicle access across the footpath. vi. The degree to which carports and garages are visually compatible with and of a similar standard to the development as a whole. vii. The degree to which large, highly visible retaining walls are avoided or screened with appropriate planting. viii. Whether the site and building design mitigates any increase in peak stormwater run-off and peak stormwater flow due to the reduction in permeable surfaces. ix. Whether the proposal is consistent with Council’s Engineering Standards for Land Development. x. The extent to which the proposal provides each dwelling with reasonable visual privacy and daylight.
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Alignment with Objectives

Purpose: The Operative District Plan does not clearly provide for multi-unit development in a comprehensive manner. There are examples where this has been done in a way that does not result in a high quality residential environment for those who will live there in the future.

Since the introduction of Plan Change 46 Town Centre there has been confusion over the definitions in the plan for retirement village, assisted living accommodation and multi-unit development (development including 2 or more dwelling units on a site). This Plan Change seeks to provide greater clarity and certainty for higher density development through this rule.

The rule is a Restricted Discretionary Activity to reflect the importance of getting the right design of these units; ensuring there remains high residential character and amenity for those who live in or nearby these developments. Site layout, onsite amenity and privacy are all key matters to ensure are correct through design. Performance standards are identified to provide certainty for plan users over the key design requirements for these types of developments in the future.

As the population ages there is growing need to provide for multi-unit or retirement living areas nationally, regionally and locally. As the population age changes over time it is

important that these areas be of high quality and sustainable for future use. This rule has been written with this in mind.

Benefits and Costs: This new rule enables the establishment of different housing units to provide for diverse housing needs and choices in Growth Precinct 4. The provisions allow the consideration of the appropriate scale and extent of this type of development and how high quality residential development can be achieved. The assessment criteria also seek to ensure that any effects of increased density do not compromise the overarching residential character objectives proposed in this Plan Change. While there are costs associated with requiring a more comprehensive design for this type of development, the future benefits of a high quality residential environment are considered to outweigh the costs.

Risks: The changes proposed recognise current best practice and will ensure future development achieves a high quality residential environment for those who want to develop a high density of development within Growth Precinct 4. The provisions are not a mandatory requirement, they merely enable this type of development if designed by a developer or landowner. This is a risk that by not enabling this type of development (through a specific rule as this one) then the District Plan can be seen as being unresponsive to current and future development pressures, resulting in the inefficient use of urban land and infrastructure.

Efficiency and Effectiveness: The proposed changes are efficient in that they enable a development framework that allows future development choice for landowners. The changes recognise that this type of development should not rely on the same standards that apply to detached dwellings as there are different matters that should be considered for higher density development. The use of assessment criteria provide plan users with greater clarity and certainty for future development. This framework is efficient and effective in that the critical design outcomes are stated, by design freedom exists as to how these outcomes are reached. This is appropriate given Growth Precinct 4 is a greenfield growth area.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Relying on standard housing rules to provide for multi-unit housing – i.e fixed performance standards with no recognition of different design requirements.

Alignment with Objectives: The purpose of Objective 4 and its policies is to ensure any higher density development achieves a high quality residential amenity. This rule gives effect to the intent of this Objective.

Key Provisions	Permitted Activity Standards
<p>Discretionary – activities not provided for Rule 15.4.8</p> <p>The following activities are</p>	<p>Performance Standard for commercial and non-residential activities</p> <p>a. The following information must be submitted to Council on lodgement of an application under this rule for commercial and non-residential activities:</p>

<p>Discretionary Activities within Growth Precinct 4:</p> <p>a. Any residential activity not otherwise specified as Permitted, Restricted Discretionary or Non-Complying Activity, or is not specifically provided for in this Plan.</p> <p>b. Any commercial or non-residential activity that is not otherwise specified as Permitted, Restricted Discretionary or Non-Complying Activity</p>	<p>i. A noise effects assessment prepared by a suitably qualified acoustic expert; and</p> <p>ii. A traffic impact assessment prepared by a suitably qualified traffic engineer or traffic planner.</p> <p>b. Outdoor storage areas</p> <p>Any outdoor storage area must be screened and not visible when viewed from any adjacent residential property, public road or open space.</p> <p>In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of Growth Precinct 4 and the Residential Zone and Chapter 3 District Wide Rules, assess any application in terms of the following assessment criteria:</p> <p>i. The extent to which the effects of noise, hours of operation and other environmental disturbance on surrounding residential neighbourhoods are avoided, or can be remedied or mitigated.</p> <p>ii. To avoid, remedy or mitigate the visual impacts of any activities, and to preserve the character and amenity of the residential environment.</p> <p>iii. Whether the Noise Management Plan prepared by an acoustical consultant identifies noise management measures to avoid, remedy or mitigate adverse effects of noise, including best practicable options adopted to minimise sound emissions.</p> <p>iv. The extent to which the additional traffic generated impacts on the safe and efficient operation of the roading network, internal circulation, parking, manoeuvring and access provisions.</p> <p>v. The extent to which appropriate landscaping elements and plantings have been incorporated to enhance the character, ambience and amenity values of the adjoining residential neighbourhood.</p> <p>vi. The extent to which onsite planting will reduce the activities visual intrusion on the adjacent properties and break up areas of hard surfacing such as fence lines and paved areas.</p>
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Alignment with Objectives

Purpose: The overall purpose of Growth Precinct 4 is to enable future residential development for Feilding. The Economic Report prepared to support the Plan Change has identified that commercial activities are not warranted in this area, other than a small convenience store. This is due to the proximity to convenience outlets on North Street and the Town Centre. On that basis commercial and non-residential activities are not encouraged as they are better provided for and suited in the Business and Industrial Zones under the District Plan. The focus for Growth Precinct 4 is predominately residential use.

On that basis Council has identified any commercial or non-residential development to be a full discretionary activity allowing all matters to be considered in any future consent application. Assessment criteria are also included to provide guidance for plan users should they consider doing such a development in Growth Precinct 4.

Benefits and Costs: This new rule signals to landowners and future developers that commercial and non-residential activities need to be carefully managed. This is to reinforce the area for residential purposes where a higher level of amenity is required than for the Business Zones. The Council encourages commercial activities in the Business and Industrial Zones where noise and hours of operation are better suited and where those activities do not impact on the enjoyment of the residential area for those who live there. The costs of obtaining consent are considered appropriate given the purpose and focus of Growth Precinct 4 in providing future residential housing.

Risks: The changes proposed recognise that commercial and non-residential activities can have adverse effects on the character and amenity of residential activities. There is a higher threshold to meet under this rule for non-residential development. Failure to restrict these types of activities would be inconsistent with the objectives and policies that relate to the creation of a high amenity residential environment. Enabling commercial and non-residential use would also further reduce choice for residential development at the expense of activities that are already provided for elsewhere (and more appropriately) in Feilding.

Efficiency and Effectiveness: The proposed changes are efficient in that they enable a development framework that protects residential amenity but still allows choice for landowners. This framework is efficient and effective in that the critical design outcomes are stated allowing future landowners to have clarity and certainty should they want to develop commercial or non-residential activities within Growth Precinct 4.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Enabling commercial and residential development. This would be at the expense of providing additional residential land for the future demands given current growth cycles. It would also displace those activities from occurring in the Business and Industrial Zones which already enable these activities.

Alignment with Objectives: The purpose of Objective 3 and its policies is to control the effects of commercial and non-residential activities on the character and amenity of the residential environment. This rule gives effect to the intent of this Objective.

Key Provisions	Permitted Activity Standards
<p>Non-Complying Rule 15.4.9</p>	<p>The following activities are Non-Complying Activities within Growth Precinct 4:</p> <p>a. Any Industrial Activity, including a service station.</p>
<p>Alignment with Objectives</p>	
<p>Purpose: The overall purpose of Growth Precinct 4 is to enable future residential development for Feilding. Similarly to the above discussion for Rule 15.4.8 there are sufficient areas in the Industrial Zone for industrial activities. Under Plan Change 52 the Industrial Zone was expanded by the addition of the Kawakawa Industrial Park (which opened up 15.6 ha of land for future industrial use). There is a service station on the corner of North Street and Kimbolton Road. There is no requirement for an additional site within Growth Precinct 4 hence this has been identified as a Non-Complying Activity.</p> <p>Industrial activities are generally noisy and would also detract from the overall amenity and character of the residential zone. Industrial activities are furthermore unlikely to achieve the required site permeability to manage stormwater. There are also additional vehicle movements that would potentially conflict with the predominate activity of Growth Precinct 4 of residential uses.</p> <p>Benefits and Costs: This new rule signals to landowners and future developers that industrial activities and service stations are not encouraged within Growth Precinct 4. This is to reinforce the area for residential purposes where a higher level of amenity is required than for the Industrial Zone. The Industrial Zone already has sufficient area for growth and this should be used, rather than taking away residential use options. The costs of obtaining consent are considered appropriate given the purpose and focus of Growth Precinct 4 in providing future residential housing and controlling the development of activities that can have adverse effects on residential amenity.</p> <p>Risks: The changes proposed recognise that industrial activities can have adverse effects on the character and amenity of residential activities. There is a higher threshold to meet under this rule for industrial development. Failure to restrict these types of activities would be inconsistent with the objectives and policies that relate to the creation of a high amenity residential environment. Enabling industrial activities would further reduce choice for residential development at the expense of activities that are already provided for elsewhere (and more appropriately) in Feilding.</p> <p>Efficiency and Effectiveness: The proposed changes are efficient in that they enable a development framework that protects residential amenity. This framework is efficient and effective approach to manage an activity that can create significant adverse effects on residential amenity from the scale and intensity of activities. Industrial activities also typically have higher vehicle movements which can also create conflict in the residential areas.</p> <p>Reasonably Practicable Alternatives: The main alternative options considered include:</p> <ul style="list-style-type: none"> • Enabling industrial activities in Growth Precinct 4. This would be at the expense of providing additional residential land for the future demands given current growth 	

cycles. It would also displace those activities from occurring in the Industrial Zone which already enable these activities.

Alignment with Objectives: The purpose of Objective 3 and its policies is to control the effects of commercial and non-residential activities on the character and amenity of the residential environment. This rule gives effect to the intent of this Objective.

5.8.5 Assessment of Proposed Rules – Chapter 3B - Transport

Key Provisions		Permitted Activity Standards
Rule 3B.4.2 Vehicle Crossings Access Permitted Activity		<p>The formation of Vehicle crossings onto roads is a Permitted Activity in all zones provided that they comply with the standards in Rule 3B.4.3 below.</p> <p>Guidance Note: All vehicle crossings must be constructed according to Council policy and that Council's vehicle crossing application form is completed and submitted for approval.</p>
3B.4.3 Vehicle Crossings Access – Standards for Permitted Activities		<p>For all zones the formation of vehicle crossings onto all roads must comply with the following standards:</p> <ul style="list-style-type: none"> a. All vehicle crossings must be sited in accordance with the minimum sight distances and intersection spacing's as defined in Appendix 3B.3. b. Vehicle crossings may only be constructed on Major Arterial Road or Minor Arterial Road identified in Appendix 3B.1 if there is no alternative legal access from the site to another road. c. In the Outer Business Zone, vehicle access to sites from SH54/Aorangi Street, between Gladstone St and Eyre Street, must be left turn in and left turn out only. b.d. No new vehicle crossings will be located within 30m of any railway level crossing. c.e. Existing vehicle crossings that are within 30m of a railway level crossing must be maintained to ensure the sightline standards detailed in Appendix 3B.5 are met. d.f. No dwelling or accessory building will have access via an unformed legal road (paper road). e.g. Onsite manoeuvring must be provided for vehicles to enter and exit in a forward direction. f.h. Vehicle crossing movements must not exceed 100 car equivalent movements per day and the car equivalent

	<p>movements must be calculated in accordance with Appendix 3B.4.</p> <p><u>g.i. Accessways and Vehicle crossings must comply with the sight distances and minimum spacing identified in Appendix 3B.3 Measurement of Sight Distances and Minimum Spacing.</u></p> <p><u>h. Vehicle Crossings must comply with Diagram D in Appendix 3B.3 if there is more than one slow, heavy or long vehicle movements per week using the accessway and vehicle crossing.</u></p> <p><u>i. All vehicle crossings must be constructed or upgraded according to Council’s Engineering Standards for Land Development.</u></p> <p><u>j. In addition to standards a. to k. above, for Major Arterial or Minor Arterial roads the following also apply:</u></p> <p style="padding-left: 20px;"><u>i. Vehicle crossings may only be constructed on Major Arterial Road or Minor Arterial Road identified in Appendix 3B.1 if there is no alternative legal access from the site to another road.</u></p> <p style="padding-left: 20px;"><u>ii. In the Outer Business Zone, vehicle access to sites from SH54/Aorangi Street, between Gladstone St and Eyre Street, must be left turn in and left turn out only.</u></p> <p><u>Guidance Note:</u> All vehicle crossings must be constructed according to Council policy and that Council’s vehicle crossing application form is completed and submitted for approval.</p>
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Alignment with Objectives

Purpose: The proposed changes above are necessary to remove confusion that has occurred in implementing the access and formation provisions in Chapter 3B Transport. The confusion has been a result of the how the vehicle access provisions in the District Plan relate to Council’s Engineering Standards for Land Development. The Council’s Engineering Standards for Land Development were introduced after Plan Change 55 was notified and the hearing held.

Changes are proposed to clearly identify access and formation requirements for arterial and local roads. This is also to achieve consistency with the provisions of Council’s Engineering Standards for Land Development. These changes remove confusion for Plan Users.

Benefits and Costs: The changes reduce the costs that would have applied to vehicle formation on local roads under the current provisions. The changes enable a greater level of land development for the future, than how the District Plan is currently written. The

benefits are that the provisions are consistent with Council’s Engineering Standards for Land Development and therefore increase consistency between Council’s strategic documents.

Risks: Council has sufficient information to make the changes, and improve the consistency between the different strategic documents prepared by Council. These provisions are seen to enable development and are considered low risk.

Efficiency and Effectiveness: The proposed changes are efficient in that they enable a development framework that assists in achieving appropriate vehicle access and formation requirement for local roads. Making this change now is considered to be an efficient and effective given the sectional district plan review process.

Reasonably Practicable Alternatives: The main alternative options considered include:

- Using the current wording in Chapter 3B. This would continue the confusion and inconsistency for plan users.

Alignment with Objectives: The minor changes proposed to this rule do not change the overall intent or purpose as outlined in Plan Change 55. The rule continues to give effect to Objectives 1, 2 and 3 in Chapter 3B Transport of the District Plan.

5.8.6 Areas proposed for rezoning

The rezoning includes approximately 256ha of land and the creation of around 1,800 residential lots. Proposed Growth Precinct 4 is located on an area of greenfield land to the north of Feilding urban area between Makino Road and Reid Line towards the current residential zone along Port Street, Pharazyn Street and Arnott Street. The existing Rimu Park zoning is proposed to change from Recreation to Residential, and strips either side of the Makino (Mangakino) Stream are proposed to become Recreation Zone.

To retain the Rural zoning is unnecessary and does not reflect the future use of the site.

Changes are required to Planning Maps 11, 26, 28 and 32. Copies of the proposed Planning Maps are contained in Appendix 5.

5.9 Statutory Evaluation

5.9.1 Part 2

Section 5: Purpose of the Act

The purpose of the Act (Section 5(1)) is to promote the sustainable management of natural and physical resources. Enabling people to make provision for their social, economic and cultural well-being and health and safety, is qualified by the goals described in paragraphs (a), (b) and (c) of Section 5(2), as follows:

Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

Safeguarding the life supporting capacity of air, water, soil and ecosystems; and

Avoiding, remedying, mitigating any adverse effects of activities on the environment

Of note with respect to the duties contained in Part 2 however, is the fact that they are by no means confined solely to effects. The definition of “sustainable management” refers not only to “... avoiding, remedying, or mitigating any adverse effects ...” but also the conjunctive requirement of “sustaining the potential of natural and physical resources ... to meet the reasonably foreseeable needs of future generations.”

Meeting the reasonable foreseeable needs of future generations requires consideration of how resources, inclusive of urban infrastructure and development, are to be used and to what extent they are to be used. These are primarily issues of allocation and scale and therefore, by inference, of efficiency.

The objectives and policies of PPC51 are established on a statutory obligation to manage the use and development of physical resources in a way that sustains the potential of physical resources to meet the reasonably foreseeable needs of future generations while managing environmental effects. The proposed changes to the subdivision chapter and residential zone chapter relating specifically to Growth Precinct 4 are necessary to reflect the intended change in land use. Rezoning this land to residential offers additional housing choice and location for the residents of Feilding.

The change to the structure and ensuring consistency between Council land development policies will enable plan users to achieve sustainable development consistent with the purpose of the Act.

The proposed changes are founded on a statutory obligation to manage natural and physical resources in a way that sustains the potential of the area to meet the reasonably foreseeable needs of future generations while managing environmental effects. Rezoning this land offers additional housing choice and location for the residents of Feilding. Overall, on the evidence above, PPC51 is considered to be consistent with upholding the purpose of the Act.

Section 6: Matter of National Importance

Section 6 of the Act identifies matters of national importance for consideration. Of relevance to PPC51 are the following matters:

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

PPC51 includes a structure plan for Growth Precinct 4. This identifies land along the Makino (Mangakino) Stream for open space uses, which will be ultimately Council land and used for active and passive recreation.

Council commissioned a Cultural Impact Assessment which was prepared by Ngāti Kauwhata. The CIA identified a number of matters of relevance to Plan Change 51 as

discussed earlier in this report. Where possible, Council has incorporated Māori Urban design principles similar to the Te Aranga Principles within this Plan Change. Council acknowledges that additional matters will be included into the District Plan through the sectional district plan review process. A visual connection will be maintained and enhanced along the Makino (Mangakino) Stream through the open space area and shared path network. It is along the banks of the Makino (Mangakino) Stream that the history of the area and its value to iwi can be celebrated through place making, signage, and information boards.

The Archaeological Assessment has identified that remnants of an old bridge at Port Street maybe found during construction of the new bridge in that location. Other than the bridge there is little known or expected archaeological remnants in Growth Precinct 4.

Overall, PC51 is therefore considered to have given effect to Section 6 of the Act.

Section 7: Other Matters

Section 7 raises a number of related matters, with respect to:

- (b) *the efficient use and development of natural and physical resources;*
- (c) *the maintenance and enhancement of amenity values;*
- (f) *maintenance and enhancement of the quality of the environment;*
- (g) *any finite characteristics of natural and physical resources;*
- (i) *the effects of climate change.*

The provisions proposed as part of this Plan Change enable the efficient use and development of natural and physical resources while maintaining and enhancing the amenity values of the District. The proposed rezoning enables the integrated and planned development of a new residential area for Feilding. This provides the community with additional choice and design options for the future.

The overall direction of the Plan Change is to ensure that the use and development of Growth Precinct 4 creates a future residential area of Feilding that is of high residential amenity. For instance, requirements around separation distances, fencing, restricting non-residential activities. This is in direct response to achieving Section 7(c) of the Act.

Development that is consistent with, and gives effect to the Structure Plan will also assist in enhancing the quality of the environment. The proposed esplanade area along the Makino (Mangakino) Stream will enable the riparian area to be planted and allow community use and access to the Stream. There is sufficient land shown on the Structure Plan to allow the Stream to naturally meander and for Council to plant the banks to filter stormwater from the surrounding residential development. These all contribute to an enhancement of the environment.

Managing the effects of climate change is provided for through the use of minimum floor levels, and requiring a freeboard level to be included in the proposed Rules. While these provisions are to give effect to the One Plan, they are also a way to achieve Section 7(i).

PC51 is therefore considered to have had particular regard to these matters, as required by Section 7 of the Act.

Section 8: Treaty of Waitangi

There are a number of iwi authorities within the Manawatū District. These include Muaūpoko, Ngāti Apa, Ngāti Hauiti, Ngāti Raukawa kī te Tonga, and Rangitāne o Manawatū. In relation to the Oroua River, Ngāti Apa and Rangitāne o Manawatū have statutory acknowledgements.

In 2015 Council and Ngāti Kauwhata signed the Oroua River Declaration. The Declaration acknowledges that the Oroua River is critically important and embodies inter-generational continuity, a water source necessary for community wellbeing and is fundamental to the wider eco-system. Both parties have agreed that the mauri, security and natural habitat of the Oroua River should be protected and enhanced. The parties are working together as partners and champions for a healthy River.

As outlined in section 5.4 and 5.5, a Cultural Impact Assessment has been completed for Growth Precinct 4. This includes the importance of the Makino (Mangakino) Stream which flows into the Oroua River. That report identified a number of recommendations that Ngāti Kauwhata wanted to see actioned as part of this Plan Change. Council and Ngāti Kauwhata continue to dialogue on these matters, and where appropriate those matters have been included in the Proposed Plan Change.

Overall the proposal is considered to be consistent with Section 8 of the Act, and Council will continue to work with tangata whenua on all matters pertaining to the District Plan review.

5.9.2 Other Matters to be considered

The Act requires consideration to also be given to other statutory documents where these are relevant. Those documents relevant to this plan change are discussed below.

National Policy Statements

National Policy Statements are instruments issued under section 52(2) of the Act. They state objectives and policies for matters of national significance. The following National Policy Statements have been issued by the Government:

- National Policy Statement on Urban Development Capacity 2016
- National Policy Statement for Freshwater Management 2014 (amended 2017)
- National Policy Statement for Renewable Electricity Generation 2011
- National Policy Statement on Electricity Transmission 2008
- New Zealand Coastal Policy Statement 2010.

For the purpose of this plan change relating Growth Precinct 4 the National Policy Statement on Urban Development Capacity and the National Policy Statement for Freshwater Management are considered directly relevant.

National Policy Statement on Urban Development Capacity 2016

Section 75(3) of the Act requires all district plans to give effect to all national policy statements. When reviewing the Operative District Plan and developing the Proposed

District Plan the National Policy Statement on Urban Development Capacity 2016 (NPSUD) was considered relevant to this Plan Change.

The National Policy Statement on Urban Development Capacity provides direction to decision-makers on planning for urban environments. It recognises the significance of well-functioning urban environments, with particular focus on ensuring that local authorities, through their planning, both:

- Enable urban environments to grow and change in response to the changing needs of the communities, and future generations; and
- Provide enough space for their populations to happily live and work.

While Feilding is not identified as a high growth area under the NPSUD Council has considered the four key four key themes in the NPSUD:

- Outcomes for planning decisions
- Evidence base to support planning decisions
- Responsive planning
- Co-ordinated planning evidence and decision-making.

In terms of outcomes for planning decisions, the focus of the NPSUD is about ensuring local authorities have sufficient housing and business land development capacity for the short, medium and long term and that this is well serviced by development infrastructure and other infrastructure. PC51 will provide additional residential choice and supply for the medium and long term or until 2038, without compromising the business or industrial land needs of the town which have been addressed as part of the Sectional District Plan Review.

The NPSUD requires housing and business land assessments to be completed on a 3 yearly basis. Council is yet to complete its housing and business land assessments under the NPSUD, but does regularly monitor its residential land supply and currently meets both the short and medium term requirements of the NPSUD. PC51, when fully developed for residential purposes, will provide approximately 1,800 additional lots in a location where there is currently limited choice for new residential lots.

PC51 is an example of the responsive planning required under the NPSUD. Manawatu District is a medium growth urban area so is not captured by the minimum targets policies within the NPSUD but is encouraged to give effect to the policies PC5 to PC11.

National Policy Statement for Freshwater Management 2014 (amended 2017)

The National Policy Statement for Freshwater Management as amended in 2017 (NPSFM) directs regional councils to set objectives for the state of freshwater bodies in their regions and to set limits on resource use to meet these objectives. While the NPSFM is directed to regional councils, there is a relevance to this plan change in relation to the central principle of Te Māna o Te Wai (the integrated and holistic wellbeing of a freshwater body).

The proposed esplanade along the Makino (Mangakino) Stream and the ability to plant within the riparian areas is a way for Council to improve water quality in this section of the Stream. The proposed provisions relating to permeable surfaces designed to reduce the amount of stormwater runoff from built form also seeks to improve the freshwater quality outcomes of the Makino (Mangakino) Stream.

National Environment Standards

National Environment Standards are regulations that are issues under Sections 43 and 44 of the Act. They can prescribe technical standards, methods or other requirements for environmental matters and provide a consistent approach across the country. Each regional, city or district council must enforce the same standard.

The following standards are currently in force:

- National Environment Standards for Air Quality
- National Environment Standard for Sources of Drinking Water
- National Environmental Standards for Telecommunication Facilities
- National Environmental Standards for Electricity Transmission Activities
- National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health
- National Environmental Standards for Plantation Forestry

Of the four standards that are currently operative, three are applicable to the Growth Precinct 4 area and the Proposed Plan Change; the National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health, and Telecommunication Facilities. Air quality standards fall under a regional council responsibility and have not been considered as part of this plan change. Nor has the Electricity Transmission Activities been considered as there are no National Grid transmission lines within Growth Precinct 4.

National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health

New Zealand has a legacy of soil contamination that is mainly associated with past practices involving storage and use of hazardous substances, and disposal of hazardous wastes. Common past activities and industries that have led to the creation of contaminated sites in New Zealand including manufacture and use of pesticides, coal, gas, petroleum, mining, timber treatment, sheep dipping.

In this instance, the history of the site shows that an area of land was used for farming activities. On that basis there is a likelihood that soil contamination could be present. As discussed in section 5.5 of this Report, the site has been assessed and determined that the site is suitable for residential development.

National Environmental Standards for Telecommunication Facilities 2016

When reviewing the Operative District Plan and developing the Proposed District Plan the National Environmental Standard for Telecommunication Facilities 2016 was considered relevant to this Plan Change.

The National Environmental Standard for Telecommunication Facilities (NESTF) provides a consistent approach nationally for local impact telecommunication infrastructure in road reserves. The NESTF prevails over the District Plan rules unless expressly stated that it does not. Under this plan change infrastructure is largely enabled and cross referencing to Chapter 3A Network Utilities (in which the District Plan specifically provides for the NESTF)

is proposed. The plan change does not seek to change the provisions already introduced into the District Plan to give effect to this NES.

5.9.3 Regional Policy Statement

Section 75(3) of the Act requires that all District Plans give effect to any regional policy statement. The Regional Policy Statement is the main vehicle for interpreting and applying the sustainable management requirements of the Act in a local context, and in this regard, guides the development of lower tier plans, including the Manawatu District Plan.

Horizons Regional Council's Regional Policy Statement is incorporated into the One Plan. The One Plan contains specific policies that direct the District Plan Review in the review and creation of District Plan provisions. The District Plan Review has given effect to the topics covered within the One Plan, including infrastructure, waste, and landscapes.

Section 75(4) of the Act requires that a District Plan not be inconsistent with any Regional Plan. During the District Plan Review, careful attention was given to the provisions of the One Plan to ensure consistency. Of particular relevance is the following provisions:

Objective 3-3: The strategic integration of infrastructure with land use

Urban development occurs in a strategically planned manner which allows for the adequate and timely supply of land and associated infrastructure.

Objective 3-4: Urban growth and rural residential subdivision on versatile soils

To ensure that territorial authorities consider the benefits of retaining Class I and II versatile soils for use as production land when providing for urban growth and rural residential subdivision.

Policy 3-2: Adverse effects of other activities on infrastructure and other physical resources of regional or national importance

The Regional Council and Territorial Authorities must ensure that adverse effects on infrastructure and other physical resources of regional or national importance from other activities are avoided as far as reasonably practicable, including by using the following mechanisms:

(f) ensuring effective integration of transport and land use planning and protecting the function of the strategic road and rail network as mapped in the Regional Land Transport Strategy.

Policy 3-4: The strategic integration of infrastructure with land use

Territorial Authorities must proactively develop and implement appropriate land use strategies to manage urban growth, and they should align their infrastructure asset management planning with those strategies, to ensure the efficient and effective provision of associated infrastructure.

Policy 3-5: Urban growth and rural residential subdivision on versatile soils

In providing for urban growth (including implementing Policy 3-4), and controlling rural residential subdivision ("lifestyle blocks"), Territorial Authorities must pay particular attention to the benefits of the retention of Class I and II versatile soils for use as production land in their assessment of how best to achieve sustainable management.

The Feilding Urban Growth Framework Plan was developed to enable Council to strategically plan for residential and industrial growth specifically for Feilding. There were a number of locations around Feilding considered, with only four residential areas identified for growth. Growth Precincts 1-3 are already included in the District Plan, with this plan change seeking to have the fourth area included.

Growth Precinct 4 was assessed by Landcare Research in 2016 as containing Class II soils (at a high level of assessment). Enabling residential development within Growth Precinct 4 will see a loss of some Class II soils. However, by uplifting the Feilding Locality Nodal Zone (Appendix 5A Diagram 1) Council is ensuring that some land with versatile soils around Feilding is being retained for production purposes. This is consistent with the One Plan policy which requires strategic planning for growth. Extending residential development beyond the area identified in Growth Precinct 4 would not be consistent with the One Plan.

Objective 9-1: Effects of natural hazard events

The adverse effects of natural hazard events on people, property, infrastructure and the wellbeing of communities are avoided or mitigated.

Policy 9-1: Responsibilities for natural hazard management

In accordance with s62(1)(i) RMA, local authority responsibilities for natural hazard management in the Region are as follows:

- (a) *The Regional Council and Territorial Authorities must be jointly responsible for:*
 - (i) *raising public awareness of the risks of natural hazards through education, including information about what natural hazards exist in the Region, what people can do to minimise their own level of risk, and what help is available.*
- (b) *The Regional Council must be responsible for:*
 - (i) *developing objectives and policies for Region-wide management of activities for the purpose of avoiding or mitigating natural hazards,*
 - (ii) *developing specific objectives, policies and methods (including rules) for the control of:*
 - (A) *all land use activities in the coastal marine area,*
 - (B) *erosion protection works that cross or adjoin mean high water springs,*
 - (C) *all land use activities in the beds of rivers and lakes,**for the purpose of avoiding or mitigating natural hazards, and*
 - (iii) *taking the lead role in collecting, analysing and storing regional natural hazard information and communicating this information to Territorial Authorities.*
- (c) *Territorial Authorities must be responsible for:*
 - (i) *developing objectives, policies and methods (including rules) for the control of the use of land to avoid or mitigate natural hazards in all areas and for all activities except those areas and activities described in (b)(ii) above, and*
 - (ii) *identifying floodways (as shown in Schedule J1) and other areas known to be inundated by a 0.5% annual exceedance probability (AEP) flood event on planning*

maps in district plans, and controlling land use activities in these areas in accordance with Policies 9-2 and 9-3.

Policy 9-2: Development in areas prone to flooding

- (a) *The Regional Council and Territorial Authorities must not allow the establishment of any new structure or activity, or any increase in the scale of any existing structure or activity, within a floodway mapped in Schedule J unless:*
- (i) *there is a functional necessity to locate the structure or activity within such an area, and*
 - (ii) *the structure or activity is designed so that the adverse effects of a 0.5% annual exceedance probability (AEP) (1 in 200 year) flood event on it are avoided or mitigated, and*
 - (iii) *the structure[^] or activity is designed so that adverse effects[^] on the environment[^], including the functioning of the floodway, arising from the structure[^] or activity during a flood event² are avoided or mitigated,*
in which case the structure or activity may be allowed.
- (b) *Outside of a floodway mapped in Schedule J the Regional Council and Territorial Authorities must not allow the establishment of any new structure or activity, or an increase in the scale of any existing structure or activity, within an area which would be inundated in a 0.5% AEP (1 in 200 year) flood event unless:*
- (i) *flood hazard avoidance is achieved or the 0.5% AEP (1 in 200 year) flood hazard is mitigated, or*
 - (ii) *the non-habitable structure or activity is on production land, or*
 - (iii) *there is a functional necessity to locate the structure or activity within such an area,*
in any of which cases the structure or activity may be allowed.
- (c) *Flood hazard avoidance must be preferred to flood hazard mitigation.*
- (d) *When making decisions under Policies 9-2(a) and b(i) regarding the appropriateness of proposed flood hazard mitigation measures, the Regional Council and Territorial Authorities must:*
- (i) *ensure that occupied structures have a finished floor or ground level, which includes reasonable freeboard, above the 0.5% AEP (1 in 200 year) flood level.*
 - (ii) *ensure that in a 0.5% AEP (1 in 200 year) flood event the inundation of access between occupied structures and a safe area where evacuation may be carried out (preferably ground that will not be flooded) must be no greater than 0.5 m above finished ground level with a maximum water velocity of 1.0 m/s, or some other combination of water depth and velocity that can be shown to result in no greater risk to human life, infrastructure or property,*
 - (iii) *ensure that any more than minor adverse effects on the effectiveness of existing flood hazard avoidance or mitigation measures, including works and structures within River and Drainage Schemes, natural landforms that protect against inundation, and overland stormwater flow paths, are avoided,*

- (iv) ensure that adverse effects on existing structures and activities are avoided or mitigated,
- (v) have regard to the likelihood and consequences of the proposed flood hazard mitigation measures failing,
- (vi) have regard to the consequential effects of meeting the requirements of (d)(ii), including but not limited to landscape and natural character, urban design, and the displacement of floodwaters onto adjoining properties, and
- (vii) have regard to the proposed ownership of, and responsibility for maintenance of, the flood hazard mitigation measures including the appropriateness and certainty of the maintenance regime.

...

Policy 9-4: Other types of natural hazards

The Regional Council and Territorial Authorities must manage future development and activities in areas susceptible to natural hazard events (excluding flooding) in a manner which:

- (a) ensures that any increase in risk to human life, property or infrastructure from natural hazard events is avoided where practicable, or mitigated where the risk cannot be practicably avoided,
- (b) is unlikely to reduce the effectiveness of existing works, structures, natural landforms or other measures which serve to mitigate the effects of natural hazard events, and
- (c) is unlikely to cause a significant increase in the scale or intensity of natural hazard events.

In this instance, PC51 seeks to specifically manage the effects of natural hazards through the inclusion of specific policies and rules. For instance, requiring minimum floor levels, and requiring permeable surfaces to be provided on all sites to reduce the effects of stormwater and flooding. The plan change also introduces a setback from the Makino (Mangakino) Stream to avoid risks associated with lateral spread. These are all measures that give effect to the requirements of the One Plan outlined above.

Overall it is considered that PC51 is consistent with the above objectives and policies in the One Plan.

5.9.4 Summary

On the basis of the discussion and assessment in this Report, the proposed changes presented in PC51 are consistent with Council’s statutory obligations under the Act.

This plan change will enable the community to provide for their social, economic and cultural wellbeing while recognising the potential environmental effects on surrounding residential and institutional uses. This is achieved by enabling additional land in Feilding to be used for residential purposes following a lengthy and strategically robust growth review.

This evaluation has been undertaken in accordance with Section 32 of the Act in order to identify the need, benefits and costs arising from PC51 and the appropriateness of the proposed approach having regard to its effectiveness and efficiency relative to other means

of achieving the purpose of the Act. The evaluation demonstrates that the proposed plan change meets the requirements of Section 32 of the Act.

8.0 SUBDIVISION

8.1 Introduction

Subdivision and subsequent land development often involves land disturbance, vegetation removal, and changes to the natural and physical environment. Subdivision is a process that enables future land use activities to establish that may not otherwise be allowed in some areas, such as additional dwellings in urban or rural areas. Once subdivision has occurred, certain expectations for the use and development of that land often become apparent.

The effects of subdivision include:

- Changing ground levels that alter run-off patterns and natural hazards
- Effects on existing natural hazards
- Additional demands on capacity of essential infrastructure (network infrastructure), existing private services and physical construction
- Effects on natural character, natural resources, water quality
- Effects on cultural and heritage sites, Tangata Whenua values
- Effects on existing character and amenity values
- Loss of productive land
- Effects on the safe and efficient functioning of the roading network, including additional vehicle accesses, traffic flows and patterns, road safety and the efficient movement of traffic.

Section 11 of the Act was amended in 2017 so that subdivision is now permitted unless expressly restricted by rules in the District Plan or a national environmental standard. This is consistent with the presumption that land use is permitted, unless restricted under Section 9 of the Act.

This chapter should be read along with the provisions in Chapter 3 – District Wide Rules and the relevant zoning provisions in the District Plan, including Chapter 15 – Residential Zone. The Council’s Engineering Standards for Land Development should also be referred to when considering subdivision of land within the District.

The key focus of this chapter is the subdivision and land development provisions for Growth Precinct 4. As the Sectional District Plan Review progresses, provisions for other zones, including the remaining Residential Zone provisions will be inserted into the Chapter through other Plan Changes.

8.2 Resource Management Issues

The following resource management issues have been identified in relation to subdivision:

1. Limitations on growth in Feilding and other centres in the District due to natural hazards, topography and natural and physical features, effluent disposal and infrastructure provision.
2. Recognition of natural hazards in the design and implementation of subdivisions, including subsequent land use.
3. The need to restrict unplanned urban expansion into rural areas which affects rural productivity, amenity, character, the natural environment and resulting land uses.
4. The need to control Feilding's growth, while providing for a variety of lot sizes for residential.
5. Uncoordinated and inefficient provision of infrastructure and the effects on urban form when development is unplanned.
6. The need to provide sufficient residentially zoned land to provide for future growth projections.
7. The need for new developments within Growth Precinct 4 to be in accordance with any relevant structure plan and be appropriately staged to ensure the integrated provision of infrastructure at the earliest stage of development.
8. The need for connectivity between staged developments and surrounding residentially zoned land.
9. The transition of land between existing rural use and future residential use following changes in zoning and creation of new reverse sensitivity issues while the area is developed in the future.

8.3 Objectives and policies

Objective 1

To ensure subdivision and land development within Growth Precinct 4 achieves the following overall urban design outcomes:

- a. A well-integrated and coordinated development that creates strong connectivity between new and existing development.

- b. Connectivity with existing infrastructure and transportation networks is achieved taking into account infrastructure capacity and requirements to upgrade capacity to meet future demands.
- c. Subdivision design that recognises and responds to the topographical and physical features of the land, including waterbodies.
- d. A range of residential densities.
- e. Efficient utility services are provided including roading, reticulated wastewater, water supply, stormwater networks and power and telecommunication networks
- f. Neighbourhood focal points which provide meeting points within the precinct.
- g. Open space networks that comprise stormwater attenuation networks, a range of recreation opportunities, and stream side esplanade reserves.
- h. Areas identified as high risk for flooding and stormwater overland flow paths and ponding hazards are avoided or managed to minimise the risk of damage to property or human life.

Policies

- 1.1 Subdivision and development within Growth Precinct 4 is guided by a structure plan that identifies:
 - a. Key transportation connections.
 - b. Open Space and recreational opportunities.
 - c. Shared pathways, including cycleways and walkways.
 - d. Hazard areas, including overland flow paths.
- 1.2 To ensure all proposed lots are designed to achieve good urban design outcomes with connected outdoor living spaces, sunlight to habitable rooms, and onsite privacy.
- 1.3 To control intensive residential subdivision and development of land.
- 1.4 To avoid fragmented patterns of subdivision and development that is inconsistent with the integrated planned development shown in Growth Precinct 4 Structure Plan in Appendix 8.1.
- 1.5 To ensure that any staged subdivision and development enables overall connectivity within and beyond Growth Precinct 4 in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1.

Objective 2

To ensure subdivision and development within Growth Precinct 4 achieves an attractive and sustainable urban neighbourhood.

Policies

- 2.1 To require subdivision design to implement the Growth Precinct 4 Structure Plan in Appendix 8.1.
- 2.2 To require the integration of new development with the surrounding environment, whereby lots including those to vest as roads, are positioned to create a logical extension of existing urban areas.
- 2.3 To require that all development is undertaken in a comprehensive manner consistent with a Comprehensive Development Plan where stages are clearly identified and connectivity is shown.
- 2.4 To ensure block layouts within the subdivision proposal have road frontage and rear lots are discouraged.
- 2.5 To avoid the use of cul-de-sacs to enable a high level of accessibility and connectivity in the local street network.
- 2.6 To encourage subdivision designs which create a neighbourhood identity using positive characteristics of established areas reflecting cultural, heritage and natural values of the site and surrounding areas.
- 2.7 To require all power and telecommunication infrastructure to be underground.

Objective 3

To ensure development of Growth Precinct 4 manages the potential risk to people and buildings from natural hazards.

Policies

- 3.1 To ensure subdivision in hazard areas is undertaken in a manner to manage natural hazard risk.
- 3.2 To require the mitigation of residual risk of inundation outside of flood hazard areas through subdivision design layout.
- 3.3 To ensure development within overland flow paths shown in Appendix 8.2 are managed in an integrated manner recognising the wider development context of Growth Precinct 4 development.
- 3.4 To encourage low impact stormwater design by ensuring adequate pervious surface is available for every residential lot in the subdivision, taking into consideration built and hard surfaces.

3.5 To ensure that any stormwater management measures and earthworks are in place and approved to Council’s engineering standards at the time of subdivision, with ongoing controls to protect the integrity of stormwater management measures of adjoining landowners.

3.6 To ensure that the water supply within Growth Precinct 4 has sufficient capacity and pressure to meet the needs of all development including New Zealand Fire Service requirements

Guidance Note: Refer also to the New Zealand Fire Service firefighting water supplied code of practice SNZ PAS 4509:2008. This Code identifies what is required for the Fire Service to have access to sufficient water during emergencies.

3.7 To ensure stormwater risk is mitigated by requiring minimum floor levels for buildings.

3.8 To require an integrated approach to stormwater management that recognises the capacity of existing systems and overland flow paths within Growth Precinct 4.

Guidance Note: Any development must also consider the requirements of the Council Engineering Standards for Land Development when preparing the Comprehensive Development Plan.

Objective 4

To enable the development of Growth Precinct 4 in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1 and where development delivers an integrated infrastructure network for the entire site.

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Policies

4.1 To ensure the integration of essential infrastructure into the existing Feilding network creating an efficient and orderly development within urban areas.

4.2 To ensure that infrastructure and services to Growth Precinct 4 are provided in a way that enables or facilitates future development opportunities while recognising the capacity of existing systems.

4.3 To ensure subdivision and development contributes to and does not undermine the integrated and comprehensive spatial layout for Growth Precinct 4.

4.4 To restrict subdivision and development within Growth Precinct 4 until essential infrastructure is in place and of sufficient capacity to service the subdivision.

4.5 To ensure all road design is consistent with form, function and amenity of roads, including provision for vehicles, walking and cycling, consistent with requirements in Chapter 3B – Transport.

Guidance Note: Any development must also consider the requirements of the Council Engineering Standards for Land Development when preparing the Comprehensive Development Plan.

8.4 Rules

Rules in this chapter need to be read in conjunction with the District Wide Rules in Chapter 3 and the relevant zone provisions.

8.4.1 Restricted Discretionary Activities

The following activity is a Restricted Discretionary Activity in respect to subdivision:

- a. Any subdivision of land within the area shown within the Growth Precinct 4 Structure Plan in Appendix 8.1.

For this activity, the Council has restricted its discretion to considering the following matters:

- The size, shape and arrangement of lots in relation to road frontages, and location of proposed boundaries.
- Provision of water supply and disposal of water, wastewater and stormwater where the design and capacity of any reticulated systems reflect the new and anticipated future demand and requirements.
- The number, location and formation of vehicle crossings.
- The provision of connected street network, with appropriate use of street hierarchy and design type, including the width, length, drainage and formation of access.
- Suitability of proposed lots for subsequent buildings and future use.
- Design and layout of the subdivision, as outlined in the Comprehensive Development Plan submitted as part of the application.
- Provision of a network of cycleways and walkways to the extent that these service the subdivision and wider Growth Precinct 4 and wider Feilding Residential Area.
- Avoidance or mitigation of flood and stormwater hazards, including the assessment of the level of flood hazard risk and what mitigation measures are required such as setback distances, minimum floor levels or specified building platforms.

- The provision of open space networks.
- How the subdivision provides for a building platform and land free from hazard risks while also achieving a permeable surface for all lots.
- Effects on the capacity of Council infrastructure.
- Staging and timing of subdivision development including the provision of infrastructure.
- Positive effects of subdivision.

Performance Standards

a. Lot Size

- i. Any subdivision must comply with an average lot size of 600m².
- ii. Any subdivision must ensure lot sizes are sufficient in size to achieve site coverage, outdoor space and permeable surface area requirements for the Residential Zone in Rule 15.4.2.

b. Access and Road Design

- i. Access and Road Design and construction must comply with Council Engineering Standards for Land Development. Common access to eight or more lots must be provided by road formed to Council standards.
- ii. Access must comply with the provisions in Rule 3B.4.2 and 3B.4.3.
- iii. Roads must comply with the design requirements of Appendix 3B.2 Road Cross Sections.

c. Shape Factor

Each residential lot must be capable of containing an 18m diameter circle.

d. Comprehensive Development Plan

Any development and subdivision must have a Comprehensive Development Plan that demonstrates how the proposal has been designed in general accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1. The Comprehensive Development Plan must demonstrate how the proposal:

- i. addresses and ensures that design, layout and servicing is in accordance with the Structure Plan in Appendix 8.1 and does not restrict future development opportunities within the area.
- ii. demonstrates a connected internal roading network that facilitates movement demands within the area while also providing a block structure that supports a high quality urban environment.
- iii. shows the location, width and design of publicly accessible roads, laneways and accessways having regard to vehicles, public transport, pedestrians and cyclists that are intended to use them.
- iv. outlines the servicing required for the development, and ensures suitable sizing of infrastructure to service the wider Growth Precinct.
- v. includes a spatial layout plan showing how the development achieves connectivity and integration to the surrounding area.
- vi. identifies the location and shape of publicly accessible open space areas, and provides indicative landscape concepts recognising the historical values of the area.
- vii. Identifies the location of natural watercourses and overland flow path and how these will be managed or enhanced.
- viii. provides clear reference to:
 - a. The objectives and policies of the Zone
 - b. Current and anticipated future built form and uses
 - c. Anticipated future capacity of the activity area
 - d. Relationships and connections within Growth Precinct 4.
- e. Earthworks
 - i. All subdivisions must comply with the provisions in Rules 3D.4.1 and 3D.4.2.
 - ii. Existing overland flow paths are maintained and not filled in, dammed or diverted.

Guidance Note: Earthworks, damming and diversion are also regulated by the Manawatu-Wanganui Regional Council and a resource consent maybe required under the rules of the One Plan.

- f. Minimum Floor Levels

Building platforms must be identified which are at or above the flood level predicted for a 0.5% annual exceedance probability (AEP) (1 in 200 year) flood event.

Guidance Note: Council has a model for stormwater that can be used to predict flood levels for areas within Growth Precinct 4. Liaison with Council’s Land Development Manager is recommended.

- g. Infrastructure
- i. All cables and pipes, including for gas, power and telecommunications must be placed underground.
 - ii. All essential infrastructure must be available for connection within 30 metres of the nearest point of the land being subdivided.
 - iii. Any subdivision must be connected to reticulated services and be designed and constructed to comply with Council Engineering Standards for Land Development.
 - iv. All new essential infrastructure proposed in a subdivision must be located within road reserve and vested in Council.
 - v. Development must only occur in areas where essential infrastructure is available and of sufficient capacity for the subdivision.

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Guidance Note: In situations where development is proposed ahead of Council infrastructure investment, Council may enter into agreements with land owners as outlined in the Council Development Contributions Policy around the provision of essential infrastructure.

In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of the Subdivision Chapter and the Residential Zone, assess any application within Growth Precinct 4 in terms of the following assessment criteria:

- i. Whether the subdivision design and layout compliments the diverse character and amenity values of Feilding’s residential area.
- ii. The extent to which the subdivision is designed to provide for the future development of adjoining sites, in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1.
- iii. How the proposed development and subdivision relates and connects to adjoining sites and areas and whether it enables future staged development and

or subdivision of adjoining lots by giving effect to the Growth Precinct 4 Structure Plan in Appendix 8.1.

- iv. The extent to which deviations from the Growth Precinct 4 structure plan will result in an alternative coordinated, comprehensive outcome that will satisfy the objectives and policies for Growth Precinct 4.
- v. The extent to which the proposed layout takes into consideration the shape, orientation and aspects of lots, to create building sites and outdoor amenity areas which have a northward orientation and ability for passive solar gain.
- vi. The extent to which the lot layout will allow new buildings to retain reasonable visual privacy and sunlight.
- vii. The extent to which all lots within the subdivision have safe and adequate vehicle access, taking into account the requirements of the access performance standards of Rules 3B.4.2 and 3B.4.3.
- viii. The extent to which natural hazards are avoided or mitigated.
- ix. The degree to which the subdivision design mitigates any likely increases in peak stormwater run-off and peak stormwater flow.
- x. The consistency of the proposed subdivision with relevant subdivision engineering requirements.
- xi. The extent to which stormwater effects are managed, including overland flow paths.
- xii. The extent to which minimum floor levels are assessed and provided for.
- xiii. The extent to which subdivision design and layout gives effect to the Growth Precinct 4 Structure Plan in Appendix 8.1.
- xiv. The degree to which the subdivision provides for the integration of essential infrastructure into the existing Council network in a manner which is orderly, timely and efficient and that facilitates future development and capacity requirements.
- xv. The extent to which Council has the ability to maintain and access infrastructure and services in the future.

Guidance Notes:

1. Earthworks, damming and diversion are also regulated by the Manawatu-Wanganui Regional Council and a resource consent maybe required under the rules of the One Plan.
2. The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (2011) also applies to subdivision and a consent may be required under those provisions.
3. The provisions of the National Environmental Standard for Telecommunications Facilities (2008) apply and resource consent may be required under those Standards. In the event of a conflict between them the provisions of the National Environmental Standard override the District Plan.

8.4.2 Discretionary Activities

The following activity is a Discretionary Activity within Growth Precinct 4:

- a. Any subdivision that does not comply with an average lot size of 600m².
- b. Any subdivision that is not in general accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1.
- c. Any subdivision that proposes earthworks to change the ground level that alters the Overland Flow Path or waterbodies shown in Appendix 8.2.
- d. Any subdivision not specifically provided for in this Plan.

In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of the Subdivision Chapter and the Residential Zone, assess any application within Growth Precinct 4 in terms of the assessment criteria in Rule 8.4.3.

Guidance Note:

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (2011) also applies to subdivision and a consent may be required under those provisions.

Appendix 8.2 Precinct 4 Overland Flow Paths



Appendix 2: New Chapter 15 - Residential Zone Chapter

15.0 RESIDENTIAL ZONE

15.1 Introduction

Maintaining and enhancing the mixed residential character and amenity of Feilding’s residential zone is a key focus of the District Plan. Feilding has a variety of housing and lot density, open space, and community facilities all within easy access of the town centre.

The focus of this chapter is the rezoning of the new Growth Precinct 4 area. It is expected that future plan changes will expand this section with provisions for the entire Residential Zone in the District Plan.

15.2 Resource Management Issues

The following resource management issues have been identified in relation to urban growth in the Growth Precinct 4 area:

1. Effects of residential development on natural and physical resources, including the vibrancy of the town centre, infrastructure, wastewater, water supply, stormwater, and the safety and efficiency of the roading network.
2. The potential fragmentation and lack of connectivity through subdivision and the prevalence of cul-de-sacs creating poor urban design outcomes.
3. Ensuring that development improves the health, safety and resilience of communities.
4. The location and design of housing and accessory buildings ensures high onsite amenity and effective use of private open space.
5. The importance of open spaces, permeable areas and vegetation in residential areas and the positive contribution trees and vegetation make to residential amenity values.
6. The scale, character and intensity of the effects of non-residential activities in the residential zone and compatibility with residential activities.

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15.3 Objectives and policies

Objective 1

To maintain or enhance the mixed residential character and amenity of Feilding’s Residential Zone, including the neighbourhood amenities for its residents.

Policies

- 1.1 To maintain the low density residential development pattern of Feilding.
- 1.2 To achieve a high quality residential streetscape environment through providing for trees on berms and in public areas, and room for planting on residential lots.
- 1.3 To ensure all residential lots have adequate access to sunlight for homes and outdoor living areas without prolonged shading from buildings and structures.
- 1.4 To ensure vehicle parking is provided onsite, to minimise on street parking in residential areas.

Objective 2

To promote development within Growth Precinct 4 that creates an attractive, healthy and safe place to live.

Policies

- 2.1 To enable development in general accordance with the Growth Precinct 4 Structure Plan (Map 8.1).
- 2.2 To minimise adverse visual effects on adjoining residential properties through controls on the height and scale of buildings.
- 2.3 To encourage an active street frontage through design controls for new dwellings, garages and fencing, whereby garages do not dominate the streetscape.
- 2.4 To ensure buildings and structures in Growth Precinct 4 are located and designed to manage the risk of natural hazards.
- 2.5 To require development to provide appropriate permeable surface areas to minimise the effects of stormwater flooding.
- 2.6 To encourage good connectivity within and between new and existing residential areas that enables future staged development of adjoining land.
- 2.7 To ensure subdivision and development provides for sustainable and efficient connectivity within Growth Precinct 4 that enables people to easily and effectively move around by driving, walking and cycling.

Objective 3

To control the effects of commercial and non-residential activities on the character and amenity of the residential environment within Growth Precinct 4.

Policies

- 3.1 To restrict commercial and non residential activities in the Residential Zone which are unsightly or otherwise detract from the amenity values and ambience of the Residential Zone.

- 3.2 To control the effects of the scale and character of commercial and non-residential activities and buildings within the Residential Zone.
- 3.3 To avoid the establishment of activities which create adverse effects on the amenity and ambience of the residential environment.
- 3.4 To ensure outdoor storage spaces are screened from public viewpoints.

Objective 4

To ensure that any multi-unit residential development and retirement living achieves high quality residential amenity.

Policies

- 4.1 To encourage comprehensively designed higher density development that is attractive to residents, responsive to housing demands, achieves high quality urban design and onsite amenity, is integrated and sympathetic with the amenity of the surrounding residential area and provides a positive contribution to Growth Precinct 4.
- 4.2 To ensure dwellings have living areas that are located and orientated to optimise sun exposure, natural lighting and views to public spaces.
- 4.3 To avoid habitable rooms that face south only.
- 4.4 To require private and public areas to be differentiated and defined, while ensuring buildings retain reasonable visual privacy and daylighting for all adjacent residential units and properties.
- 4.5 To ensure higher density development incorporates open space and landscaping that is well planned and designed to deliver high levels of residential amenity and well located, good quality open spaces.
- 4.6 To ensure individual units or multi units on a site are clearly expressed and entrances are signalled and readily visible from the street or entranceways.

15.4 Rules

Rules in this chapter apply to Growth Precinct 4 and the chapter needs to be read in conjunction with the District Wide Rules in Chapter 3.

15.4.1 Permitted Activities – Dwellings and Accessory buildings

The following activities are Permitted Activities within Growth Precinct 4, provided that they comply with the standards in Rule 15.4.2 below:

- a. One dwelling on a site.
- b. Accessory buildings.

15.4.2 Standards for Permitted Activities – Dwellings and Accessory Buildings

The permitted activities specified in Rule 15.4.1 above for Growth Precinct 4 must comply with the following standards:

a. Site Coverage

Maximum building site coverage of 35%.

b. Building Envelope

i. Maximum height 9m

ii. All parts of a building must be contained within a 45 degree plane commencing at 2.8 metres above ground level inclined inwards at right angles in plan. See Figure 15.1 below.

iii. The height recession plane in condition b.ii above does not apply to:

a. Eaves

b. Solar panels and water heaters

c. Antennas, aerials or chimneys

d. Gable roof ends, if the total area of that part of the building above the height recession plane does not exceed 1/3 of the gable end height.

Height Recession Plane

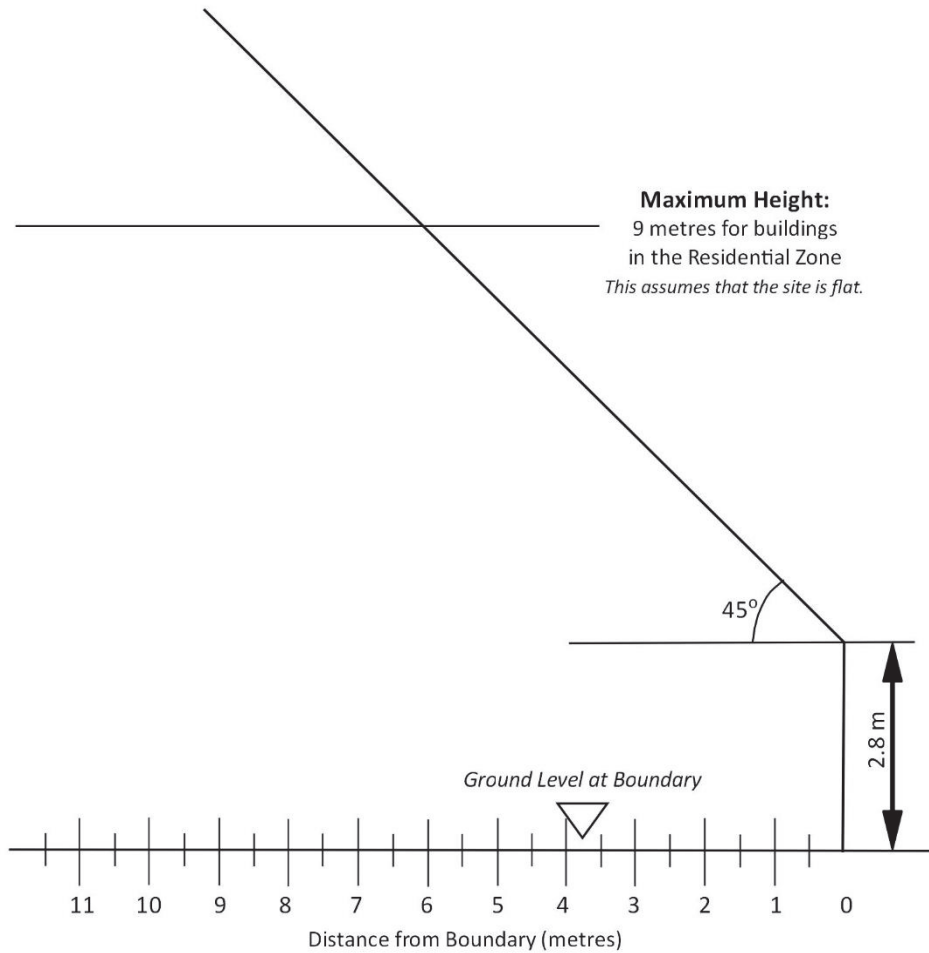


Figure 15.1

c. Minimum Floor Levels

Floor levels must be above the flood level predicted for a 0.5% annual exceedance probability (AEP) (1 in 200 year) flood event, plus 500mm freeboard.

Guidance Note: Council has a model for stormwater that can be used to predict minimum floor levels for areas within Growth Precinct 4. Liaison with Council’s Land Development Manager is recommended.

d. Yards

- i. All dwellings and accessory buildings must be setback 3m from all yard boundaries.
- ii. No new dwelling or accessory buildings are erected within 10 metres of the landward edge of the Makino Stream.

e. Outdoor Living Courts

All dwellings shall have an outdoor living court:

- i. At least 36m² in area.
- ii. That is capable of containing a circle 6m in diameter.
- iii. Accessible directly from the main living area.
- iv. Orientated east, north or west of the dwelling.
- v. The outdoor living court cannot comprise:
 - a. part of the outdoor living court of another dwelling;
 - b. driveways, manoeuvring areas, and car parking spaces; or
 - c. accessory buildings.

f. Outdoor Service Courts

- i. Each dwelling shall have an outdoor service court adjoining the dwelling or outdoor living court no less than 20m² in area and at least 3m in width. This area must be free of driveways and manoeuvring areas.

g. Permeable Surface Area

A minimum of 50% of the net site area shall be a permeable surface. This includes decks provided the surface material of the deck allows water to drain through to a permeable surface.

h. Access

- i. Compliance with Rule 3B.4.2 and Council's Engineering Standards for Land Development.
- ii. A side boundary fence must not exceed 1.1 metres in height for a distance of 3 metres into the property from the road boundary when next to the driveway. After 3 metres the fence may be a maximum of 1.8 metres in height.

- i. Parking
Compliance with Rule 3B.4.4.
- j. Visual Amenity
 - i. No more than one derelict vehicle shall be kept within view of neighbouring property or a public place.
- k. Earthworks
Compliance with Rules 3D.4.1 and 3D.4.2.
- l. Fencing
Compliance with Rule 15.4.3.
- m. Garages

Any road fronting garage wall that is either partly or wholly within 3m from a road front boundary must be screened along 70% of the frontage of the garage with vegetation capable of growing to a minimum of 1 metre tall. Glazing must be provided for at least 10% of the surface area of the road fronting garage wall.

Guidance Note:

Earthworks are also regulated by the Manawatū-Whanganui Regional Council and a resource consent may be required under the rules of the One Plan.

15.4.3 Permitted Activities – Fencing

Fencing in Growth Precinct 4 is a permitted activity provided:

- a. Boundaries with public spaces:

A fence must not exceed 1.1 metres in height for more than half the property boundary directly adjoining public open space (reserve, walkway or park) with the other half not exceeding 1.8 metres in height, unless the fence is of open construction in which case the fence must not exceed 1.8 metres in height.
- b. Boundaries with road frontage:

A fence must not exceed 1.1 metres in height along the entire property boundary directly adjoining a road frontage, unless the fence is of open construction in

which case the fence must not exceed 1.8 metres in height and not over more than 1/3 of the frontage width.

c. Side Boundary Fence

A side boundary fence must not exceed 1.1 metres in height for a distance of 3 metres into the property from the road boundary when next to the driveway. After 3 metres the fence may be 1.8 metres in height.

15.4.4 Permitted Activities – Non-Residential Activities

The following activities are Permitted Activities within Growth Precinct 4, provided that they comply with the standards in Rule 15.4.5 below:

a. Home occupations.

15.4.5 Standards for Permitted Activities – Non-Residential Activities

The permitted activities specified in Rule 15.4.4 above within Growth Precinct 4 must comply with the following standards:

a. Permitted Activity Performance Standards

Compliance with Rule 15.4.3.

b. Number of staff

Home occupations shall only involve people who reside at the house. No staff are permitted.

c. Site and Floor Area

No more than 40m² of the dwelling or accessory building (including gross floor area and external storage areas) may be used for the activity.

d. Hours of Operation

Non-residential activities within the Residential Zone may only operate between 7am and 7pm (Monday to Saturday).

e. Retailing

Only goods manufactured and grown on the site may be retailed or distributed from the site.

f. Storage and Display

No equipment, raw materials, finished or partly processed products or rubbish shall be stored or displayed outdoors, or visible from a public space.

g. Noise

Compliance with Rule 3C.4.2.

15.4.6 Restricted Discretionary Activities – Activities Not Complying with Relevant Standards

The following activities are Restricted Discretionary Activities within Growth Precinct 4:

- a. Any permitted activity that does not comply with any of the relevant standards in Rules 15.4.2, 15.4.3 or 15.4.5.

For these activities, the Council has restricted its discretion to considering the following matters:

- The safe, efficient and integrated operation of the roading network
- Location, design and appearance of the dwelling or accessory building
- Residential character and amenity values including onsite amenity
- Visual amenity effects on adjoining residential properties and surrounding streetscape
- Parking
- Landscaping
- Access
- Noise
- Fencing
- Essential Infrastructure
- Natural hazards including stormwater management.

In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of Growth Precinct 4 and the Residential Zone and Chapter 3 District Wide Rules, assess any application in terms of the following assessment criteria:

- i. The degree of non-compliance with the particular performance standards that the proposal fails to meet.
- ii. Whether the application will result in any adverse effects on the amenity values of neighbouring properties or the character of the Residential Zone.
- iii. Whether the proposal contains sufficient onsite parking to meet the needs of the activity.
- iv. The extent to which noise, hours of operation, and other environmental disturbance on surrounding residential neighbours can be avoided or mitigated.
- v. The extent to which additional traffic generated impacts on the safe and efficient operation of the roading network.
- vi. To ensure the activity is in character with or complementary to the surrounding residential neighbourhood.
- vii. Whether the proposed landscaping maintains or enhances the ambience and amenity values of the surrounding residential area.
- viii. The extent to which the site and building design mitigates any increase in peak stormwater run-off and peak stormwater flow due to the reduction in permeable surfaces.
- ix. Whether the existing Council essential infrastructure network has sufficient capacity for the proposed development.

15.4.7 Restricted Discretionary Activities – Retirement Living and Multi-Unit Residential Development

The following activities are Restricted Discretionary Activities:

- a. Development involving 2 or more dwelling units on a site.
- b. Retirement village.

For these activities, the Council has restricted its discretion to considering the following matters:

- Amenity effects on surrounding residential environment and streetscape
- Design, scale and appearance of buildings and structures
- Site layout and access arrangements

- Onsite landscaping
- Privacy across boundaries and within the development
- The safe and efficient operation of the roading networks, and internal circulation, parking, loading and manoeuvring areas
- Residential character and amenity values including onsite amenity
- Lighting
- Access
- Natural hazards, including stormwater management

Performance Standards

a. Site coverage

A maximum site coverage of 40% applies to development of the site.

b. Outdoor Living Court

- i. Each unit must be provided with a private outdoor living court within the site which can meet the following requirements:
 - a. At least 30m² in area that is free of driveways, parking spaces, buildings and manoeuvring areas.
 - b. Is able to accommodate a circle of 4 metres in diameter
 - c. Is accessible directly from the main living area for a length of not less than 2 metres
 - d. Is orientated to the west, north or east of the unit.

c. Separation distances between dwellings and buildings on the same site

- i. 1.8 metres between each accessory building serving separate dwellings, except where the accessory building is joined by a common party wall.
- ii. 1 metre between an accessory building and a dwelling, except for habitable rooms which must be 3m between an accessory building and a dwelling.
- iii. 1.5m between a dwelling and right of way or driveway.

- iv. 3m between dwellings, except where the dwelling is joined by a common party wall.
- d. Access
Compliance with Rule 3B.4.2. and Council’s Engineering Standards for Land Development.
- e. Parking
Compliance with Rule 3B.4.4.
- f. Permeable surface
Compliance with Rule 15.4.2.h.
- g. Lighting
All exterior lighting must not result in light spill to neighbouring properties.
- h. Fencing
Compliance with Rule 15.4.2.l.

Guidance Note:

Refer also to the New Zealand Fire Service firefighting water supplies code of practice SNZ PAS 4509:2008. This Code identifies what is required for the Fire Service to have access to sufficient water for fire fighting purposes.

In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of Growth Precinct 4 and the Residential Zone and Chapter 3 District Wide Rules, assess any application in terms of the following assessment criteria:

- i. How new development relates to the patterns of the height and width of primary building forms, predominant roof types and pitches in the surrounding residential areas.
- ii. The extent to which building materials are sympathetic to the surrounding residential environment.
- iii. Whether the development allows views of the street and communal spaces within the development, including views of outdoor carparking spaces from the dwelling.
- iv. The extent to which significant planting and trees are retained, and neighbourhood amenity character is reinforced with the type and species of new planting.

- v. The degree to which fences are sufficiently low to provide for visual connection between the dwelling and street and allow safe vehicle access across the footpath.
- vi. The degree to which carports and garages are visually compatible with and of a similar standard to the development as a whole.
- vii. The degree to which large, highly visible retaining walls are avoided or screened with appropriate planting.
- viii. Whether the site and building design mitigates any increase in peak stormwater run-off and peak stormwater flow due to the reduction in permeable surfaces.
- ix. Whether the proposal is consistent with Council’s Engineering Standards for Land Development.
- x. The extent to which the proposal provides each dwelling with reasonable visual privacy and daylight.

15.4.8 Discretionary – activities not provided for

The following activities are Discretionary Activities within Growth Precinct 4:

- a. Any residential activity not otherwise specified as Permitted, Restricted Discretionary or Non-Complying Activity, or is not specifically provided for in this Plan.
- b. Any commercial or non-residential activity that is not otherwise specified as Permitted, Restricted Discretionary or Non-Complying Activity.

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Performance Standard for commercial and non-residential activities

- a. The following information must be submitted to Council on lodgement of an application under this rule for commercial and non-residential activities:
 - i. A noise effects assessment prepared by a suitably qualified acoustic expert; and
 - ii. A traffic impact assessment prepared by a suitably qualified traffic engineer or traffic planner.
- b. Outdoor storage areas

Any outdoor storage area must be screened and not visible when viewed from any adjacent residential property, public road or open space.

In determining whether to grant a resource consent and what conditions to impose, the Council will, in addition to the objectives and policies of Growth Precinct 4 and the Residential Zone and Chapter 3 District Wide Rules, assess any application in terms of the following assessment criteria:

- i. The extent to which the effects of noise, hours of operation and other environmental disturbance on surrounding residential neighbourhoods are avoided, or can be remedied or mitigated.
- ii. To avoid, remedy or mitigate the visual impacts of any activities, and to preserve the character and amenity of the residential environment.
- iii. Whether the Noise Management Plan prepared by an acoustical consultant identifies noise management measures to avoid, remedy or mitigate adverse effects of noise, including best practicable options adopted to minimise sound emissions.
- iv. The extent to which the additional traffic generated impacts on the safe and efficient operation of the roading network, internal circulation, parking, manoeuvring and access provisions.
- v. The extent to which appropriate landscaping elements and plantings have been incorporated to enhance the character, ambience and amenity values of the adjoining residential neighbourhood.
- vi. The extent to which onsite planting will reduce the activities visual intrusion on the adjacent properties and break up areas of hard surfacing such as fence lines and paved areas.

15.4.9 Non-Complying

The following activities are Non-Complying Activities within Growth Precinct 4:

- a. Any Industrial Activity, including a service station.

Appendix 3: New District Plan Structure Explanation

MANAWATU DISTRICT COUNCIL - 2ND GENERATION DISTRICT PLAN

Table of Contents

Part 1 – Reviewed

Cover Page
Public Information - Statutory Acknowledgements of the Crown
Chapter 1 – Introduction
Chapter 2 – Definitions
Chapter 3 – District-wide Rules
Chapter 4 – Historic Heritage
Chapter 9 - Designations
Chapter 10 – Business Zones
Chapter 16 – Industrial Zone

1 main Contents Page will be added to front of the plan.

Part 2 – Not Yet Reviewed (1st Generation District Plan)

Plan Strategy

Section 2 - Significant Resource Management Issues Facing The District
Section 4 – Managing Land Use Effects
Section 5 – Subdivision
Section 6 – Esplanade Management
Section 7 – Financial Contributions
Section 8 – Natural Hazards
Section 9 – Energy and Water Use and Air Quality
Section 10 – Utilities
Section 11 – Cross Boundary Issues

District Rules – Rule A

District Rules – Rule B

Zoning Standards – Rule B; B1 Residential Zone, B2 Village Zone, B3 Rural Zones
Rule B4 – Business Zone
Rule B6 – Recreation Zone
Rule B7 – Flood Channel Zones
Rule B8 – Manfeild Park Zone
Rule B9 – Special Development Zone

District Rules – Rule C

Rule C1 – Status of Subdivision
Rule C2 – Zone Standards – Subdivision
Rule C3 – Esplanade Management

District Rules – Rule D – Financial Contributions

Appendices

Appendix 1 – Heritage Places
Appendix 1A - Wetlands, Lakes, Rivers and their Margins
Appendix 1B – Significant Areas of Indigenous Forest/Vegetation (Excluding Reserves)
Appendix 1C – Outstanding Natural Features
Appendix 1D – Trees with Heritage Value
Appendix 1E – Buildings and Objects with Heritage Value
Appendix 1F – Sites with Heritage Value
Appendix 1I – Criteria for Assessing the Significance of Natural Areas
Appendix 1J – Clearance of Indigenous Vegetation
Appendix 2 – Parking/Roading
Appendix 3 – Airports/Noise/Pig Farming
Appendix 5 – Rural Subdivision Nodes
Appendix 6 – Land Subject to Inundation
Appendix 7B – Ohakea Height Control
Appendix 8 – Manfeild Park and Special Development Zones
Appendix 9 – Structure Plans Growth Precincts
Appendix 10 – Subdivision Design Guide
Schedule 1 – Statutory Acknowledgements

The Plan has been organised into a Part 1 and Part 2.

Part 1 – Reviewed: All content that has been reviewed, and notified as part of a Plan Change.

Part 2 – Not Yet Reviewed (1st Generation District Plan): All content that is yet to be reviewed. Once reviewed, content will move into Part 1. 'Sections' will become 'Chapters'.

7. FINANCIAL CONTRIBUTIONS

7.1 INTRODUCTION

Council is only allowed to collect financial contributions from subdividers or developers if those contributions are authorised by provisions in the Plan. Contributions can be required as a condition of land use approval or subdivision consent, or upon any permitted activity, and may be in the form of:

- a) Money or
- b) Land (including esplanade reserves) or
- c) Any combination of money and land.

Any financial contributions collected must be used for the purposes specified, and must be calculated in the manner described in the Plan. (Refer Rule D1, Page 162).

7.2 OBJECTIVES

Objectives

FC 1) To ensure that subdividers and developers provide, or contribute toward the cost of providing, roading, utility services and reserves.

FC 2) To ensure that the level of these financial contributions is related to:

- i) The degree to which the facilities concerned serve the land in the subdivision or development,
- ii) The additional demands which the development or subdivision places on public services or facilities, or
- iii) The level of benefit which accrues to the subdivider/developer and future residents of the land.

FC 3) To use financial contributions to mitigate the adverse effects of development or subdivision on the environment.

(Issues 5 and 10) (Refer also: Objectives S4, S8 and U 1 –Pages 49, 53 and 81).

Explanation

Sewerage, water and stormwater systems, roading networks and recreation reserves are important in maintaining an acceptable level of public health, safety and convenience. Council has a role in ensuring the continued provision of roading and reserves, and provides utility services in some places. These facilities are part of the physical resources which need to be managed under the Act.

New development and subdivision often results in a demand for the extension and upgrading of services, including reserves. It would be unreasonable for the entire cost of such extensions and upgrading to be met by the community as a whole. The purpose of taking financial contributions is to recover a portion of these costs from those who benefit directly from development (ie the subdivider/developer). A large part of the developer's "contribution" will often be installing new roads and services to cater for the development itself. Such works are not within the definition of "financial contributions", but will be required

Main heading will be deep green

7 FINANCIAL CONTRIBUTIONS

7.1 Introduction

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- a. Money or
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7.2 Objectives

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Objectives

- FC 1) To ensure that subdividers and developers provide, or contribute toward the cost of providing, roading, utility services and reserves.
 - FC 2) To ensure that the level of these financial contributions is related to:
 - i) The degree to which the facilities concerned serve the land in the subdivision or development,
 - ii) The additional demands which the development or subdivision places on public services or facilities, or
 - iii) The level of benefit which accrues to the subdivider/developer and future residents of the land.
 - FC 3) To use financial contributions to mitigate the adverse effects of development or subdivision on the environment.
- (Issues 5 and 10) (Refer also: Objectives S 4 (5.3.4), S 8 (5.3.8) and U 1 (10.1)).*

PAGE
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Explanation

Sewerage, water and stormwater systems, roading networks and recreation reserves are important in maintaining an acceptable level of public health, safety and convenience. Council has a role in ensuring the continued provision of roading and reserves, and provides utility services in some places. These facilities are part of the physical resources which need to be managed under the Act.

Section 7 – Financial Contributions

Objectives will be removed from grey boxes

- f) To require the subdivider or developer to pay for any upgrading which is needed to cope with a new activity, (eg stronger culverts and bridges), if a formed road is adequate for its present function and location.
- g) To require developers to pay for any new street lights, street signs, vehicle crossings or entranceways required to serve their development.

Explanation

All sorts of subdivisions may involve the formation of new roads, lanes and rights-of-way. If such roads and driveways will only benefit the lots in the subdivision, they should be paid for fully by the subdivider.

Subdivisions and other land use activities may also result in a need or demand for existing roads (including unformed roads) to be upgraded, widened or realigned. Existing roads within the District are usually sufficient to fulfill their present function, and Council is under no obligation to form them to a higher standard. Council is of course willing to discuss the possibility of upgrading specific roads. This may involve a staged programme including payments from the landowner.

The Plan allows Council to require a subdivider to pay all or part of the cost of upgrading any existing road, (formed or unformed) if:

- a) The particular subdivision or development is likely to give rise to additional traffic on the road concerned, and
- b) The road then needs to be upgraded to a higher standard as a result of this traffic.

If an existing road does need to be upgraded, any benefits to other landowners on the road will also be considered. The actual amount of contribution sought will be fixed at the time of subdivision consent. Once it has been paid, Council is obliged to carry out the full upgrading which has been costed.

There will be many situations where subdivisions or new houses rely on an unformed road for access. As noted above, Council is under no legal obligation to form or upgrade any unformed road. In cases where a building or new allotment needs access from such a "paper" road, the cost should be borne by the subdivider or developer, rather than by the community at large. Council will ensure that any works take concerns such as drainage and soil stability into account.

The onus will always be on the landowner and/or the operator of any land use activity involving heavy traffic to consult with the roading authority at an early stage to determine whether their proposals are compatible with the roading network. (Refer: Rule B3 3.3.1 H), Page 127). Council will seek to recover the cost of any repairs to its roads (above those caused by normal "wear and tear") from the landowner and/or operator through the relevant legislation.

District Plan Methods

- Rules D1 1.3 and 1.4 (Pages 162 and 163).

Other Methods

- Local Government Act penalties for damage to roads.
- Road damage deposits.

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District Plan Methods

- Rules D1.3 and D1.4.

Other Methods

- Local Government Act penalties for damage to roads.
- Road damage deposits.

New style of cross-referencing to District Rules, e.g. (Refer Rule B7 7.4) now (Refer Rule B7.4). Cross-referencing to page numbers has been removed to future-proof the text.

Section 7 – Financial Contributions

PAGE 5

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3 DISTRICT WIDE RULES

3.1 Introduction

This chapter contains provisions that apply in the Manawatu District relating to:

- Network utilities
- Transport
- Noise
- **Earthworks**
- Signage
- **Temporary activities**
- **Relocated buildings**

Terms included in the Definitions chapter will be bolded throughout the plan

This chapter is intended to be read in conjunction with the relevant zoning provisions. Where specific rules are included in the relevant zoning rules, then those rules apply (unless otherwise referenced in this chapter).

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Sub-section numbering – District Rules - e.g. 6.1 Permitted Activities will now be B6.1 Permitted Activities.

6.1 PERMITTED ACTIVITIES	B6.1	Permitted Activities
6.1.1 List of Activities	B6.1.1	List of Activities

SECTION 7 – FINANCIAL CONTRIBUTIONS

Each Section or Chapter will include its own contents page

7	FINANCIAL CONTRIBUTIONS _____	1
7.1	Introduction _____	1
7.2	Objectives _____	1
7.3	Utility Services _____	2
7.4	Roads and Streets _____	4
7.5	Reserves Provision _____	6
7.6	Environmental Results Anticipated _____	8
7.7	Monitoring and Review Procedures – Financial Contributions _____	8

Appendix 4: Cross Referencing Changes

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Managing Land Use Effects	4.2 --> Objective --> LU 4	(Refer also: Objectives HV 2 and LU 28 -Pages 7 and 42)	Refer also: Objectives HV 2 and LU 28
Managing Land Use Effects	4.2--> Objective	(Refer also: Objectives LU 9, 10, 12,14, 16 and U1 – Pages 19, 21, 23, 25, 28 and 81)	(Refer also: Objectives LU 9, LU 10, LU 12 , LU 14 , LU 16 and U 1).
Managing Land Use Effects	4.2 --> Policies -> f.)	Objectives HV 2 and EWA 2 – Pages 7 and 77)	Objectives HV 2 and EWA 2
Managing Land Use Effects	4.2 --> Policies -> h.)	Objectives LU 10-12 and 14 – Pages 21, 23 and 25	Objectives LU 10, LU 12, LU 14
Managing Land Use Effects	4.2. --> District Plan Methods	District Rules A2 and B, Pages 97-150.	District Rules A2 and B.
Managing Land Use Effects	4.3.1 --> Objective --> LU7) --> (a)	Objective S1-Page 46	Objective S 1
Managing Land Use Effects	4.3.1 --> Objective --> LU7) --> (b)	Objective S1 -Page 46	Objective S 1
Managing Land Use Effects	4.3.1 --> Objective --> LU7) --> (c)	Objectives S8, S9 and EWA 1 -Pages 53, 55 and 77	Objectives S 8, S 9 and EWA 1
Managing Land Use Effects	4.3.1 --> Explanation	(Refer: Objective S1, Page 46).	(Refer: Objective S 1).
Managing Land Use Effects	4.3.1 --> Explanation	(Refer: Subdivision Objective 8, Page 53)	(Refer: Subdivision Objective 8)
Managing Land Use Effects	4.3.1 --> Explanation	(Refer: Rule A1 1.3.4, Page 94)	(Refer: Rule A1.3.4)
Managing Land Use Effects	4.3.1 --> Explanation	(Refer: Objective S1, Page 46).	(Refer: Objective S 1).
Managing Land Use Effects	4.3.1 --> District Plan Methods	District Rules A1 1.3.4 and B3. (Pages 94 and 124).	District Rules A1.3.4 and B3.
Managing Land Use Effects	4.3.2 --> Objective	(Refer also: Objectives LU 5, LU 9 and LU10 - Pages 12, 19 and 21).	(Refer also: Objectives LU 5, LU 9 and LU 10).
Managing Land Use Effects	4.3.2 --> Policies --> d	referred to in Policy 4.3.4 h	referred to in 3B.3 Policy 1.1 e.
Managing Land Use Effects	4.3.2 --> Explanation	(Refer Rule B3 3.3.1C), Page 126)	(Refer Rule B3.3.1 c.)

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Managing Land Use Effects	4.3.2 --> Explanation	(Refer explanation to Objective LU 25- Page 34)	(Refer explanation to Objective LU 25.
Managing Land Use Effects	4.3.2 --> Explanation	(Refer Policy 5.3.3 b), Page 48).	(Refer Chapter 5.3.3 Policy b.).
Managing Land Use Effects	4.3.2 --> Explanation	conflict with Objectives LU 8 and S1 to S5.	conflict with Objectives LU 8 and S 1 to S 5.
Managing Land Use Effects	4.3.2 --> District Plan Methods	District Rule B3 (Pages 124-133)	District Rule B3
Managing Land Use Effects	4.3.3 --> Objective	(Refer also: Objectives HV1, LU 5, LU 8 and LU 23 -Pages 7, 12, 17 and 32).	(Refer also: Objectives HV 1, LU 5, LU 8) and LU 23.
Managing Land Use Effects	4.3.3 --> Explanation	(Rule A1 1.3.4, Page 95).	(Rule A1.3.4).
Managing Land Use Effects	4.3.3 --> Explanation	(Objective LU 8, Page 17)	(Objective LU 8)
Managing Land Use Effects	4.3.3 --> District Plan Methods	District Rules B3 3.3.1 D) and C2 2.4.1 H) (Pages 126 and 157).	District Rules B3.3.1 D) and C2.4.1 H).
Managing Land Use Effects	4.3.4 --> Objective --> LU 10)	(Refer also: Objective LU 5 -Page 12).	(Refer also: Objective LU 5).
Managing Land Use Effects	4.3.4 --> Objective --> LU 11)	(Refer also: Objectives LU 1 and 2 -Page 12).	(Refer also: Objectives LU 1 and 2).
Managing Land Use Effects	4.3.4 --> Explanation	(Refer explanation to Objective LU 25- Page 34).	(Refer explanation to Objective LU 25).
Managing Land Use Effects	4.3.4 --> Explanation	Objectives LU 10 and LU 11	Objectives LU 10 and LU 11
Managing Land Use Effects	4.3.4 --> Explanation	(Refer Rule A2 2.2, Page 97).	(Refer Rule A2.2).
Managing Land Use Effects	4.3.4 --> District Plan Methods	Rule B3, Pages 124-133.	Rule B3, Rural Zones.
Managing Land Use Effects	4.4 --> Objective --> ii)	Refer also: Objective LU 26 -Page 39).	Refer also: Objective LU 26 - Page 42).
Managing Land Use Effects	4.4 --> Objective --> vi)	(Refer also: Objective LU 25- Page 34)	(Refer also: Objective LU 25 - Page 36)
Managing Land Use Effects	4.4 --> Objective --> viii)	(Refer also: Objectives LU 27 and S 9, -Pages 40 and 55).	(Refer also: Objectives LU 27 and S 9).

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Managing Land Use Effects	4.4 --> Objective --> x)	Refer also: Objective S9, -Page 55).	(Refer also: Objective S 9).
Managing Land Use Effects	4.4 --> Objective	(Issue 5) (Refer also: Objectives LU1, LU2 and LU5, -Page 12).	(Issue 5) (Refer also: Objectives LU 1, LU 2 and LU 5).
Managing Land Use Effects	4.4 --> District Plan Methods	District Rule B1, Pages 108-116.	District Rule B1, Residential Zone.
Managing Land Use Effects	4.5 --> Objective --> LU14) --> iv)	(Refer also: Objective LU 25 - Page 34).	(Refer also: Objective LU 25).
Managing Land Use Effects	4.5 --> Objective --> LU14) --> ix)	(Refer also: Objective LU 27 -Page 40).	(Refer also: Objective LU 27).
Managing Land Use Effects	4.5 --> Objective --> LU14) --> xii)	(Refer also: Objective LU 5 -Page 12).	(Refer also: Objective LU 5).
Managing Land Use Effects	4.5 --> Policies	(Refer also: Objective LU 27, Page 40).	(Refer also: Objective LU 27).
Managing Land Use Effects	4.5 --> Explanation	(Refer Policy 5.3.3 b), Page 48)	(Refer Section 5.3.3 Policy b.)
Managing Land Use Effects	4.6 --> Objective --> LU16) --> ix)	(Refer also: Objective LU 5 –Page 12).	(Refer also: Objective LU 5).
Managing Land Use Effects	4.6 --> Objective	(Issue 5) (Refer also: Objectives LU 1 and LU 2 – Page 12).	(Issue 5) (Refer also: Objectives LU 1 and LU 2).
Managing Land Use Effects	4.6 --> Policies --> b)	(Refer also: Objective HV 1, Page 7).	(Refer also: Objective HV 1).
Managing Land Use Effects	4.6 --> Policies --> d)	(Refer Rule B4 4.3.1 H), Page 136).	(Refer Rule B4.3.1 h.).
Managing Land Use Effects	4.6 --> Explanation	(Refer: Part 3.4, Page 7).	(Refer: Chapter 3.4).
Managing Land Use Effects	4.6 --> Explanation	(Refer Appendix 1E, Page 178).	(Refer Appendix 1E).
Managing Land Use Effects	4.6 --> Explanation	(Refer Appendix 4A, Page 214)	(Refer Appendix 4A)
Managing Land Use Effects	4.6 --> District Plan Methods	District Rules A2 2.3 and B4, (Pages 98 and 134) and Appendix 1H. (Page 188).	District Rules A2.3 and B4, (Business Zone) and Appendix 1H.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Managing Land Use Effects	4.8 --> Recreation Zone --> Objective --> LU 20)	(Refer also: Objectives LU 12 and LU 14 -Pages 23 and 25).	(Refer also: Objectives LU 12 and LU 14).
Managing Land Use Effects	4.8 --> Recreation Zone --> Objective --> LU 21) --> iv)	(Refer also: Objectives HV1 and HV2 -Page 7).	(Refer also: Objectives HV 1 and HV 2).
Managing Land Use Effects	4.8 --> District Plan Methods	District Rule B6 (Pages 142 to 144).	District Rule B6 (Recreation Zone).
Managing Land Use Effects	4.9 --> Objective --> LU22)	(Refer also: Objectives LU 1, LU 2 and EM 3, Pages 12 and 59).	(Refer also: Objectives LU 1, LU 2 and EM 3).
Managing Land Use Effects	4.9 --> District Plan Methods	District Rule A2 2.6, Page 106).	District Rule A2.6
Managing Land Use Effects	4.10 --> Objective --> LU23)	(Refer also: Objectives HV1, LU 9, and EM 3 - Pages 7, 19 and 59).	(Refer also: Objectives HV 1, LU 9, and EM 3).
Managing Land Use Effects	4.10 --> Objective --> LU24)	(Refer also: Objectives EM 1 and EM 2 -Page 59).	(Refer also: Objectives EM 1 and EM 2).
Managing Land Use Effects	4.10 --> Policies --> a)	(Refer also: Objective LU 9, Page 19).	(Refer also: Objective LU 9).
Managing Land Use Effects	4.10 --> Policies --> b)	(Refer also: Objectives S 8 and NH 2, Pages 53 and 72).	(Refer also: Objectives S 8 and NH 2).
Managing Land Use Effects	4.10 --> Policies --> d)	(Refer also: Objective EM 2, Page 59).	(Refer also: Objective EM 2).
Managing Land Use Effects	4.10 --> Explanation	(Refer Appendix 1J, Page 190).	(Refer Appendix 1J).
Managing Land Use Effects	4.10 --> Explanation	(Refer: Part 11.2, Page 83).	(Refer: Chapter 11.2).
Managing Land Use Effects	4.10 --> Explanation	(Refer Rule C1 1.3.1, Page 152).	(Refer Rule C1.3.1).
Managing Land Use Effects	4.10 --> District Plan Methods	District Rules B2, B3, C1 and C3, (Pages 117-133, 151 and 159-161).	District Rules B2, B3, C1 and C3.
Managing Land Use Effects	4.10 --> District Plan Methods	District Rules B3 3.4.1 A) ii) and B7 7.4.1 A) ii), (Pages 131 and 149).	District Rules B3.4.1 a. ii) and B7.4.1 a. ii).
Managing Land Use Effects	4.11 --> Objective --> LU 25)	(Refer also: Objective LU 2 -Page 12).	(Refer also: Objective LU 2).

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Managing Land Use Effects	4.12 --> Objective --> LU 26)	(Refer also: Objectives LU 1 and LU 2-Page 12).	(Refer also: Objectives LU 1 and LU 2).
Managing Land Use Effects	4.14 --> Objective --> LU 28)	(Refer also: Objectives LU 1 and LU 4 -Page 12).	(Refer also: Objectives LU 1 and LU 4).
Managing Land Use Effects	4.14 --> District Plan Methods	District Rule B, (Pages 108-150).	District Rule B.
Managing Land Use Effects	4.17 --> 1.	(Objectives LU 4 and LU 28, Pages 12 and 42).	(Objectives LU 4 and LU 28).
Managing Land Use Effects	4.17 --> 2.	(Objective LU 7, Page 14).	(Objective LU 7).
Managing Land Use Effects	4.17 --> 3.	(Objectives LU 8 and LU 9, Pages 17 and 19).	(Objectives LU 8 and LU 9).
Managing Land Use Effects	4.17 --> 4.	(Objectives LU 10 and LU 11, Page 21).	(Objectives LU 10 and LU 11).
Managing Land Use Effects	4.17 --> 5.	(Objectives LU 12 and LU 13, Pages 23 and 25)	(Objectives LU 12 and LU 13).
Managing Land Use Effects	4.17 --> 6.	(Objective LU 16, Page 28).	(Objective LU 16).
Managing Land Use Effects	4.17 --> 7.	(Objective LU 16).	(Objective LU 16).
Managing Land Use Effects	4.17 --> 8.	(Objectives LU 17, LU 18 and LU 20, Pages 28, 30 and 31)	(Objectives LU 17, and LU 20).
Managing Land Use Effects	4.17 --> 9.	(Objective LU 23, Page 32).	(Objective LU 23).
Managing Land Use Effects	4.17 --> 11.	(Objectives LU 22 and LU 25, Pages 32 and 34).	(Objectives LU 22 and LU 25).
Managing Land Use Effects	4.17 --> 12.	(Objective LU 26, Page 39).	(Objective LU 26).
Subdivision	5.3.1 --> Objective	(Refer also: Objective LU 7 –Page 14).	(Refer also: Objective LU 7).
Subdivision	5.3.1 --> Policies --> b)	(Refer also: Policy 5.3.8 a), Page 53).	(Refer also: Policy 5.3.8 a.).
Subdivision	5.3.1 --> Explanation	Objective LU7. (Page 15).	Objective LU 7).
Subdivision	5.3.1 --> Explanation	(Refer: Objective S 3, Page 48).	(Refer: Objective S 3).
Subdivision	5.3.1 --> District Plan Methods	District Rule C2 2.4. (Page 154).	District Rule C2.4.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Subdivision	5.3.2 --> Objective	(Refer also: Objectives LU 10 and LU 11 –Page 21).	(Refer also: Objectives LU 10 and LU 11).
Subdivision	5.3.2 --> Policies	Refer: Parts 4.3.2 and 4.3.4, Pages 17 and 21).	(Refer: 4.3.2 and 4.3.4)
Subdivision	5.3.2 --> Explanation	Refer Policy 5.3.3 b), Page 48.	Refer Policy 5.3.3 b.
Subdivision	5.3.2 --> District Plan Methods	District Rule C2 2.4 (Page 154).	District Rule C2.4.
Subdivision	5.3.3 --> Objective	(Refer also: Objectives LU 8, LU 12 and LU 14 – Pages 17, 23 and 25).	(Refer also: Objectives LU 8, LU 12 and LU 14).
Subdivision	5.3.3 --> Explanation	(Refer Objective S1, Page 46)	(Refer Objective S 1)
Subdivision	5.3.4 --> Objective	(Refer also: Objectives FC 1 and EWA 3 –Pages 66 and 77).	(Refer also: Objectives FC 1 and EWA 3).
Subdivision	5.3.4 --> Policies --> c)	(Refer also: Policy 6.2(l), Page 60).	(Refer also: Policy 6.2 l.).
Subdivision	5.3.4 --> District Plan Methods	(Rules C2 2.4.1 and 2.5D), Pages 154 and 158).	(Rules C2.4.1 and C2.5 d.).
Subdivision	5.3.4 --> District Plan Methods	(Rule A1 1.2, Page 87).	(Rule A1.2).
Subdivision	5.3.5 --> Objective	(Refer also: Objective EWA 3 –Page 77).	(Refer also: Objective EWA 3).
Subdivision	5.3.5 --> District Plan Methods	District Rules C2 and D1 1.5. (Pages 153 and 163).	District Rules C2 and D1.5.
Subdivision	5.3.6 --> Objective	(Refer also: Objectives NH 1 and NH 2 -Page 72).	(Refer also: Objectives NH 1 and NH 2).
Subdivision	5.3.6 --> Explanation	(Refer Objective NH 2, Page 72).	(Refer Objective NH 2).
Subdivision	5.3.6 --> District Plan Methods	District Rule C2. (Page 153).	District Rule C2.
Subdivision	5.3.7 --> Objective	(Refer also: Objectives LU 27 and S 8 –Pages 40 and 53).	(Refer also: Objectives LU 27 and S 8).
Subdivision	5.3.7 --> District Plan Methods	District Rules C2 2.1.1, 2.2.1 and 2.4.1 l), Pages 153 and 157.	District Rules C2.1.1, C2.2.1 and C2.4.1 l.
Subdivision	5.3.8 --> Objective	(Refer also: Objectives LU 7, LU 27, S 1, NH 1, NH 2 and U 1 -Pages 14, 40, 46, 72 and 81).	(Refer also: Objectives LU 7, LU 27, S 1, NH 1, NH 2 and U 1).
Subdivision	5.3.8 --> Policies	(Refer Also: Part 7.3, Page 67)	(Refer Also: Part 7.3).
Subdivision	5.3.8 --> Explanation	(Refer: Part 7.3, Page 67).	(Refer: 7.3).
Subdivision	5.3.8 --> Explanation	(Refer: Objective S9 d), Page 55).	(Refer: Objective S 9).
Subdivision	5.3.8 --> District Plan Methods	District Plan Rules C2 and D1 1.5 (Pages 153 and 163).	District Plan Rules C2 and D1.5.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Subdivision	5.3.9 --> Objective	(Refer also: Objectives HV1, LU 7, LU 12, EWA 1 and U 1, Pages 7, 14, 23, 77 and 81).	(Refer also: Objectives HV 1, LU 7, LU 12, EWA 1 and U 1).
Subdivision	5.3.9 --> District Plan Methods	(Rule C2 2.5B), Page 158).	(Rule C2.5 b.).
Subdivision	5.3.10 --> District Plan Methods	District Rules C2 2.1.1, 2.1.1, 2.1.2 and C2 2.3.1, Pages 153 and 154.	District Rules C2.1.1, C2.1.2 and C2.3.1.
Subdivision	5.3.11 --> Objective	(Refer also: Objectives HV1, HV5, LU 9, EM 4 and EWA 3 –Pages 7, 8, 19, 59 and 77).	(Refer also: Objectives HV 1 and HV 5, LU 9, EM 4 and EWA 3).
Subdivision	5.3.11 --> District Plan Methods	District Rule C2 2.4.1 J) (Page 158).	District Rule C2.4.1 J)
Subdivision	5.4 --> 1	(Objective S1, Page 46).	(Objective S 1).
Subdivision	5.4 --> 2	(Objective S1, Page 46).	(Objective S 1).
Subdivision	5.4 --> 3	(Policy 5.3.1 b.), Page 46).	(Policy 5.3.1 b.).
Subdivision	5.4 --> 4	(Objective S2, Page 47).	(Objective S 2).
Subdivision	5.4 --> 5	(Objective S2, Page 47).	(Objective S 2).
Subdivision	5.4 --> 6	(Objective S3, Page 48).	(Objective S 3).
Subdivision	5.4 --> 7	(Objectives S4 and S5, Page 49).	(Objectives S 4 and S 5).
Subdivision	5.4 --> 8	(Objective S6, Page 50).	(Objective S 6).
Subdivision	5.4 --> 9	(Objective S10, Page 56).	(Objective S 10).
Subdivision	5.4 --> 10	(Objective S7, Page 51).	(Objective S 7).
Subdivision	5.4 --> 11	(Objective S8, Page 53)	(Objective S 8)
Subdivision	5.4 --> 12	(Objective S8, Page 53)	(Objective S 8)
Subdivision	5.4 --> 13	(Objective S11, Page 56)	(Objective S 11)
Subdivision	5.4 --> 14	(Objective S9, Page 55).	(Objective S 9).
Esplanade Management	6.1 Intro	(Refer: Part 4.10, Page 32).	(Refer: Chapter 4.10).
Esplanade Management	6.2 --> Objectives --> EM 1)	(Refer also: Objectives HV5 and LU 24 –Pages 8 and 32).	(Refer also: Objectives HV 5 and LU 24).
Esplanade Management	6.2 --> Objectives --> EM 2)	(Refer also: Objectives HV5, LU 22 and LU 24 – Pages 8 and 32).	(Refer also: Objectives HV 5 , LU 22 and LU 24).
Esplanade Management	6.2 --> Objectives --> EM 3)	(Refer also: Objectives HV 1, HV 5, LU 9 and LU 23 –Pages 7, 8, 19, and 32).	(Refer also: Objectives HV 1 and HV 5 , LU 9 and LU 23).

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Esplanade Management	6.2 --> Objectives --> EM 4)	(Refer also: Objectives HV 1, HV 5 and S11, - Pages 7, 8 and 56).	(Refer also: Objectives HV 1 and HV 5 and S 11).
Esplanade Management	6.2 --> Objectives --> EM 5)	(Refer also: Objectives LU 1, S 11 and EWA 3 – Pages 12, 56, and 77).	(Refer also: Objectives LU 1, S 11 and EWA 3).
Esplanade Management	6.2 --> Objectives --> EM 6)	(Refer also: Objective U 1 -Page 81).	(Refer also: Objective U 1).
Esplanade Management	6.2 --> Explanation	(Refer: Objective HV1, Page 7).	(Refer: Objective HV 1).
Esplanade Management	6.2 --> Explanation	(Refer: Part 8.2, Page 72).	(Refer: Chapter 8.2).
Esplanade Management	6.2 --> Esplanade Reserves and Strips	(Refer: Part 7.1, Page 66).	(Refer: Chapter 7.1).
Esplanade Management	6.2 --> Esplanade Reserves and Strips	(Refer: Rules C3 3.1.1 and 3.4.1, Pages 159 and 160).	(Refer: Rules C3.1.1 and C3.4.1).
Esplanade Management	6.2 --> Esplanade Reserves and Strips	(Refer Rule C3 3.2.1, Page 159).	(Refer Rule C3.2.1).
Esplanade Management	6.2 --> District Plan Methods	District Rule C3, Page 159.	District Rule C3.
Financial Contributions	7.1 --> Introduction	(Refer Rule D1, Page 162).	(Refer Rule D1).
Financial Contributions	7.2 --> Objectives	(Refer also: Objectives S4, S8 and U 1 –Pages 49, 53 and 81).	(Refer also: Objectives S 4 , S 8 and U 1).
Financial Contributions	7.3 --> District Plan Methods	Rules D1 1.2 and 1.5 (Pages 162 and 163).	Rules D1.2 and D1.5.
Financial Contributions	7.4 --> Explanation	(Refer: Rule B3 3.3.1 H), Page 127).	(Refer: Rule B3.3.1 h.).
Financial Contributions	7.4 --> District Plan Methods	Rules D1 1.3 and 1.4 (Pages 162 and 163).	Rules D1.3 and D1.4.
Financial Contributions	7.5 --> Explanation	(Refer: Part 6.2, Page 59).	(Refer: Chapter 6.2).
Financial Contributions	7.5 --> District Plan Methods	Rule D1 1.1 (Page 162).	Rule D1.1.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Natural Hazards	8.2 --> Objectives	(Refer also: Objectives S6 and S8 –Pages 50 and 53).	(Refer also: Objectives S 6 and S 8).
Natural Hazards	8.2 --> Policies	(Refer Policy 5.3.6 (a), Page 50).	(Refer Policy 5.3.6 a.).
Natural Hazards	8.2 --> Explanation	(Refer: Objectives LU 23 and S8, Pages 32 and 53).	(Refer: Objectives LU 23 and S 8).
Natural Hazards	8.2 --> District Plan Methods	District Rules B7 and C2 2.4.1 H). (Pages 145 and 157).	District Rules B7 and C2.4.1 h.
Energy and Water Use and Air Quality	9.2 --> Objective --> EWA 1)	(Refer also: Objectives LU 7 and S9 -Pages 14 and 55).	(Refer also: Objectives LU 7 and S 9).
Energy and Water Use and Air Quality	9.2 --> Objective --> EWA 2)	(Refer also: Objectives LU 4 and LU 28 –Pages 12 and 42).	(Refer also: Objectives LU 4 and LU 28).
Energy and Water Use and Air Quality	9.2 --> Objective --> EWA 3)	(Refer also: Objectives LU 7, S 5, S 9, S 11, EM 5 and U 1 –Pages 14, 49, 55, 56, 59 and 81).	(Refer also: Objectives LU 7, S 5, S 9, S 11, EM 5 and U 1).
Energy and Water Use and Air Quality	9.2 --> Objective --> EWA 4)	(Refer also: Objectives LU 1 and LU2 –Page 12).	(Refer also: Objectives LU 1 and LU 2).
District Rules - Rule A1	1.31 --> A)	(Rules A2 2.3.2, B1 1.2.1, B2 2.2.1, B3 3.2.1 and B5 5.2.1).	Refer to matters of control provided for in Rule 3G.4.1
District Rules - Rule A1	1.3.4 Assessment of Discretionary Activity Applications --> xv)	(Refer: Part 4.3.3, Page 19).	(Refer: Chapter 4.3.3).
District Rules - Rule A1	2.6 Surface Water Activities	(Refer Part 4.9, Page 32)	(Refer Chapter 4.9)
District Rules - Rule A1	1.2.6 Notification and Service of Applications --> B) --> iv)	(Rule B4 4.4.1, Page 137)	(Rule B4.4.1)
District Rules - Rule A1	1.2.6 Notification and Service of Applications --> B) --> v)	(Rules B3 3.4 and B7 7.4, Pages 131 and 149).	(Rules B3.4 and B7.4).
District Rules - Rule A1	1.3.3 --> E)	(Rule C1 1.2 A) iii), Page 151)	(Rule C1.2 a. iii))
District Rules - Rule A1	1.3.3 --> I)	(Rule B3 3.3.1 G) iii), Page 127)	(Rule B3.3.1 g. iii)
District Rules - Rule A1	1.3.3 --> J)	(Rules B3 3.4 and B7 7.4, Pages 131 and 149).	(Rules B3.4 and B7.4)

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule A1	1.3.3 --> xxiv)	Rule C1 1.3.1 A) ii) (Page 152)	Rule C1.3.1 a. ii):
District Rules - Rule A1	1.3.3 --> xxvi)	Rule C1 1.3.1 A) ii) (Page 152)	Rule C1.3.1 a. iii):
District Rules - Rule A2	2.2.4 --> B)	Rule A1 1.3.4 (Page 94)	Rule A1.3.4
District Rules - Rule B1		(Refer Part 4.4, Page 23)	(Refer Part 4.4)
District Rules - Rule B1		Rule E (Pages 165-173).	Chapter 2 (Definitions).
District Rules - Rule B1	1.1.1 --> A) --> xi)	with Rule B1 1.3.6	with Rule 3E.4.1.
District Rules - Rule B1	1.1.1 --> A) --> xiii)	refer to Rule B1 1.3.5	Rule 3D.4.1 and 3D.4.2
District Rules - Rule B1	1.2.2 --> A)	Rule A1 1.3.1 (Page 90).	Rule A1.3.1
District Rules - Rule B1	1.3.1 --> B) --> iii) --> b)	(Rule E, Page 167)	(Chapter 2, Definitions).
District Rules - Rule B1	1.3.1 --> C) --> vi)	Refer Rule B1 1.3.5, Page 115.	Refer Rule B1.3.5.
District Rules - Rule B1	1.3.1 --> F) --> i)	Appendix 2B (Pages 192 and 193)	Compliance with Rule 3B.4.2 and Rule 3B.4.3.
District Rules - Rule B1	1.3.1 --> G)	Refer to Rule A2 2.4, (Page 100).	Compliance with Rule 3B.4.5.
District Rules - Rule B1	1.3.2 --> A)	Rule B1 1.3.1	Rule B1.3.1
District Rules - Rule B1	1.3.3 --> B)	Rule B1 1.3.2 B)	Rule B1.3.2 B)
District Rules - Rule B1	1.3.3 --> E)	Rule A2 2.4, Page 100.	Rule 3B.4.5.
District Rules - Rule B1	1.3.4 --> B)	Rule B1 1.3.1 B) (Page 109).	Rule B1.3.1 B)
District Rules - Rule B1	1.3.4 --> C)	Rule B1 1.3.1 C) (Page 110)	Rule B1.3.1 C)

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B1	1.3.4 --> H)	Refer Rule A2 2.4, (Page 100)	Rule 3B.4.5.
District Rules - Rule B1	1.3.4 --> K)	Rule B1 1.3.1 F) (Page 111)	Rule 3B.4.3.
District Rules - Rule B1	1.3.5 --> E)	Appendix 2F (Page 202)	Appendix 3B.5
District Rules - Rule B1	1.4 --> A)	Rule B1 1.6	Rule B1.6
District Rules - Rule B1	1.4 --> A)	Rules B1 1.3.1 to B1 1.3.6	Rules B1.3.1 to B1.3.6
District Rules - Rule B1	1.4 --> B)	Rule A1 1.3.3 (Page 93).	Rule A1.3.3
District Rules - Rule B1	1.5.1 --> xiii)	B1 1.1, B1 1.2 or B1 1.4.	B1.1, B1.2, or B1.4
District Rules - Rule B1	1.5.2	Rule A1 1.3.4 (Page 94)	Rule A1.3.4
District Rules - Rule B1	1.6.1 --> A) --> a)	Rule B1 1.3.5 F);	Rule B1.3.5 F);
District Rules - Rule B1	1.6.1 --> A) --> b)	Rule B1 1.3.5 F) iii) b) or Rule B1 1.3.5 F) iii) c); a	Rule B1.3.5 F) iii) b) or Rule B1.3.5 F) iii) c); a
District Rules - Rule B2		(Refer Part 4.5, Page 25)	(Refer Part 4.5)
District Rules - Rule B2		Rule E (Pages 165-173).	Chapter 2.
District Rules - Rule B2	2.1.1 --> A)	Rule 2.3	Rule B2.3
District Rules - Rule B2	2.1.1 --> A) --> xii)	Rule B2 2.3.3	3E.4.1 and 3E.4.2.
District Rules - Rule B2	2.1.1 --> B)	Rule 2.3	Rule B2.3
District Rules - Rule B2	2.2.1 --> A)	Rule 2.3	Rule B2.3
District Rules - Rule B2	2.2.2 --> A)	Rule A1 1.3.1.	Rule A1.3.1.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B2	2.3.1 --> B) --> ii)	(Refer: Diagram B, Page 109).	(Refer: Diagram B)
District Rules - Rule B2	2.3.1 --> F)	Refer to Rule A2 2.4, Page 100.	Refer to 3B.4.5.
District Rules - Rule B2	2.3.2 --> C) --> ii)	(Refer Diagram B, Page 109).	(Refer Diagram B).
District Rules - Rule B2	2.3.2 --> D)	Refer to Rule A2 2.4, Page 100.	Rule 3B.4.5.
District Rules - Rule B2	2.3.2 --> E)	Appendix 2F (Page 202)	Rule 3B.4.3 and Appendix 3B.5.
District Rules - Rule B2	2.4	Rules B2 2.3.1 to B2 2.3.3	Rules B2.3.1 to B2.3.3
District Rules - Rule B2	2.4	Rule A1 1.3.3 (Page 93)	Rule A1.3.3
District Rules - Rule B2	2.5.1 --> A) --> xiv)	Rules B2 2.1, 2.2 or 2.4.	Rules B2.1, 2.2 or 2.4.
District Rules - Rule B2	2.5.1 --> B) --> iii)	Rules B2 2.1, B2 2.2 or B2 2.4.	Rules B2.1, B2.2 or B2.4.
District Rules - Rule B2	2.5.2	Rule A1 1.3.4 (Page 94)	Rule A1.3.4
District Rules - Rule B3		Rule E (Pages 165-173)	Chapter 2, Definitions
District Rules - Rule B3	3.1.1	Rule 3.3	Rule B3.3
District Rules - Rule B3	3.1.1 --> A) --> vii)	(Refer Appendix 3A, Page 198).	(Refer Appendix 3A).
District Rules - Rule B3	3.1.1 --> A) --> viii)	Rule C2 2.4.1 H) (Page 157).	Rule C2.4.1 H)
District Rules - Rule B3	3.1.1 --> A) --> xiv)	(Refer: Appendix 2B, Pages 192 and 193).	(Refer: Appendix 3B.1).
District Rules - Rule B3	3.1.1 --> A) --> xxiv)	Rule B3 3.3.2 (Page 130)	Rules 3E.4.1 and 3E.4.2.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B3	3.1.1 --> A) --> xxvii)	Appendix 1J (Page 190)	Appendix 1J.
District Rules - Rule B3	3.1.1 --> A) --> xxvii) NB:	Rule A2 2.3 (Page 98)	Rule A2.3
District Rules - Rule B3	3.2.2 --> A)	Rule A1 1.3.1 (Page 90).	Rule A1 1.3.1.
District Rules - Rule B3	3.3.1 --> A) --> iii)	Appendix 3B (Page 211) and Appendix 3C (Page 212).	
District Rules - Rule B3	3.3.1 --> A) --> iii) --> NB	(Refer Appendix 7B, Pages 229-233).	(Refer Appendix 7B).
District Rules - Rule B3	3.3.1 --> E)	Appendix 3D, Page 213	Appendix 3D
District Rules - Rule B3	3.3.1 --> H)	Refer Part 7.4, Page 68).	(Refer Part 7.4).
District Rules - Rule B3	3.3.1 --> N)	Appendix 3A (Page 203)	Appendix 3A
District Rules - Rule B3	3.3.1 --> O)	Refer Rule A2 2.4 (Page 100)	Rule 3B.4.5.
District Rules - Rule B3	3.3.1 --> P)	Appendix 2F (Page 202)	Rule 3B.4.3 and Appendix 3B.5.
District Rules - Rule B3	3.3.2 (was c now b) --> ii)	Rule A2 2.2 (Page 97).	Rule 3E.4.2.
District Rules - Rule B3	3.4.1 --> i)	B3 3.3.1 or B3 3.3.2.	B3.3.1 or B3.3.2.
District Rules - Rule B3	3.4.1 --> ii)	Appendix 1J (Page 190)	Appendix 1J.
District Rules - Rule B3	3.4.2 --> A)	Rule A1 1.3.3. (Page 93).	Rule A1.3.3.
District Rules - Rule B3	3.51 --> ii)	Rules B3 3.1.1 and B3 3.2.1	Rules B3.1.1 and B3.2.1
District Rules - Rule B3	3.51 --> xii)	Rule B3 3.1.1.	Rule B3.1.1
District Rules - Rule B3	3.51 --> xiv)	Appendix 2B (Pages 192 and 193)	Appendix 3B.1

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B3	3.51 --> xx)	Refer: Appendix 3A, Page 203	Refer: Appendix 3A
District Rules - Rule B3	3.5.2 --> i)	Rules B3 3.1.1 and B3 3.2.1.	Rules B3.1.1 and B3.2.1.
District Rules - Rule B3	3.5.2 --> ix)	Appendix 2B (Pages 192 and 193)	Appendix 3B.1
District Rules - Rule B3	3.5.3	Rule A1 1.3.4 (Page 94)	Rule A1.3.4
District Rules - Rule B3	3.6.1--> A)	(Refer Appendix 3A, Page 203)	(Refer Appendix 3A)
District Rules - Rule B4		Refer Part 4.6 - Page 28	Refer Part 4.6)
District Rules - Rule B4	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions)
District Rules - Rule B4	4.1.1 --> A)	(Refer Appendix 4B, Page 215)	(Refer Appendix 4B)
District Rules - Rule B4	4.1.1 --> A) --> xi)	Rule B4 4.3.2	Rules 3E.4.1 and 3E.4.2.
District Rules - Rule B4	4.2.2 --> A)	Rule A1 1.3.1 (Page 90).	Rule A1.3.1.
District Rules - Rule B4	4.3.1 --> A) --> ii)	(Refer Diagram B, Page 109).	(Refer Diagram B).
District Rules - Rule B4	4.3.1 --> D)	Rule B1 1.3 (Pages 109-116)	Rule B1.3
District Rules - Rule B4	4.3.1 --> H)	Appendix 4C (Page 216)	Appendix 4C
District Rules - Rule B4	4.3.1 --> J)	Appendix 4C	Appendix 3B.6
District Rules - Rule B4	4.3.1 --> J)	Rule A2 2.4 (Page 100)	Rule 3B.4.5.
District Rules - Rule B4	4.3.1 --> K)	Appendix 2F (Page 202)	Appendix 3B.5.
District Rules - Rule B4	4.3.2 --> C) --> a)	Rule A2 2.2. (Page 97).	Rule A2.2.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B4	4.4.1 --> A) --> i)	Rules B4 4.3.1 or B4 4.3.2.	Rules B4.3.1 or B4.3.2.
District Rules - Rule B4	4.4.1 --> A) --> ii)	Appendix 4A (Page 214).	Appendix 4A.
District Rules - Rule B4	4.4.2 --> A)	Rule A1 1.3.3. (Page 93).	Rule A1.3.3.
District Rules - Rule B4	4.5.1 --> A)	(Refer Appendix 4B, Page 215)	(Refer Appendix 4B):
District Rules - Rule B4	4.5.2 --> A)	Rule A1 1.3.4 (Page 94)	Rule A1.3.4
District Rules - Rule B6		(Refer Part 4.8, Page 31)	(Refer Part 4.8)
District Rules - Rule B6	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions).
District Rules - Rule B6	6.1.1 --> A) --> vi)	Rule 6.2.2	Rules 3E.4.1 and 3E.4.2
District Rules - Rule B6	6.2.1 --> B) --> ii)	(Refer Diagram B, Page 109).	(Refer Diagram B).
District Rules - Rule B6	6.2.1 --> F)	Appendix 2B (Pages 192 and 193)	Rule 3B.4.3.
District Rules - Rule B6	6.3	Rule B6 6.2.1	Rule B6.2.1
District Rules - Rule B6	6.3	Rule A1 1.3.3. (Page 93).	Rule A1.3.3.
District Rules - Rule B6	6.4.2 --> A)	Rule A1 1.3.4 (Page 94)	Rule A1.3.4
District Rules - Rule B7		(Refer Part 8 Page 70)	(Refer Part 8 - Natural Hazards)
District Rules - Rule B7	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions).
District Rules - Rule B7	7.1.1 --> A) --> vi)	Rule B3 3.3.2 (Page 130)	Rules 3E.4.1 and 3E.4.2
District Rules - Rule B7	7.1.1 (was xii) now xi)	Appendix 1J (Page 190)	Appendix 1J.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B7	7.1.1 NB	Rule A2 2.3 (Page 98).	A2.3
District Rules - Rule B7	7.2.2 --> A)	Rule A1 1.3.1. (Page 90)	Rule A1.3.1.
District Rules - Rule B7	7.3.1 --> A) --> ii)	(Refer Diagram B, Page 109)	(Refer Diagram B)
District Rules - Rule B7	7.3.1 --> A) --> iii)	Appendix 3B (Page 211) and Appendix 3C (Page 212).	Appendix 3B and Appendix 3C.
District Rules - Rule B7	7.3.1 --> D)	Appendix 2F (Page 202)	Appendix 3B.5.
District Rules - Rule B7	7.4.1 --> A) --> i)	Rule B7 7.3	Rule B7.3
District Rules - Rule B7	7.4.1 --> A) --> ii)	Appendix 1J (Page 190)	Appendix 1J
District Rules - Rule B7	7.4.1 --> NB	Rule A2 2.3 (Page 98).	Rule A2.3.
District Rules - Rule B7	7.4.2 --> A)	Rule A1 1.3.3. (Page 93).	Rule A1 1.3.3.
District Rules - Rule B7	7.5 --> A) --> iii)	(Refer Appendix 3A, Page 203)	(Refer Appendix 3A)
District Rules - Rule B7	7.5.2 --> A)	Rule A1 1.3.4 (Page 94)	Rule A1 1.3.4.
District Rules - Rule B7	7.6.1 --> A)	(Refer Appendix 3A, Page 203)	(Refer Appendix 3A)
District Rules - Rule B8		(Refer Part 4.15 Page 43)	(Refer Part 4.15)
District Rules - Rule B8	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions)
District Rules - Rule B8	8.1.1 --> A)	Rule B8 8.3	Rule B8.3
District Rules - Rule B8	8.2.1 --> A)	Rule B8 8.3	Rule B8.3
District Rules - Rule B8	8.2.2 --> A)	Rule A1 1.3.1. (Page 90)	Rule A1.3.1.

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule B8	8.3.1 --> N) --> i)	Rule B9 9.3.1	Rule B9.3.1
District Rules - Rule B8	8.4.1 --> A) --> i)	B8 8.3	B8.3
District Rules - Rule B8	8.4.2 --> A)	Rule A1 1.3.3	Rule A1.3.3
District Rules - Rule B8	8.5	Rule A2 2.1.	Rule A2.1.
District Rules - Rule B9		(Refer Part 4.16 Page 44)	(Refer Part 4.16)
District Rules - Rule B9	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions)
District Rules - Rule B9	9.1.1 --> A)	Rule B9 9.3	Rule B9.3
District Rules - Rule B9	9.2.1 --> A)	Rule B9 9.3	Rule B9 9.3
District Rules - Rule B9	9.2.2 --> A)	Rule A1 1.3.1 (Page 90).	Rule A1.3.1
District Rules - Rule B9	9.4.1 --> A) --> i)	Rule B9 9.3	Rule B9.3
District Rules - Rule B9	9.4.2 --> A)	Rule A1 1.3.3.	Rule A1.3.3.
District Rules - Rule B9	9.5 --> A) --> NB.	Rule A2 2.1.	Rule A2.1.
District Rules - Rule C1		(Refer Part 5, Page 45)	(Refer Part 5)
District Rules - Rule C1	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions)
District Rules - Rule C1	1.1.1 --> A)	Rule C2 2.4.1 A) (Page 154).	Rule C2.4.1 A).
District Rules - Rule C1	1.1.1 --> C)	Rules C2 2.1 to 2.3 and Rule 2.5 (Pages 153, 154 and 158).	Rules C2.1 to 2.3 and Rule 2.5
District Rules - Rule C1	1.1.1 --> D)	Rules C2 2.4 and C2 2.5 (Pages 154-158)	Rules C2.4 and C2.5

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule C1	1.1.1 --> E)	Rule C2 2.2.1 to 2.3	Rule C2.2.1 to 2.3
District Rules - Rule C1	1.1.2 --> A)	Rule A1 1.3.2 (Page 92)	Rule A1 1.3.2.
District Rules - Rule C1	1.2.1 --> A) --> i)	Rule C2 2.4.1 H)	Rule C2.4.1 H)
District Rules - Rule C1	1.2.1 --> A) --> i)	Rule B3 3.3.1 D) (Page 126)	Rule B3.3.1 D)
District Rules - Rule C1	1.2.1 --> A) --> i)	Rule C2 2.4 (Pages 154-158)	Rule C2.4
District Rules - Rule C1	1.2.1 --> A) --> ii)	Rule C2 2.4 (Pages 154-158)	Rule C2.4
District Rules - Rule C1	1.2.1 --> A) --> iv)	Rule C1 1.2.1 a. vii)	Rule C1.2.1 a. vii)
District Rules - Rule C1	1.2.1 --> A) --> v)	Rule C2 2.1.1 E. or C2 2.3.3.	Rule C2.1.1 E. or C2.3.3.
District Rules - Rule C1	1.2.1 --> A) --> vi)	Rule C2 2.1.1 G. or C2 2.5 D.	Rule C2.1.1 G. or 2.5 D.
District Rules - Rule C1	1.2.1 --> A) --> vii)	Rule C2 2.1.1 F).	Rule C2.1.1 F).
District Rules - Rule C1		Rule A1 1.3.3 (Page 93)	Rule A1 1.3.3.
District Rules - Rule C1	1.3.1 --> A) --> i)	(Refer Appendix 1I, Page 189)	(Refer Appendix 1I).
District Rules - Rule C1	1.3.1 --> A) --> ii)	Rule C2 2.4 (Pages 154-158)	Rule C2.4
District Rules - Rule C1	1.3.1 --> A) --> ii)	(Appendix 2B, Pages 192 and 193)	(Appendix 3B.1)
District Rules - Rule C1	1.3.1 --> A) --> vi)	Rule C2 2.1.1 (A)	Rule C2.1.1 A)
District Rules - Rule C1	1.3.1 --> A) --> viii)	Rule C2 2.1.1 H).	Rule C2.1.1 H).
District Rules - Rule C1	1.3.2 --> A)	Rule A1 1.3.4 A)	Rule A1.3.4 A)

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule C1	1.3.2 --> A)	(Page 94)	Page number reference removed
District Rules - Rule C1	1.3A.1 --> A) --> i)	C2 2.1.1 (F).	C2.1.1 F).
District Rules - Rule C1	1.4	(Refer Part 5.3.6, Page 50).	(Refer Part 5.3.6).
District Rules - Rule C2	NB	Rule E (Pages 165-173)	Chapter 2 (Definitions)
District Rules - Rule C2	2.1	(Refer Part 5.3.3 to 5.3.11, Pages 48-57)	(Refer Part 5.3.3 to 5.3.11)
District Rules - Rule C2	2.1.2 --> A) --> i)	Rule B1 1.3 (Pages 109-116)	Rule B1.3
District Rules - Rule C2	2.1.2 --> B)	Rules C2 2.1.1 B)	Rules C2.1.1 B)
District Rules - Rule C2	2.1.2 --> NB	(Refer Rule A1 1.2.3, Page 87)	(Refer Rule A1.2.3)
District Rules - Rule C2	2.2	(Refer Parts 5.3.3 to 5.3.11, Pages 48-57)	(Refer Parts 5.3.3 to 5.3.11)
District Rules - Rule C2	2.3	(Refer Part 5.3.3 to 5.3.11, Pages 48-57)	(Refer Part 5.3.3 to 5.3.11)
District Rules - Rule C2	2.4	(Refer Parts 5.3.1 to 5.3.7 and 5.3.11, Pages 46-53 and 57)	(Refer Parts 5.3.1 to 5.3.7 and 5.3.11)
District Rules - Rule C2	2.4.1 --> NB	(Refer Rule A1 1.3.2 a. xiii) Page 92)	(Refer Rule A1.3.2 a. xiii)).
District Rules - Rule C2	2.4.1 --> H)	(Refer Appendix 3A, Page 203)	(Refer Appendix 3A)
District Rules - Rule C2	2.4.1 --> I) --> i)	Appendix 2C (Page 194)	Appendix 3B.3.
District Rules - Rule C2	2.4.1 --> NB	(Refer Rules B3 3.3.1 Q) and B7 7.3.1 E), Pages 129 and 146	(Refer Rules B3.3.1 Q) and B7.3.1 E).
District Rules - Rule C2	2.4.1 --> J) --> i)	Appendix 1A (Page 174)	Appendix 1A
District Rules - Rule C2	2.4.1 --> K)	Appendix 2C, Page 194	Appendix 3B.3

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
District Rules - Rule C3		(Refer Part 6, Page 59)	(Refer Part 6)
District Rules - Rule C3	3.2.1 --> A)	Rule C3 3.4.1	Rule C3.4.1
District Rules - Rule C3	3.2.1 --> B)	Rule C3 3.4.1	Rule C3.4.1
District Rules - Rule C3	3.2.1 --> D)	Appendix 1I. (Page 189)	Appendix 1I.
District Rules - Rule C3	3.2.1 --> E)	Rule C3 3.4.1	Rule C3.4.1
District Rules - Rule C3	3.4.1 --> A)	C3 3.1.1 A)	C3.1.1 A)
District Rules - Rule D		(Refer Part 7, Page 66)	(Refer Part 7)
District Rules - Rule D	NB	Rule E (Pages 165-173)	Chapter 2
District Rules - Rule D	1.1	(Refer Part 7.5, Page 69)	(Refer Part 7.5)
District Rules - Rule D	1.1.2 --> A)	D1 1.1.1 A)	D1.1.1 A)
District Rules - Rule D	1.1.2 --> A)	D1 1.1.1 B)	D1.1.1 B)
District Rules - Rule D	1.1.2 --> B)	D1 1.1.2 A)	D1.1.2 A)
District Rules - Rule D	1.2	(Refer Part 7.3, Page 67)	(Refer Part 7.3)
District Rules - Rule D	1.3	(Refer Part 7.4, Page 68)	(Refer Part 7.4)
District Rules - Rule D	1.5	(Refer Part 7.4, Page 68)	(Refer Part 7.4)
District Rules - Rule D	1.6	(Refer Part 7.3, Page 67)	(Refer Part 7.3)
Appendix 1A		Refer Rules A2 2.3 and C2 2.2.41 J) (Pages 98 and 158)	Refer Rules A2.3 and C2.2.41 J)

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Appendix 1B		Refer Rules A2 2.3 and C2 2.4.1 J) (Pages 98 and 158)	Refer Rules A2.3 and C2.2.41 J)
Appendix 1C		Refer Rule A2 2.3 (Page 98)	Refer Rule A2.3
Appendix 1D		Refer Rule A2 2.3 (Page 98)	Refer Rule A2.3
Appendix 1E		Refer Rule A2 2.3 (Page 98)	Refer Rule A2.3
Appendix 1F		Refer Rule A2 2.3 (page 98)	Refer Rule A2.3
Appendix 1I		Refer Rules A1 1.3.4 A) and C3 3.2.1 C). (Pages 95 and 159)	Refer Rules A1.3.4 A) and C3.2.1 C).
Appendix 1I	c)	Rule C3 3.2.1 (Page 159)	Rule C3.2.1
Appendix 1I	d)	Rule A2 2.3. (Page 98) (Refer also Rule A1 1.3.4 A) xiv) - Page 95)	Rule A2 2.3. (Refer also Rule A1 1.3.4 a. xiv).
Appendix 1I	e)	(Refer Rules C1 1.3.1 A) i) and C2 2.4.1 J), Pages 152 and 158)	(Refer Rules C1.3.1 A) i) and C2.4.1 J).
Appendix 1I	Criteria	Appendix 1B (Page 175)	Appendix 1B
Appendix 1J		Refer Rules B3 3.1.1, B7 7.1.1. (Pages 124 and 145)	Refer Rules B3.1.1, B7.1.1.
Appendix 1J	NB	Rule A2 2.3 (Page 98)	Rule A2.3.
Appendix 3A		Refer Rules A1 1.3.3, A1 1.3.4, B3 3.3.1, B7 7.5.1, and C2 2.4.1, (Pages 93, 96, 124, 149 and 157)	Refer Rules A1.3.3, A1.3.4, B3.3.1, B7.5.1, and C2.4.1
Appendix 3A - Schedule P		Refer Rules A1 1.3.3, A1 1.3.4 and B3 3.3.1 (Pages 93, 96 and 129)	Refer Rules A1.3.3, A1.3.4 and B3.3.1.
Appendix 3A - Schedule Q		Refer Rules A1 1.3.3, A1 1.3.4 and B3 3.3.1 (Pages 93, 96 and 129)	Refer Rules A1.3.3, A1.3.4 and B3.3.1.
Appendix 3A - Schedule R		Refer Rules A1 1.3.3, A1 1.3.4 and B3 3.3.1 (Pages 93, 96 and 129)	Refer Rules A1.3.3, A1.3.4 and B3.3.1.
Appendix 3B		Refer Rule B3 3.3.1 and B7 7.3.1 (Pages 125 and 146)	Refer Rule B3.3.1 and B7.3.1.
Appendix 3C		Refer Rule B3 3.3.1 and B7 7.3.1 (Pages 125 and 146)	Refer Rule B3.3.1 and B7.3.1.
Appendix 3D		Refer Rule B3 3.2.1 A) (Page 125)	Refer Rule B3.2.1 A).
Appendix 3D	NB	(Refer Rule A1 1.3.4 A) xix), Page 95)	(Refer Rule A1.3.4 A) xix)
Appendix 3D	List of Substantial Existing Piggeries	(Refer Rule B3 3.3.1 E), Page 127)	(Refer Rule B3.3.1 E).

Section	Heading	Old Online District Plan	Administrative Changes Notified via PC51
Appendix 5A	Diagram 1	Refer Rule C1 1.3.1 (Page 152)	Refer Rule C1.3.1
Appendix 5A	Diagram 2	Refer Rule C1 1.3.1 (Page 152)	Refer Rule C1.3.1
Appendix 5A	Diagram 3	Refer Rule C1 1.3.1 (Page 152)	Refer Rule C1.3.1
Appendix 6A	Diagram 1	Refer Rule B1 1.2.1, (Page 108)	Refer Rule B1.2.1
Appendix 6A	Diagram 2	Refer Rule B1 1.2.1 (Page 108)	Refer Rule B1.2.1
Appendix 6A	Diagram 3	Refer Rule B1 1.2.1 (Page 108)	Refer Rule B1.2.1
Appendix 6A	Diagram 4	Refer Rule B1 1.2.1 (Page 108)	Refer Rule B1.2.1
		Refer Rule A2 2.8.1 (Page 106)	Refer Rule A2 2.8.1

Reference	Minor Administrative Changes to be Notified in PC51
Part 1 Chapters, Part 2 Sections and Appendices	Bolding of all terms included in Definitions
Blank pages for deleted sections:	Blank pages to demarcate sections or appendices that have been deleted, with reference to the relevant plan change: Section 1: Matters of Importance [DELETED PC55] Section 3: Heritage Values [DELETED PC46] Section 10: Utilities [DELETED PC55] Appendix 2: [DELETED PC55] Appendix 4: [DELETED PC46]
Appendix 7A – List of Designations	Have removed Appendix 7A, as it has been moved to Chapter 9: Designations. Appendix 7B remains.
Chapter 9: Designations E.g. D15 Halcombe STP Sewage Treatment Purposes	‘Purposes’ added ensure consistent terminology throughout the schedule
Chapter 9: Designations D35 & D35A Legal Descriptions	Corrected legal descriptions to align with Council records and legal title documents.
Notes to top of chapters	Chapter 2 – Definitions – “NOTE: the District Plan is being updated regularly as a result of plan changes. The following definitions are the current operative definitions, and may be subject to review in the future.” Chapter 4 – Historic Heritage – “NOTE: Text in grey has not been reviewed, and will be reviewed in a subsequent plan change.” Chapter 9 – Designations – “NOTE: This chapter has legal effect (as of 1 May 2017) but has not yet been made fully operative. This note does not apply to Designation D35A and D124.”
Separate Chapter and Section contents pages	Contents pages to front of each chapter or section
Part 1 and Part 2 contents pages	Contents pages to list Chapters & Appendices in Part 1, and Sections & Appendices in Part 2

Part 2 – Page numbers and header	Page numbers, headers and footers changed in style (as in part 1): Page number on left or right of page, and in deep green colour. Section or chapter title on left or right side in deep green and blue as header. Footer in deep green and blue.
Plan Strategy – Section 4, Section 5, Section 6, Section 7, Section 8, Section 9, District Rules – Rule A1, A2, B1, B2, B3, B4, B6, B7, B8, B9, C1, C2, C3, D	Cross references to sub-sections included. Any references to page numbers removed. (Full list of cross reference differences between Gen 1 District Plan and Not-Yet Reviewed Chapters available). References to ‘Part’ now reference to ‘Chapter’
Sub-section numbering – District Rules	e.g. 4.1 Permitted Activities will now be B4.1 Permitted Activities.
Cross-Referencing to District Rules	New style of cross-referencing to District Rules, e.g. (Refer Rule B7 7.4) now (Refer Rule B7.4)
Formatting of Objectives	Objectives to be removed from grey box.
Formatting of Headings	Main heading – Deep green Sub-section headings – Blue Subsequent headings – Aqua blue



Manawatu District Plan

**Draft Plan Change 51
(Precinct 4)
1 December 2018**

Feilding

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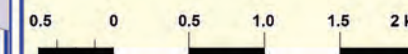
Manawatu District Plan

**Draft Plan Change 51
(Precinct 4)
1 December 2018**

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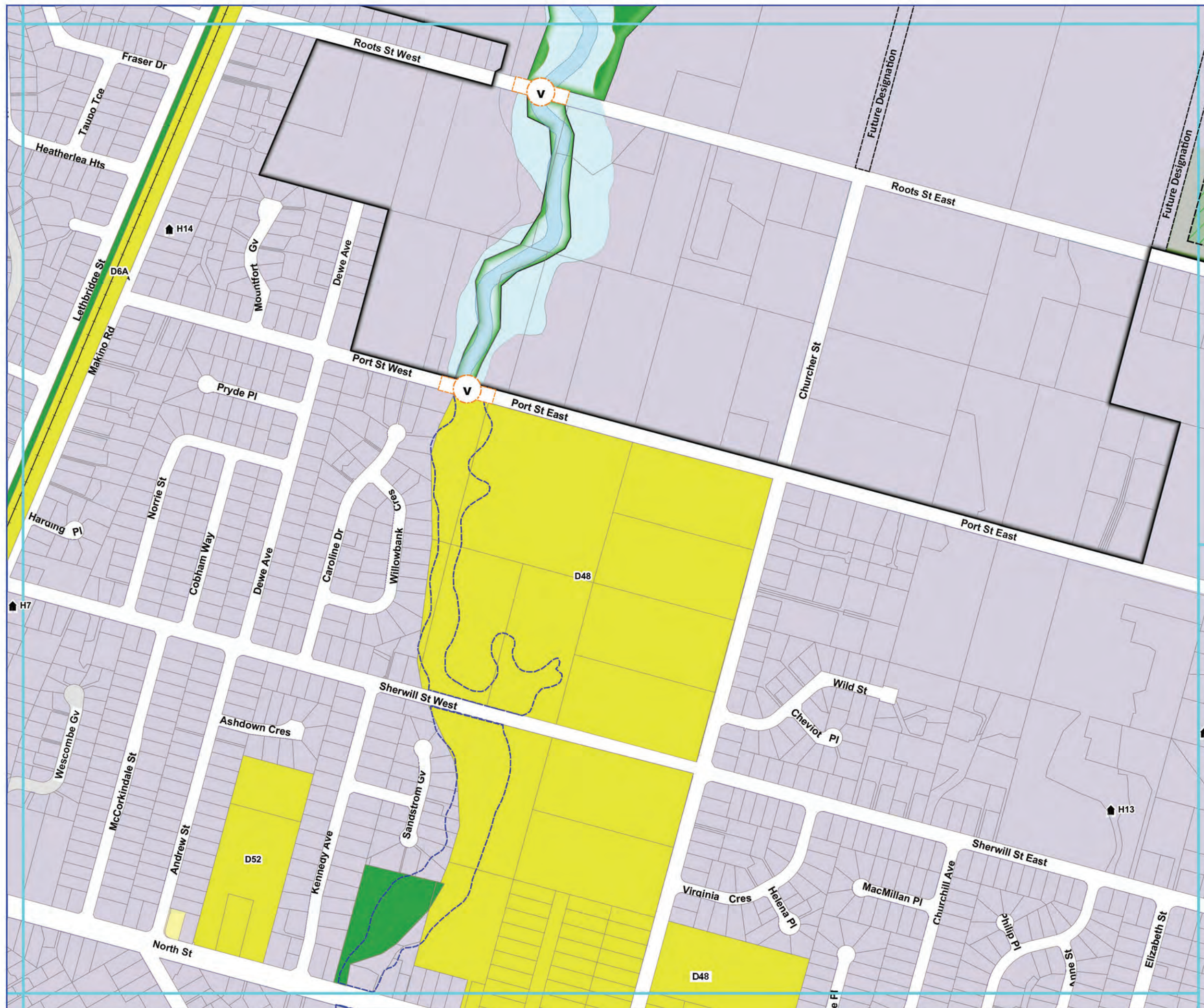
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Manawatu District Plan

**Draft Plan Change 51
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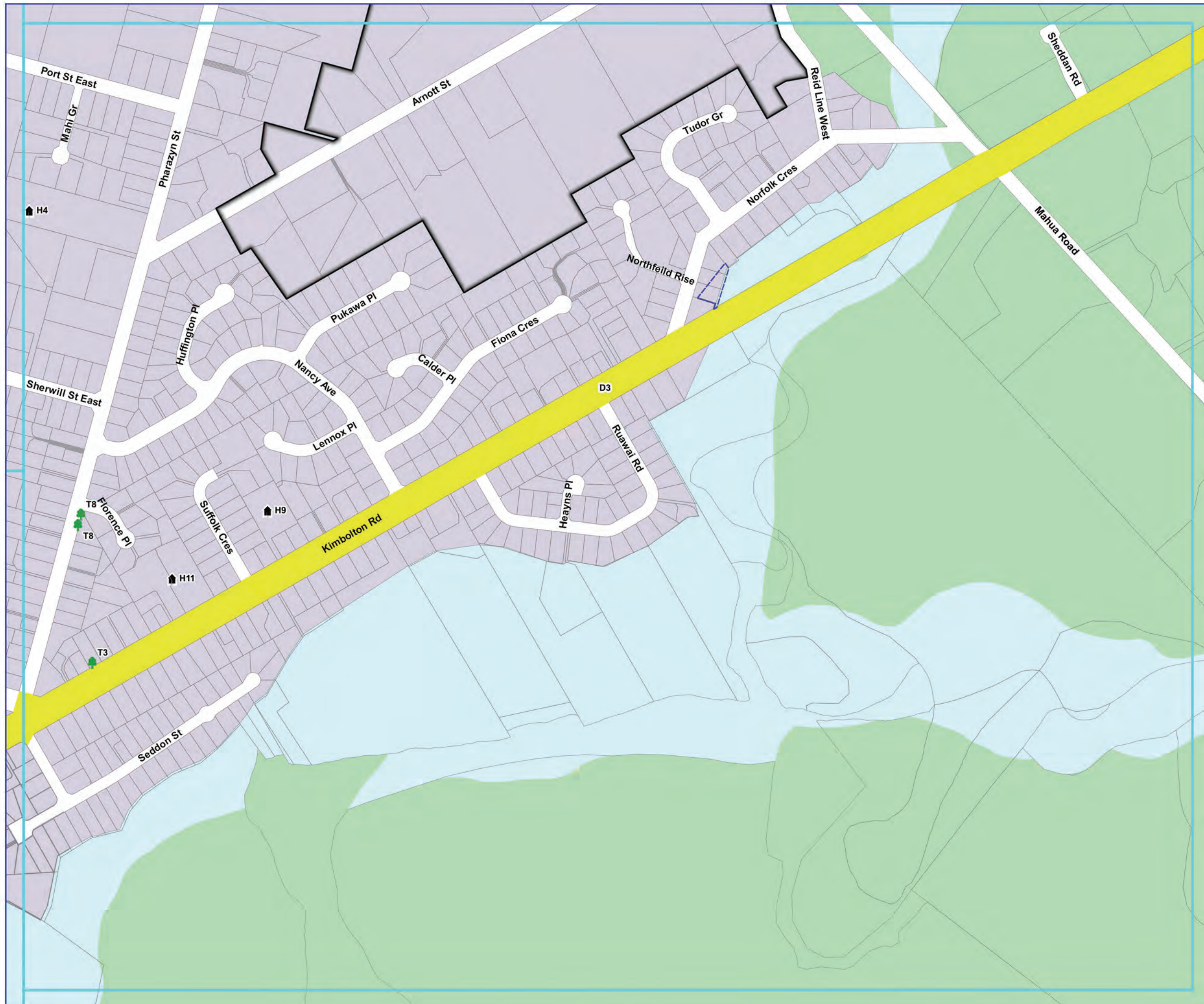
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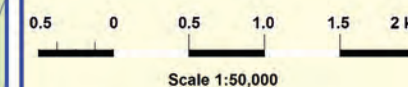


Manawatu District Plan

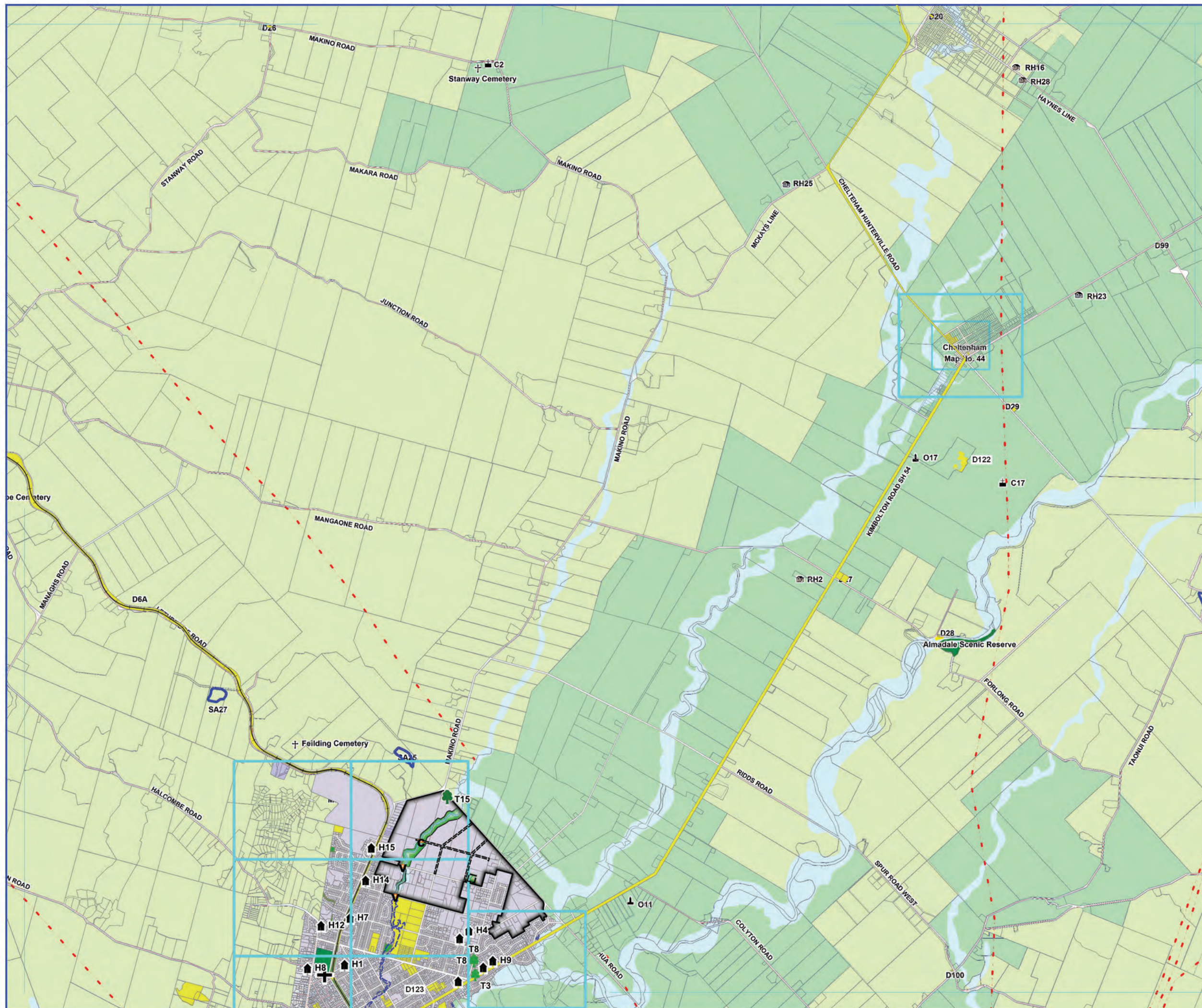
**Draft Plan Change 51
(Precinct 4)
1 December 2018**

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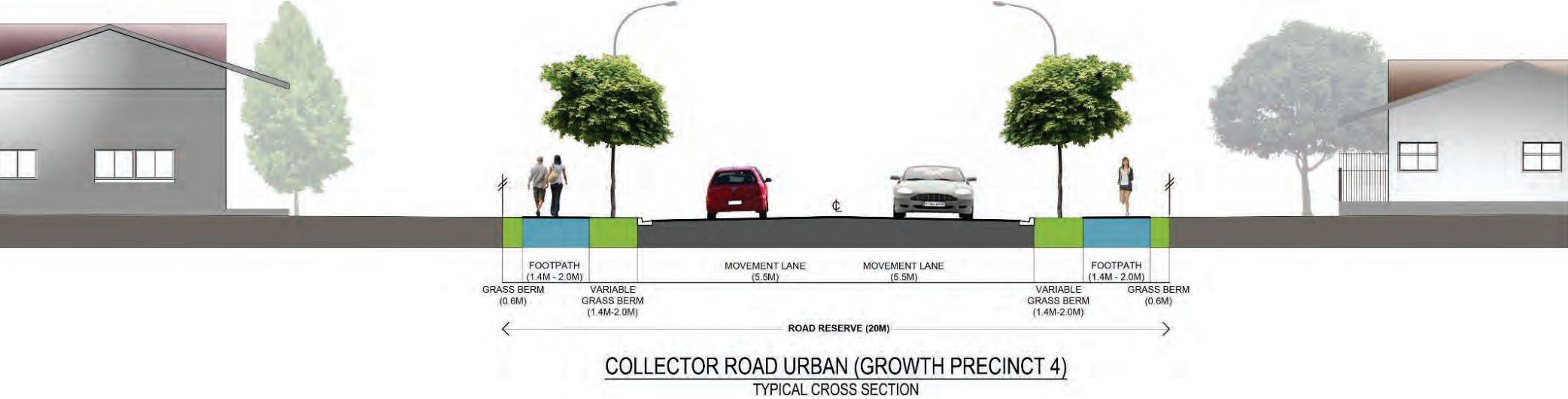
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Appendix 6: Road Cross Sections Collector Roads (Growth Precinct 4)



Appendix 7: Consultation Record

Contact Details	Date	Topic/Issue	Support/Oppose	Comment
Woodlands of Feilding				
Woodlands Resident	23-Nov-17	Roading Traffic Green network Commercial Area Walkways/Footpaths Public Transport	Not Stated	Access to Rimu park is a concern – bridge plans may need to be executed sooner. Highlighted concerns for intersections: Makino/North St is pressured, and Kimbolton Rd/East St is dangerous and congested. Suggestion that a walkway is developed along Makino stream. Recommended shops be placed within easy walking distance of Woodlands as many of the 106 residents no longer have licences; a bus stop on Sherwill St would also support these residents.
Woodlands Resident	23-Nov-17	Housing Commercial Area	Not stated	A mixture of both larger/small section sizes should exist, at a minimum 500m ² . Should be a commercial area in the development – perhaps Port St/Roots St/Churcher St block, or either side of Roots St/Churcher St intersection.
Woodlands Resident	23-Nov-17	Commercial Area Public Transport	Not Stated	Suggestion of a bus stop outside Sherwill St Retirement Centre, as well as regularly scheduled buses to Feilding and Palmerston North – residents currently walk to North St to access bus. A small grocery store would be well appreciated.
Woodlands Resident	23-Nov-17	Roading Traffic	Not Stated	Investigations of roading intersections, e.g. Kimbolton Rd
Woodlands Resident	23-Nov-17	Roading Traffic Green network Public Transport	Not Stated	Concerns for increased traffic to North/Kimbolton Rd/Pharazyn St corner. Upgrade for Port St East should be continued. Suggestion that a walkway is developed along Makino stream. Bus stop should be placed outside of Woodlands as many residents have lost licences due to degenerating health issues. The bus route should include Port St East.

Woodlands Resident	23-Nov-17	Roading Traffic	Not Stated	Serious concerns re: Kimbolton Rd/North St/Pharazyn St/Seddon St intersections. Apprehensions based on large increase to traffic observed, and personal experience of several traffic incidents on this intersection. Pressure on this intersection added to by subdivision of Accolade, Cherry Lane & extensions off Pharazyn St, as well as extension of Woodlands Retirement Village. Traffic congestion further added to by servicing of country areas using Kimbolton Rd, as well as businesses and community facilities in the area. Suggestion of a roundabout to maintain good safe traffic flow.
Feilding Farmers Market - 24th November 2017				
Farmers Market Attendee	24-Nov-17	Zoning	Not Stated	Request for zoning map to be sent via email
Farmers Market Attendee	24-Nov-17	Stormwater Schools Green network Liquefaction Flooding	Not Stated	Question raised re: Makino Rd Drain Cleaning and storm water drainage to 16 houses on Makino Rd. Makino changing channel north of Precinct 4. Concern whether there is enough capacity in schools for future demand caused by increased housing. Not enough green space. Questioned risk of liquefaction & stop-bank failure.
Farmers Market Attendee	24-Nov-17	General	Not Stated	Potential for Manfield camp ground to be repurposed as a park
Farmers Market Attendee	24-Nov-17	General	Not Stated	Campsite should be walking distance to Manfield – needs to go
Farmers Market Attendee	24-Nov-17	Commercial Area	Not Stated	Café, laundromat, dairy needed
Jean & Keith, 10 Arnott Street	24-Nov-17	Stormwater	Not Stated	Concerned about drain and neighbours building a deck over it
Farmers Market Attendee	24-Nov-17	Community Facilities	Not Stated	Important to have community facilities such as halls for individuals and groups to use
Farmers Market Attendee	24-Nov-17	Green network	Not Stated	Important to encourage bird life along the makino stream corridor
Farmers Market Attendee	24-Nov-17	Section sizes	Not Stated	Pepper-pot areas for larger homes
Farmers Market Attendee	24-Nov-17	Housing	Not Stated	Restrictions on size of timber fences

Farmers Market Attendee	24-Nov-17	General	Not Stated	Do it once, do it right – important to have good community consultation and planning in the beginning so get it right first time
Farmers Market Attendee	24-Nov-17	Green network	Not Stated	Non-residential buildings – helpful to have plantings (2 x week meeting, new church)
Farmers Market Attendee	24-Nov-17	Housing	Not Stated	Pockets of houses for first home buyers
Farmers Market Attendee	24-Nov-17	Roading	Not Stated	Information re: development of Sherwill St, Awatea Village (tarseal)
Farmers Market Attendee	24-Nov-17	Community Facilities	Not Stated	A community hall is vital
Farmers Market Attendee	24-Nov-17	Public Transport	Not Stated	Public transport services important for Woodlands and Precinct 4
Farmers Market Attendee	24-Nov-17	Community Facilities	Not Stated	Need a neighbourhood gathering area closer and more central to housing area
Farmers Market Attendee	24-Nov-17	Parks & Reserves	Not Stated	Pocket parks as well as the Esplanade
Farmers Market Attendee	24-Nov-17	Infrastructure Green network	Not Stated	Social issues with compact infrastructure – noise, cars etc. Important to deliver country town amenities and greenspace
Farmers Market Attendee	24-Nov-17	Stormwater Flooding	Not Stated	Storm water management critical, as well as Horizons flood protection
Feilding Farmers Market – 1st December 2017				
Farmers Market Attendee	1-Dec-17	Zoning Liquefaction	Not stated	Interested in liquefaction report
Resident Pukawa Place	1-Dec-17	Parks & Reserves Car parking	Not stated	Make small parks for residents and children. Small park in each subdivision. CBD requires more car parking which will provide visibility when backing
Farmers Market Attendee	1-Dec-17	Roading Traffic Flooding	Not stated	Heavy traffic and agricultural vehicles on Pharazyn street – perception of rural road – in reality there are young children around. Makino stream levels have come up high.
Farmers Market Attendee	1-Dec-17	Roading	Oppose	Don't support vehicle bridge on Port St East as it is an undersized road. Maintain rural character

Best Choice Development Trust	1-Dec-17	Roading Zoning	Support	Interested in existing zoning and proposed roading maps
Farmers Market Attendee	1-Dec-17	Roading	Not stated	When is Root St to be upgraded?
Farmers Market Attendee	1-Dec-17	Green network Roading Traffic Public Transport	Not stated	Need dog walks and pathways for residents, especially Accolade. Traffic calming required for Pharazyn – if have paths you can lift speed limits. Public transport and bus stops are important. Prefer lifestyle in Arnott St block – status quo Concerned that staging of Accolade – why not north to south?
Farmers Market Attendee	1-Dec-17	Stormwater	Not stated	Concerned about storm water from spillway and flow to Arnott. Collecting at Arnott/Pharazyn intersection. Will this be resolved?
Farmers Market Attendee	1-Dec-17	Roading Traffic Stormwater	Not stated	Problems with Pharazyn road users not following speed limits. Highlighted issue with storm water entering property – drainage is not adequate, wasn't measured at sign off. Affects neighbours as well.
Farmers Market Attendee	1-Dec-17	General	Not stated	Booklet should be produced about why things are the way they are, e.g. rate levels etc.
Farmers Market Attendee	1-Dec-17	Cycleways	Not stated	More cycleway marking on roads & designated cycleways
Farmers Market Attendee	1-Dec-17	Roading	Not stated	Upgrading Montagu St – progress on this?
Farmers Market Attendee	1-Dec-17	Commercial Area	Not stated	Concerned re: commercial at Maihi Grove – setting a precedence
Farmers Market Attendee	1-Dec-17	Green network	Not stated	More street trees – provide shade and general wellbeing

Manawatu Youth Ambassadors				
Manawatu Youth Ambassadors Group	15-Dec-17	Parks & Reserves Schools Walkways/Footpaths Rooding Traffic Community Facilities Green network Commercial Area	Not stated	<p>Questioned what schools precinct 4 children would be zoned for, and whether these schools are able to cope with an influx of students. The area may need preschool or after school care in the future. Suggestion of a separate path that links to James Palmer Park over the Makino Stream – would allow a safe link to North Street allowing students to walk etc. to school, avoiding the busy streets. Request for improvements to footpaths, particularly on Roots and Port Street. Footpath up Pharazyn Street towards Reid Line should travel all along Reid Line and connect with the path on Makino Rd and Northfork Cr.</p> <p>Suggested playground & greenspace for the area, which are linked up with pathways. Green networks encouraged to entice native birds.</p> <p>Commercial node would do well in this area, perhaps could include dairy with community notice board, and electric car charging station.</p> <p>Bus service needs to be extended to this area, especially to accommodate Woodlands residents.</p> <p>Concern at narrow nature of Reid Line bridges, as well as the main bridge needing to be fixed.</p>
Webpage Feedback				
Webpage Submitter	Dec-17	Community Facilities	Not stated	Should be more mini playgrounds with play equipment with any large developments
Webpage Submitter	Dec-17	Rooding	Oppose	Concerns over Precinct 4 proposed roads and intersection on boundary of his Oranga Lane property, and the effects this will have on future resale ability. The property was purchased because it was private and quiet, with no surrounding roads – these features will be removed with the proposed roads.
Webpage Submitter	Dec-17	Green network Community Facilities Rooding Public Transport Commercial Area Infrastructure Section sizes	Not stated	<p>Support encouragement for developers to build in green corridor spaces between new dwelling areas to allow space for walkways etc. Don't want area to have dense housing with nothing else. A park or reserve similar to Victoria park would be well used for exercising, dog walking etc.</p> <p>Intersection Pharazyn St/Kimbolton road is often congested and needs to be redesigned.</p> <p>Trees should be planted along major roads such as Pharazyn St. A regular bus service is essential, and retail space for a dairy or supermarket would be useful. Would suggest min lot size of 700m², and would like to see current upmarket style houses to be continued – no relocated houses to be allowed in this area.</p>

Webpage Submitter	11-Dec-17	Roading Traffic	Not stated	Concern re: Kimbolton Road/North Street/Pharazyn Street junction in terms of traffic & safety. Acknowledged efforts of council in adding a stop sign on North Street but concluded that most ignore this stop sign. Expressed that would not support development around Pharazyn Street without significant redesign of the junction. Suggestion of a large oval roundabout including Seddon Street, & possibly the petrol station, as a solution.
Webpage Submitter	17-Dec-17	Community Facilities Commercial Area Cycleways		Expressed how important community facilities, such as playgrounds and parks, are to community integration and bonding. Aware there may be plans for something to be developed near Nancy Ave/Arnott St, but suggested a playground or park within easy walking distance to Accolade Gr/Cherry Pl area. A park should also incorporate something for elderly members of the community to enjoy, e.g. a pond. Suggested that a dairy/local shop in the area would be highly convenient for residents. Important to plan for cycle safety of children on roads when developing the area.
Key Stakeholder Feedback				
Powerco	15-Jan-18	Infrastructure	Neutral	Wants to ensure no unreasonable constraints made on gas/electricity assets, including below ground distribution networks. Network Utility operators must have unrestricted access to continue with development, operation, maintenance (including trimming and clearance of vegetation) and upgrading of assets. New developments, buildings, structures or earthworks should not result in damage or interference with existing utilities. Relocation of assets needs to be authorised, supervised and undertaken by Powerco and their approved contractor. Any future District Plan provisions give effect to The New Zealand Energy Strategy (NZES) (2011-2021) & the National Policy Statement on Urban Development Capacity. Vegetation management and The Electricity (Hazards from Trees) Regulations 2003 should be taken into account during development, particularly for potential green links/vegetation corridors along Root St, Port St East and Pharyzyn St. Seeks to be kept informed throughout the District Plan review to provide feedback and to understand final numbers of potential new electricity and gas connections in the area.

Knox Congregation and Leaders – 21st February 2018

Breakout Group 1	21-Feb-18	Walkways/Footpaths Public Transport Parks & Reserves Commercial Area Community Facilities Housing	Neutral	<p>Suggested an extended bus route to cater for school kids and working adults. Feeder buses would be useful.</p> <p>Potential for a Feilding circle, supermarkets, health centre and 2-way circuit.</p> <p>A grid pattern would be good.</p> <p>Walkway along stream side of the Makino stream would be a good access point, as well as access points near bridges.</p> <p>Proposed park is in a good location. BMX dirt track, fenced playground and small spaces would be well used.</p> <p>Knox café could be an option, and potential to develop the hall into a multi-function community centre – this is a good area in emergency situations such as floods as it is a high point.</p> <p>Commercial area could form a small complex 4 site. Proposed road 2 could be incorporated with park/walkway facilities along the Makino.</p> <p>Council should support new building activity, especially eco/sustainable building.</p> <p>House types should be duplex housing – joint garages and walls. More small format housing.</p> <p>There should be stricter controls on developers re: whether what they are building is meeting demand.</p> <p>Concern raised that developers are not considering environmental factors.</p>
Breakout group 2	21-Feb-18	Public Transport Parks & Reserves Housing	Neutral	<p>Local Feilding bus routes would be useful.</p> <p>Suggested provision of many small green spaces.</p> <p>Mixed housing to suit all age groups should be considered (not all 4 bdrm/3 bathroom/ 3 car garaging).</p> <p>Important to provide for solos/singles, couples and young families.</p>
Breakout group 3	21-Feb-18	Cycleways Walkways/Footpaths Rooding Commercial Area Community Facilities Housing	Neutral	<p>Wider footpaths and cycle designated lanes on Main Road. East St could become a main access route.</p> <p>Commercial area of Precinct 4 needs to be bigger than 4 shops.</p> <p>Transport options could include Bus transfer to meet with PN and circuit to include Woodlands, Mt Stewart, Mt Taylor etc.</p> <p>Potential for church to link with developers to assess the possibility of building a hub. The community house is currently looking to do more, but has a funding limitation.</p> <p>The Knox church is a good place in a flood because of the height.</p> <p>A variety of building types should be considered. Older citizens need smaller homes.</p>

Member of Knox Congregation	21-Feb-18	Housing Schools Commercial Area Public Transport Rooding	Neutral	<p>Highlighted change from Feilding as rural hub for farmers, to home of commuters and retirees. Important for Feilding to cater for all of these various groups when developing housing – should include commodious houses as well as low-cost houses.</p> <p>With more young families, there will need to be more pre-schools.</p> <p>A commercial area with a supermarket/four square, postal services, and places to accommodate small businesses would be popular.</p> <p>A road linking Mt Taylor with Lethbridge Road would build connectivity. A serviceable route to support those commuting to Palmerston North was suggested, with possibly of roundabouts at Kimbolton/North/Pharazyn Streets, Kimbolton/East/Lytton Streets and East/Aorangi Streets.</p> <p>A bus route servicing Feilding only would be well used, with a depot for transfer buses to and from Palmerston North.</p>
Stakeholder Feedback				
Pharazyn Road Resident	26-Mar-18	Parks & Reserves Commercial Area Public Transport Rooding Housing	Support	<p>Providing a park area, as well as utilising the Makino Stream edges (10m widths) for recreational purposes would be desirable. Would also enable access for equipment to maintain the stream. Important that current CBD of Feilding is retained/enhanced, and any commercial/retail development in Precinct 4 should complement rather than compete with it, e.g. corner dairy rather than shopping centre.</p> <p>Important for public transport routes to be extended to Precinct 4 to support people getting to Feilding CBD.</p> <p>Proposed rooding network appropriate as it enables development of land for housing. Sufficient housing sections should be created to support investment in sewerage & stormwater services. However, housing density also limits the amount of productive farm land that may be required for housing in the future.</p>

Roots St West Resident	17-Apr-18	Walkways/Footpaths Parks & Reserves Green network Cycleways	Not Stated	<p>Access to Rimu Park for residents in the East via a pedestrian/cycle bridge over Makino Stream either on Roots St or Port St. Would also provide alternative access to FAHS for students who live on the NW side of town.</p> <p>A park/reserve/cycleway running along Makino Stream from Reid Line to North St would be very popular with nearby residents who wish to walk/cycle away from traffic.</p> <p>An upgrade to toilets, plantings, playground & park benches in Rimu Park would attract more visitors.</p> <p>A path from Dewe Ave to Roots St would allow for it to be crossed in winter when it is water logged.</p> <p>Extending the Green Spine along the Lethbridge St side of the railway would be well appreciated by those who live near the tracks.</p>
Stakeholder	18-Apr-18	Infrastructure	Support	Disability planning should be at the forefront of development of all footpaths, bus stops, community housing and shopping areas for the Precinct 4 area
Stakeholder	19-Apr-18	Cycleways	Not Stated	Cycling is becoming popular for health benefits and environmental friendliness, so important to include cycling areas in Precinct 4. A cycling trail along Makino Stream (James Palmer Reserve and beyond) could be included with road cycle lanes connecting to it. Complemented the trail along Cemetary Road in Sanson, and Green Spine in Feilding.
Churcher Street Resident	20-Apr-18	Green network Parks & Reserves Section sizes Housing Commercial Area Public Transport Tangata Whenua	Not Stated	<p>Walkway alongside Makino stream, as well as planting of native plant species for flood protection and water quality. Park sizes need to be larger than planned, and open space between houses should be included to encourage children to play outside. Section sizes should be large enough to promote planting of trees, especially natives. Disability friendly walkways should be included as footpaths amongst traffic are not always appealing.</p> <p>Houses should not all be large and expensive as they need to also accommodate people on low incomes, and the ageing population who may want to downsize without moving to a retirement village. High fences should be discouraged to promote a neighbourly feeling, and commercial areas should harness a sense of community. Buses of all sizes servicing the area would be well used.</p> <p>Tangata Whenua should be preserved in all development activities.</p>

Port Street East Resident	2-May-18	Utilities Parks & Reserves Public Transport	Not Stated	Believe that underground power should be part of the upgrade of Port St East, especially as Council's own engineering standards require that at least provision is made for underground power through the installation of suitable ducts (Engineering Standards for Land Development Section 1.11 Network Utilities). Would prefer pocket parks as opposed to another large open green field area. Would like to see a bus service extended to Pharazyn Street.
Long Term Plan 2018-28 Submissions				
Port Street East Resident	2-May-18	Utilities	Not Stated	Understands that underground power is not part of the upgrade of Port St East and thinks this is unacceptable, especially as MDC's own engineering standards require that at least provision is made for underground power through the installation of suitable ducts (Engineering Standards for Land Development Section 1.11 Network Utilities).
Feilding Community Committee	3-May-18	Green network Roading Parks & Reserves Housing Community Facilities Walkways/Footpaths	Not Stated	Green way-sustainable urban development include Makino Stream Green project. Build bridge to connect Pharazyn St development to Rimu Park and create another traffic route. 3 intersections need urgent upgrades and action, and streets need to be widened. Develop Rimu Park plan for sports, cultural, youth and dogs. Developers should provide land for new park areas and businesses Council should provide a wide range of housing options, e.g. small & large Along subdivisions there should be spacious green-ways for cycling, walking and mobility scooters. Believes that another park should be planned for the Rimu park area. The lower wet part of Rimu park should be upgraded and drained. Feilding groups should plant a green-way of natives at Rimu. Potential to connect Pharazyn development with Root St area, East West divide, another road option, and enhance river access by proposed bridge. Believes that residents should be encouraged to walk more, and provided with the walking network to do so. Highlights that Roots Street West is in a very poor state with open drains and collapsing culverts. Are keen to see the Makino stream walkway continued for Northern residents. Requests fresh water fountains in all parks around Feilding
Sherwill Street East Resident	30-Apr-18	Walkways/Footpaths Utilities Infrastructure Parks & Reserves	Not Stated	Would like more walking tracks in Feilding free of dogs and bikes. Every subdivision should have a childrens play area, wastewater systems, flood protection, and footpaths.

MidCentral District Health Board	3-May-18	Roading Walkways/Footpaths	Not Stated	Highlights the importance of good roading, cycleways and footpaths., Important to ensure that footpaths are accessible and suitable for people with low mobility, e.g. for the use of mobility scooters. Active transport should be encouraged via transport infrastructure due to it's health benefits. Older adults and residents have raised concerns about the safety of cyclists.
Stakeholder	1-May-18	Stormwater	Not Stated	Expressed that Council does not clean the roadside drain which is overgrown and causes flooding at Reids Line intersection every year
Makino Leisure and Flow Park group	26-Apr-18	Community Facilities	Not Stated	Would like to work with MDC council consider examine possible skatepark park options, investigate stakeholders, suppliers, park designs and fundraising options.
Manawatu Youth Ambassadors Group	3-May-18	Parks & Reserves Green network Walkways/Footpaths Community Facilities	Not Stated	Supports the construction of a new park and walkways in the Precinct 4 area, but disagrees with the proposal not to fund a car parking area and toilet facilities. The submission also believes that Precinct 4 needs more green space.
Facebook Feedback				
Facebook User	13-Nov-18	Housing	Not stated	Should be home owners choice how their fence looks
Facebook User	13-Nov-18	Housing	Not stated	2 metre fences in front of every property reinforces the 'paranoia'. The height also doesn't help if you get broken into as neighbours wouldn't see. 1.1 metre height in the document seems reasonable
Facebook User	13-Nov-18	Infrastructure	Not stated	Sumps are needed in Precinct 4 - Accolade area is shocking for drainage problems.
Facebook User	13-Nov-18	Infrastructure	Not stated	Should be home owners choice how their fence looks
Facebook User	13-Nov-18	Housing	Not stated	Need guidelines on fences, but the new definition goes too far
Facebook User	13-Nov-18	Housing	Not stated	Should be the home owners choice what type of fence they have - do we need to be so regulated?

Facebook User	13-Nov-18	Housing	Not stated	Would never buy or build with a 1.1m covenant in place. Should be my home - my privacy.
Stakeholder Feedback				
Powerco	19-Nov-18	Utilities	Support	<p>CHAPTER 8 SUBDIVISION COMMENTS</p> <ul style="list-style-type: none"> - 8.2 (1) - "infrastructure provisions" should read "infrastructure provision" - Issue 7 - Relief sought: The need for new developments within Growth Precinct 4 to be in accordance with any relevant structure plan, and be appropriately programmed and/or staged to ensure enable the integrated provision of infrastructure at the earliest stage of development - Objective 1 - Support the reference to electricity and gas in clause (e), and support the overall objective to be retained, and properly given effect to policies to implement it (as is) - Policies - No references to infrastructure and utility services in policies 1.1 to 1.5 that follow objective 1. Additional clause to be added to policies supporting objective 1: Relief sought: <u>1.6 Enable integrated infrastructure and utility services to be provided for Growth Precinct 4 in a staged and co-ordinated manner including the provision of reticulated wastewater, water supply, stormwater networks and power and telecommunication networks to all new lots.</u> - Objective 2 - supported as drafted - Policies - Need flexibility in Policy 2.7 regarding requirement for all power and telecommunication infrastructure to be underground, as not always practical to achieve. Remove the word 'require' as is directive. Questioned whether the wide definition of infrastructure in the RMA would require all aspects of power and telecommunication infrastructure to be underground. Policy 2.7 is more directive than Chapter 3A District Wide - Network Utilities, Policy 1.3 which uses 'encourage all new cables and line...' Seek similar wording to policy 1.3. Relief sought: <u>2.7 To require all power and telecommunication infrastructure to be underground. To encourage all new cables and lines, including electricity distribution lines (but not the National Grid) to be installed underground where practicable.</u> - Objective 4 - Intent is supported, but structure of objective awkward Relief sought: To enable the dDevelopment of Growth Precinct 4 that is in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1 and only where development delivers an integrated infrastructure network for the entire site.

				<p>- Policy 4.1 & 4.4 - Supported in part. This policy would be better incorporated into a wider definition of infrastructure to ensure integration with existing Feilding network. E.g. gas reticulation is not included in definition of essential infrastructure. Highlighted section of definition for network utility: "which provide an essential service to the public." Inconsistency in definition of network utility and definition of essential infrastructure. Policy 4.1 does not include gas. Where gas is included in development, gas mains are installed in common trenches with other utilities</p> <p>Relief Sought: New definition – Essential Infrastructure means the Manawatu District Council reticulated sewage and reticulated water supply systems, stormwater systems, gas, and electrical power and telecommunication (including fibre) networks.</p> <p>- Rule 8.4.1, Performance standard (g) - Infrastructure - does not appear to apply to gas pipes. Relief sought: All cables and pipes, including for power, gas and telecommunications must be placed underground. Use of the word 'essential infrastructure' should be given consideration. Noted the NZ energy strategy position of environmental friendliness of gas as a customer choice.</p> <p>CHAPTER 15 RESIDENTIAL COMMENTS</p> <p>- Objective 2 - Relief sought: To promote development within Growth Precinct 4 that creates an attractive, healthy, and safe and well serviced place to live.</p> <p>- Definitions - Relief sought to definition of 'open construction': "Means, with respect to any fence, able to be..." Gas should be included in definition of essential infrastructure, but if gas is a form of 'power' and infrastructure is to remain outside this definition, changes to drafting of new subdivision objectives, policies and rules is required.</p> <p>- Planning Maps- Change of zoning from Rural and Rec to Residential is supported</p>
Email Submitter	14-Nov-18	Housing	Not stated	<p>Disagree with front fence not being able to exceed 1.1 metres for more than third of the property. Due to wanting to ensure children don't climb over fences onto the road, stopping cars from driving into houses, stopping dogs from jumping over fences, and needing to plant behind fences to reduce noise and at night disturbances. Unlikely that owners would build cheap fences anyway as the area is not cheap to buy into/build in. A blanket rule on fencing will make houses look very much the same which is disappointing.</p>

Feilding Library Consultation – 14 th November 2018				
Feilding Library Visitor Lancewood Avenue Resident	14-Nov-18	General Public Transport	Not stated	New resident to Feilding and has found community is very conservative. Questioned why tenants have to mow the lawns in social housing. Noted that street patrol group (structure) is predicated on 'partners'. Makes it difficult to get involved if you don't have a partner. Interested in Precinct 4 as her neighbours are not very supportive/neighbourly. Should be a shuttle bus to get to the shops. Small bus routes (mini bus) within Feilding to serve local residents.
Feilding Library Visitor Dewe Avenue Resident	14-Nov-18	Parks & Reserves	Not stated	Property is proximal to Rimu Park. Ensure there are plenty of rubbish bins and green bins in the growth precinct. Interested in the proposal to relocate Rimu Park and rezoning to residential. Thought that the proposed relocation had some merit.
Feilding Library Visitor	14-Nov-18	Stormwater Public Transport General	Not stated	Property is on Makino Rd and backs onto growth area. Support public transport in the area, as well as a Feilding circular. Would like a copy of precinct 3 plan, incl. roading development and subdivision scheme. Notes property is very damp at the back. Was interested to know about the effect of development on stormwater management.
Feilding Library Visitor	14-Nov-18	Housing	Not stated	Husband is irritated by noisy neighbours. Looking for new section, potentially in Precinct 4. Prefers north facing, east-west street, south side. Is concerned about the Feilding Herald - no delivery for some time now.

Iwi Consultation Record

Contact Details	Date	Topic/Issue	Comment
Ngā Manu Tāiko Committee	18/12/15	District Plan Programme – Timeline, Plan Change scheduling – Discussion on iwi consultation preferences.	Presentation by Senior Planner; Questions and answers
Ngā Manu Tāiko Committee	19/5/16	Resource Legislation Amendment Bill 2015 – Maori Participation in Planning Processes.	Presentation by Senior Planner; Questions and an and answers
Ngā Manu Tāiko Committee	13/6/17	Resource Legislation Amendment Act – Update; Changes to Maori Participation in RMA planning processes.	Presentation by Senior Planner; Questions and answers
Ngā Manu Tāiko Committee	9/8/16	Plan Change 51 (Precinct 4).	Presentation by Senior Planner; Questions and answers
Ngati Kauwhata (Dennis Emery and Dr April Bennett – Massey University)	24/8/16	Feilding Growth Planning – Briefing on Growth Precinct 4; Initial discussion with Nga Kaitiaki- Ngati Kauwhata on engagement principles to establish a good support a working relationship.	Meeting between Principal and Senior Planners, Opus Planning Consultant and Dennis Emery and Dr Bennett (Massey).
Dr April Bennett (Researcher - Ngati Kauwhata)	5/9/16	Cultural Impact Assessment Report – scoping discussion	Meeting with Senior Planner
Dr April Bennett and Massey Planning Students (Cultural Impact Assessment - research team)	14/9/17	Planning context for Precinct 4 (Proposed Plan Change 51).	Presentation by Senior Planner; questions and answers

Grant Huwyler Chris Shenton (Ngati Apa)	4/10/17	Mana Whakahono a Rohe Discussion and District Plan Briefing, including Precinct 4	Meeting between Manawatu District Council CEO, Senior Planner, Community Development Advisor and Ngati Apa leaders. Ngati Apa confirm that planning for Precinct 4 is not a priority matter for RoM at this time.
Ngati Kauwhata (Dennis Emery)	16/11/17	Cultural Impact Assessment Report – Contract discussion and approval. Request for MoU	Meeting to discuss Work Programme and arrangements for the Cultural Impact Assessment Report.
Dr April Bennett (Researcher - Ngati Kauwhata)	11/12/17	Cultural Impact Assessment Report – Work in progress update.	Meeting between Senior Planner and Dr April Bennett.
Ngati Kauwhata (Dennis Emery)	22/12/17	Signing of MoU between MDC and Ngati Kauwhata Cultural Assessment Impact Report for Growth Precinct 4	Meeting between Manawatu District Council CEO, Strategy Manager, Senior Planner & Dennis Emery (Ngati Kauwhata).
Ngā Manu Tāiko Committee	13/2/18	Precinct 4 - Update	Presentation by Senior Planner; questions and answers
Ngā Manu Tāiko Committee	11/4/18	Statutory Acknowledgements – Rangitane & Ngati Apa	Presentation by Senior Planner; question and answers
Manawatu District Council CEO, Strategy Manager, Senior Planner & Dennis Emery (Ngati Kauwhata)	5/3/18	Precinct 4 Cultural Impact Assessment Report discussion	Meeting to discuss progress on the Cultural Impact Report and delivery timeframe.
Ngā Manu Tāiko Committee	12/6/18	Planning for Precinct 4 - Update	Presentation by Senior Planner; question and answers

Ngati Kauwhata (Dennis Emery and Dr April Bennett)	13/6/18	Cultural Impact Assessment Report for Precinct 4	Meeting to discuss the Cultural Impact Assessment Report and Report Recommendations.
Morrison Kent Lawyers (iwi client)	20/6/18 – 23/7/18	Precinct 4 – LGOIMA request	Phone discussions on information request, letter and submission of information.
Dr Bennett (Ngati Kauwhata - Dennis apology)	20/7/18	Precinct 4 – Site visit with Mr Bailey (54 Roots Street)	Mr Bailey led a farm tour for the Senior Planner, Opus Consultant, MDC Legal Counsel and Dr Bennett. Dennis Emery put in an apology (bereavement).
Rangitane o Manawatu Te Ao Turoa Environmental Centre	30/8/18	Mana Whakahono a Rohe Discussion and District Plan Briefing, including Precinct 4	Rangitane O Manawatu (RoM) confirm that planning for Precinct 4 is not a priority matter for RoM at this time.
Dr Bennett, Massey Planning Students	17/9/18	Planning context for Precinct 4	Presentation by Senior Planner; question and answers
Ngati Kauwhata (Dennis Emery and Dr April Bennett)	28/9/18	Precinct 4 – Cultural Impact Assessment Report – Feedback to Ngati Kauwhata on Council’s response to the Cultural Impact report recommendations	Council feedback to Ngati Kauwhata on Council’s response to the Cultural Impact report recommendations.
Ngā Manu Tāiko Committee	9/10/18	Precinct 4 - Update	Presentation by Senior Planner; question and answers

<p>Ngati Kauwhata (Dennis Emery and Jeff Rakatau)</p>	<p>22/11/18</p>	<p>Precinct 4 Workshop with representatives of Ngati Kauwhata to present salient information on infrastructure, housing and recreation planning for Precinct 4.</p>	<p>Meeting with Council staff (CEO, GM- Community and Strategy, Strategy Manager, Principal Planner, Principal Advisor – Maori; Utilities Manager, Community Facilities Manager, Corporate Projects Advisor) Opus Consultant and representatives of Ngati Kauwhata. Ngati Kauwhata representatives provided support in principle to the Council's plans for Precinct 4.</p>
<p>Ngati Kauwhata (Dennis Emery)</p>		<p>Follow-up discussion from Precinct 4 Workshop, to discuss amongst other matters, the tangata whenua values for the s 32 report.</p>	<p>Meeting with Council staff (CEO, GM- Community and Strategy, Principal Planner, Principal Advisor – Māori).</p>
<p>Ngāti Raukawa (Jessica Kereama)</p>	<p>29/03/19</p>	<p>Meeting to discuss general intent of Precinct 4, and to discuss issues raised by Raukawa. Memo provided on page 557 of section 32 report.</p>	<p>Meeting with Council staff (GM - Community & Strategy, Principal Advisor – Māori , Contracted Principal Policy Planner, Senior Policy Planner.</p>



Manawatu District Council

Feilding Liquefaction Study Precinct-4 (Expanded Area)


Geotechnical Assessment Report



Manawatu District Council


Feilding Liquefaction Study Precinct-4 (Expanded Area) Geotechnical Assessment Report

Prepared By


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Ravi Sundar
Geotechnical Engineer

Opus International Consultants Ltd
Whanganui Office
Opus Whanganui, 74 Ingestre Street
PO Box 654, Whanganui Mail Centre,
Whanganui 4541
New Zealand


Reviewed By


.....
Mark Frampton
Principal Geotechnical Engineer

Telephone: +64 6 349 6600
Facsimile: +64 6 348 4601

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Release By


.....
Mark Frampton
Principal Geotechnical Engineer

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Version	Date	Prepared by	Reviewed by	Approved by
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Appendix-A Trial Pits and Hand Auger Logs

Appendix-B Laboratory Test Results

1 Introduction

Opus was commissioned by Manawatu District Council (MDC) in 2013 to carry out a high-level liquefaction risk assessment of the Precinct 4 (Residential) and Precinct 5 (Industrial) growth areas. Opus completed a series of geotechnical investigations and liquefaction assessment for the two growth areas. The investigations showed the liquefaction hazard is generally low in the development areas.

MDC is considering expanding the Precinct 4 growth area boundary from the Makino Stream to Makino Road. MDC requires an addendum to the 2013 liquefaction report that covers the additional land, and whether it is suitable for residential development.

Opus has been engaged by MDC to undertake further geotechnical investigations in the additional growth area near the Makino Stream, to assess the hazard posed by liquefaction and lateral spreading.

The purpose of geotechnical investigations and assessment of the expanded area is to:

- ❖ confirm the land between Makino Stream and Makino Road is suitable for residential development
- ❖ identify the extent of any no build areas near the Makino Stream
- ❖ identify the extent for where geotechnical testing is required to support land development (this could be either at subdivision or land use consent stages).
- ❖ identify any specific foundation requirements that should be included in the District Plan.

This report presents a characterisation of the ground conditions and geotechnical hazards in the additional growth areas, and makes recommendations for land use planning taking into account the earthquake hazards. The proposed additional development area is marked in the below Figure-1



Figure 1: Proposed additional development area plan

2 Site Description

The proposed expanded residential area is located on the north-east outskirts of Feilding's urban area. The location of the expanded growth area is shown on Figure 1. The area is situated on predominantly flat to gently undulating alluvial plains, with a gentle slope from Makino Road towards the Makino Stream. The land is predominantly under agricultural use with some rural-residential developments.

Expanded Precinct-4 (area 72.4 hectares) has several streams and drains crossing the site, flowing towards the Makino Stream; Makino Stream forms the south-eastern boundary and Makino Road forms the north-western boundary of the expanded Precinct-4.



Photograph 1: Proposed development area looking east

3 Geological Setting

3.1 Geology

The geology of the Feilding area has been mapped at 1:250,000 scale by the Institute of Geological and Nuclear Sciences Limited, Lower Hutt, New Zealand (IGNS, 2000). The map shows the study area to be underlain by late Pleistocene age river deposits, comprising poorly to moderately sorted gravel with minor sand and silt underlying terraces; includes minor fan deposits and loess.

Source: <http://data.gns.cri.nz/geology/>

4 Site Investigations

4.1 General

The following site-specific geotechnical investigations were completed on 7th November 2017 as part of this report to characterise ground conditions for the proposed development area:

- A walkover inspection of the site by a geotechnical engineer
- Seven trial pits (TP-1 to TP-7)
- One hand auger (HA-8)

4.2 Trial Pits

Seven trial pits (TP-1 to TP-7) were excavated to a maximum depth of 4.1m with a hydraulic excavator. Scala penetrometer tests were undertaken adjacent to the trial pits from ground level to a depth of 1.5m, and then from the partly excavated trial pit at 1.5m depth for a further 1.5m or refusal, to give a continuous blow count from ground level to a maximum depth of 3.0m. The number of blows for each 100mm penetration was recorded. Pilcon vane shear tests were also undertaken in the near surface soils during excavation of the trial pits.

4.3 Hand Augers and Scala Penetrometers

One hand auger (HA-8) was excavated in the Rimu Park instead of trial pit to avoid ground disturbance in the park grassed area by using the excavator. The hand auger was undertaken to a depth of 1.6m, with Scala penetrometer test undertaken adjacent to the hand auger hole to refusal. Hand augers were unable to penetrate into a very dense gravel layer at 1.6m.

4.4 Test locations

Refer to Table-1 below for summary of the trial pits and hand auger. The locations of the trial pits and hand auger are shown on Figure-2. Logs of trial pits, hand auger and Scala Penetrometer tests are provided in Appendix-A. Opus's Geotechnical Engineer supervised the site investigation and logged the trial pits and hand auger in accordance with the New Zealand Geotechnical Society (2005), Guidelines for the Field Description of Soil and Rock.

Table 1: Trial pit summary

Test ID	Location*		Depth (m)	Depth of gravel layer (m)	Ground Water (m)
	Easting	Northing			
TP1	1819319	5547074	2.6	1.9	Not encountered
TP2	1819127	5547241	2.4	1.2	Not encountered
TP3	1818950	5547329	2.6	1.4	Not encountered
TP4	1819071	5546770	2.5	2.0	Not encountered
TP5	1818777	5546902	4.1	4.1	Not encountered
TP6	1818825	5546733	2.2	1.8	Not encountered
TP7	1818865	5546529	2.7	1.7	Not encountered
HA8	1818629	5546446	1.6	1.4	Not encountered

*Coordinates are in metres to NZTM2000.



Figure 2: Site Investigation plan

5 Laboratory Testing

Laboratory testing of recovered samples has been carried out to support the site investigation results, with tests for natural moisture content and plasticity index. Sample locations, description, and test results are summarised in Table 2 and the analytical results are summarised in Appendix B.

Table 2: Laboratory test summary

Sample source	Depth (m)	Description	Plasticity Index			Natural w/c (%)	Linear Shrinkage (%)
			LL	PL	PI		
TP3	0.5 m	CLAY	42	20	22	22.7	11
TP5	1.0 m	CLAY	66	22	44	32.8	17
TP6	1.6 m	CLAY	41	16	25	21.4	11

6 Ground Conditions

6.1 Ground Conditions

The area under investigation is located on semi-rural land on the outskirts of Feilding. The site lies on flat to gently undulating alluvial terrace surfaces, which are underlain by young (Late Pleistocene age) interbedded alluvial deposits. The generalised soil profile inferred at the site is provided in Table 3 below. This soil profile is based on geotechnical investigations carried out in November 2017.

Table 3: Generalised soil profiles in the expanded growth area

Unit	Stratigraphy	Depth Encountered (m bgl)	Thickness (m)	Scala Blows / 100 mm depth of penetration	Undrained Shear Strength, Su (kPa)
1	TOP SOIL	0.0 (Surface)	0.3 to 0.4 m	-	-
2	SILT / SILT with some clay	0.3 to 0.4	0 to 0.9 m	1-3	35-114
3	Silty SAND/ Sandy SILT	0.7 to 1.3	0 to 1.8 m	1-12	127 - 159
4	Silty CLAY/ Clayey SILT	0.3 to 3.1	0 to 1.0 m	1-7	95 - 159
5	Sandy GRAVEL	1.2 to 2.0 (4.1 at TP-5)	>1 m	Refusal	-

The geotechnical information on the ground conditions in the Precinct-4 area is provided by the November 2017 site investigations and factual information from the October 2013 site investigations (Opus, 2013). These investigations show the surficial soil layer in the local area consists of clayey SILT, silty CLAY and silty SAND layers until typically 1m to 2m thick below ground level, underlain by medium dense to dense gravel layers until 20m below ground level.

Trial pit TP5 differed from the generalised ground condition described above, with a 1.8m thick layer of silty sand between a silt layer and silty clay layer, and gravel encountered at 4.1m below ground level. We believe this is because the ground level in the general area of TP5 test location is approximately 1.5m above the average ground level of the other test locations, and this test site may be on a fan deposit or higher alluvial deposit than the other test sites.

6.2 Groundwater Conditions

No groundwater was encountered in any of the trial pits and hand auger excavated across the expanded residential area. Note the groundwater level at any time is influenced by the seasonal variations of climatic condition in the region. As the investigation was carried out in early-November, the observations may reflect end of spring groundwater level.

The Makino Stream is likely to have a strong influence on regional groundwater conditions. Groundwater level data recorded during previous site investigations and Horizons Regional Council record shows, the groundwater is between 1m and 4m depth below ground level in the Precinct 4. The ground water level may fluctuate seasonally with infiltration from rainfall and changes in the Makino Stream level.



Photograph 2: Makino Stream looking north

7 Liquefaction

7.1 General

Liquefaction occurs when saturated loose to medium dense fine grained granular materials and silt are subjected to ground shaking. Liquefaction can cause sand boils, subsidence, lateral spreading and flow slides. When saturated soils liquefy by earthquake vibrations, these soils are densified and compacted, resulting in vertical settlements (subsidence) that can be of significant magnitude. In addition, liquefaction-induced lateral spreading of ground towards the river and stream can occur as a consequence of liquefaction. For liquefaction and lateral spreading to occur, three main conditions must be met:

- The presence of soil types that are susceptible to liquefaction (e.g. sands/silts in a loose state);
- Groundwater table near the ground surface or at the surface level;
- Sufficient earthquake intensity and duration.

7.2 Assessment

7.2.1 Soil Susceptibility

Based on the previous investigations and the current investigations the site is underlain by soil of alluvial origin mainly comprises of clayey SILT, silty CLAY and silty SAND layers until typically 1m to 2m thick below ground level, underlain by medium dense to dense gravel layers until 20m below ground level.

Based on the previous analysis, visual observation and dense nature, the gravel layer (Unit 5) encountered at 1m to 2m depth below ground level is not considered susceptible to liquefaction. Therefore, based on the previous borehole information, gravel encountered from 2m to 20m below ground level is not susceptible to liquefaction

A layer of loose to medium dense silty Sand / sandy SILT layer (Unit 3) encountered in the top 1m to 2m below ground level. The sand layers are free-draining and unlikely to sustain the saturated condition necessary for liquefaction to occur. Therefore, this layer does not appear to be susceptible to liquefaction.

The laboratory test confirms that the soils in the top 1m to 2m are generally cohesive silty clay and clayey silt layers (Unit 2 & Unit 4) that are not susceptible to liquefaction. Based on the observation in Aadapazari during the Koceli (1999) earthquake Bray et al. (2004) found that that soils with $PI < 12$ underwent liquefaction, soils between 12 and 18 were moderately prone to liquefaction and soils with $PI > 18$ were not prone to liquefaction at the effective confining pressures used in the experiments. The cohesive soils in the top 1m to 2m have a Plasticity Index (PI) value of between 22 and 44, which is in the range of not prone to liquefaction.

7.2.2 Groundwater

The potential for liquefaction will be strongly influenced by the groundwater table depth. The groundwater level recorded during previous investigations in Precinct-4 was between 1.1m and

2.2m depth. As described above in Section 6.2, the groundwater was not encountered in any trial pits and hand auger in the proposed additional development area.

In all the tests undertaken in the Precinct-4 area, the gravel layer was encountered before the groundwater. The underlying gravels are typically dense to very dense, and have very low potential to liquefaction. The groundwater table is lower than the liquefiable material which implies the potential for liquefaction will be minimum.

7.2.3 Earthquake Intensity

Numerous active faults and potentially seismogenic structures are mapped in the Manawatu Region. The known active fault and their recurrence intervals are listed in the Opus's Geotechnical Evaluation Interpretative Report (2013). Each fault has the potential to generate felt intensities of MM7 or more in the Feilding area. It is apparent from the number of active faults, that there are numerous potential seismic sources capable of producing ground shaking of MM7 or greater, sufficient to cause liquefaction in Feilding, if susceptible soils are present.

7.2.4 Discussion

Despite having numerous potential seismic sources capable of producing ground shaking of MM7 or greater and high-water table, the site would appear to have a low risk of liquefaction because of the dense nature of the gravel encountered between 2m and 20m below ground level.

8 Geotechnical Hazards

8.1 General

Our assessment indicates that the expanded Precinct 4 area has a low risk of liquefaction. Therefore, the hazards associated with liquefaction, such as loss of bearing strength, subsidence, and lateral spread are not expected during the design earthquake shaking. This assessment of a low risk of liquefaction applies to both sides of the Makino Stream.

A buffer zone, (150m wide on both sides of the Makino Stream) with a 'less intensive land use', was recommended in the Opus's Geotechnical Evaluation Interpretative Report (2013c). This was based on assumed ground conditions, and was necessarily conservative. The testing undertaken as part of this study has shown dense gravels to be present from a shallow depth, and a low water table. The assessment based on these ground conditions has shown a low risk of liquefaction near the stream.

The previous recommendation for a buffer zone around the stream to mitigate the liquefaction risk is now not required. This area can be added to the intensive development zone without any restrictions related to the liquefaction hazard.

8.2 Slope Stability Hazard

As 2m-3m of vertical slope is present near the Makino Stream, it is considered that building setbacks from the existing crests of slopes would provide appropriate mitigation of the slope stability hazard. We recommend no residential structure be built closer than 10m from the top of the stream slopes.

This setback distance does not allow for any stream channel erosion or scour. This assessment is outside the scope of this report.

8.3 Poor Foundation Conditions

Localised poor foundation may be present in the area due to the nature of the deposition of alluvial materials. The testing undertaken was not sufficiently intense to classify each potential building site.

Foundation requirement for the building in the growth area should be assessed based on the shallow soil testing such as Scala penetrometer and shear vane test in accordance with NZS3604:2011 for timber frame residential structures, or other relevant standards, during the development phase.

9 Conclusions

Based on the analysis and geotechnical testing results, we have concluded the following:

- The ground conditions are generally uniform across the site, with clayey SILT, silty CLAY and silty SAND layers until typically 1m to 2m thick below ground level, underlain by medium dense to dense gravel layer.
- The ground conditions at the proposed expanded growth area in the Precinct-4 generally have low vulnerability to liquefaction and liquefaction-induced ground damage.
- The ground conditions at the site are more favourable than previously assumed, and the risk of liquefaction is assessed as low.

10 Recommendations

It is recommended that:

- The less intensive land use restriction (buffer zone) adjacent to the Makino Stream, to mitigate the liquefaction hazard, can be removed.
- No residential structure should be built closer than 10m from the top of the Makino Stream bank, to avoid slope stability hazards.
- The scour and erosion hazard due to Makino Stream flows have not been assessed as part of this study, and should be considered further.
- Foundation requirements for the buildings should be based on the shallow soil testing such as Scala penetrometer and shear vane test detailed in NZS3604:2011 for timber frame residential structures, or similar appropriate standards during the development of the area.
-

11 Use of Report and Limitations

This report has been prepared for the benefit of Manawatu District Council, for the purpose of land use planning for the proposed additional residential development area near Precinct-4. Opus accepts no responsibility for the validity, appropriateness, sufficiency or consequences of the Client using the report for purposes other than for the land use planning for the proposed additional residential development area near Precinct-4.

12 References

Geological Nuclear Science Online, New Zealand Geology Web Map, 2013. Accessed November 2017 at: <http://data.gns.cri.nz/geology/>

Opus International Consultants (2013a), Feilding Liquefaction Study, Stage 1 -Preliminary Geotechnical Assessment Report.

Opus International Consultants (2013b), Feilding Liquefaction Study, Site Investigations Factual Report.

Opus International Consultants (2013c), Feilding Liquefaction Study, Geotechnical Evaluation Interpretive Report.

Bray, J.D., Sancio, R.B., Reimer, M.F. and Durgunoglu, T. (2004), "Liquefaction Susceptibility of Fine-grained Soils", Proc. 11th Int. Conf. on Soil Dynamics and Earthquake Engineering and 3rd Inter. Conf. on Earthquake Geotech. Engrg., Berkeley, CA, Jan. 7-9, Vol. 1, pp. 655-662.

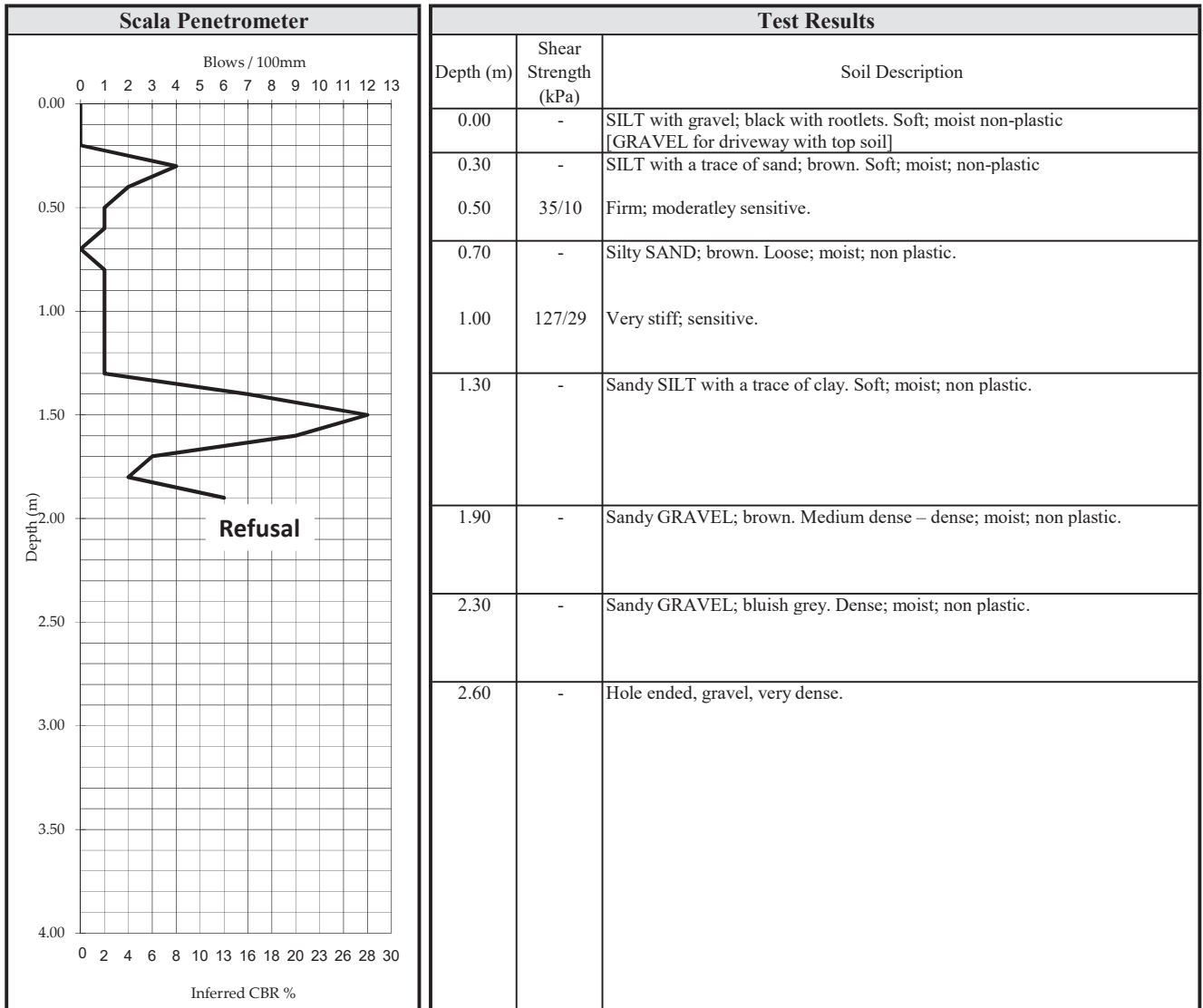
Appendix-A Trial Pits and Hand Auger Logs

**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-1**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.1)
Client Ref No :



Test Methods
 Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**

**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005, Scala over 1.5m and Inferred CBR values are not IANZ accredited.

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 Date reported : 27/11/17

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S Darby
 Designation : *Senior Laboratory Technician*
 Date : 27/11/17



PF-LAB-061 (05/07/2017)

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 Whanganui Laboratory
 Quality Management Systems Certified to ISO 9001

Opus Laboratory, 16 Pacific Place
 PO Box 654, Wanganui Mail Centre,
 Wanganui 4541, New Zealand

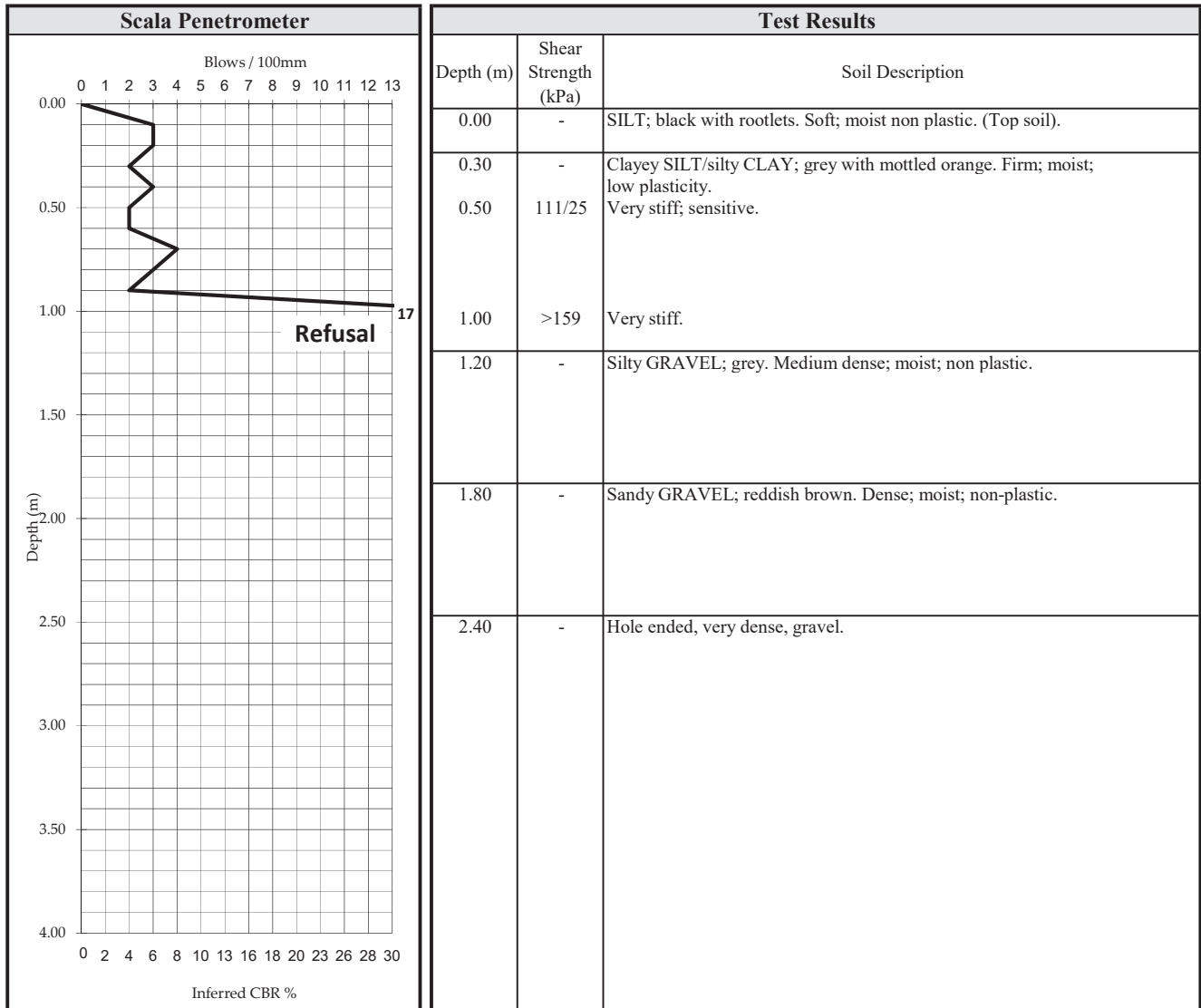
Telephone +64 6 349 6640
 Facsimile +64 6 348 4601
 Website www.opus.co.nz

**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-2**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.2)
Client Ref No :



Test Methods	
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2** Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001 Inferred CBR values taken from Austroads Pavement Design Manual 2004**	**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005 and Inferred CBR values are not IANZ accredited.

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 Date reported : 27/11/17

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 Date : 27/11/17

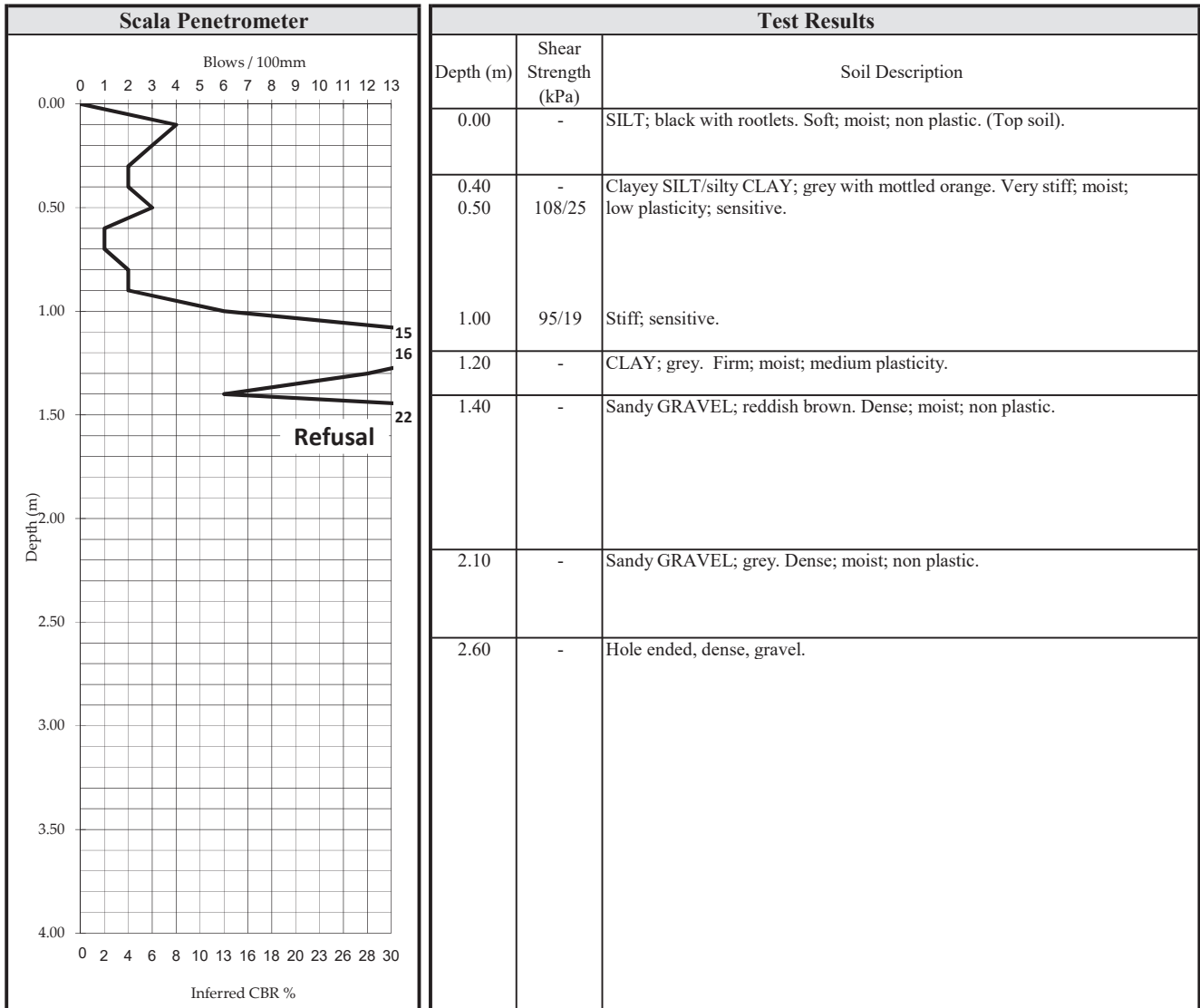


**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-3**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.3)
Client Ref No :



Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**

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 Date : 27/11/17



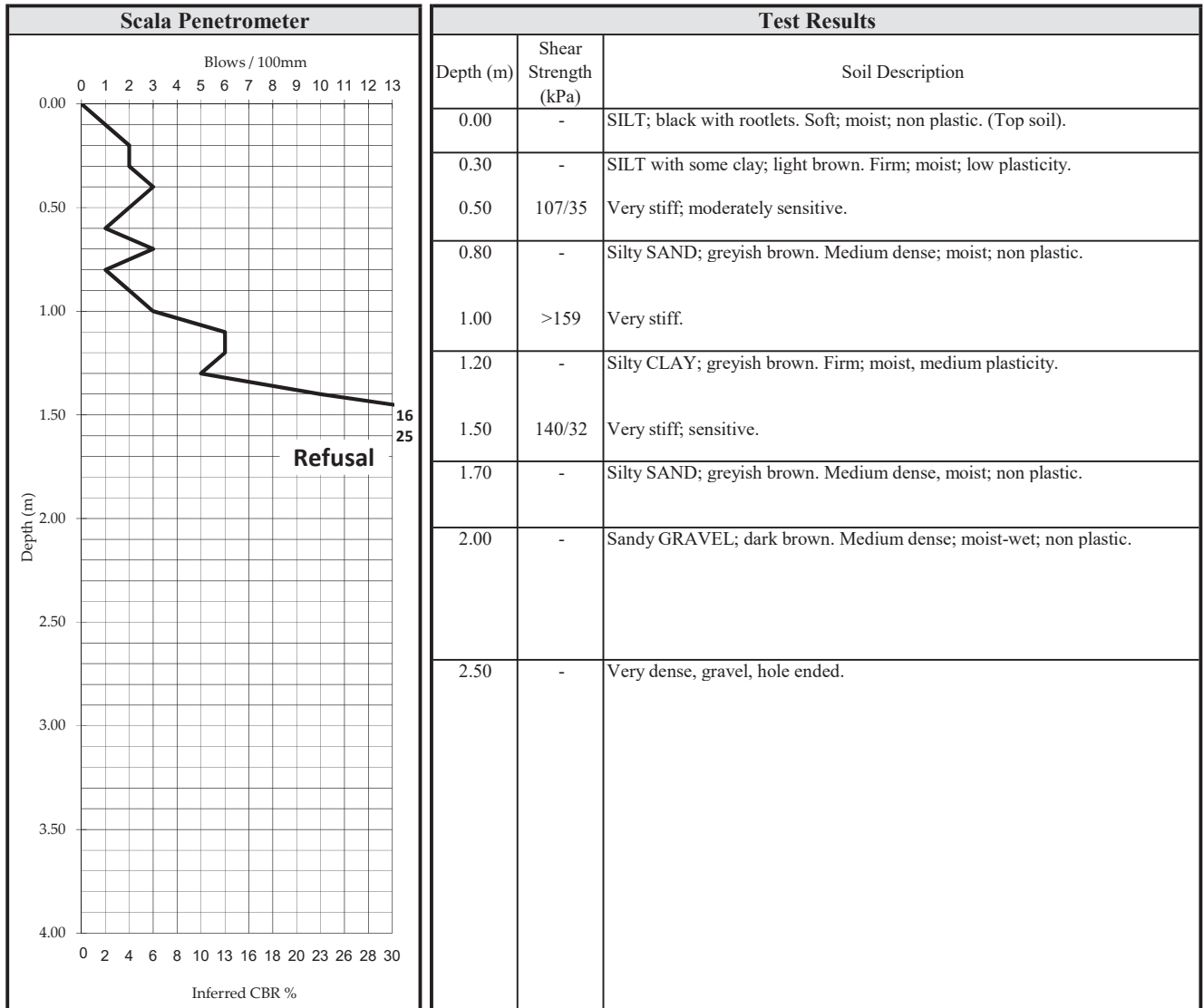
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**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-4**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.4)
Client Ref No :



Test Methods
 Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**

**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005, Scala over 1.5m and Inferred CBR values are not IANZ accredited.

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 Date reported : 27/11/17

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S Darby
 Designation : *Senior Laboratory Technician*
 Date : 27/11/17

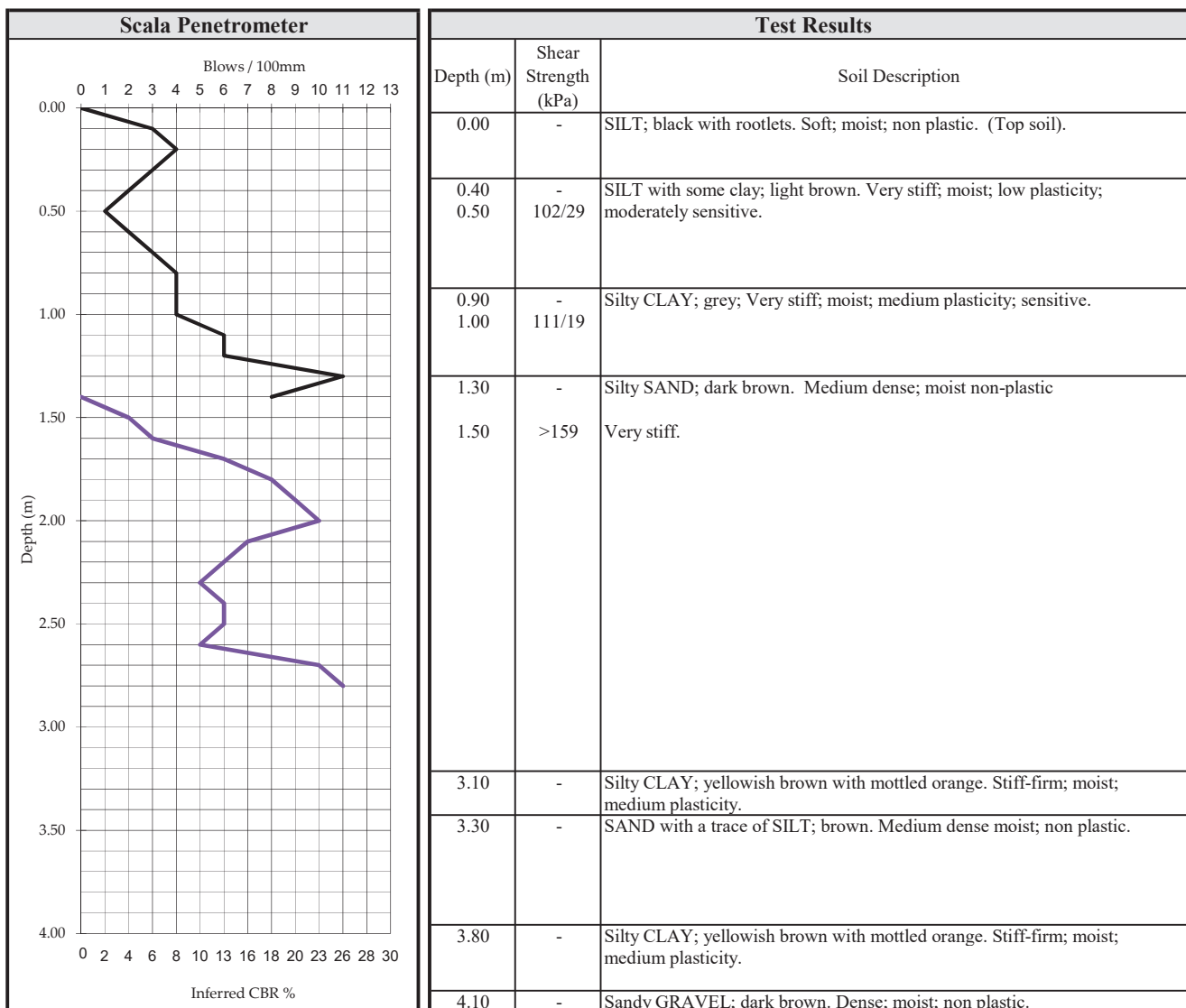


**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-5**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.5)
Client Ref No :



Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**

**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005, Scala over 1.5m and Inferred CBR values are not IANZ accredited.

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 Date reported : 27/11/17

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 Designation : *Senior Laboratory Technician*
 Date : 27/11/17

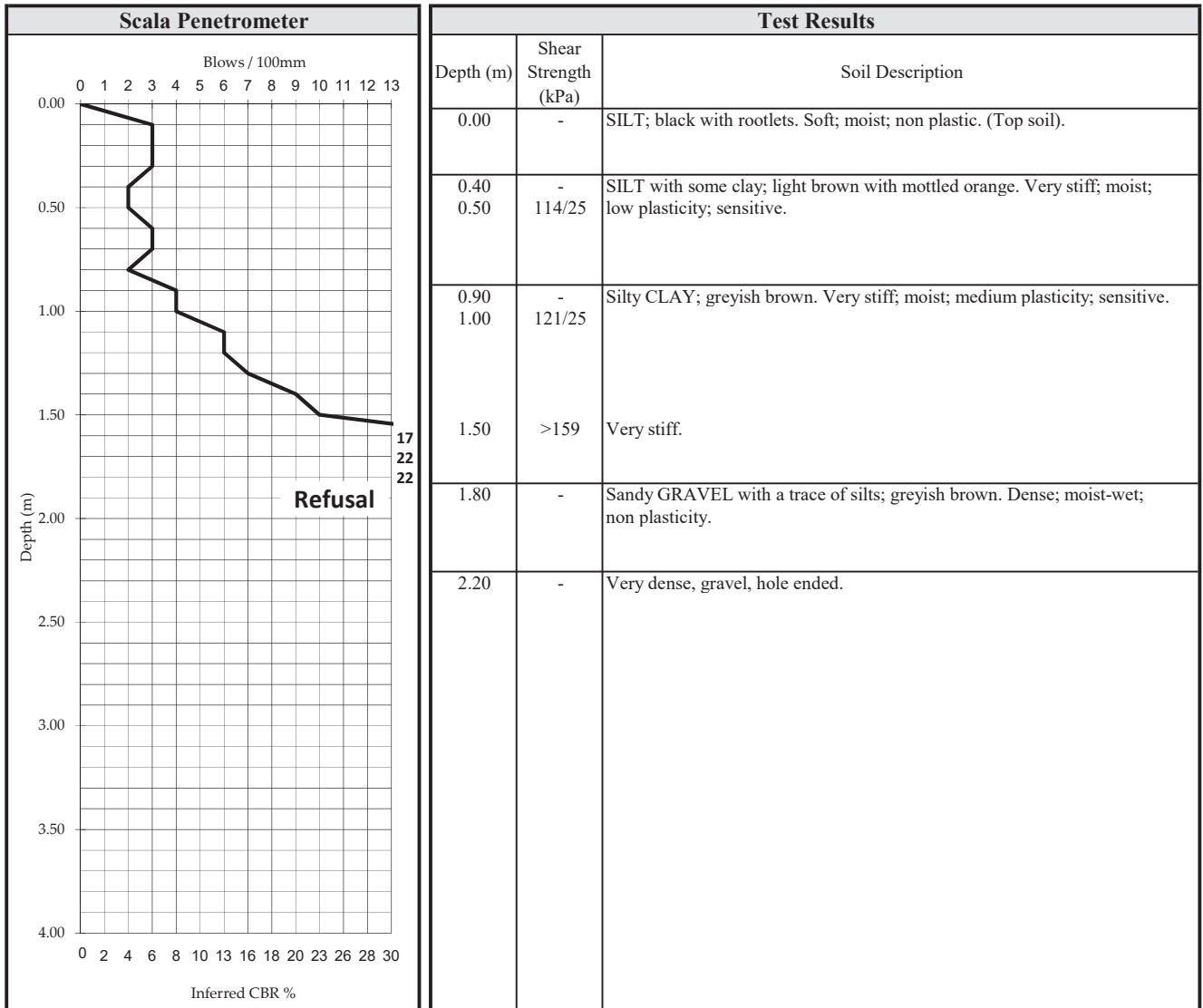


**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-6**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.6)
Client Ref No :



Test Methods
 Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**

**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005, Scala over 1.5m and Inferred CBR values are not IANZ accredited.

Date tested : 07/11/17
 Date reported : 27/11/17

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 Date : 27/11/17

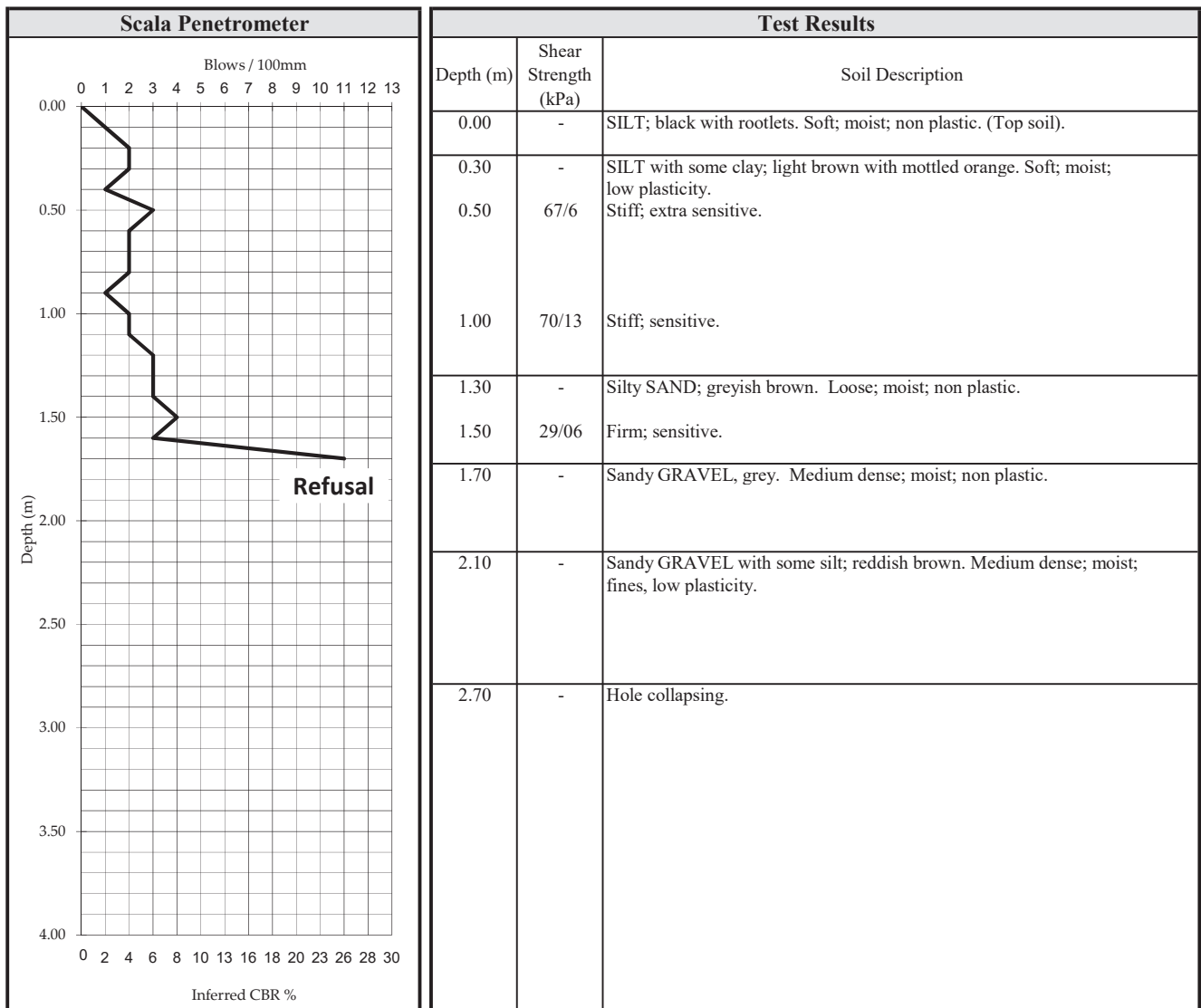


**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **TP-7**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.7)
Client Ref No :



Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Shear Strength using a Hand Held Shear Vane: NZ Geotechnical Soc Inc 8/2001
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**

**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005 and Inferred CBR values are not IANZ accredited.

Date tested : 07/11/17
 Date reported : 27/11/17

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 Designation : *Senior Laboratory Technician*
 Date : 27/11/17

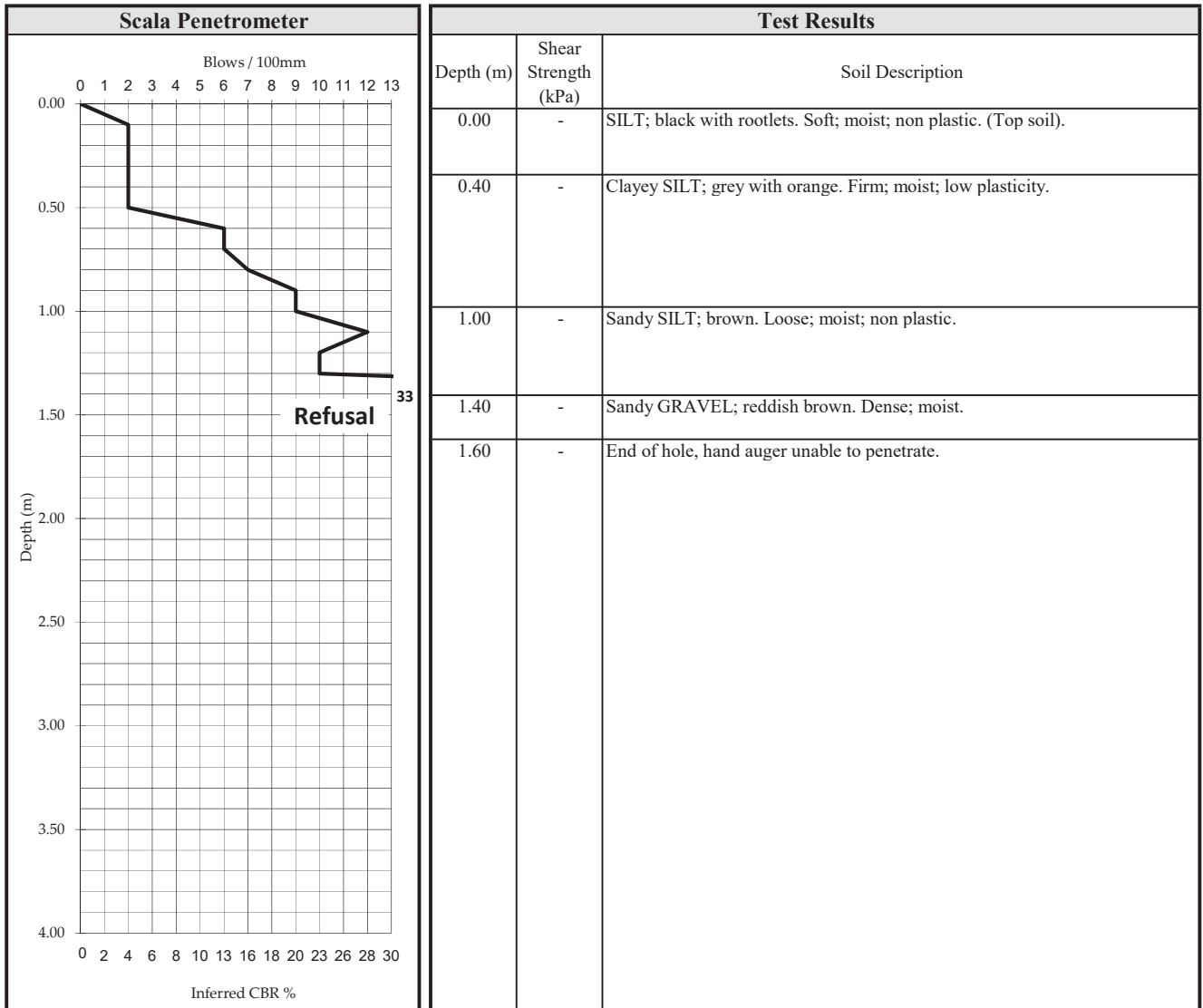


**AUGER / SCALA PENETROMETER
TEST REPORT**



Project : **Feilding Liquefaction Study Precinct-4**
 Location : **Makino Road, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants Ltd, Wanganui**
 Test number : **HA-8**
 Shear vane number : **S47 - 1**
 Shear vane correction : **6.347**
 Water level (m): **Nil**
 Reduced level (m): **Existing ground level**

Project No : 5-WT368.01
Lab Ref No : WA197 (Report WA197.8)
Client Ref No :



Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2**
 Inferred CBR values taken from Austroads Pavement Design Manual 2004**
 Soil descriptions in accordance with NZ Geotechnical Society Inc, Dec 2005**

**Field Descriptions of Soils and Rocks by NZ Geotechnical Society Dec 2005 and Inferred CBR values are not IANZ accredited.

Date tested : 07/11/17
 Date reported : 27/11/17

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S Darby
 Designation : *Senior Laboratory Technician*
 Date : 27/11/17



Appendix-B Laboratory Test Results

**PLASTICITY INDEX FOR SOILS
TEST REPORT**



Project : **Feilding Liquefaction Study**
 Location : **Precinct-4, Feilding**
 Client : **Manawatu District Council**
 Consultant : **Opus International Consultants**
 Sampled by : **R Sundar & S Darby**
 Date sampled : **07/11/17**
 Sampling method : **Test Pits**
 Sample description : **see below**
 Sample condition : **As received, sealed, moist**


Project No : 5-WT368.01
Lab Ref No : Report WA179.1
Client Ref No :

Test Results				
Test Pit :		3	5	6
Depth : (m)		0.5	1.0	1.6
Description :		CLAY; orange, mottled grey	CLAY; light grey, mottled orange	CLAY; light grey, some mottled orange
Natural Water Content : (%)		22.7	32.8	21.4
Liquid Limit :		42	66	41
Plastic Limit :		20	22	16
Plasticity Index :		22	44	25
Linear Shrinkage (%)		11	17	11

Test Methods	Notes
Water Content	NZS 4402 : 1986, Test 2.1
Liquid Limit	NZS 4402 : 1986, Test 2.2
Plastic Limit	NZS 4402 : 1986, Test 2.3
Plasticity Index	NZS 4402 : 1986, Test 2.4
Linear Shrinkage	NZS 4402 : 1986, Test 2.6

Date tested : 09/11/17 - 14/11/17
 Date reported : 16/11/17

Sampling is not covered by IANZ Accreditation. Results apply only to sample tested.
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IANZ Approved Signatory
 R Jones 
 Designation : *Laboratory Manager*
 Date : 17/11/17



All tests reported herein have been performed in accordance with the laboratory's scope of accreditation



Opus International Consultants Ltd

Opus Whanganui, 74 Ingestre Street
PO Box 654, Whanganui Mail Centre,
Whanganui 4541
New Zealand

t: +64 6 349 6600
f: +64 6 348 4601
w: www.opus.co.nz



Lot 146 DP 3479

54 Roots Street, Feilding

Detailed Site Investigation Report
Manawatu District Council



Contact Details

Name: Christopher Bergin

Opus International Consultants Ltd
Greymouth Office
23 High Street
PO Box 365, Greymouth 7840
New Zealand

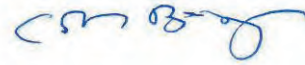
Telephone: +64 3 769 9330
Mobile: +64 21 243 5409

Document Details:

Date: December 2017
Reference: 6-WMAN2.01
Status: Issue 1

Prepared by:

Christopher Bergin | Senior Environmental
Consultant
SQEP



Reviewed by:

Lisa Bond | Senior Consultant - Environmental
SQEP



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Executive Summary

Opus International Consultants Ltd (Opus) was commissioned by the Manawatu District Council to conduct a Detailed Site Investigation (DSI) at Lot 146 DP 3479, 54 Roots Street, Fielding (the "site") as shown in the site location plan - Figure 1. This investigation will address NES requirements associated with the intended change in land use of the land parcel from production land to residential. The work will also inform disposal arrangements for excess soil requiring off-site disposal. In defining the piece of land for the purposes of compliance with the NES this DSI will focus on the land where the machinery workshop is located and land immediately surrounding.

This DSI will assess potential contaminant levels in the soils at the site and consider the impact of the proposed subdivision on human health.

The DSI included the excavation of three shallow test pits to depths of up to 900mm. Soil sampling and analysis was undertaken for identified contaminants of concern.

The Site is not listed on the Horizon Regional Councils (HRC) HAIL (Hazardous Activities and Industries List) sites register as HAIL site, based on the current and historic use of Lot 146 DP 3479, 54 Roots Street, Fielding.

Analytical results for revealed that heavy metals are present across the site at levels above expected background with the exception of nickel. The heavy metals arsenic and cadmium were detected at levels above Soil Contaminant Standards for Health (SCS_(health)) for a residential land use at test pit 2 as shown in figure 6. Arsenic and cadmium levels assessed against a commercial industrial land use scenario show that the levels detected are below the respective SCS_(health). Samples collected at TP2 were in the top 100mm of soil.

The sample collected from TP2 indicates that there is a hot spot of arsenic and cadmium in this area. The extent of this hot spot could not be delineated fully as part of this investigation. The presence of arsenic at this site suggests that a sheep dip site may have been located in and around TP 2, however no pesticides were encountered in excess of their method detection limit within the sample analysed.

A review of aerial photos doesn't suggest a dip tank to be present in this area, however it is possible that it may have been buried on site (if present at all) or this may have been the area where dip fluids were disposed to ground.

The risk to human health from heavy metal sources associated with the determined pathways is considered HIGH should any disturbance of the ground be undertaken on the site. Although top soil is not present in this locality, the nature of activity in this area is of a predominantly industrial, therefore it is considered that the exposure risks to humans is LOW provided no change in land use occurs at this site.

Polycyclic Aromatic Hydrocarbons, Total Petroleum Hydrocarbons and asbestos were not detected at levels above the limit of detection in any samples analysed.

The analytical results for soils for all test pits were below the soil screening levels for the protection of groundwater for potable use.

Based on the results of this investigation, Opus recommends:

- The site at 54 Roots Street is considered to fall within the Hazardous Activities and Industries List (HAIL) as evidence of HAIL activities have been found on the site.
- Should any ground disturbance be undertaken at the site the risk to human health is considered to be high and therefore appropriate personal protective equipment should be worn to ensure the safety of site workers, particularly within the vicinity of TP2.
- Residential development in and around TP2 should be avoided or the site remediated.
- A Preliminary Site Investigation be undertaken across the property title block (beyond the piece of land identified in this study), to investigate the potential source of the elevated arsenic and cadmium levels.
- Generally, if soils are proposed to be disposed of off-site, they may need additional testing before removal. Leaving the soils on site may be an acceptable solution for residential

properties and some management of the soils would be required under a “Site Management Plan” to ensure risks are mitigated.

- For any development to be considered, on site remedial options should be considered to remove contaminated materials and provide appropriate ground conditions for development.

A description of land use options are included in section 7.1 of this report.

1. Introduction

1.1. Background

Manawatu District Council (herein referred to as 'the Client') commissioned Opus International Consultants Ltd (Opus) to undertake a Detailed Site Investigation (DSI) for a piece of land located at Lot 146 DP 3479, 54 Roots Street, Feilding (herein referred to as 'the site').

This DSI will address NES requirements associated with the intended change in land use of the land parcel from production land to residential. The work will also inform disposal arrangements for excess soil requiring off-site disposal. In defining the piece of land for the purposes of compliance with the NES this DSI will focus on the land where the machinery workshop is located and land immediately surrounding as identified in figure 1.



Figure 1: Piece of land investigated

1.2. Objectives

This report has been prepared in order to assess the presence and amount of potential contaminants across the piece of land. The objectives have been determined based upon discussions with Manawatu District Council and have been identified as follows:

- Determine the ground conditions present on the site;
- Provide an overview of potential contaminants of concern on the site;
- Assess the chemical characteristics of soils on the site;
- Assess the potential risk to human health from soil borne contaminants which may be located on site;
- Assess whether further action is required with respect to the risks assessed and provide recommendations where appropriate.

1.3. Scope of Work

To achieve the objectives, set out above the following scope of works was undertaken:

- An initial Preliminary Site Assessment to determine historical activities on the site and surrounds;
- A site investigation comprising the excavation of test pits to facilitate soil sampling in order to provide information regarding the soil chemistry with respect to potential contaminant concentrations at the site; This includes the collection of 7 samples in the land surrounding the machinery workshop for contaminants likely to have been discharged as a result of motor vehicle workshop activities and buildings containing asbestos identified in the area. Note: It is impractical to take samples in the machinery workshop if the floors are hardstand.
- The samples would be taken for selected contaminants based on the activities identified in the area at depths between 100mm - 1000mm below ground level (bgl). Testing of groundwaters is excluded from this study.
- Characterisation of the soils to determine the risk to human health and the environment.

2. Site Identification and Description

2.1. Location and Description

The site is located on the corner of 54 Roots Street, Feilding, approximately 2.4km north east the Feilding CBD, as shown on the Site Location Plan in Figure 2.



Figure 2: Site Location Plan

The site is located within the land parcel legally described as Lot 146 DP 3479, (Certificate of Title WN263/81), with an area of approximately 2000m².

Adjacent land uses to the site generally comprise rural allotments, with open ground which is generally level. The site is immediately bound to the south by Roots Street. At its closest point the site is located approximate 650m east of the Makino Stream and 1.5km west of the Oroua River.

Details of the site and its surroundings are shown on the Quickmap plan in Figure 3.

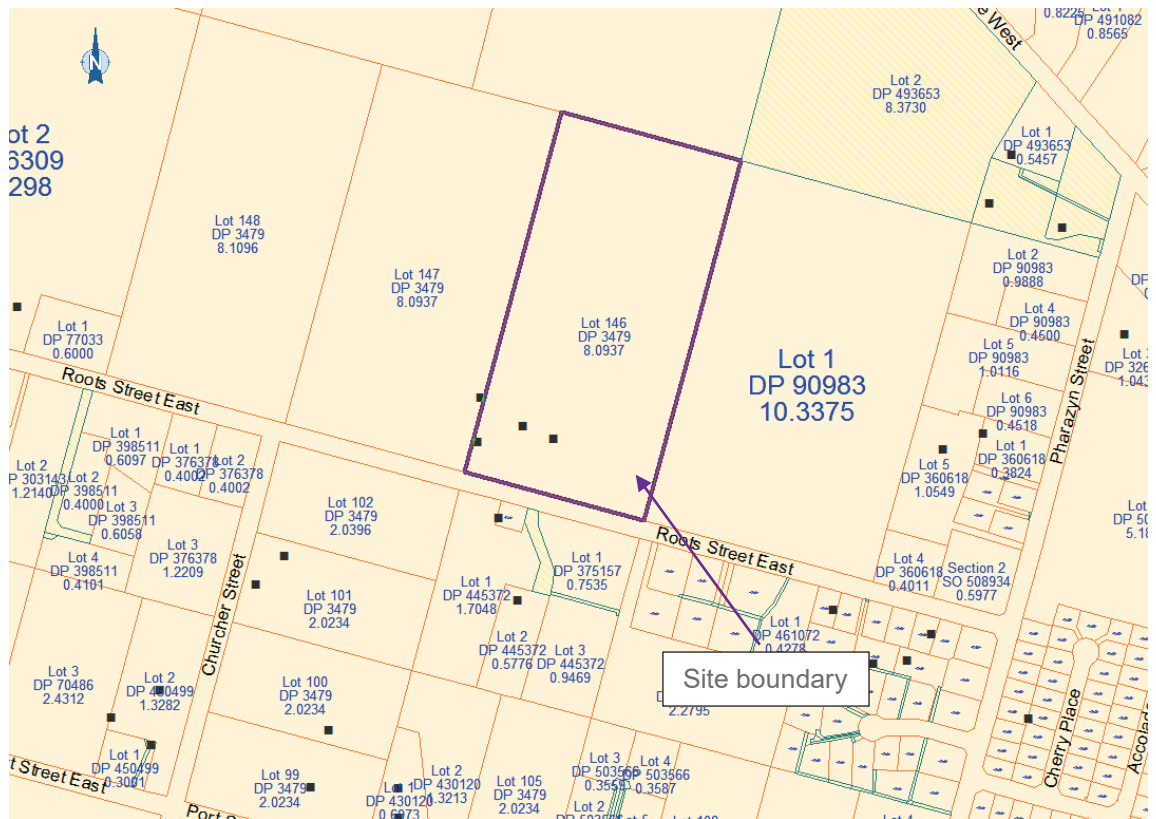


Figure 3: Quickmap plan of site and surrounds

2.2. Geology and Hydrogeology

The geology of the site is shown on the 1:250,000 scale GNS Geology Web Map extract (accessed November 2017) as shown in Figure 4.

This map indicates the site to be underlain by river gravels and fan deposits.



Figure 4: GNS Geology Web Map

Limited information regarding groundwater was available from HRC. The current land owner advised that drinking water for the household is collected from rain water tanks on site. Bore water is used for stock and irrigation..

2.3. Site History

The history of the site has been derived from a review of sources including historical documents and plans from Opus' Quickmap Arc GIS Database and anecdotal evidence from the current site owner and Manawatu District Council. A copy of the certificate of title is presented in Appendix A of this report.

Discussions with Manawatu District Council Planning Department indicates that the history of the site has generally been gleaned from anecdotal evidence of locals. It is believed that the site has been used for a number of decades as agricultural land, however the duration and timing of its use cannot be confirmed.

Google Earth images dating from 2005 onwards indicates that the site at this time was in a condition similar to that of the present day. No evidence of land filling is noted on any of the images viewed.

2.4. Land Use Database

A review of Manawatu District Councils District Plan Maps indicates that the piece of land lies within a Rural 1 Zone as shown in Figure 5 below.

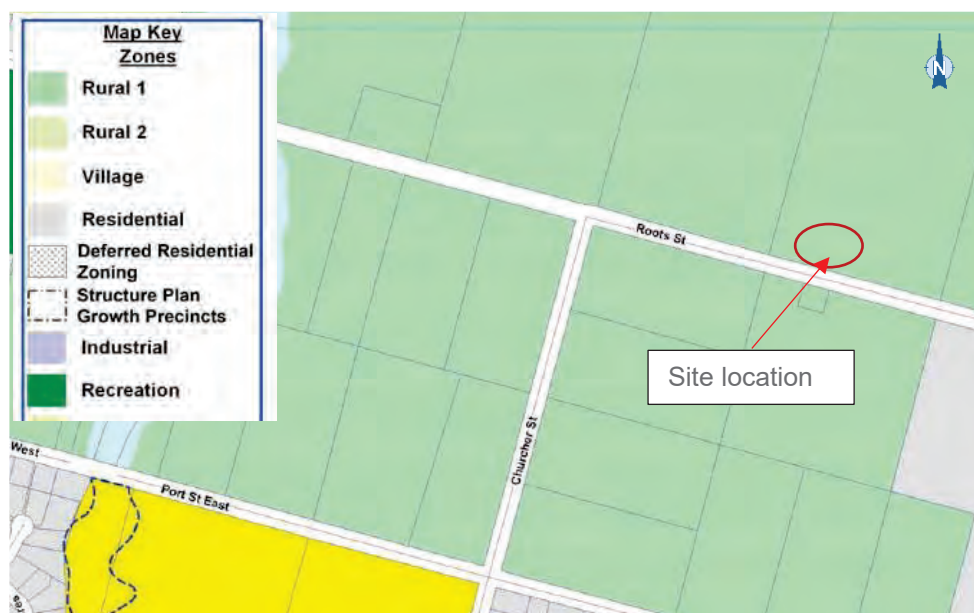


Figure 5 Extract from Manawatu DC District Plan (GIS Property Mapping)

Enquiries with Horizons Regional Council (HRC) indicates that the land does not currently appear on their HAIL database, however the absence of available information does not necessarily mean that the property is uncontaminated, rather that no information exists on the Database. The response from HRC is included in Appendix B.

2.5. Site Inspection

A site inspection was undertaken on 15th November 2017 by Opus staff under supervision by an Opus SQEP. Details of the inspection are outlined below with a selection of site photographs taken at the time of the site visit presented within Appendix C.

During the initial site visit, the site was accessed via Roots Street. The site is private land with a series of agricultural sheds, a dwelling house and a swimming pool present on the area determined for this investigation to be the 'piece of land'. The topography of the site was generally flat adjacent to Root Street. No surface water was present on the site which appeared to be free draining.

2.6. Anecdotal Evidence

Discussions with the current property owner has identified that the property has been in the same family for quite some time circa 1920, with little change in land use over this time. During that time, the property had generally been used as a farm to graze stock.

It is considered more likely than not that at some time in the sites history a sheep dip or spray race has been located on this site – the property owner confirmed that the property had a history of running sheep. A review of historical aerial photos has not however revealed the presence of a sheep dip on the piece of land.

3. Proposed Development

At present no development is thought to be proposed for the site, with this investigation being undertaken to assess liabilities and the potential for a residential development should it be considered in the future.

4. Conceptual Site Model

This section of the report relates to the assessment of contamination arising from the previous and current site conditions, both on and off the site that may impact on any proposed development of the site.

4.1. Source-Pathway-Receptor Assessment

4.1.1. Potential Sources of Contamination

Potential of sources of contamination on the site are likely a result of a possible sheep dip or spray race, farm spray, farm machinery workshops or asbestos containing material from older building stock on site. As such potential contaminants of concern associated with this source may include:

- Heavy metals including lead, mercury and arsenic;
- Organo-chlorine Pesticides
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Asbestos Containing Materials (ACM);

4.1.2. Pathways

A review of available information for the site has given an indication of the potential contaminant pathways on the site.

The primary exposure routes (pathways) for consideration in association with sensitive receptors (human health) are therefore:

- Direct contact: dermal absorption
- Direct ingestion of contaminated soils
- Inhalation of dusts/vapours/gasses emitted from contaminated soils

Environmental pathways include leaching of the contaminants through the soil matrix into groundwater and/or migration of the contaminants into surface water bodies, overland run-off or drainage channels. The community receive drinking water from the reticulated supply, however the farm uses rain water for human consumption and a bore for farm activities. Therefore, the risk to human health from ground water exposure is discounted.

4.1.3. Potential Receptors

Considering the environmental setting of the site and the potential sources of contamination, the most sensitive receptors on the site have been identified as being end-users of the site such as future occupiers and residents (via direct contact with contaminated soils and direct ingestion pathways) and construction workers (via direct contact, ingestion and inhalation of dusts created during ground works).

Environmental receptors include ecological receptors within surface water and users of abstracted groundwater. These have been considered when undertaking the preliminary risk assessment for the site.

Using the data obtained from this report a preliminary Conceptual Site Model has been derived for the site and is presented in Table 1.

Table 1: Conceptual Site Model

SOURCE	PATHWAY	RECEPTOR	ASSESSMENT OF LINKAGE	
Heavy Metals; Organo-chlorine pesticides PAHs; Asbestos	Ingestion;	Site users	The current use of the site is not currently proposed to change from that of a privately owned rural property. At present it is considered highly unlikely that users of the site would come in to contact with potentially contaminated soil.	
		(workers and visitors)		
	Direct contact; and	Inhalation of contaminated dust or vapours/fibres	Construction Workers if development occurs	Any disturbance of the ground would generate a plausible pathway between sources and construction workers on site.
				No ground disturbance is indicated as part of this assessment.
	Leaching of soluble contaminants both vertically and laterally		Groundwater beneath the site	Groundwater is not used for drinking water purposes within the vicinity of the site.
			(controlled waters)	
			Neighbouring properties off site	Soluble contaminants within the near surface soils may potentially migrate laterally. It is likely that migration would be in a south westerly direction towards the Makino River.
			Ecological receptors within surface waters	Surface water is not present on the site, however during and following periods of wet weather any contaminants which may be present within the near surface soils may leach through the soil to other nearby properties or surface waters and be taken up by plants or aquatic life.
			(on site standing water)	

For sensitive receptors to be at risk from identified sources of contamination a plausible linkage or pathway must exist.

As such the plausible risk to human health from potential contaminants present within the near surface deposits is considered to be HIGH until further investigations are undertaken to confirm the presence of fill materials on the site.

In order to more appropriately quantify the potential risks posed from historic activities on the site, a Detailed Site Investigation was completed involving the excavation of hand dug test pits to facilitate sampling and subsequent analysis of soils considered to be potentially contaminated.

5. Detailed Site Investigation

5.1. Investigation Design Strategy

A Detailed Site Investigation programme was undertaken on 15th November 2017, supervised by an Opus SQEP. Soils samples were taken from test pits excavated to depths of up to 900mm below ground level (bgl) corresponding to pile foundation depths under the New Zealand Buildings code. Sample locations were determined by the SQEP prior to commencement of site works and were located to cover all areas of the site taking into consideration topography and ground conditions at the time of investigations. The property has a series of buildings that cover much of the site and it was not considered practical to excavate the soils beneath these buildings, therefore suitable locations were selected adjacent to these structures. The buildings themselves provide an encapsulating layer between the soils and any affected populations above them and are considered a suitable barrier with the exception of the buildings next to test pit 3 which are built over exposed soils.

Three test pits were excavated on the site with samples taken at the discretion of the SQEP within both made ground and natural deposits.

5.2. Ground Conditions

Topsoil was present at ground level in test pits 1 & 3. Near surface soils generally comprised greyish brown silts with varying amounts of sand and gravel to 300mm bgl. Black staining was noted on the road surface next to test pit 2.

At depths below 300mm the soils generally comprises clayey silt which were brownish grey to mottled brownish orange.

Natural ground was encountered in all of the excavated test pits with near surface ground encountered within Test Pit 1 next to the dwelling, considered to be reworked natural materials. This ground is likely to have been disturbed during construction of the house on site.

Test Pit logs for all locations are presented in Appendix D

The location of test pits are detailed in the location plan in Figure 7.

5.3. Field Quality Assurance and Quality Control

Sampling of soils was completed on 15th November 2017. Weather conditions were fine and clear with no rain having fallen within the previous 24 hours.

Samples were collected in laboratory supplied clean plastic pots or glass jars and sent to Hill Laboratories via courier for analysis. No blind replicas were collected for analysis as part of this investigation.

Decontamination of equipment was completed between the sample locations. Soil samples for laboratory analysis were collected using a hand trowel whilst wearing protective disposable gloves. Gloves were then changed between sample sites and the trowel was brushed and washed between each sample location.

5.4. Laboratory QA/QC

The Hill Laboratory Analysis report has been appended for perusal in Appendix E. This includes the analytical methods used by the laboratory and the laboratory accreditation for analytical methods used.

All Laboratory Analysis was completed through Hill Laboratories. Hill Laboratories are accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.

5.5. QA/QC Data Evaluation

Table 2: QA/QC Data Evaluation

EVALUATION OF ALL FIELD AND LABORATORY QA/QC INFORMATION	
Documentation and data completeness	Refer to sections 5.1 and 5.2.
Data representativeness	Refer to section 5 and 5.1.
Precision and accuracy of sampling and analysis for each analyte in each environmental matrix informing data users of the reliability, unreliability or qualitative value of the data.	Refer to sections 5.1 and 5.2
Data comparability checks	
Collection and analysis of samples by different personnel	Same Personnel.
Collection and analysis by the same personnel using the same methods but at different times	N/A
Use of different sampling or analytical methodologies from those stipulated in the guideline documents	N/A
Spatial and temporal changes	N/A.
Relative percent differences for inter and intra laboratory duplicates	N/A

6. Basis for Guideline Values

For contaminated site assessments the hierarchy of reference documents containing guidelines for soils and waters, the MfE Contaminated Land Management Guidelines No 2 (November 2003) is referred to.

The site at Roots Street has been developed (dwelling house, farm shed, swimming pool and gardens), with no known future development plans. However, it is considered plausible that should it be developed in the future this would be to a residential land use consistent with the zoning and adjacent land uses.

The primary human health receptors have been determined to be construction workers and end-users of the site. As such the residential (10% produce) is proposed for assessment purposes to take in to consideration potential contact with soils on the site by end-users, as highlighted in Table 3. Assessment of the results against the commercial/industrial land use has also been undertaken as the final land use for this location had not been determined as part of the proposed district plan change. This is to provide information for decision making around varying land use options in relation to land use of parcels.

Table 3: Land Use Scenario

Scenario	Description
Rural / lifestyle block	Rural residential land use, including home-grown produce consumption (10 per cent). Applicable to the residential vicinity of farm houses for protection of farming families, but not the productive parts of agricultural land. (Not for regulatory use.)
Residential	Standard residential lot, for single dwelling sites with gardens, including home-grown produce consumption (10 per cent)
High-density residential	Urban residential with limited soil contact, including small ornamental gardens but no vegetable garden (no home-grown produce consumption); applicable to urban townhouses, flats and ground-floor apartments with small ornamental gardens, but not high-rise apartments.
Parks / recreational	Public and private green areas and reserves that are used for active sports and recreation. This scenario is intended to cover playing fields and suburban reserves where children play frequently. It can also reasonably cover secondary school playing fields but not primary school playing fields. Check exposure for park maintenance staff using commercial / industrial unpaved.
Commercial / industrial outdoor worker (unpaved)	Commercial / industrial site with varying degrees of exposed soil. Exposure of outdoor workers to near-surface soil during routine maintenance and gardening activities with occasional excavation as part of maintaining sub-surface utilities (i.e. a caretaker or site maintenance personnel). Also conservatively applicable to outdoor workers on a largely unpaved site.

Results from these screening analyses have initially been compared against soil guideline values (SGVs) from the National Environmental Standards (NES) Appendix B: Soil Contaminant Standards. Where no New Zealand Standards were available or more detailed guideline values were required contaminant concentrations have been assessed using the appropriate guidelines within the MfE Environmental Guideline Value (EGV) Database and are specified in the assessment results. SGVs for contaminants used in this assessment are outlined in the summary tables below.

6.1. Results of Chemical Laboratory Analysis

Chemical analysis results have revealed that heavy metals are present across the site at levels above expected background with the exception of nickel.

The heavy metals arsenic and cadmium were detected at levels above Soil Contaminant Standards for Health (SCS_(health)) for a residential land use at test pit 2 as shown in figure 6.

Arsenic and cadmium levels assessed against a commercial industrial land use scenario show that the levels detected are below the respective SCS_(health).

Polycyclic Aromatic Hydrocarbons, Total Petroleum Hydrocarbons and asbestos were not detected at levels above the limit of detection in any samples analysed.

The full chemical laboratory results are presented in Appendix E and summarised in Figures 7 to 9.

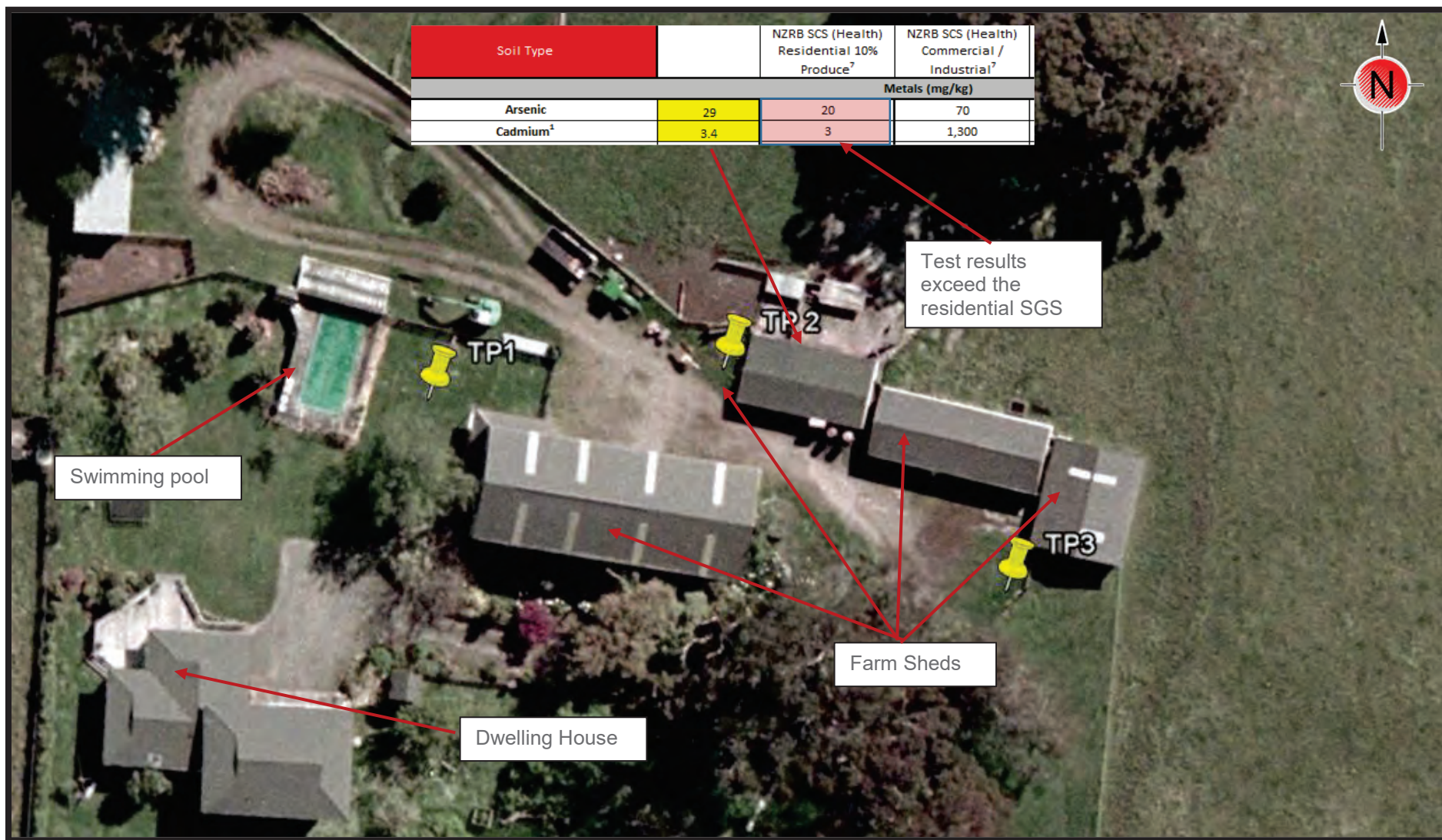


Figure 6: Test Pit Location Plan



Table No:		1						
Site:		54 Roots Street East						
Project No:		6-WMAN2.01						
Sample media:		Soil						
Analysis:		Total Recoverable Concentrations						
End-Use:		Residential 10% Produce						
Date:		15-Nov-17						
Revision:		1						
Sample Name	TP1(A)	TP2(A)	TP3(A)	Assessment Criteria (mg/kg)				
				Protection of Human Health		Application of NES Regulation 5(9)	Protection of Groundwater for Potable Use	
Sample Depth (m bgl)	100mm	100mm	100mm					
Natural / Fill?	Fill	Natural	Natural					
Soil Type	Sandy Gravels	Sandy silts	Sandy silts	NZRB SCS (Health) Residential 10% Produce ⁷	IRB NEPM SGV HIL A Residential with 10% Produce ⁸	Wellington Background Concentrations Main soil type	IRB - US EPA SSL Values Dilution Factor x20 ¹¹	
Metals (mg/kg)								
Arsenic	6	29	8	20	-	<2-7	29	
Cadmium ¹	0.22	3.4	0.73	3	-	<0.1-0.1	8	
Chromium ²	14	23	15	460	-	7-12	38	
Copper	15	44	20	>10,000	-	4-10	-	
Lead	64	43	81	210	-	4-9	-	
Mercury ³				310	-	ADD	2	
Nickel	7	7	8	-	400	4-9	130	
Zinc	113	170	270	-	7,400	28-79	12,000	
Boron				>10,000	-	ADD	-	
Pesticides (mg/kg)								
DDT ⁴	<1.0	<1.0	<1.0	70	-	-	102*	
Dieldrin ⁵	<0.5	<0.5	<0.5	2.6	-	-	0.504**	
Dioxin-like PCBs (mg/kg)								
Dioxin-like PCB TEQ ⁶				0.12	-	-	-	

Figure 7: Summary of heavy metal, and pesticide results

Table No:	2								
Site:	54 Roots Street East								
Project No:	G-WMAN2.01								
Sample media:	Soil								
End-Use:	Residential 10% Produce								
Date:	15/11/2017								
Revision:	1								
Sample Name	TP1(A)	TP2(A)	TP3(A)	Assessment Criteria (mg/kg)					
	100mm	100mm	100mm	Protection of Human Health			Application of NES Regulation 5(a)	Protection of groundwater for potable use	Protection of groundwater for potable supply
Natural / Fill?	Fill	Natural	Natural						
Soil Type	Sandy Gravels	Sandy silts	Sandy silts	NZRB SCS (Health) Residential 10% Produce ¹	MfE SGV - Gasworks Guidelines Residential 10% Produce ²	MfE SGV - Petroleum Hydrocarbon Guidelines Residential (soil type & depth specific) ³	Wellington Background Concentrations ⁴ 95% upper confidence limit	MfE SGV - Petroleum Hydrocarbon Guidelines (soil type & depth specific) ³	IRB - US EPA SSL Values ⁵ Dilution Factor x20
Acenaphthene	< 0.03	< 0.04	< 0.05	-	800	-	0.055	-	570
Acenaphthylene	< 0.012	< 0.013	< 0.017	-	500	-	0.069	-	-
Anthracene	< 0.012	< 0.013	< 0.017	-	9,000	-	0.113	-	12,000
Benzo(a)anthracene	< 0.012	< 0.013	< 0.017	-	-	-	0.470	-	2
Benzo(a)pyrene	< 0.012	< 0.013	< 0.017	-	-	-	0.595	ADD	8
Benzo(b)fluoranthene	< 0.012	< 0.013	< 0.017	-	-	-	0.947	-	5
Benzo(g,h,i)perylene	< 0.012	< 0.013	< 0.017	-	-	-	0.459	-	-
Benzo(k)fluoranthene	< 0.012	< 0.013	< 0.017	-	-	-	0.296	-	49
Chrysene	< 0.012	< 0.013	< 0.017	-	-	-	0.539	-	160
Dibenzo(a,h)anthracene	< 0.012	< 0.013	< 0.017	-	-	-	0.112	-	2
Fluoranthene	< 0.012	< 0.013	0.02	-	3,200	-	1.345	-	4,300
Fluorene	< 0.012	< 0.013	< 0.017	-	800	-	0.060	-	560
Indeno(1,2,3-c,d)pyrene	< 0.012	< 0.013	< 0.017	-	-	-	0.385	-	14
Naphthalene	< 0.06	< 0.07	< 0.09	-	17	70	0.029	ADD	84
Phenanthrene	< 0.012	< 0.013	< 0.017	-	900	-	0.703	-	-
Pyrene	< 0.012	< 0.013	< 0.017	-	1,500	N/A	1.362	ADD	4,200
B(a)P Equivalent ⁶	0.02904	0.03146	0.04117	10	-	Superseded by SCS	0.922	-	-

Figure 8: Summary of PAH results

Table No:	3										
Site:	54 Roots Street East										
Project No:	6-WMAN2.01										
Sample media:	Soil										
End-Use:	Residential 10% Produce										
Revision:	1										
Sample Name	TP1(A)	TP1(B)	TP2(A)	TP2(B)	TP3(A)	TP3(B)					
Sample Depth (m bgl)	100mm	500mm	100mm	900mm	100mm	900mm					
Natural / Fill?	Fill	Fill	Natural	Natural	Natural	Natural					
Soil Type	Sandy gravels	Gravel	Sandy silts	Silt with Clay	Sandy Silts	Silt with Clay	Sandy Silt SGV Residential <1.0m ^{1,2,3}	Sandy Silt SGV Residential 1.0 - 4.0m ^{1,2,3}	Sandy Silt Commercial / Industrial Surface <1m GW 2m	Sandy Silt Commercial / Industrial 1m - 4m GW 4m	
Total Petroleum Hydrocarbons and BTEX (mg/kg)											
PID Reading (ppm)							-	-	-	-	
TPH C₇ - C₉	< 9	< 8	< 8	< 8	< 8	< 10	(500) m	(500) m	(5,200)	NA	
TPH C₁₀ - C₁₄	< 20	< 20	< 20	< 20	< 20	< 20	(510) x	(670) x	(9,200)	NA	
TPH C₁₅ - C₃₆	< 40	< 40	240	< 40	420	< 40	NA	NA	NA	NA	

Figure 9: Summary of TPH results

6.2. Risk Assessment

During this assessment, we were advised by the client that the portion of land in the vicinity of TP2 may be zoned as an industrial or roading use should contamination levels indicate that this is a suitable end land use.

6.2.1. Residential (10% produce) Scenario

Assessment of results against a residential end-use scenario indicate that arsenic and cadmium are present in the near surface soils in excess of their relevant respective $SCS_{(health)}$ for a residential end use.

Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), Organo-Chlorine Pesticides (OCP) and asbestos were not detected at levels above the limit of detection.

6.2.2. Commercial/ Industrial Scenario

Arsenic and cadmium levels assessed against a commercial industrial land use show that the levels detected are below the respective $SCS_{(health)}$. Samples collected at TP2 were in the top 100mm of soil.

As mentioned above PSH, TPH, OCP and asbestos were not detected above their method detection limit.

6.2.3. Discussion

The sample collected from TP2 indicates that there is a hot spot of arsenic and cadmium in this area. The extent of this hot spot could not be delineated fully as part of this investigation. The presence of arsenic at this site suggests that a sheep dip site may have been located in and around TP 2, however no pesticides were encountered in excess of their method detection limit within the sample analysed.

A review of aerial photos doesn't suggest a dip tank to be present in this area, however it is possible that it may have been buried on site (if present at all) or this may have been the area where dip fluids were disposed to ground.

The risk to human health from heavy metal sources associated with the determined pathways is considered HIGH should any disturbance of the ground be undertaken on the site.

Although top soil is not present in this locality, the nature of activity in this area is of a predominantly industrial, therefore it is considered that the exposure risks to humans is LOW provided no change in land use occurs at this site.

Polycyclic Aromatic Hydrocarbons, Total Petroleum Hydrocarbons and asbestos were not detected at levels above the limit of detection. Visual observations at the site show dark patches of soils where fuel spills may have occurred at the gravel road. This appears to be on the surface of the gravel road and elevated hydrocarbon levels have not been detected at TP2 suggesting a low migration potential.

7. Conclusions and Recommendations

The conceptual site model and human health risk assessment presented herein is based upon information gained from a site inspection, information gained from the Client and other sources together with an assessment of the soil conditions using data from soil sampling and chemical analyses.

The findings of the Detailed Site Investigation can be summarised as follows:

- The site has a flat topography with ground cover generally level.
- Ground conditions encountered generally comprised natural ground.
- Chemical analysis revealed concentrations of arsenic and cadmium above a residential (10% produce) SGV within TP2.
- All sites contained levels of heavy metals above expected background levels and therefore do not meet the cleanfill criteria.
- The full extent of contamination is likely to extend beyond the piece of land boundaries into the adjacent paddocks.

In its present form the site may not be considered suitable for development for a residential end use due to elevated concentrations of contaminants of concern, with the risk to human health considered to be LOW in its current form rising to HIGH should ground disturbance be undertaken on the site.

7.1. Recommendations

Based on the findings of this Detailed Site Investigation, Opus recommends that:

- The site at 54 Roots Street is considered to fall within the Hazardous Activities and Industries List (HAIL) as evidence of HAIL activities have been found on the site.
- Should any ground disturbance be undertaken at the site the risk to human health is considered to be high and therefore appropriate personal protective equipment should be worn to ensure the safety of site workers, particularly within the vicinity of TP2.
- Residential development in and around TP2 should be avoided or the site remediated.
- A Preliminary Site Investigation be undertaken across the property title block (beyond the piece of land identified in this study), to investigate the potential source of the elevated arsenic and cadmium levels.
- Generally, if soils are proposed to be disposed of off-site, they may need additional testing before removal. Leaving the soils on site may be an acceptable solution for residential properties and some management of the soils would be required under a "Site Management Plan" to ensure risks are mitigated.
- For any development to be considered, on site remedial options should be considered to remove contaminated materials and provide appropriate ground conditions for development.

7.1.1. Remedial Options

- **Do nothing:** in its current form as private agricultural land, which is grassed with minimal landscaping and a topsoil cover, the site is considered to be production land. As such, in its current form the site is not considered to be a high risk to human health. The site can effectively be considered to be 'commercial/industrial ground' at present. Although some arsenic and cadmium concentrations exceed the residential SCS_(health), they are not in excess of commercial end use values.
- **Removal of contaminated soils:** Should any ground disturbance be undertaken on the site the risk to human health is considered to be **high**. As such, the most appropriate course of action would be to excavate the contaminated soils and remove them to an appropriately licensed facility. Any remedial works would require validation assessment to ensure that all contaminants of concern have been removed from the site and that the site is suitable for any proposed end-use.
- **Encapsulation - hardstand:** The area of highest contamination could be encapsulated in hard stand or paving such as road. Typical road formation would require scraping top soils to prepare the road base. If soils are to be excavated they

would need to be managed as described above. However, the base of the road could be designed to enable clean “fill” material to be placed over contaminated soils to avoid disturbance of the soils, and present an encapsulating layer.

- **Encapsulation - vegetated:** Any soils excavated from the site may be able to remain on site and planted over with non-production planting ie no fruits or vegetables, that requires no-minimal contact with soils eg dense bush, banded mounds. These will require a layer of clean soils at least 200mm to be placed over them.
- **Commercial/Industrial zoning:** The soils meet the “commercial/industrial” land use SCS_(health), and may be appropriately zone with this land use type and development limited to this type of activity. Any earthworks required to be undertaken for this development would require management of the soils. The soils may be able to remain on site.

8. Applicability and Limitations

This report has been prepared for the benefit of the client, Manawatu District Council, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our review or agreement.

This report has been prepared for a specific purpose, as agreed between Opus and the client. A tailored scope of works has been used to achieve the objectives and the report should therefore not be used for different objectives.

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The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry best practice. Due to the inherent variation in spatial and temporal patterns of contamination, the interpretation of site conditions at the specific locations investigated is not a complete description of all material at the site. Whilst this report may express an opinion on the possible configuration of strata or contaminants between or beyond exploratory hole positions or in the possible presence of features based on either visual, verbal or published evidence, this is for guidance only and no liability can be accepted for its accuracy. Should further data be obtained that differs from that presented in this report, then conclusions and recommendations may no longer be valid.

This report is valid at the date of release. The condition of the site may change with time so that the results and interpretation are no longer valid. In addition, guidelines and legislation may change, making assessment of results and recommendations invalid.

Appendix A – Certificate of Title

Appendix B – HAIL enquiry

Christopher Bergin

From: Hail Enquiries <Hail.Enquiries@horizons.govt.nz>
Sent: Friday, 24 November 2017 1:51 p.m.
To: Christopher Bergin
Subject: FW: HAIL enquiry - Lot 146 DP 3479, 54 Roots Street, Fielding (++43047++)

At the time of this response Lot 146 DP 3479 was not on the Horizons HAIL database.

Regards

Contaminated Land Enquiries

HAIL.enquiries@horizons.govt.nz
Tel: 0508 800 800 | Cell: 021 247 7341

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Appendix C – Site Photos

Site Photos



Figure 1: Test Pit 1 next to house



Figure 2: Test Pit 2



Figure 3: Test Pit 3

Appendix D – Soil Logs

**AUGER / SCALA PENETROMETER
FIELD SHEET**

Project No : _____
 Lab Ref No : _____
 Client Ref : _____

Project : _____
 Location : 54 ROOTS ST EAST, FEILDING
 Client : MDC
 Contractor : OPUS
 Test number : TP2
 Shear vane number : N/A
 Shear vane correction : N/A
 Water level (m) : NIL
 Reduced level (m) : EXISTING GROUND LEVEL
 Tested by : S. DARBY
 Checked by : _____

Date : 15/11/17
 Date : _____

Scala Penetrometer	
Depth	Blows /100mm
0.00	
0.10	
0.20	
0.30	
0.40	
0.50	
0.60	
0.70	
0.80	
0.90	
1.00	
1.10	
1.20	
1.30	
1.40	
1.50	
1.60	
1.70	
1.80	
1.90	
2.00	
2.10	
2.20	
2.30	
2.40	
2.50	
2.60	
2.70	
2.80	
2.90	
3.00	
3.10	
3.20	
3.30	
3.40	
3.50	
3.60	
3.70	
3.80	
3.90	
4.00	

Test Results		
Depth (m)	Shear Strength (kPa)	Soil Description
0.0	-	GRAVELLY SILT WITH SOME SAND; GREYISH BROWN
0.1	-	pH = 7.2 6.8
0.2	-	SILT WITH SOME GRAVEL; LIGHT GREYISH BROWN.
0.3	-	CLAYEY SILT; BROWNISH GREY, MOTTLED BROWNISH ORANGE.
0.5	-	SILT WITH A TRACE OF CLAY; LIGHT BROWNISH GREY WITH BROWNISH ORANGE.
0.9	-	pH = 6.3

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
 Shear Strength using Picon Shear Vane, Manufacturers Notes (BS1377)

**AUGER / SCALA PENETROMETER
FIELD SHEET**

Project No : _____
 Lab Ref No : _____
 Client Ref : _____

Project : _____
 Location : ROOT STREET, FELDING
 Client : MDC
 Contractor : OPUS
 Test number : TP3
 Shear vane number : N/A
 Shear vane correction : N/A
 Water level (m) : NIL
 Reduced level (m) : EXISTING GROUND LEVEL
 Tested by : S. DARGY
 Checked by : _____

Date : 15/11/17
 Date : _____

Scala Penetrometer	
Depth	Blows /100mm
0.00	
0.10	
0.20	
0.30	
0.40	
0.50	
0.60	
0.70	
0.80	
0.90	
1.00	
1.10	
1.20	
1.30	
1.40	
1.50	
1.60	
1.70	
1.80	
1.90	
2.00	
2.10	
2.20	
2.30	
2.40	
2.50	
2.60	
2.70	
2.80	
2.90	
3.00	
3.10	
3.20	
3.30	
3.40	
3.50	
3.60	
3.70	
3.80	
3.90	
4.00	

Test Results		
Depth (m)	Shear Strength (kPa)	Soil Description
0.0		TOPSOIL
0.05	-	GRAVELLY SILT WITH SOME SAND; GRAYISH BROWN.
0.10	-	^p pH = 6.5
0.2	-	SAME AS TP2, 0.2 - 0.3 m
0.3	-	SAME AS TP2, 0.3 - 0.5 m
0.8	-	SILTY SAND; LIGHT BROWNISH GRAY & BROWN WITH ORANGE
0.9	-	SILTY CLAY; BROWNISH GRAY & BROWNISH ORANGE WITH DARK BROWN pH = 6.2

Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
 Shear Strength using Pilcon Shear Vane, Manufacturers Notes (BS1377)

Appendix E – Laboratory Results



ANALYSIS REPORT

Client:	Opus International Consultants	Lab No:	1878249	SPV1
Contact:	Christopher Bergin C/- Opus International Consultants PO Box 365 Greymouth 7840	Date Received:	16-Nov-2017	
		Date Reported:	23-Nov-2017	
		Quote No:	88861	
		Order No:		
		Client Reference:		
		Submitted By:	Steve Darby	

Sample Type: Soil

Sample Name:	TP1 (a) (0.1m) 15-Nov-2017 10:30 am	TP1 (b) (0.5m) 15-Nov-2017 10:45 am	TP2 (a) (0.1m) 15-Nov-2017 10:00 am	TP2 (b) (0.9m) 15-Nov-2017 11:00 am	TP3 (a) (0.1m) 15-Nov-2017 11:00 am
Lab Number:	1878249.1	1878249.2	1878249.3	1878249.4	1878249.5

Individual Tests

	g/100g as rcvd	69	84	77	81	76
Dry Matter	g/100g as rcvd	69	84	77	81	76
Benzo[a]anthracene	mg/kg dry wt	0.022	-	0.013	-	0.43
Benzo[a]pyrene (BAP)	mg/kg dry wt	0.027	-	< 0.013	-	0.45
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	0.029	-	0.013	-	0.59
Benzo[k]fluoranthene	mg/kg dry wt	< 0.015	-	< 0.013	-	0.24
Chrysene	mg/kg dry wt	0.020	-	< 0.013	-	0.43
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	-	< 0.013	-	0.081
Fluoranthene	mg/kg dry wt	0.042	-	0.021	-	0.68
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	0.022	-	0.018	-	0.37

Heavy Metals, Screen Level

Total Recoverable Arsenic	mg/kg dry wt	6	-	29	-	8
Total Recoverable Cadmium	mg/kg dry wt	0.22	-	3.4	-	0.73
Total Recoverable Chromium	mg/kg dry wt	14	-	23	-	15
Total Recoverable Copper	mg/kg dry wt	15	-	44	-	20
Total Recoverable Lead	mg/kg dry wt	64	-	43	-	81
Total Recoverable Nickel	mg/kg dry wt	7	-	7	-	8
Total Recoverable Zinc	mg/kg dry wt	113	-	170	-	270

Asbestos in Soil

As Received Weight	g	756.2	-	-	-	-
Dry Weight	g	641.0	-	-	-	-
<2mm Subsample Weight	g ashed wt	53.4	-	-	-	-
Asbestos Presence / Absence		Asbestos NOT detected.	-	-	-	-
Description of Asbestos Form		-	-	-	-	-

Polycyclic Aromatic Hydrocarbons Screening in Soil

1-Methylnaphthalene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
2-Methylnaphthalene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Perylene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	-	< 0.03	-	< 0.03	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	-	< 0.03	-	< 0.04	-
Acenaphthylene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Acenaphthene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Anthracene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Benzo[a]anthracene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	-	< 0.012	-	< 0.013	-



Sample Type: Soil						
Sample Name:	TP1 (a) (0.1m) 15-Nov-2017 10:30 am	TP1 (b) (0.5m) 15-Nov-2017 10:45 am	TP2 (a) (0.1m) 15-Nov-2017 10:00 am	TP2 (b) (0.9m) 15-Nov-2017 11:00 am	TP3 (a) (0.1m) 15-Nov-2017 11:00 am	
Lab Number:	1878249.1	1878249.2	1878249.3	1878249.4	1878249.5	
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Benzo[e]pyrene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Benzo[g,h,i]perylene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Benzo[k]fluoranthene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Chrysene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Dibenzo[a,h]anthracene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Fluoranthene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Fluorene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Naphthalene	mg/kg dry wt	-	< 0.06	-	< 0.07	-
Phenanthrene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Pyrene	mg/kg dry wt	-	< 0.012	-	< 0.013	-
Haloethers in SVOC Soil Samples by GC-MS						
Bis(2-chloroethoxy) methane	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Bis(2-chloroethyl)ether	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Bis(2-chloroisopropyl)ether	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
4-Bromophenyl phenyl ether	mg/kg dry wt	< 0.5	-	< 0.4	-	< 0.4
4-Chlorophenyl phenyl ether	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Nitrogen containing compounds in SVOC Soil Samples by GC-MS						
2,4-Dinitrotoluene	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
2,6-Dinitrotoluene	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Nitrobenzene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
N-Nitrosodi-n-propylamine	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
N-Nitrosodiphenylamine + Diphenylamine	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
Organochlorine Pesticides in SVOC Soil Samples by GC-MS						
Aldrin	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
alpha-BHC	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
beta-BHC	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
delta-BHC	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
gamma-BHC (Lindane)	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
4,4'-DDD	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
4,4'-DDE	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
4,4'-DDT	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Dieldrin	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Endosulfan I	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Endosulfan II	mg/kg dry wt	< 2	-	< 2	-	< 2
Endosulfan sulphate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Endrin	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
Endrin ketone	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Heptachlor	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Heptachlor epoxide	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Hexachlorobenzene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS						
Acenaphthene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Acenaphthylene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Anthracene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Benzo[a]anthracene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.5	-	< 0.5	-	0.5
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.5	-	< 0.5	-	0.6
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Benzo[k]fluoranthene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
1&2-Chloronaphthalene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5

Sample Type: Soil						
Sample Name:	TP1 (a) (0.1m) 15-Nov-2017 10:30 am	TP1 (b) (0.5m) 15-Nov-2017 10:45 am	TP2 (a) (0.1m) 15-Nov-2017 10:00 am	TP2 (b) (0.9m) 15-Nov-2017 11:00 am	TP3 (a) (0.1m) 15-Nov-2017 11:00 am	
Lab Number:	1878249.1	1878249.2	1878249.3	1878249.4	1878249.5	
Polycyclic Aromatic Hydrocarbons in SVOC Soil Samples by GC-MS						
Chrysene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Fluoranthene	mg/kg dry wt	< 0.5	-	< 0.5	-	0.7
Fluorene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.5	-	< 0.5	-	0.5
2-Methylnaphthalene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Naphthalene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Phenanthrene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Pyrene	mg/kg dry wt	< 0.5	-	< 0.5	-	0.7
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	0.04	-	< 0.04	-	0.70
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	-	< 0.04	-	0.70
Phenols in SVOC Soil Samples by GC-MS						
4-Chloro-3-methylphenol	mg/kg dry wt	< 5	-	< 5	-	< 5
2-Chlorophenol	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
2,4-Dichlorophenol	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
2,4-Dimethylphenol	mg/kg dry wt	< 3	-	< 3	-	< 3
3 & 4-Methylphenol (m- + p- cresol)	mg/kg dry wt	< 3	-	< 3	-	< 3
2-Methylphenol (o-Cresol)	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
2-Nitrophenol	mg/kg dry wt	< 5	-	< 5	-	< 5
Pentachlorophenol (PCP)	mg/kg dry wt	< 30	-	< 30	-	< 30
Phenol	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
2,4,5-Trichlorophenol	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
2,4,6-Trichlorophenol	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Plasticisers in SVOC Soil Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	mg/kg dry wt	< 5	-	< 5	-	< 5
Butylbenzylphthalate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Di(2-ethylhexyl)adipate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Diethylphthalate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Dimethylphthalate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Di-n-butylphthalate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Di-n-octylphthalate	mg/kg dry wt	< 1.0	-	< 1.0	-	< 1.0
Other Halogenated compounds in SVOC Soil Samples by GC-MS						
1,2-Dichlorobenzene	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
1,3-Dichlorobenzene	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
1,4-Dichlorobenzene	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
Hexachlorobutadiene	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
Hexachloroethane	mg/kg dry wt	< 0.9	-	< 0.8	-	< 0.8
1,2,4-Trichlorobenzene	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Other compounds in SVOC Soil Samples by GC-MS						
Benzyl alcohol	mg/kg dry wt	< 10	-	< 10	-	< 10
Carbazole	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Dibenzofuran	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Isophorone	mg/kg dry wt	< 0.5	-	< 0.5	-	< 0.5
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 9	< 8	< 8	< 8	< 8
C10 - C14	mg/kg dry wt	< 20	< 20	< 20	< 20	< 20
C15 - C36	mg/kg dry wt	< 40	< 40	240	< 40	420
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	< 70	240	< 70	420

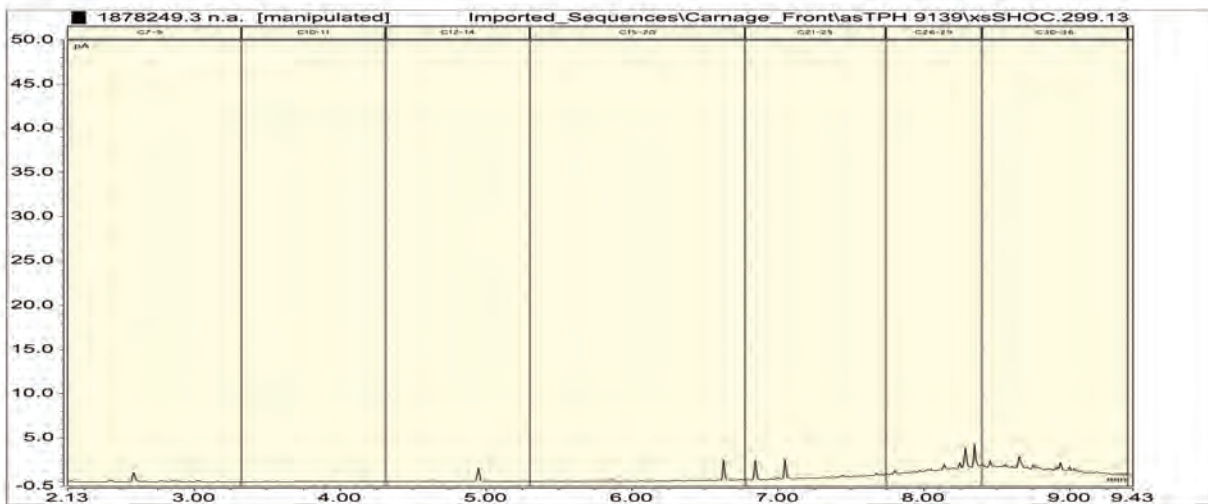
Sample Type: Soil

Sample Name:	TP3 (b) (0.9m) 15-Nov-2017 11:15 am				
Lab Number:	1878249.6				

Individual Tests

Dry Matter	g/100g as rcvd	60	-	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Soil						
1-Methylnaphthalene	mg/kg dry wt	< 0.017	-	-	-	-
2-Methylnaphthalene	mg/kg dry wt	< 0.017	-	-	-	-
Perylene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	-	-	-	-
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.05	-	-	-	-
Acenaphthylene	mg/kg dry wt	< 0.017	-	-	-	-
Acenaphthene	mg/kg dry wt	< 0.017	-	-	-	-
Anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[e]pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.017	-	-	-	-
Benzo[k]fluoranthene	mg/kg dry wt	< 0.017	-	-	-	-
Chrysene	mg/kg dry wt	< 0.017	-	-	-	-
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.017	-	-	-	-
Fluoranthene	mg/kg dry wt	0.020	-	-	-	-
Fluorene	mg/kg dry wt	< 0.017	-	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Naphthalene	mg/kg dry wt	< 0.09	-	-	-	-
Phenanthrene	mg/kg dry wt	< 0.017	-	-	-	-
Pyrene	mg/kg dry wt	< 0.017	-	-	-	-
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	< 10	-	-	-	-
C10 - C14	mg/kg dry wt	< 20	-	-	-	-
C15 - C36	mg/kg dry wt	< 40	-	-	-	-
Total hydrocarbons (C7 - C36)	mg/kg dry wt	< 70	-	-	-	-

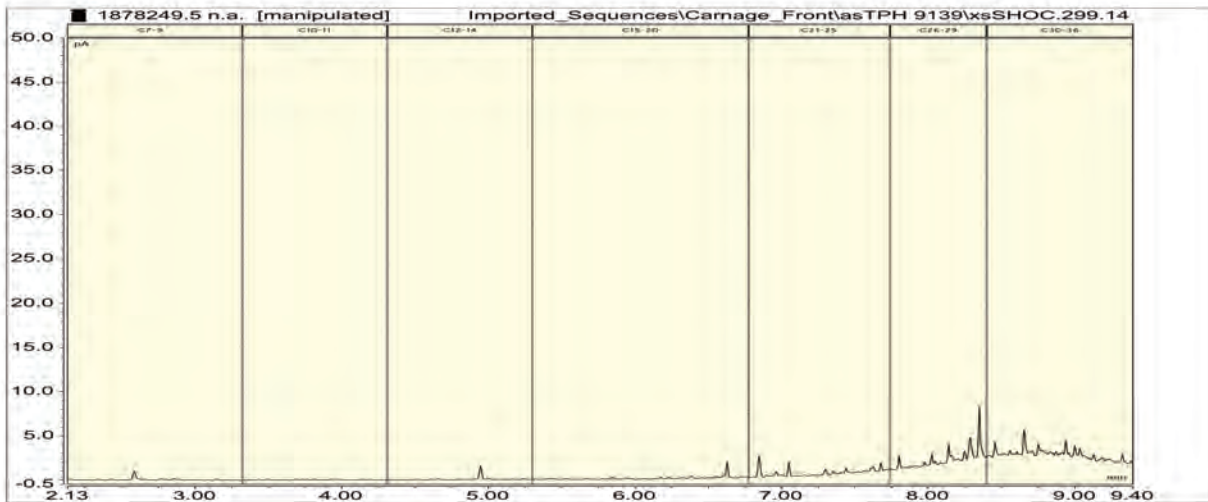
1878249.3
TP2 (a) (0.1m) 15-Nov-2017 10:00 am
Client Chromatogram for TPH by FID



1878249.5

TP3 (a) (0.1m) 15-Nov-2017 11:00 am

Client Chromatogram for TPH by FID



Analyst's Comments

It was observed that the container for sample 1878249.2 was not completely filled. Volatile loss may have occurred due to the headspace created in the container.

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil

Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. (Free water removed before analysis, non-soil objects such as sticks, leaves, grass and stones also removed). US EPA 3550.	0.10 g/100g as rcvd	1-6
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Potency Equivalence calculated from Benzo(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1. Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	2, 4, 6
Benzo[a]pyrene Toxic Equivalence (TEF)	BaP Toxic Equivalence calculated from Benzo(a)anthracene x 0.1 + BaP x 1 + Benzo(b)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Chrysene x 0.01 + Dibenzo(a,h)anthracene x 1.1 + Indeno(1,2,3-c,d)pyrene x 0.1. Guidelines for assessing and managing contaminated gasworks sites in New Zealand (GMG) (MfE, 1997).	0.002 mg/kg dry wt	2, 4, 6
TPH Oil Industry Profile + PAHscreen	Sonication in DCM extraction, SPE cleanup, GC-FID & GC-MS analysis. Tested on as received sample. US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:5786,2805,10734;2695]	0.002 - 60 mg/kg dry wt	2, 4, 6
Heavy Metals, Screen Level	Dried sample, < 2mm fraction. Nitric/Hydrochloric acid digestion US EPA 200.2. Complies with NES Regulations. ICP-MS screen level, interference removal by Kinetic Energy Discrimination if required.	0.10 - 4 mg/kg dry wt	1, 3, 5
Semivolatile Organic Compounds Screening in Soil by GC-MS	Sonication extraction, GC-MS FS analysis. Tested on as received sample	0.002 - 30 mg/kg dry wt	1, 3, 5
Total Petroleum Hydrocarbons in Soil	Sonication extraction in DCM, Silica cleanup, GC-FID analysis US EPA 8015B/MfE Petroleum Industry Guidelines. Tested on as received sample [KBIs:5786,2805,10734]	8 - 60 mg/kg dry wt	1, 3, 5
Asbestos in Soil			
As Received Weight	Measurement on analytical balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1

Sample Type: Soil			
Test	Method Description	Default Detection Limit	Sample No
Dry Weight	Sample dried at 100 to 105°C, measurement on balance. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	0.1 g	1
<2mm Subsample Weight	Sample ashed at 400°C, weight of <2mm sample fraction taken for asbestos identification if less than entire fraction. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch.	-	1
Asbestos Presence / Absence	Examination using Low Powered Stereomicroscopy followed by 'Polarised Light Microscopy' including 'Dispersion Staining Techniques'. Analysed at Hill Laboratories - Asbestos; 101c Waterloo Road, Christchurch. AS 4964 (2004) - Method for the Qualitative Identification of Asbestos in Bulk Samples.	-	1
Description of Asbestos Form	Description of asbestos form and/or shape if present.	-	1

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Ara Heron BSc (Tech)
Client Services Manager - Environmental



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Precinct 4 Project: Archaeological Assessment of Effects

Feilding, Manawatu
Prepared for Manawatu District Council



Contact Details

Name: Emily Cunliffe

Opus International Consultants Ltd
Wellington Environmental Office
L10, Majestic Centre, 100 Willis St
PO Box 12 003, Thorndon, Wellington 6144
New Zealand

Telephone: +64 4 471 7000
Mobile: +64 21 466 895

Document Details:

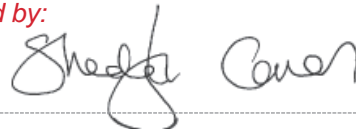
Date: 19 December 2017
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Prepared by:



Emily Cunliffe | Archaeologist

Reviewed by:



Sheelagh Conran | Principal Archaeologist

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1. Introduction

1.1. Purpose of this Report

Opus International Consultants Limited (Opus) were commissioned by Manawatu District Council to prepare an archaeological assessment report for the proposed District Plan change for Precinct 4, a proposed urban growth area for future residential development in Feilding (Figure 1).

The purpose of this report is to identify the probability of archaeological sites being within the proposed Precinct 4 development area, and assess the value of these sites and how the values may be affected. This report provides recommendations for managing / mitigating the effects this development may have on archaeological values. All recommendations in this report are made in accordance with statutory requirements.

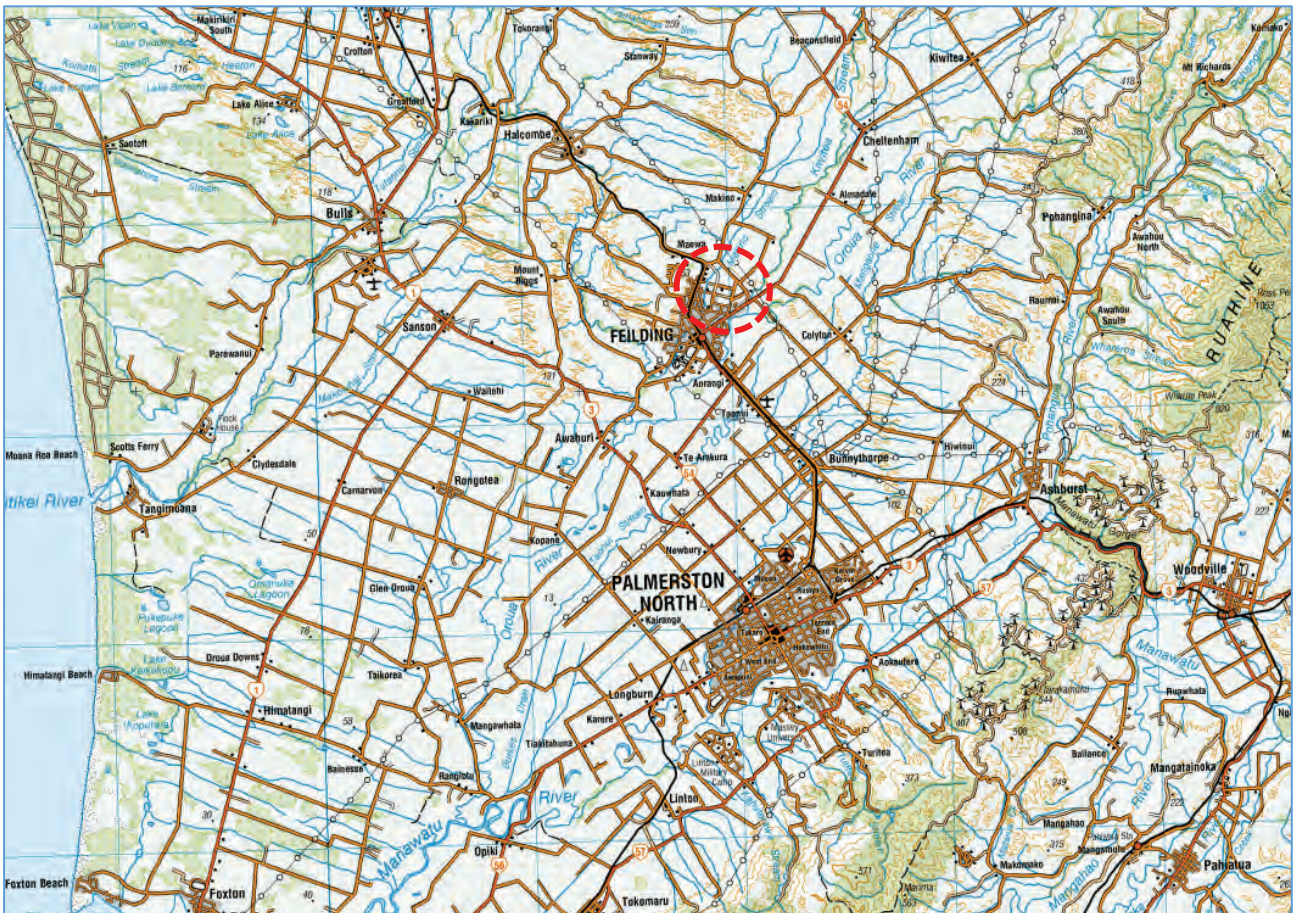


Figure 1: Location of the proposed project area.

1.2. The Proposed Development Area

The proposed Precinct 4 area is situated to the north of the Feilding town centre, between Makino Road, Reid Line, and Port Street (Figure 2). The area will be the site of a new road layout and the development of residential and commercial buildings, as well as recreational areas. The Makino Stream runs through the western side of the area.

The area is mainly pasture. There are a small number of houses within the area which are mainly located along Roots Street and Port Street.



Figure 2: The Precinct 4 area.

1.3. Constraints and Limitations

The NZAA ArchSite was the primary resource used for identifying recorded sites in the area. It is important to note that the archaeological site location data in ArchSite should be regarded as a guide only, and is generally based on reconnaissance rather than on accurate survey information. The coordinates of many of the sites in the database are of variable accuracy. In addition to this, the areal extents for many recorded sites are poorly defined.

This report does not include an assessment of Māori cultural values. Statements are made as to the location and nature of archaeological sites and their archaeological values. There are no statements on the cultural significance of the project area nor are the views of tāngata whenua represented in this report. An assessment of cultural significance will not necessarily correlate with an assessment of the archaeological significance of the area.

2. Statutory Framework

There are two main pieces of legislation in New Zealand that control work affecting archaeological sites. These are the **Heritage New Zealand Pouhere Taonga Act 2014** (HNZPTA) and the **Resource Management Act 1991** (RMA). In addition to these the Manawatu District Council District Plan has an objective to protect historic built heritage.

2.1. Heritage New Zealand Pouhere Taonga Act 2014

The HNZPTA provides blanket protection to all archaeological sites meeting the definition in the Act, whether they are recorded or not. Protection and management of sites is managed by the archaeological authority process, administered by Heritage New Zealand. It is illegal to destroy, damage or modify archaeological sites without an authority to do so from Heritage New Zealand.

Any person who intends on carrying out work that may damage, modify or destroy an archaeological site, or to investigate an archaeological site using invasive archaeological techniques, must first obtain an authority from Heritage New Zealand. The process applies to sites on land of all tenure including private, public and designated land. The HNZPTA contains penalties for unauthorised site damage.

The archaeological authority process applies to all archaeological sites that fit the HNZPTA definition regardless of whether the site is recorded in the New Zealand Archaeological Association (NZAA) Site Recording Scheme or registered with Heritage New Zealand; or if the site only becomes known about as a result of ground disturbance; and/or the activity is permitted under a district or regional plan, or a resource or building consent has been granted, or the ground is subject to a designation.

For the purposes of defining what an archaeological site is, the following definition from the HNZPTA is provided. An archaeological site is defined under section 43.1 as:

- (a) Any place in New Zealand including any building or structure (or part of a building or structure) that:
 - (i) was associated with human activity that occurred before 1900 or is the site of the wreck of any vessel where that wreck occurred before 1900; and
 - (ii) provides, or may provide through investigation by archaeological methods, evidence relating to the history of New Zealand (HNZPTA Section 6); and
- (b) Includes a site for which a declaration is made under Section 43(1) of the Act.

Heritage New Zealand also maintains the New Zealand Heritage List/Rārangi Kōrero (The List). The List can include archaeological sites. The purpose of The List is to inform members of the public about such places, and to assist with their protection under the RMA.

2.2. The Resource Management Act 1991

Part II of the Resource Management Act 1991 (RMA) outlines the Purposes and Principles of the Act. In outlining the purpose of the Act, Section 5 states:

1. The purpose of this Act is to promote the sustainable management of natural and physical resources.
2. In this Act, “sustainable management” means managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while –
 - a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
 - b) Safeguarding the life supporting capacity of air, water, soil, and ecosystems; and
 - c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

Section 6 of the RMA outlines that “in achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance.” In 2003 amendments to the RMA elevated historic heritage to a Matter of National Importance under Section 6 (f), which identifies the need for “the protection of historic heritage from inappropriate subdivision, use, and development.”

A definition of Historic Heritage has also been added with the amendments to the RMA. This defines Historic Heritage as:

- a) Those natural and physical resources that contribute to an understanding and appreciation of New Zealand’s history and cultures deriving from any of the following qualities:
 - i. Archaeological
 - ii. Architectural
 - iii. Cultural
 - iv. Historic
 - v. Scientific
 - vi. Technological; and
 - i. Includes –
 - a. Historic sites, structures, places, and areas; and
 - b. Archaeological sites; and
 - c. Sites of significance to Maori, including waahi tapu; and
 - d. Surroundings associated with the natural and physical resources.

As such, when considering applications under the Act, the consenting authority must have regard to historic heritage as a Matter of National Importance. To assist in this assessment criteria in guidelines produced by the Historic Places Trust (see Section 3.2 below) and in Regional Policy Statements can be used.

3. Methodology

This archaeological assessment of effects combines both desktop research and site visit information.

The desktop research component utilised a range of sources including:

- Published and unpublished local histories;
- Archaeological investigation and survey reports, and archaeological assessments;
- The NZAA Digital Site Recording Scheme (ArchSite), and
- Historic maps and aerial photography.

The site survey was undertaken by the author on 6 November 2017. The methodology was to drive the streets within the Precinct 4 area and, from the street, inspect the buildings that were visible on the 1940s aerial image to identify any pre-1900 buildings, or sites where pre-1900 buildings may have been situated. A site walkover of the Makino Stream bed was also conducted from Port Street and Roots Street to identify the presence of pre-1900 bridge components.

4. Physical Environment

Feilding is situated within the Manawatu district just west of the junction between the KIWITEA Stream and the Oroua River. The Oroua River feeds into the Manawatu River south of Palmerston North. The landscape is an old seabed which is mainly flat with occasional domes where folds in the bedrock have risen to create high points in the landscape. The rivers flow around these domes, and have created natural levees from sediment deposition, and in times of high flow the water became trapped in the surrounding low lying basins forming wetlands (Knight 2014). There was an extensive swamp along the western side of the Oroua River, called Roto-nui-a-hau. Subsequently, the original vegetation comprised mixed podocarp forest interspersed with swamp vegetation such as flax and toe toe.

Following the arrival of European settlers the forests were rapidly felled for timber, and much of the flax was harvested from the swamps. The establishment of agriculture and farming in the area led to the swamps being drained to form large swaths of arable land.

The proposed Precinct 4 area is situated north of Feilding town centre, and is a mostly flat, semi-rural area comprising mainly pasture with occasional residential houses. The Makino Stream runs roughly north to south through the western side of the project area.

5. Historic Background

5.1. Pre-European Occupation

Prior to European settlement the Manawatu area was relatively sparsely populated compared to other parts of the North Island. This is mainly due to the heavily forested and swampy nature of the environment. The earliest human settlement of the Manawatu region was focused around the coast. However, following the decline of food resources such as the moa, the people living around the river mouths began to travel inland and transition to a reliance on the cultivation of crops and freshwater food sources, such as eels and birds (Knight 2014). While settlements inland, including pa and kainga, were scarce, they were mainly focused along the edges of the rivers which provided ease of access to food resources and travel.

5.2. European Arrival

Feilding was established in 1874 by the London-based Emigrant and Colonist's Aid Corporation, and was the first township on the Manchester Block. William Henry Adelbert Feilding, who was chief representative of the corporation, visited New Zealand in 1871, and purchased 100,000 acres of Manawatu land which was named the Manchester Block. The first settlers arrived in 1874, and much of the initial phase of settlement was occupied with the clearance of the surrounding bush and the improvement of communication between Foxton

(then the main port for the district). In 1876 the railway line from Foxton to Palmerston North was extended to Feilding, opening an outlet for the town. Following the arrival of the railway the town grew quickly. The early industries included timber and flax milling. There were a number of highly productive saw mills located close to Feilding.

Flax milling was an important industry in the Fielding area prior to 1900, and there were numerous flax mills operating along the waterways in the region. Although no direct references could be found that indicated there were flax mills operating on the Makino Stream within the project area, there are some references to this industry occurring south of Port Street. In the late 1880s a number of complaints appeared in the Fielding Star about the pollution of the Makino Stream from flax milling¹, which led to a filter dam being installed on the Makino Stream². This was presumably constructed north of where the stream flow enters the town centre. One such newspaper letter stated that

“...the water being so polluted that it is turning quite bitter and of an inky blackness, this being caused by the stream being diverted to run through a flax mill and carry off their washings... If anyone doubts the truth of this just let him walk up the Makino as far as Port Street crossing, view and taste the water, and judge for themselves.”³

A timber bridge was constructed over the Makino Stream on Port Street at least as early as 1889⁴. The timber bridge was swept away in 1926 by a flood, and council deferred rebuilding the bridge until another bridge required replacement and the timber could be repurposed⁵. In 1928 the council ruled that a new structure was not warranted⁶. No reference to the bridge ever being replaced could be found, and it is likely that this never happened given that no bridge exists at the site currently.

The proposed project area is situated north of the main town of Feilding, and was originally subdivided into ‘Suburban Sections’ (see DP 20, Figure 3). An aerial image taken in 1949 shows that the majority of the land within the proposed project area was used for pasture during this time (Figure 4). There are a number of houses, but mainly the area is undeveloped land. The only area north of the township that was developed for residential housing prior to 1900 was along the east side of Makino Road.

The extant houses within the Precinct 4 area are virtually all post-1900 buildings. There is one known pre-1900 house situated within Precinct 4. Located at 69 Pharazyn Street, ‘Awatea’ was constructed for the Clapham family in 1893 (Figure 5).

5.2.1. Awatea

Awatea is a Queen Anne style timber homestead with outbuildings, including stables and a wind mill. The homestead was located on one of Feilding’s 10 acre blocks (Lot 73, DP 20, see Figure 3). The Clapham family shifted from Wellington to take advantage of the economic growth. By the time Awatea was constructed in 1893, the Manchester Block settlement was maturing and the economic advantages of this were particularly seen in the growth of its principle town, Feilding, in this period. Awatea is an important legacy of this prosperity. The fortunes of the Clapham family seem to have mirrored this development, because after purchasing the property in 1878 the Clapham family had prospered sufficiently by the 1890s to construct an attractive homestead which suitably reflected their economic and social status⁷. The building is listed with heritage New Zealand as a Category II historic place.

¹ “The Pollution of the Makino”, Feilding Star, 21 November 1889

² “Our Flaxmills”, Feilding Star, 7 December 1889

³ “The Pollution of the Makino”, Feilding Star, 21 November 1889

⁴ “Feilding Borough Council” Feilding Star, 7 September 1889

⁵ “Port Street Bridge”, Manawatu Times, 30 July 1926

⁶ “Feilding Borough”, Manawatu Times, 20 April 1928

⁷ <http://www.heritage.org.nz/the-list/details/2826>

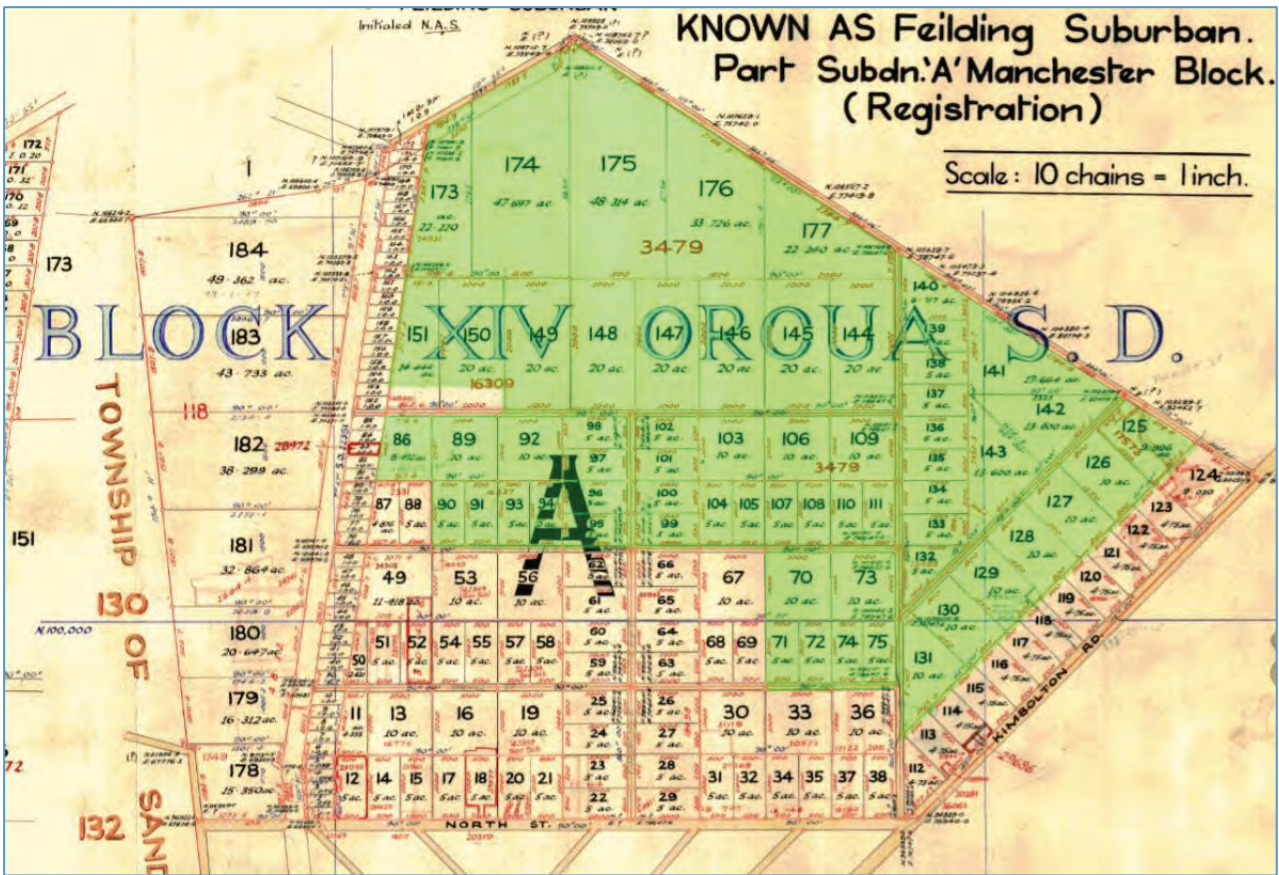


Figure 3: Survey plan DP 20 drawn up in 1875 showing the proposed project area (highlighted in green).



Figure 4: The proposed project area in 1949 (highlighted in green).



Figure 5: Awatea in the 1900s. Image from the Heritage New Zealand Pouhere Taonga List Entry #2826.

6. Previous Archaeological Work

There are only three archaeological site records situated within the wider Fielding area (Figure 6). Given that the town was developed prior to 1900, the lack of site records indicates that this area has never been the subject of any archaeological site surveys or systematic recording programs. Thus, the absence of archaeological site records in this area does not necessarily mean an actual absence of archaeological sites.

In addition to the three site records in central Feilding, there are also three records located approximately 8 km south of the proposed development area which are recorded as ovens/hearths. These were recorded in the 1980s on the bank of Taonui Stream.

The three sites recorded are all early European occupation sites. None of these sites will be affected by the development of Precinct 4.

S23/99 – This site was recorded in 2010 as the site of a store that occupied the site in 1893.

S23/102 – This site was recorded in 2011 as the site of pre-1900 buildings.

S23/103 – This site was recorded in 2013 as the site of a historic lodge.

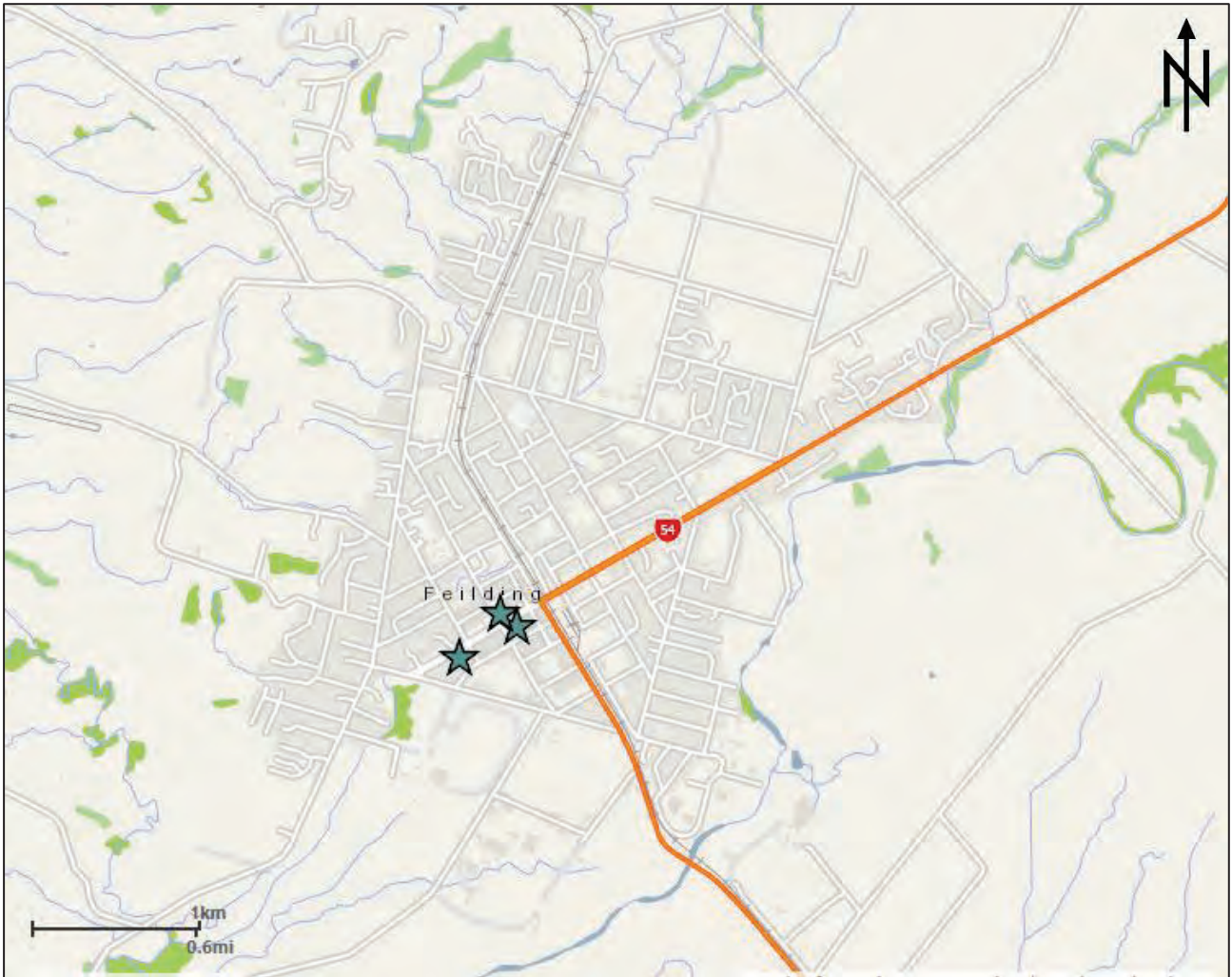


Figure 6: Archaeological site records (stars) in the Feilding area. Image from ArchSite.

7. Site Visit Results

A site visit to the proposed Precinct 4 area was undertaken by the author on 6 November 2017. The purpose of the site visit was primarily a reconnaissance of the general environment, and to identify any pre-1900 buildings or sites that may be affected by the proposed development area.

7.1. The Makino Stream

The Makino Stream was accessed from Port Street and Roots Street to identify the presence of any pre-1900 bridge structures, and none were observed (Figure 7 and Figure 8). It is unlikely that there was ever a bridge present at Roots Street, given that the street has never had a significant population. The Port Street bridge was washed away in 1926, and after two years the council opted to not replace it due to a lack of need.



Figure 7: Looking up the Makino Stream at Roots Street.



Figure 8: The end of Roots Street looking west towards the Makino Stream.

7.2. Historic Farm Buildings

The property to the west of the Makino Stream was accessed from Reid Line to assess the structures situated in the field north of Roots Street West. These were identified as most likely being early 20th century farm buildings (Figure 9 and Figure 10). The buildings both had timber-frame poured concrete foundations, with

timber structures, and both were in a state of dilapidation. There was no indication that they were associated with pre-1900 activity.

The houses present within the project area were all observed, and none of these (with the exception of Awatea) appeared to have been constructed prior to 1900.



Figure 9: Disused farm buildings on the property west of the Makino Stream.



Figure 10: Disused farm buildings on the property west of the Makino Stream.

8. Archaeological and Other Values

8.1. Archaeological Values

Although there are no recorded archaeological sites within the Precinct 4 area, there is one known and one potential historic / archaeological sites that have been identified during the course of this report. These are 'Awatea' and the location of the bridge at Port Street.

In addition to the known pre-1900 building, there is also the two stream crossings at Port Street and Roots Street where there is minimal potential for the remains of pre-1900 bridge structures. It is likely there was never a bridge at Roots Street, and there has not been a bridge at Port Street since 1926. Therefore, the likelihood of encountering archaeological features associated with pre-1900 structures is considered to be minor.

8.1.1. *Awatea*

Condition

This building and associated windmill, stable and well remain on the property in good condition. However, the northern half of the land has been subdivided away for the development of Mahi Grove.

Rarity/Uniqueness

While nineteenth century houses are not rare or unique in New Zealand, Awatea is an excellent example of a timber, Queen Anne-style inspired, modest sized, rural homestead of the late nineteenth century. With the compliment of structures on the property, which are contemporary with the homestead's construction, including a windmill and stable, there is potential to provide an insight into life in the late nineteenth and early twentieth centuries.

Contextual Value

The house has contextual value as a component of early European settlement in the Feilding and wider Manawatu district. By the time Awatea was constructed in 1893, the Manchester Block settlement was maturing and the economic advantages of this were particularly seen in the growth of Feilding during this period.

Amenity Value

The house is currently in private ownership, thus is not accessible by the public. The building has good potential for public amenity.

Cultural Associations

European.

8.1.2. *Port Street Bridge*

Condition

The bridge was destroyed by a storm in 1926. There is a slight possibility that subsurface structures associated with the abutments remain present. However, these are not likely to remain intact or undamaged.

Rarity/Uniqueness

Timber bridge structures were fairly common during the nineteenth century, and there are many that remain extant around the country.

Contextual Value

The bridge will have contextual value as a component of the early development of Feilding.

Amenity Value

The area where the bridge was located will be developed into an Esplanade Reserve, thus there is good amenity potential. However, the extant remains of the bridge (if any) are unlikely to be very visible.

Cultural Associations

European.

8.2. Other Values

The area may have been the site of early Maori activity, and any sites uncovered during the project pertaining to Maori activities/occupation will hold Maori cultural values. These can only be established through consultation with Tangata Whenua.

9. Assessment of Effects

9.1. Proposed Works

Manawatu District Council are proposing to rezone the land from rural to residential in the Manawatu District Council District Plan to allow for residential development within the area of Precinct 4. No development is currently planned for the area, but in the future landowners will be able to develop the sites.

This assessment report will inform the proposed development rules for subdivision and dwellings in this area following rezoning.

9.2. Evidence of Archaeological Sites

There is one nineteenth century building (Awatea) within the area proposed for rezoning. This building is a Category II heritage site listed by Heritage New Zealand Pouhere Taonga. The house and out buildings hold both heritage and archaeological value, and the property holds potential archaeological value. The house originally sat on a ten acre lot, the northern section of which has since been subdivided away to form Mahi Grove. However, the original house and outbuildings remain intact. Any modifications or demolition of these buildings or disturbance of the ground on this property (Figure 11) have the potential to affect archaeological values of the site.

There is also potential for remnants of the nineteenth-century bridge at Port Street to be present (Figure 11). However, no evidence of any physical remains was identified during the site visit, and historical records show that there has been no bridge at the site since the original one was destroyed by a flood in 1926. Given the lack of physical evidence and the length of time since the bridge was destroyed, the probability of any physical remains being intact is considered to be very low.

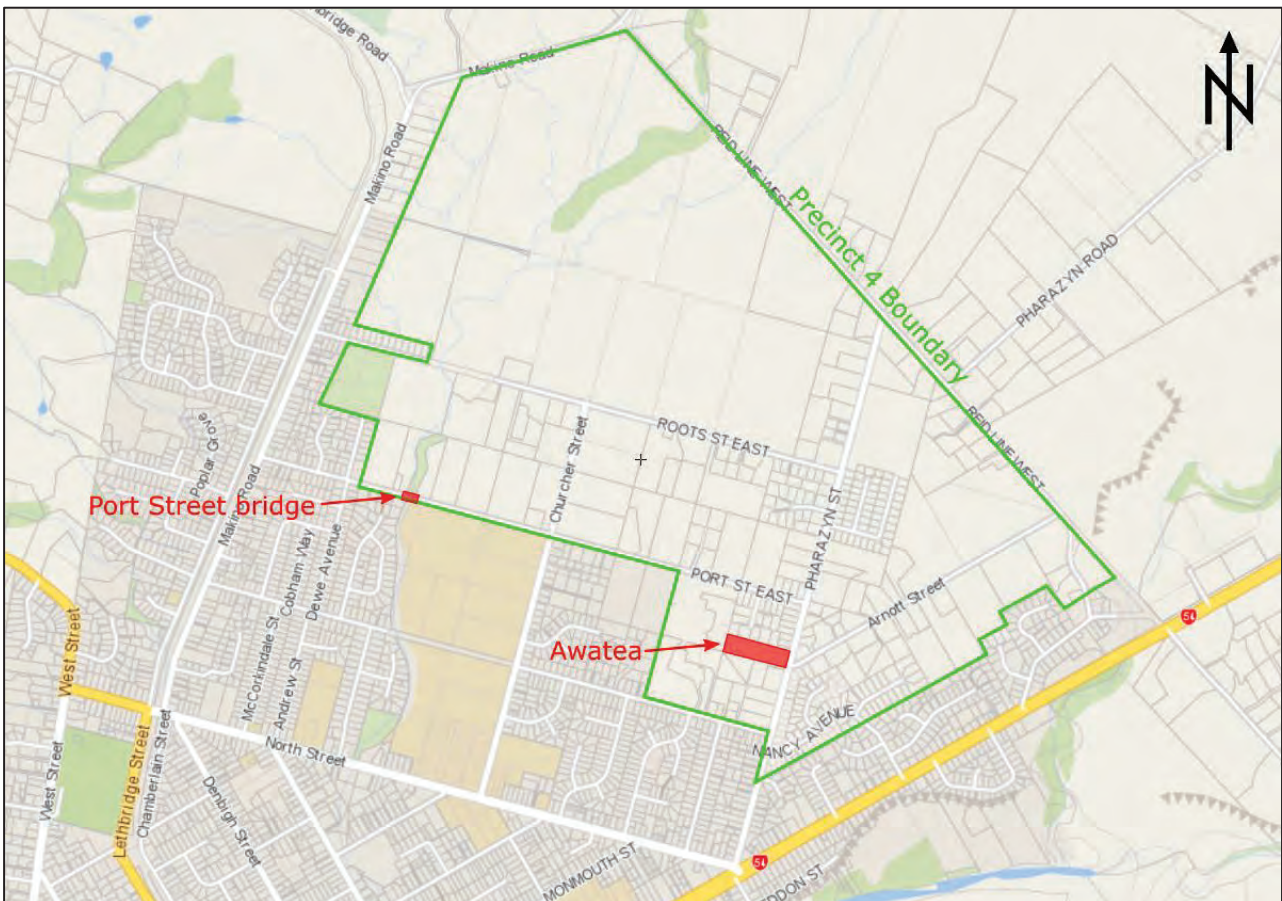


Figure 11: Areas of archaeological potential within the proposed Precinct 4 area.

9.3. Effect of Proposed Works

The proposed works are not physical in nature. Therefore, currently there is no potential for the sites to be affected. However, future developments within the property of Awatea have the potential to disturb archaeological material. The remainder of this project area, including the area at the Port Street bridge site, is considered to have a low probability of unrecorded sites being present.

The current proposed works involves rezoning the land from rural to residential, and there is potential to apply development requirements to the Awatea property at 69 Pharazyn Street to ensure the protection of archaeological values.

10. Conclusions and Recommendations

This archaeological assessment report has been prepared for the Manawatu District Council for the purpose of assessing the Precinct 4 area north of Feilding, which is proposed as a new urban growth area. Manawatu District Council proposes to rezone the land within Precinct 4 from rural to residential, which will allow residential development intensification. The purpose of this report is to identify any potential areas of archaeological significance.

There are no previously recorded archaeological sites within the project area. However, the Category II heritage building 'Awatea', at 69 Pharazyn Street listed with Heritage New Zealand Pouhere Taonga is situated within the project area, and also holds archaeological values as a farmstead built in 1893. There is also potential for subsurface archaeological features and deposits to remain extant on the property at Awatea.

There was a nineteenth century timber bridge situated at the Port Street crossing of the Makino Stream, however this was washed away in 1926, and was not replaced. No evidence of the bridge was visible during the site visit, and it is considered unlikely that physical material remains at the site.

The remainder of the project area has remained rural, and largely undeveloped since European settlement in the Feilding area, and it is not known to have been an area of permanent settlement for Maori. Thus, the area is considered to have low archaeological potential, and developments outside of the Awatea property are unlikely to require input by an archaeologist.

10.1. Recommendations

The following recommendations are made in this report:

- An Archaeological Authority from Heritage New Zealand Pouhere Taonga should be sought by any developers undertaking ground modifying activities at the Awatea property at 69 Pharazyn Street.
- Development in the remainder of the Precinct 4 area should be undertaken following an Archaeological Discovery Protocol whereby works should cease in the event of the discovery of any archaeological material and an Archaeological Authority should be sought.
- In the event of the discovery of archaeological sites of Maori origin, iwi should be engaged with during the Archaeological Authority process.

11. References

Books / Reports:

Knight, C. 2014. *Ravaged Beauty: An Environmental History of the Manawatu*. Dunmore Publishing: Auckland.

Online Sources:

ArchSite (accessed via <https://archsite.eaglelegis.co.nz/NZAA>)

Papers Past (accessed via <https://paperspast.natlib.govt.nz/>)

Heritage New Zealand Pouhere Taonga List / Rārangi Kōrero (accessed via <http://www.heritage.org.nz/the-list>)

Relevant Survey Plans (accessed via QuickMap):

SO 11148

DP 20

DP 3479



www.opus.co.nz

PROPERTY ECONOMICS



FEILDING RESIDENTIAL GROWTH UPDATE - PRECINCT 4

Project No: 51712

Date: February 2018

Client: Manawatu District Council



SCHEDULE

Code	Date	Information / Comments	Project Leader
51712.3	Feb 2018	Report	Tim Heath / Phil Osborne

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1. EXECUTIVE SUMMARY

In order to assess residential demand for Precinct 4, two markets have been identified, a primary market which represents the Feilding Urban Area and a secondary market that represents the balance of the Manawatu – Whanganui Region. This is the result of Precinct 4 (and Feilding in general), attracting growth and competing with residential capacity from beyond Feilding itself.

Household forecasts show Feilding is increasing in significance within the wider Region with a higher proportional growth rate (32% vs 14% respectively). In terms of current residential capacity within Feilding's urban area, there is enough to accommodate around 700 dwellings. Precinct 4 holds enough capacity for an additional 1,788 dwellings taking Feilding's total residential capacity to almost 2,500 households (of which the majority is located within Precinct 4). This is a noteworthy level of capacity given Feilding's size and projected growth.

Feilding is growing significantly faster (proportionally) than the wider Region, by 2038 demand is forecast to be similar to the estimated capacity of vacant residential sites in Feilding including the proposed Precinct 4.

Precinct 4's core retail market is likely to be localised, given the limited surrounding population base and likely role and function of the area, an appropriate estimation of retail expenditure for the identified market would consist of a few convenience retail stores only. The market currently generates enough convenience retail expenditure to sustain around 3-5 convenience stores and 1-2 commercial service activities.

As localised convenience shops, any development within Precinct 4 would predominately be competing against other convenience activity in Feilding (including the town centre) and essentially allow the localised market to be more efficiently serviced for frequently required goods and services while maintaining the role and function of surrounding centres.

In terms of the possible provision for a retirement village in Precinct 4, the market has an estimated demand of an additional 660 retirement village dwellings by 2038. The Whanganui-Manawatu District is experiencing a rapidly aging population, with the population base of people aged 65+ years forecast to more than double by 2038. This acts as a stimulus for increasing demand for retirement villages but is not the only factor, an increased acceptance of retirement village living and increased product availability and quality lifestyle living options are also large influences.

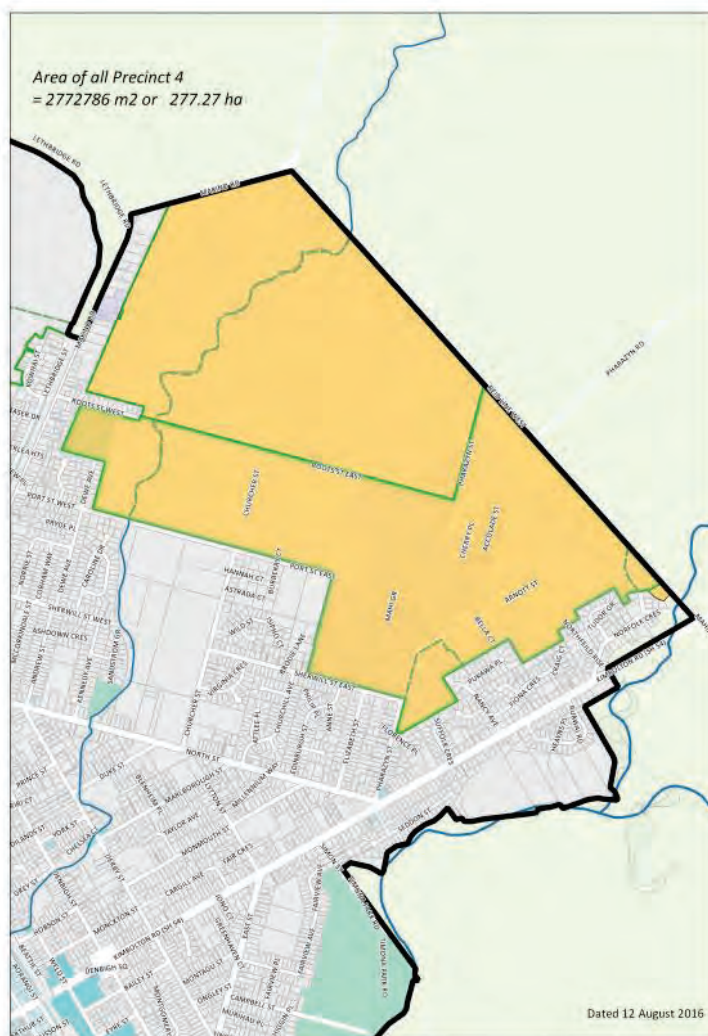
2. INTRODUCTION

As requested by Manawatu District Council (MDC), Property Economics has been engaged to provide an update to the earlier research and assessment (October 2016) of the residential market within the Feilding urban area, focusing on quantifying the scale of future demand that Feilding is forecast to be required to accommodate. This report reflects the updated residential growth forecasts provided by Council as part of their updated LTP programmes and assesses the merits of the proposed extension of the Residential Zone referred to as Precinct 4 (currently Rural Zoned land).

Precinct 4

Figure 1 outlines Precinct 4 (in yellow), an approximate 256ha area located on the north-eastern periphery of Feilding. This area is bordered by Lethbridge Street, Makino Road, Reid Line and Arnott Street. Precinct 4 is one of six growth areas on the periphery of Feilding identified by MDC in response to demand for greenfield residential subdivisions in and around Feilding.

FIGURE 1: PROPOSED PRECINCT 4



Source: Manawatu District Council

This analysis will provide robust base data and economic enquiry that will assist MDC in understanding the residential market that Precinct 4 will operate in, both currently and over the foreseeable future. It will quantify the 'at capacity' population and household base of the core market for Precinct 4 and quantify growth in the level of demand that the market is projected to generate out to 2038.

In addition to this, a high-level analysis of changing demographic trends in age and population will be carried out to assess the potential provision for retirement villages in Precinct 4.

2.1. KEY RESEARCH OBJECTIVES

The main objectives of this report are to:

- (i) Quantify the level of residential growth projected for the Feilding market over a forecast period to 2038.
- (ii) Quantify the level and extent of existing residentially zoned land (capacity) within the district geospatially.
- (iii) Comment on the potential provision for retirement villages in Precinct 4 based on updated growth estimates provide by MDC regarding people aged 65-year and over.
- (iv) Delineate and map the geospatial extent of Precinct 4's core retail market within the surrounding commercial centre network, both from a localised and wider district perspective, and validate whether some localised convenience retail activity should be provided within the Precinct.
- (v) Quantify the 'at capacity' population and household base of the core retail market as at 2038.
- (vi) Calculate the level of retail expenditure generated within the proposed Precinct 4's core retail market on an annualised basis in the relevant retail sectors and forecast out to 2038. This will quantify growth in the level of retail demand the market is projected to generate on an annualised basis in NZD terms.
- (vii) Determine the amount of sustainable retail floorspace that can be sustained by the core market of the proposed Precinct 4 development out to 2038 in terms of GFA for the relevant retail activities appropriate in the Feilding market, this location and centre function. This will determine the appropriate retail provision for Precinct 4 in the context of the wider Feilding market, and the size of the market population base.

2.2. INFORMATION & DATA SOURCES

Information has been obtained from a variety of data sources and publications available to Property Economics, including:

- Household and Population Projections – MDC
- Retail Trade Survey – Statistics NZ
- Precinct 4 Area – MDC
- Existing Residential Capacity – MDC
- Feilding Residential Overview – Property Economics

3. RESIDENTIAL MARKETS

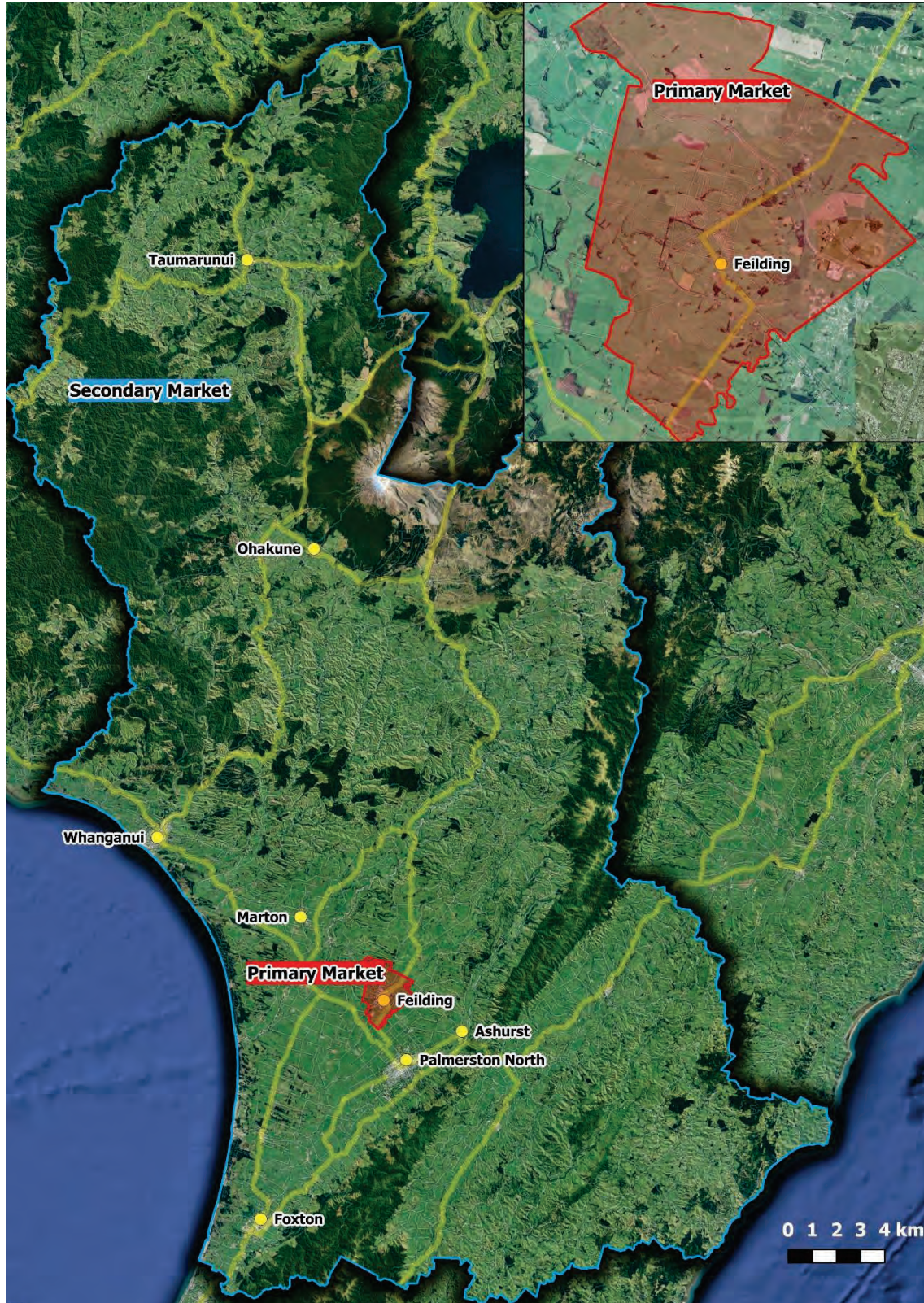
For the purposes of this analysis, two residential markets have been identified for Precinct 4's residential demand, these have been split into Primary and Secondary catchments to represent the higher propensity for capturing residential demand within the primary catchment compared to the secondary catchment.

The primary catchment represents Feilding Urban Area, which encompasses Precinct 4's immediate residential market. A look at residential movements in and out of Feilding revealed that the majority of Feilding's growth comes from redistribution within the Region rather than from an influx from beyond of the region, for this reason the Whanganui – Manawatu Region was determined as the secondary market. This represents the catchment that Feilding's growth will predominantly derive from beyond its primary catchment.

While Precinct 4 may draw residential demand from beyond these catchment's, the primary and secondary market represent the core economic market that Precinct 4 is primarily designed to derive market growth from, and where Precinct 4 has a locational and strategic advantage in terms of proximity.

Figure 2 denotes the core economic markets on which the subsequent analysis in this report are based.

FIGURE 2: PRIMARY AND SECONDARY RESIDENTIAL MARKETS



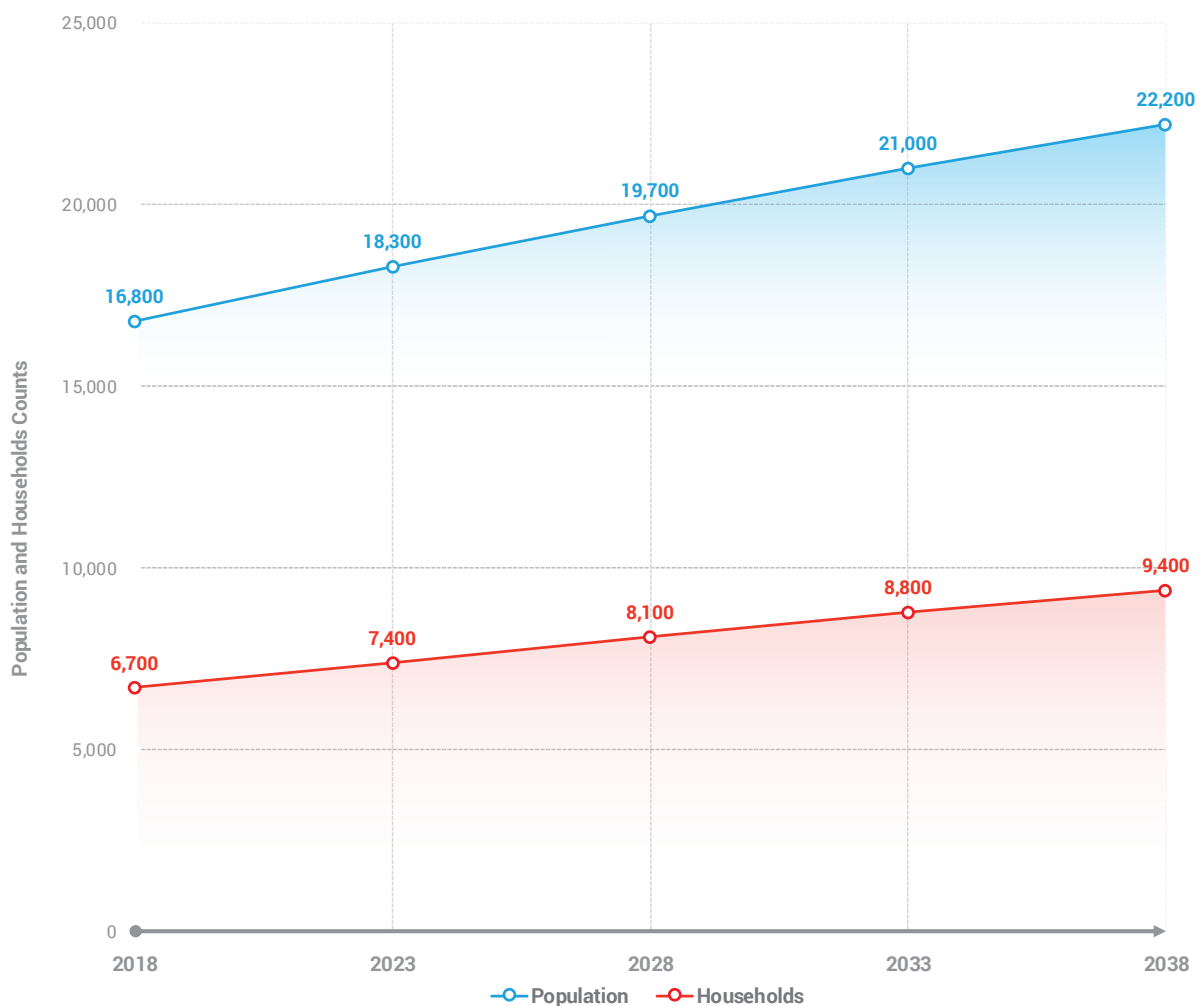
Source: Property Economics

4. POPULATION AND HOUSEHOLD PROJECTIONS

Figure 3 displays the population and household growth projections within Feilding's Urban Area and represents Precinct 4's primary economic market. The growth forecasts utilised in this report have been provided to Property Economics by Manawatu District Council and are consistent with other Council LTP documents.

The primary catchment currently has a population base of around 16,800 people and 6,700 households (rounded). This is forecast to grow to 22,200 and 9,400 respectively over the projection horizon to 2038. This equates to an average growth of around 135 households per annum over the assessed period, or growth of over 40% over the 20-year time horizon.

FIGURE 3: PRIMARY CATCHMENT POPULATION AND HOUSEHOLD FORECASTS



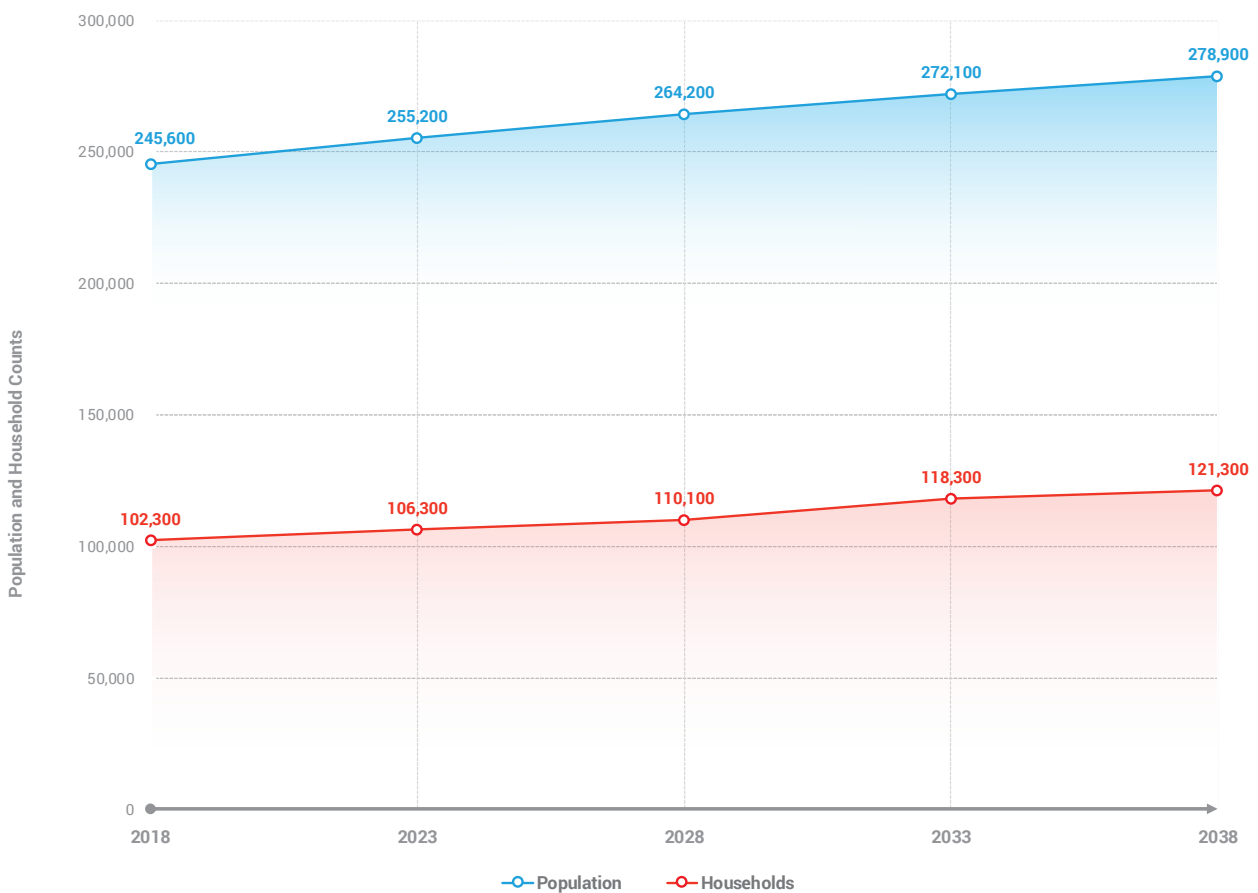
Source: Property Economics, MDC

Figure 4 illustrates the household and population growth projections for Precinct 4’s wider residential market. This is represented by the Manawatu-Whanganui Region which for the purpose of this assessment **includes** the primary catchment (Feilding urban area).

Within the Manawatu-Whanganui Region, there is currently a population base of around 245,600 people and 102,300 households (rounded). This is forecast to experience relatively lower growth of households over the assessed period (14%) to around 121,300 households by 2038. This highlights that Precinct 4’s primary market (Feilding urban area) is growing twice as fast as the wider regional market proportionally, and consequently increasing its significance within the Region. In essence Feilding is projected to be one of the region’s growth hubs over the next 20 years.

Growth in households is forecast to increase at a faster proportional rate than the population in both markets due to a projected fall in the person per dwelling ratio over the forecast period. This trend is not isolated to the identified catchments but projected to occur across the country due to an aging population, smaller families and a higher proportion of ‘split’ or single households.

FIGURE 4: MANAWATU - WHANGANUI POPULATION AND HOUSEHOLD FORECAST



Source: Property Economics, MDC

5. FEILDING RESIDENTIAL CAPACITY

This section evaluates at a high level residential capacity within Feilding’s urban area currently as well as the potential capacity created by the proposed rezoning of Precinct 4. The data is based on the Residential Capacity for Feilding Map obtained from MDC and the current Residential zone restrictions under the Operative District Plan.

Precinct 4 encompasses 256ha of land, of which an estimated 227ha is for residential use and the balance of approximately 29ha for recreational land uses. MDC has determined a maximum additional residential dwelling yield for the proposed Precinct 4 area of 1,788, with a maximum density of 600sqm per lot.

Table 1 summarises Feilding’s existing and potential residential capacity.

TABLE 1: FEILDING URBAN AREA RESIDENTIAL CAPACITY

Feilding Capacity	Ha	Dwellings
Existing	115	690
Precinct 4	256	1,788
Total Capacity	371	2,478

Source: Property Economics

5.1. EXISTING FEILDING URBAN AREA CAPACITY

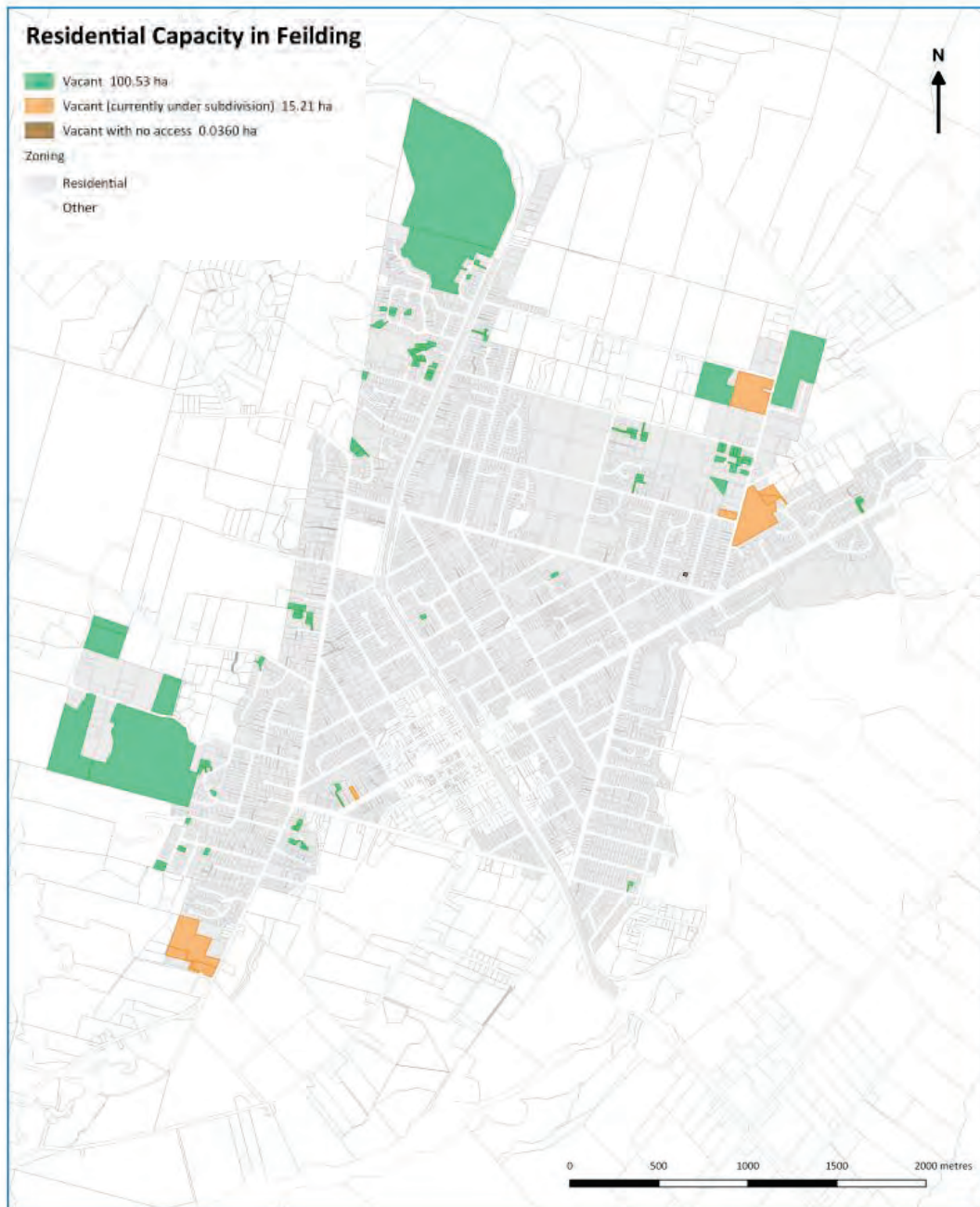
Figure 5 provides a point in time snap shot of existing residential capacity within Feilding's urban area as at 2017.

Currently, Feilding has around 100ha of residentially zoned vacant land and 15ha of vacant land that is currently under subdivision, equating to a total of 115ha of residential capacity. The majority of this is located in Precinct 1 and Precinct 3 (growth areas that were recently rezoned from rural to residential) as is proposed for Precinct 4.

Applying an average rate of 40% of total site to developed residential land area, to account for roading and infrastructure etc., total capacity equates to 69ha of vacant and *developable* land. This translates into almost 700 (690) dwellings and highlights a noteworthy level of residential capacity already exists within Feilding's urban area.

Figure 5 highlights the existing vacant residential capacity within Feilding geospatially for context.

FIGURE 5: FEILDING'S EXISTING RESIDENTIAL CAPACITY



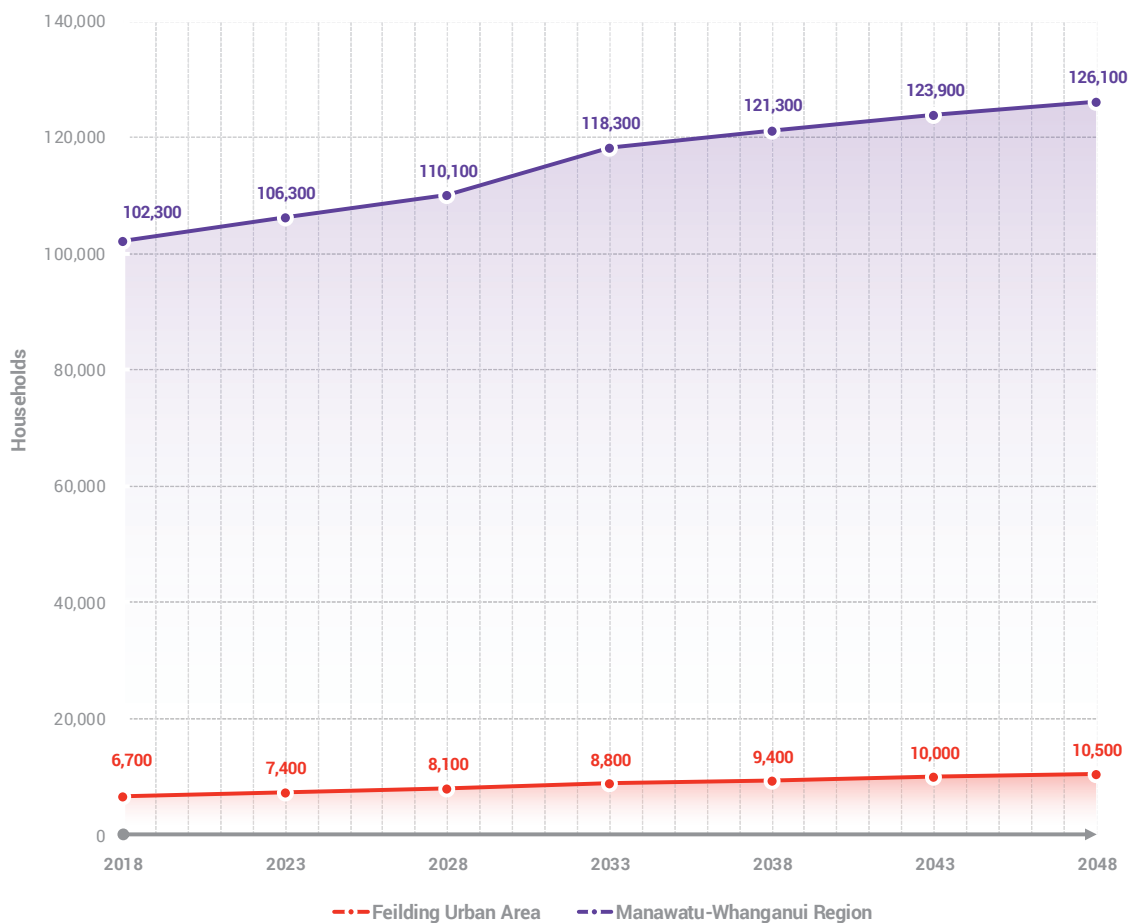
Source: Manawatu District Council

Precinct 4 represents an area of approximately 227ha of residential land, after taking into account roading, infrastructure and open space (approximately 40%) and existing dwellings, around 136ha is available for residential development. Assuming a maximum density of 600sqm, Precinct 4 can accommodate an estimated 1,788 additional dwellings. This takes the total capacity for Feilding urban area to almost 2,500 households, of which just over 70% is located within Precinct 4.

6. RESIDENTIAL DEMAND

To calculate the size of the potential residential market within the Feilding urban area and the wider region, both currently and in the future, it is important to look at projected household growth. Figure 6 shows the household projections for the identified catchments as identified in Figure 2.

FIGURE 6: PRIMARY AND SECONDARY MARKETS - HOUSEHOLD FORECAST (2018-2048)



Source: Property Economics

Figure 6 shows that over the assessed period there is projected growth of an additional 19,000 households by 2038 within the Region, with around 14% of regional growth or 2,700 households, attributable to the Primary Catchment (Feilding Urban Area). Based on these projections Feilding urban area, and assuming Precinct 4 maintains its proportional composition (70%), both Precinct 4 and the wider Feilding urban area are forecast to reach full capacity by 2038. This would indicate Precinct 4 is likely to be an important component in Feilding accommodating future residential growth.

7. PRECINCT 4 RETAIL POTENTIAL

To assess retail demand, Property Economics uses a sustainable footprint approach and forecasts the level of retail sector expenditure that is generated by the identified markets¹. These results provide a benchmark for the level of sales productivity (\$/sqm) that allows retail stores to trade profitably and provide a good quality retail environment as well as forecasting the level of retail expenditure that represents what Feilding commercial centres, and the retail stores within that, could potentially achieve under the high and low growth population scenarios.

Retail expenditure forecasts have been based on the aforementioned growth projections shown in Figures 3 and 4 and has been prepared using the Property Economics Retail Expenditure Model. A more detailed breakdown of the model and its inputs can be seen in Appendix 1.

Note the figures below exclude the retail activities, as categorised under the ANZSIC² classification system, of:

- Accommodation (hotels, motels, backpackers, etc.)
- Vehicle and marine sales & services (petrol stations, car yards, boat shops, caravan sales, and stores such as Repco, Super Cheap Autos, tyre stores, panel beating, auto electrical and mechanical repairs, etc.)
- Hardware, home improvement, building and garden supplies retailing (e.g. Mitre 10, Hammer Hardware, Bunnings, PlaceMakers, ITM, Kings Plant Barn, Palmers Garden Centres, etc.)

The above activities are not considered to represent core retail expenditure, nor fundamental retail centre activities in terms of visibility, location, viability or functionality. The latter two bullet points contain activity types that generally have great difficulty establishing new stores in centres for land economic and site constraint reasons, i.e. the commercial reality is that for most of these activity types it would be unviable to establish new stores in centres given their modern store footprint requirements and untenable to remain located within them for an extended period of time (beyond an initial lease term) in successful centres due to property economic considerations such as rent, operating expenses, land value, site sizes, etc.

Also excluded are trade based activities such as kitchen showrooms, plumbing stores, electrical stores, paint stores, etc. for similar reasons.

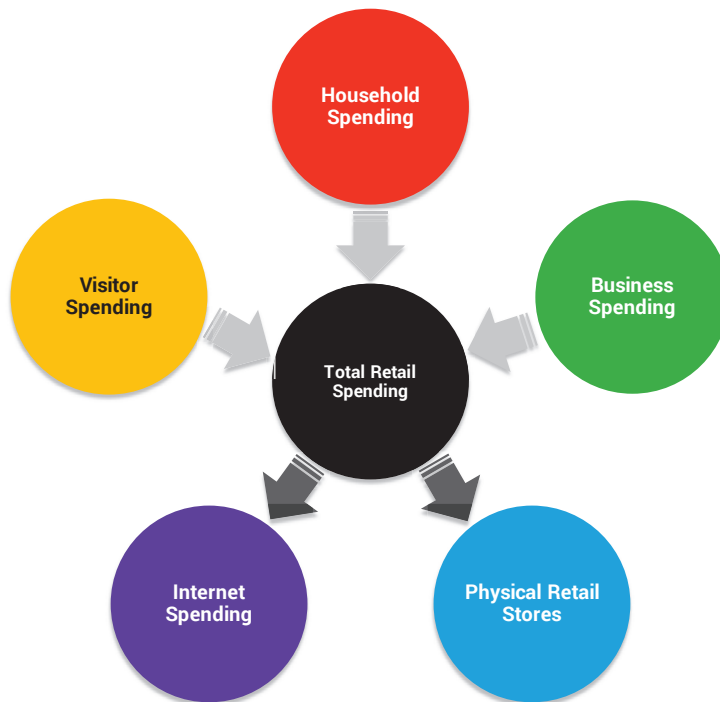
This is not to imply that these activity types are not situated in centres, as in many instances some of these land uses remain operating in centres as an historical overhang. However, moving forward it is increasingly difficult from a retail economic perspective to see these store types

¹ Retail sector expenditure is calculated on an annualised basis in NZ dollars using the 2006 ANZSIC categorisation system.

² Australia New Zealand Standard Industrial Classification

establishing stores in centres (new or redeveloped), albeit they likely have equal planning opportunity to do so.

The following flow chart provides a graphical representation of the Property Economics Retail Expenditure Model to assist MDC in better understanding the methodology, key inputs utilised, and to assist in interpreting outputs.



Growth in real retail spend has also been incorporated at a rate of 1% per annum over the forecast period. The 1% rate is an estimate based on the level of debt retail spending, interest rates and changes in disposable income levels, and is the average inflation adjusted increase in spend per household over the assessed period.

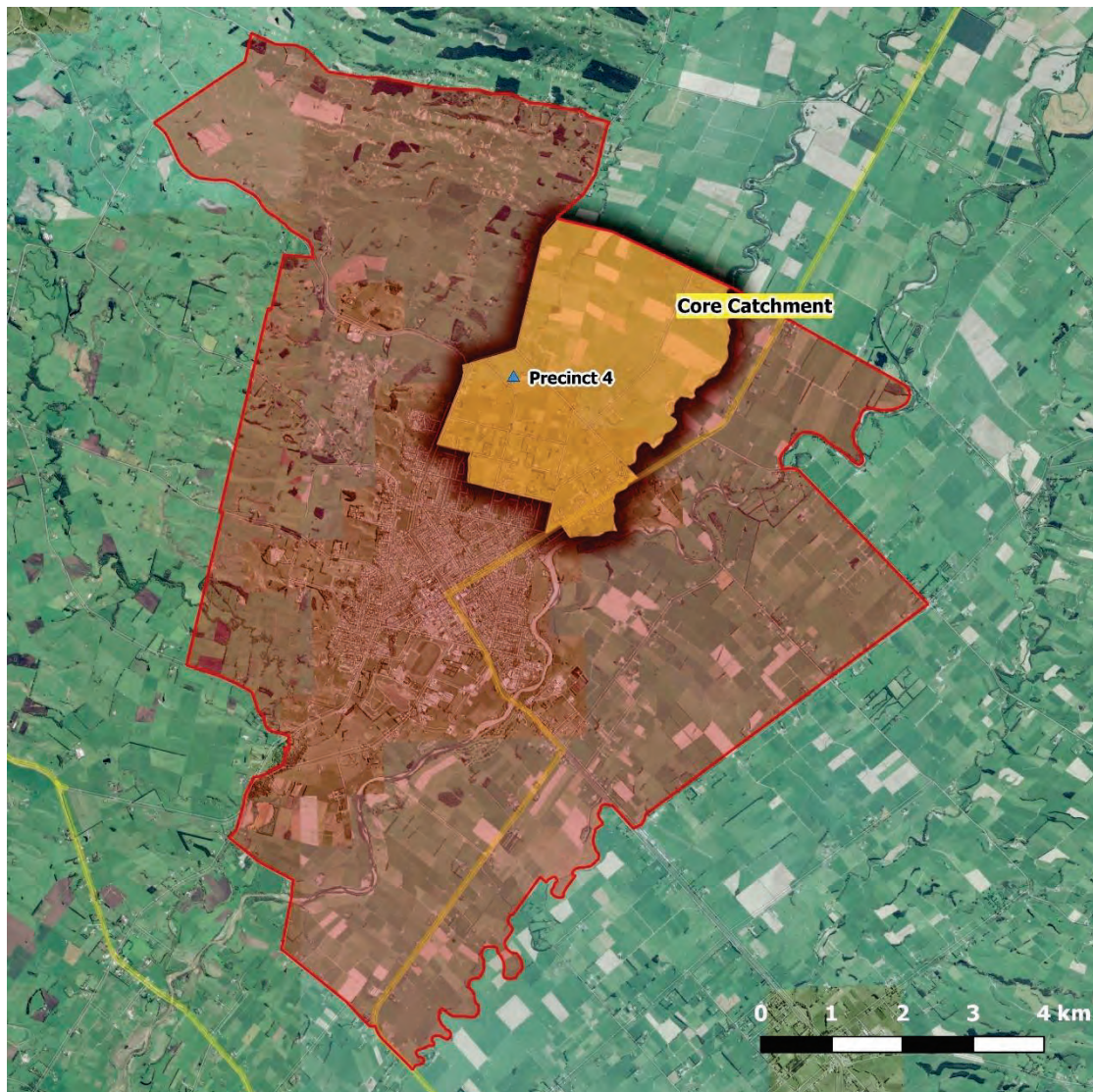
It is important to note that the retail expenditure generated in the identified market does not necessarily equate to the sales of any retail stores within the market. Residents can freely travel in and out of the area, and they will typically choose the centres with their preferred range of stores, products, brands, proximity, accessibility and price points.

A good quality centre will attract customers from beyond its core market, whereas a low quality centre will have retail expenditure leakage out of its core market. Therefore, the retail expenditure generated in an area represents the sales centres or retail stores within that area could potentially achieve.

7.1. CORE RETAIL MARKET

Figure 7 illustrates the indicative core economic market (core localised trade catchment) for Precinct 4. This is the core economic market on which the subsequent retail analysis in this assessment is based.

FIGURE 7: PRECINCT 4 CORE RETAIL CATCHMENT



Source: Property Economics

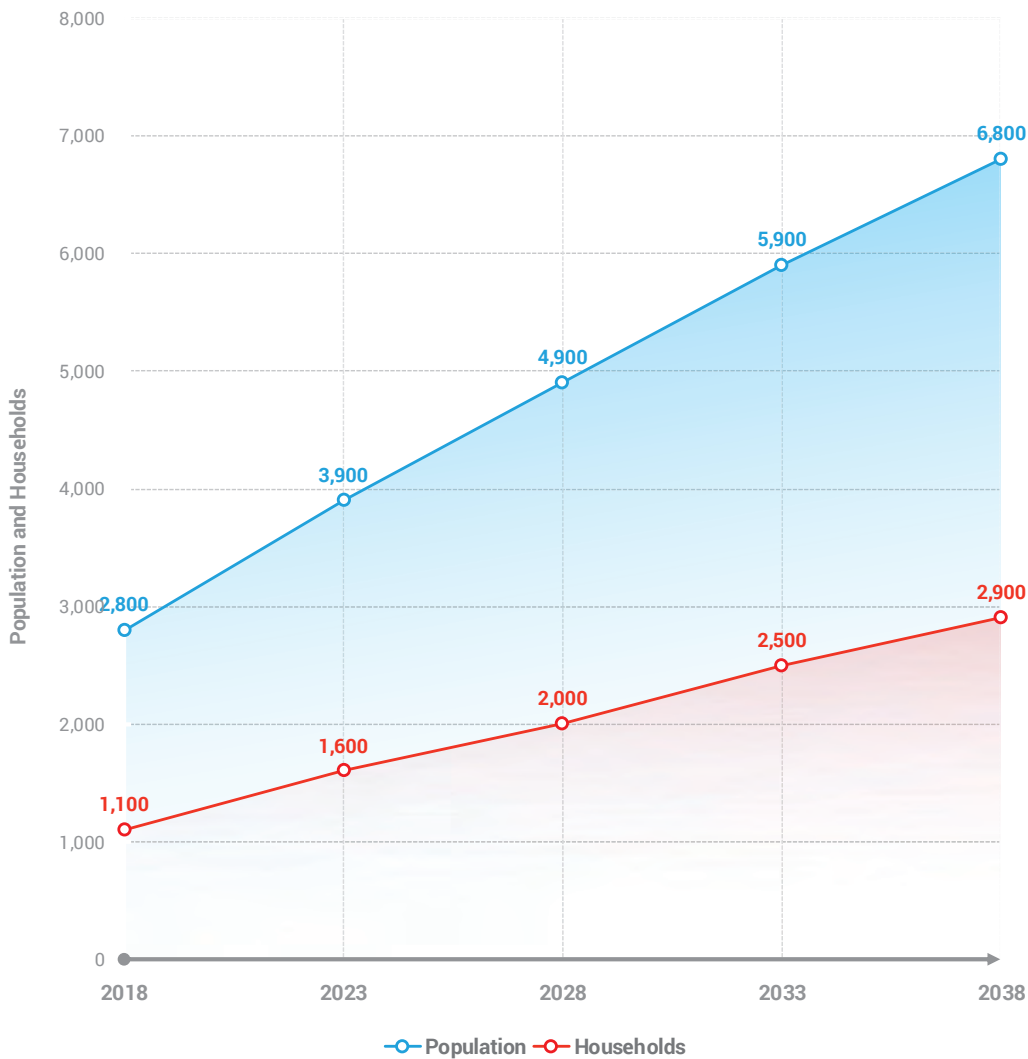
Precinct 4's core retail market is relatively small and localised with a current population base of around 2,800 people and around 1,100 households (rounded)³. Assuming Precinct 4 reaches full

³ Note the core market of Precinct 4, in retail economic terms, extends lightly beyond Precinct 4 boundaries.

capacity by 2038, this is forecast to grow to around 6,800 and 2,900 respectively. Given the limited population base and likely role and function of the area, Property Economics considered it unlikely that any retail offer in Precinct 4 would be able to play a higher order comparison role or has a market large enough to sustain a supermarket. As such, a more appropriate estimation of retail expenditure for the identified market would consist of convenience (excluding supermarket spend) retailing only. Convenience retailing represents a subset of the total retail market considered to be relevant to Precinct 4's retail opportunity.

Figure 8 quantifies the 'at capacity' population and household base of the core retail market as at 2038.

FIGURE 8: CORE PRECINCT 4 'AT CAPACITY' MARKET TO 2038



Source: Property Economics, MDC

7.2. RETAIL EXPENDITURE AND SUSTAINABLE GFA

This section illustrates the total retail expenditure generated in the identified catchment (in 2018 dollars) and the resulting level of sustainable GFA under the assumption that Precinct 4 is 'at capacity' with 1,800 additional households by 2038.

Net floorspace demand has been estimated by applying sustainable retail sales productivity rates to forecast retail expenditure on a sector by sector basis. Sustainable floorspace refers to the level of floorspace proportional to an area's retainable retail expenditure, that is likely to result in appropriate quality and offer in the retail environment. This does not necessarily mean the 'breakeven' point for retailers, but a level of productivity that allows retail stores to trade profitably and provide a good quality retail environment.

It is useful to translate net retail trading into Gross Floor Area (GFA) as net retail trading floorspace excludes the floor area in a retail store used for storage, warehousing, staff room, office, toilets, etc. These uses typically occupy around 25-30% of a store's GFA. It is important to separate out 'back office' floorspace as it does not generate any retail spend and the general public is typically excluded. For the purpose of the analysis in this report, Property Economics have applied a 'back office' ratio of 30%.

Precinct 4's core economic market currently generates around \$16m per annum of total retail expenditure (across all core ANZSIC⁴ retail sectors), with this projected to increase by 180% over the assessed period to an estimated \$45m annually by 2038 above the existing 2018 base year. This scale of growth is considered to represent transformational change in the Precinct 4 area. However, focusing on the more appropriate convenience estimation of retail expenditure (excluding supermarket expenditure) Precinct 4 currently generates \$3m of convenience retail expenditure per annum, this is projected to increase to \$8m by 2038.

Table 2 breaks down the convenience spend generated as a subset of the total localised market for Precinct 4 for the assessed period on an annualised basis.

TABLE 2: RETAIL EXPENDITURE PROJECTIONS WITH PRECINCT 4 'AT CAPACITY' (\$M)

TOTAL RETAIL SPEND	2018	2023	2028	2033	2038
Total	\$16	\$22	\$29	\$36	\$45
Convenience Spend	\$3	\$4	\$5	\$6	\$8

Source: Property Economics

⁴ Australia New Zealand Standard Industrial Classification

The market currently generates enough annualised retail expenditure to sustain almost 300sqm of convenience GFA. This translates to around 2-3 convenience stores and one commercial service outlet. This is essentially the equivalent of a typical corner dairy, takeaways, butcher and real estate agency type centre.

The level of retail convenience sustainable by the core market is forecast to grow over the assessed period with Precinct 4 reaching full capacity by 2038 to a total of almost 1,000sqm GFA if all this spend was internalised. This analysis shows that given the size of the population base, only a small convenience orientated centre would be appropriate for Precinct 4. Given approximately half this convenience spend should be attributed to the Feilding Town Centre, only around 500sqm retail GFA of this is considered appropriate to allocate to the local market.

Convenience centres operate within a specific sector of the retail market and fulfil the role of servicing the localised market for their day to day convenience retailing and commercial service needs. This is significantly different to the roles played by higher order centres such as Feilding Town Centre and supermarket-based neighbourhood centres who offer a more comprehensive retail offer with more specialised store types.

As a localised convenience centre, any development within Precinct 4 would predominately be competing against other convenience activity and essentially allow the localised market to be more efficiently serviced while maintaining the role and function of surrounding centres. Currently within the vicinity of Precinct 4 the local retail activities include a retail strip on North Street / Andrew Street comprised of a Fish and Chips store as well as a 4-Square superette. There is also a BP petrol station located on Pharazyn Street and Makino Dairy.

Table 3 provides sustainable GFA forecasts for the retail convenience retail expenditure generated by the identified core market with Precinct 4 'at capacity' out to 2038.

TABLE 3: SUSTAINABLE GFA WITH PRECINCT 4 'AT CAPACITY' (SQM)

TOTAL GFA (SQM)	2018	2023	2028	2033	2038
Total	2,900	4,100	5,400	6,700	8,200
Convenience Spend	400	500	700	800	1,000

Source: Property Economics

8. RETIREMENT VILLAGE OVERVIEW

Table 4 provides a high-level analysis of changing demographic trends in relation to changes in age population in the Manawatu District in order to assess the potential provision for retirement villages in Precinct 4. The population and household projections in this section of the report have been provided to Property Economics by MDC.

TABLE 4: RETIREMENT VILLAGE DWELLING POTENTIAL MARKET

Aged 65+	2018	2023	2028	2033	2038	Net Growth
Population MDC	4,800	5,800	8,000	9,300	10,400	5,600
Households MDC	3,000	3,700	5,100	5,900	6,600	3,500
Retirement village dwelling demand	360	470	690	860	1,020	660

Source: Property Economics, MDC

The Whanganui-Manawatu District is experiencing a rapidly aging population, with the population base of people aged 65+ forecast to more than double by 2038. This trend is not isolated to the District but is projected to occur across New Zealand.

This acts as a driver for increasing demand for retirement villages but is not the only factor, an increase acceptance of retirement village living and increased product availability and quality of retirement village living options are also large influences.

Currently, the identified market has a population base of 4,800 people aged 65 years and over, this is forecast to grow to 10,350 by 2038. In terms of households, this means that the current potential market within the District for people aged 65 years and older is estimated to be around 3,000 households currently, growing to just over 6,550 households by 2038.

It is important to note that the household figures represented in Table 4 represent all households with people aged 65+ years residing in them. This includes households with extended family's members such as grandparents living within the same household. It is interesting to note however, the average household size for people aged 65+ years is around 1.58 indicating that most people within this age group live in single or couple-based households.

For the purposes of this analysis, the proportion of households with people aged 65+ that move into retirement villages is currently 12%, this is forecast to increase to 15% by 2038. Applying these adoption rates, the retirement village demand within the District is estimated to equate to an additional 660 dwellings.

It is important to keep in mind however, that because adoption rates are also influenced by standard of supply and not purely based on growth in the market, demand has the potential to increase with the provision of high quality retirement villages / lifestyle living villages within the market.

APPENDIX 1: PROPERTY ECONOMICS RETAIL MODEL

This overview outlines the methodology that has been used to estimate retail spend generated at Census Area Unit (CAU) level for the identified catchment out to 2038.

CAU 2013 Boundaries

All analysis has been based on Census Area Unit 2013 boundaries, the most recent available.

Permanent Private Households (PPH) 2013

These are the total Occupied Households as determined by the Census 2013. PPHs are the primary basis of retail spend generation and account for approximately 71% of all retail sales. PPHs have regard for (exclude) the proportion of dwellings that are vacant at any one time in a locality, which can vary significantly, and in this respect account for the movement of some domestic tourists.

International Tourist Spend

The total international tourism retail spend has been derived from the Ministry of Economic Development Tourism Strategy Group (MEDTSG) estimates nationally. This has been distributed regionally on a 'spend per employee' basis, using regional spend estimates prepared by the MEDTSG. Domestic and business based tourism spend is incorporated in the employee and PPH estimates. Employees are the preferred basis for distributing regional spend geo-spatially as tourists tend to gravitate toward areas of commercial activity, however they are very mobile.

Total Tourist Spend Forecast

Growth is conservatively forecast in the model at 3% per annum for the 2015-2038 period.

2013-2038 PPH Average Household Retail Spend

This has been determined by analysing the national relationship between PPH average household income (by income bracket) as determined by the 2013 Census, and the average PPH expenditure of retail goods (by income bracket) as determined by the Household Economic Survey (HES) prepared by Statistics NZ.

While there are variables other than household income that will affect retail spending levels, such as wealth, access to retail, population age, household types and cultural preferences, the effects of these are not able to be assessed given data limitations, and have been excluded from these estimates.

Real Retail Spend Growth (excl. trade based retailing)

Real retail spend growth has been factored in at 1% per annum. This accounts for the increasing wealth of the population and the subsequent increase in retail spend. The following explanation has been provided.

Retail Spend is an important factor in determining the level of retail activity and hence the 'sustainable amount' of retail floorspace for a given catchment. For the purposes of this outline 'retail' is defined by the following categories:

- Food Retailing
- Footwear
- Clothing and Softgoods
- Furniture and Floor coverings
- Appliance Retailing
- Chemist
- Department Stores
- Recreational Goods
- Cafes, Restaurants and Takeaways
- Personal and Household Services
- Other Stores.

These are the retail categories as currently defined by the ANZSIC codes (Australia New Zealand Standard Industry Classification).

Assessing the level and growth of retail spend is fundamental in planning for retail networking and land use within a regional network.

Internet Retail Spend Growth

Internet retailing within New Zealand has seen significant growth over the last few decades. This growth has led to an increasing variety of business structures and retailing methods including; internet auctions, just-in-time retailing, online ordering, virtual stores, and etc.

As some of internet spend is being made to on-the-ground stores, a proportion of internet expenditure is being represented in the Statistics NZ Retail Trade Survey (RTS) while a large majority remain unrecorded. At the same time this expenditure is being recorded under the Household Economic Survey (HES) as a part of household retail spending, making the two datasets incompatible. For this reason, Property Economics has assumed a flat 5% adjustment percentage on HES retail expenditure, representing internet retailing that was never recorded within the RTS.

Additionally, growth of internet retailing for virtual stores, auctions and overseas stores is leading to a decrease in on-the-ground spend and floor space demand. In order to account for this, a non-linear percentage decrease of 2.5% in 2016 growing to 15% by 2038 has been applied to retail expenditure encompassing all retail categories in our retail model. These losses represent the retail diversion from on-the-ground stores to internet based retailing that will no longer contribute to retail floor space demand.

Retail Spend Determinants

Retail Spend for a given area is determined by: the population, number of households, size and composition of households, income levels, available retail offer and real retail growth. Changes in any of these factors can have a significant impact on the available amount of retail spend generated by the area. The coefficient that determines the level of 'retail spend' that eventuates from these factors is the MPC (Marginal Propensity to Consume). This is how much people will spend of their income on retail items. The MPC is influenced by the amount of disposable and discretionary income people are able to access.

Retail Spend Economic Variables

Income levels and household MPC are directly influenced by several macroeconomic variables that will alter the amount of spend. Real retail growth does not rely on the base determinants changing but a change in the financial and economic environment under which these determinants operate. These variables include:

Interest Rates: Changing interest rates has a direct impact upon households' discretionary income as a greater proportion of income is needed to finance debt and typically lowers general domestic business activity. Higher interest rates typically lower real retail growth.

Government Policy (Spending): Both Monetary and Fiscal Policy play a part in domestic retail spending. Fiscal policy, regarding government spending, has played a big part recently with government policy being blamed for inflationary spending. Higher government spending (targeting on consumer goods, direct and indirectly) typically increases the amount of nominal retail spend. Much of this spend does not, however, translate into floors pace since it is inflationary and only serves to drive up prices.

Wealth/Equity/Debt: This in the early-mid 2000s had a dramatic impact on the level of retail spending nationally. The increase in property prices has increased home owners unrealised equity in their properties. This has led to a significant increase in debt funded spending, with residents borrowing against this equity to fund consumable spending. This debt spending is a growth facet of New Zealand retail. In 1960 households saved 14.6% of their income, while households currently spend 14% more than their household income.

Inflation: As discussed above, this factor may increase the amount spent by consumers but typically does not dramatically influence the level of sustainable retail floor space. This is the reason that productivity levels are not adjusted but similarly inflation is factored out of retail spend assessments.

Exchange Rate: Apart from having a general influence over the national balance of payments accounts, the exchange rate directly influences retail spending. A change in the \$NZ influences the price of imports and therefore their quantity and the level of spend.

General consumer confidence: This indicator is important as consumers consider the future and the level of security/finances they will require over the coming year.

Economic/Income growth: Income growth has a similar impact to confidence. Although a large proportion of this growth may not impact upon households MPC (rather just increasing the income determinant) it does impact upon households discretionary spending and therefore likely retail spend.

Mandatory Expenses: The cost of goods and services that are necessary has an impact on the level of discretionary income that is available from a household's disposal income. Important factors include housing costs and oil prices. As these increase the level of household discretionary income drops reducing the likely real retail growth rate.

Current and Future Conditions

Retail spend has experienced a significant real increase in the early-mid 2000s. This was due in large part to the increasing housing market. Although retail growth is tempered or crowded out in some part by the increased cost of housing it showed massive gains as home owners, prematurely, access their potential equity gains. This resulted in strong growth in debt / equity spending as residents borrow against capital gains to fund retail spending on consumption goods. A seemingly strong economy also influenced these recent spending trends, with decreased employment and greater job security producing an environment where households were more willing to accept debt.

Over recent years this reversed when the worldwide GFC recession took hold. As such, the economic environment has undergone rapid transformation. The national market is currently experiencing low interest rates (although expected to increase over this coming year) and a highly inflated \$NZ (increasing importing however disproportionately). Recently emerging is a rebound in the property market and an increase in general business confidence as the economy recovers from the post-GFC hangover. These factors will continue to influence retail spending throughout the next 5 or so years. Given the previous years (pre-2008) substantial growth and high levels of debt repayment likely to be experienced by New Zealand households it is expected that real retail growth rates will continue to be subdued for the short term.

Impacts of Changing Retail Spend

At this point in time a 1% real retail growth rate is being applied by Property Economics over the longer term 20-year period. This rate is highly volatile however and is likely to be in the order of 0.5% to 1% over the next 5 – 10 years rising to 1% - 2% over the more medium term as the economy stabilises and experiences cyclical growth. This would mean that it would be prudent in the shorter term to be conservative with regard to the level of sustainable retail floor space within given centres.

Business Spend 2013

This is the total retail spend generated by businesses. This has been determined by subtracting PPH retail spend and Tourist retail spend from the Total Retail Sales as determined by the Retail Trade Survey (RTS) which is prepared by Statistics NZ. All categories are included with the exception of accommodation and automotive related spend. In total, Business Spend accounts for 26% of all retail sales in NZ. Business spend is distributed based on the location of employees in each Census Area Unit and the national average retail spend per employee.

Business Spend Forecast 2013-2038

Business spend has been forecasted at the same rate of growth estimated to be achieved by PPH retail sales in the absence reliable information on business retail spend trends. It is noted that while working age population may be decreasing as a proportion of total population, employees are likely to become more productive over time and therefore offset the relative decrease in the size of the total workforce.



Feilding Growth Precinct 4 Traffic Impact Assessment

May 2018



Contact Details

WSP Opus
Palmerston North Office
L4, The Square Centre
478 Main Street
PO Box 1472, PN Central
Palmerston North 4440
New Zealand

Telephone: +64 6 350 2500
Mobile:

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Prepared by:



Matthew Evis | Senior Transport Planner
Matthew Gatenby | Principal Transport Engineer

Reviewed by:



Kristoffer Hansson | Auckland Transport Planning
Team Leader

Approved for Release by:



Rochelle MacDonald | Civil Team Leader

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Executive Summary

Introduction

WSP-Opus have been commissioned by Manawatu District Council (MDC) to develop a traffic impact assessment (TIA) in relation to the proposed Growth Precinct 4 of the Urban Growth Plan Change. The TIA will be used to support the Plan Change and Section 32 report at time of public notification.

The purpose of the traffic impact assessment is to assess the transportation effects of the proposed re-zoning and future residential development of Growth Precinct 4 (with reference to the conceptual roading network) on the efficient and effective operation of the surrounding road network.

Study Area

The Traffic Impact Assessment focuses on the effects of additional traffic generation from Growth Precinct 4 on the arterial road network located within the immediate vicinity of the development, focusing on the following sites:

- Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street;
- Site 2: North Street / Churcher Street; and
- Site 3: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street.

The assessment has given consideration to and evaluates the effects of increases in through traffic and trip generation arising from the rezoning change from rural to residential and recreational.

Growth Precinct 4

The proposed Growth Precinct 4 is located on an area of greenfield land (approximately 256ha) to the north of Feilding urban area. The proposed masterplan developed for the Growth Precinct 4 site indicates approximately 227ha of residential and 29ha of recreational land would be available for development, and is expected to yield approximately 1,800 residential households upon completion.

The primary accesses onto the arterial road network from the Growth Precinct 4 site upon full development will be via Makino Road, Churcher Street and Pharazyn Street. There are currently limited east-west connections over the Makino Stream within the existing network layout and a new bridge structure is not expected to be provided until mid-2030, therefore Churcher Street and Pharazyn Street will operate as the primary arterial connections within the initial stages of development.

Existing Peak Periods

Traffic turning count surveys were undertaken by TEAM Traffic on the 22nd February 2018. Traffic turning count surveys were undertaken during both the AM peak period (06:30-09:30hrs) and the PM peak period (15:00-18:00hrs). Based on the findings of the traffic surveys, the following peak hours were determined:

- **AM Peak hour** – 08:00-09:00hrs; and
- **PM Peak hour** – 16:45-17:45hrs

As the proposed development primarily comprises of residential development, it is expected that peak hour traffic will correspond with wider network peak periods. As such, the peak periods identified through traffic counts have been used as a basis for determining the effects of future growth on network performance.

Development Staging

Development forecasts provided by MDC indicate that the Growth Precinct 4 area could be fully occupied by 2038. Assuming linear growth in development occurs over the next 20 years, the following scenarios were tested within the future forecast traffic models:

- **Scenario 1: 2023** – 25% developed (450 Households);
- **Scenario 2: 2028** – 50% developed (900 households);
- **Scenario 3: 2033** – 75% developed (1,350 households); and
- **Scenario 4: 2038** – 100% developed (1,800 households).

Background Traffic Growth

Average Daily Traffic (ADT) count data has been extracted from RAMM by Manawatu District Council (MDC) on local road network and State Highway traffic count data (2012-2016) to determine background annual traffic growth rates on roads within the study area. Based on the findings of the background traffic growth, the following linear traffic growth rates have been assumed:

- *Major Arterial Roads* – 2% Annual Growth;
- *Arterial / Collector Roads* – 1% Annual Growth; and
- *Residential Roads* – 0% Annual Growth (all growth based on future development).

Trip Generation and Distribution

Trip generation rates for the proposed residential growth area have been determined from industry standard data sources. Upon completion of the full development, the site has a trip generation potential of **1,800** vehicle trips during each peak hour and **18,000** all day vehicle trips (during a typical weekday). Trip generation rates for each stage of the development are summarised within **Table 0-1**.

Table 0-1: Trip Generation Rates per Development Stage

STAGE	AM PEAK			PM PEAK			ALL DAY		
	Total	In	Out	Total	In	Out	Total	In	Out
Stage 1 (2023)	450	112	338	450	284	166	4,500	2,250	2,250
Stage 2 (2028)	900	225	675	900	567	333	9,000	4,500	4,500
Stage 3 (2033)	1,350	338	1,012	1,350	850	500	13,500	6,750	6,750
Stage 4 (2038)	1,800	450	1,350	1,800	1,134	666	18,000	9,000	9,000

Trip distribution across the road network was determined from the 2013 census data to determine likely trip origins for movements into the site, and destinations for trips travelling out from the site during peak periods. Trip generation rates for each of the development stages were then allocated to each of the accesses.

It should be noted that bridging connections across the Makino Stream will be provided for vehicle traffic as part of Stage 3 network development¹, permitting traffic generated by the site to access Makino Road. In the interim, the modelling and distribution assumptions assume that Churcher Street and Pharazyn Street will operate as the primary north-south collector routes from the development.

Assessment of Effects

The results of the modelling assessment indicates that:

- **Site 1 – North St / Lethbridge St / Makino Rd / Chamberlain St / Denbigh St**

The intersection will generally perform within acceptable levels of delay during the first two stages of the development, although some growing deficiencies will be experienced on Lethbridge Street (South) during the PM peak period during Stage 2 of the development. However, it is noted that the availability of alternative north-south routes (Chamberlain Street or West Street) may permit redistribution of these movements to avoid excessive queueing or delay. During Stage 3 of the development numerous approaches are expected to operate at a Level of Service (LoS) F, and are likely to warrant intersection upgrades.

- **Site 2 – North St / Churcher St**

The intersection will perform within acceptable levels of delay and congestion until the latter part of the Stage 2 development, when excessive queues and delay on Churcher Street during the AM peak hour may warrant mitigation measures to be in place by 2028. Under its existing layout, the intersection will operate within acceptable levels of delay and congestion during the PM peak hour following full development of the site.

- **Site 3 – Kimbolton Rd (SH54) / North St / Pharazyn St / Seddon St**

The North Street approach to the Kimbolton Road (SH54) intersection is significantly affected by the addition of development traffic (largely to and from Pharazyn Street) at the intersection, with mitigation required at an early stage (unless significant traffic re-assignment onto alternative routes through local streets is

¹ Based on route network staging plans provided by Brent Holmes at project initiation meeting.

experienced). The Pharazyn Street approach is expected to operate within acceptable levels of delay until Stage 4 of the of the development.

Table 0-2 below provides a summary of key findings of the intersection analysis at the three sites.

Table 0-2: Summary of Intersection Performance

SITE	PERFORMANCE				COMMENT
	2023	2028	2033	2038	
SITE 1 – NORTH ST / LETHBRIDGE ST / MAKINO RD / CHAMBERLAIN ST / DENBIGH ST					Significant delay (Level of Service F) experienced by vehicles exiting both Lethbridge Street approaches from the full development of Stage 2
SITE 2 – NORTH ST / CHURCHER ST					Intersection exceeds capacity in the AM peak period towards the second half of the Stage 2 development
SITE 3 – KIMBOLTON RD (SH54) / NORTH ST / PHARAZYN ST / SEDDON ST					Significant delay (Level of Service F) experienced by vehicles exiting North Street during Stage 1 development. Pharazyn Street approach performance deteriorates by Stage 4 (2038).

Wider Observations

In addition to the traffic modelling assessment, the following observations have been made:

- The proposed structure plan indicates that a new east-west link across the Makino Stream will be provided within Stage 3 of the development. Accelerating the provision of a new east-west link may relieve anticipated capacity issues on the Churcher Street / North Street intersection within Stage 2; however, redistribution of traffic onto Makino Road may accelerate the need for improvements at the North Street / Makino Road intersection.
- The traffic assignment and distribution assumptions used within the assessment are based on current trip patterns and likely routes for development which are allocated as fixed routes through the network. Due to congestion forecast at the three sites within the analysis above, a number of alternative routes could become more attractive.
- Changing traffic volumes/patterns on the local road network may require modifications to the existing local road network (i.e. provision of turning bays) as well as a review of the existing form of other intersections on Kimbolton Road (SH54) to ensure the continued safe and efficient operation of the network.
- The trip assignment indicates that peak hour traffic volumes on Kimbolton Road (SH54) south of Pharazyn Street would roughly double from current (2018) traffic volumes upon completion of Stage 4 of the development (by 2038). Changes in traffic patterns and increases in volumes of this scale are also likely to result in other intersections within the network experiencing a deterioration in performance, particularly on approaches to the town centre.

Next Steps

Based on the findings of the transport assessment, it is recommended that MDC:

- Undertake annual traffic monitoring on the arterial road network and key interconnecting routes to establish the level of growth from Growth Precinct 4;
- Considers accelerating the development of an east-west roading link across the Makino Street from its current staging proposal (Stage 3) to be delivered prior to the completion of the Stage 2 development stage (i.e. 900 households);
- Undertakes an option assessment of North Street / Lethbridge Street / Makino Road / Denbigh Street / Chamberlain Road and Churcher Street / North Street intersections to identify preferred mitigation options; and
- Discuss the findings of the modelling assessment with relevant funding and investment partners within NZTA to identify and confirm preferred options for upgrading the Pharazyn Street / North Street / Kimbolton Road (SH54) intersection. Given growing midblock traffic volumes and increased access demands from

local roads onto Kimbolton Road (SH54), consideration should be given undertaking a holistic review of network performance of the corridor between North Street and Aorangi Road.

1 Introduction

WSP-Opus has been commissioned by Manawatu District Council (MDC) to develop a traffic impact assessment (TIA) in relation to the proposed Growth Precinct 4 of the Urban Growth Plan Change. The TIA will be used to support the Plan Change and Section 32 report at time of public notification.

The purpose of the traffic impact assessment is to assess the transportation effects of the proposed re-zoning and future residential development of Growth Precinct 4 (with reference to the conceptual road network) on the efficient and effective operation of the surrounding road network. The assessment has given consideration to and evaluates the effects of increases in through traffic and trip generation arising from the rezoning change from rural to a mixed land use of residential and recreational.

1.1 Project Context

The Growth Precinct 4 was originally identified as a residential growth area within the Feilding Urban Growth Framework Plan (developed in 2013). The proposed Growth Precinct 4 is located on an area of greenfield land (approximately 256ha) to the north of main Feilding urban area, and currently comprises rural land-use, pockets of rural lifestyle blocks and environmental features including the Makino Stream (see **Figure 1-1**).

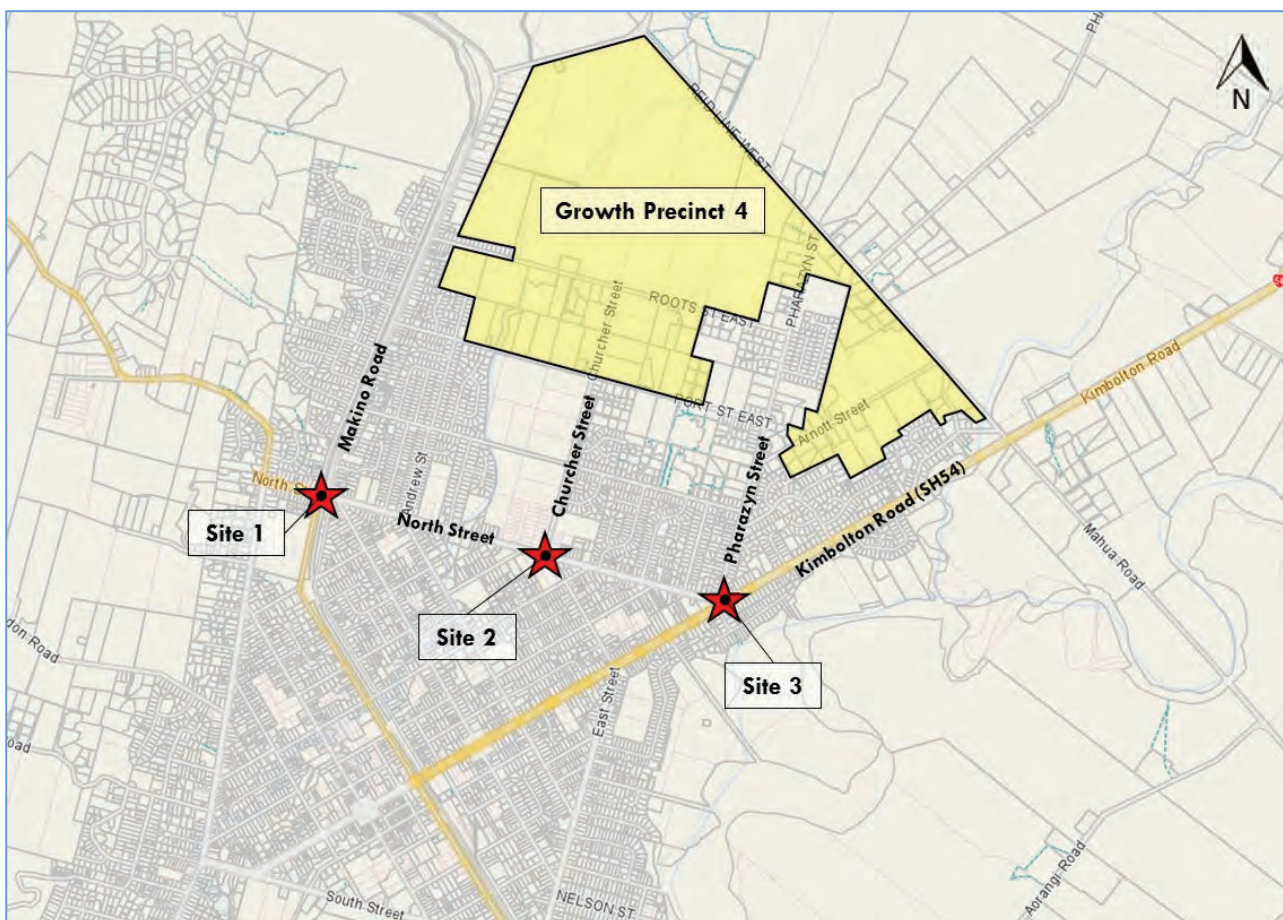


Figure 1-1: Key Sites Considered within the Traffic Impact Assessment

The proposed Growth Precinct 4 site is bounded by Port Street East, Pharazyn Street, Reid Line and Makino Road. The proposed masterplan developed for the Growth Precinct 4 site indicates approximately 227 ha of residential and 29 ha of recreational land. The proposed Growth Precinct 4 is expected to yield 1,800 residential households by 2038 (20 years).

Although an indicative masterplan has been developed to provide an understanding of potential site yield and intended transport network, no assessment of the network effects of the proposed Growth Precinct 4 site has been undertaken. This TIA has been developed to provide an understanding of the trip generation potential resulting from various stages of the proposed development to determine the extent of potential network deficiencies under future road network conditions and identifies thresholds for which future mitigation (i.e. intersection improvements) may be required.

1.2 Project Purpose

The TIA focuses on the effects of additional traffic generation from Growth Precinct 4 on the main arterial connections and associated intersections located within the immediate vicinity of the development.

In particular, the assessment has focused on the following sites:

- Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street;
- Site 2: North Street / Churcher Street; and
- Site 3: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street.

The purpose of this report is to provide an overall understanding of the effects of the development potential on network performance under existing conditions to provide advice on roading network staging, as well as provide evidence of potential problems to support any future funding applications by MDC.

It should be noted that the project scope does not include the identification and testing of potential network mitigation measures.

1.3 Project Objectives

The objectives of the project area to:

- Confirm existing network conditions, including traffic volumes, commuter travel patterns and crash history within the study area;
- Identify the trip generation potential and resulting forecast traffic growth from each stage of the proposed Growth Precinct 4 development over the next 20 years (i.e. by 2038); and
- Use appropriate traffic modelling tools to assess the performance and lifespan of the current transportation infrastructure and identify if/when potential network deficiencies are likely to occur within the network.

1.4 Data Collected

This TIA has been developed using the following information sources:

- **Manawatu District Council RAMM Database**

The RAMM database provides Annual Daily Traffic (ADT) and heavy vehicle figures for the local road network within the Feilding urban area (i.e. non State Highway roads). This has been used to estimate current traffic volumes and estimate historical traffic growth rates on the road network.

- **New Zealand Transport Agency's State Highway Traffic Volumes (2012-2016)**

NZTA's traffic data collection system used to establish Average Annual Daily Traffic (AADT) volumes, traffic composition and growth rates on Kimbolton Road (SH54). This has been used to estimate historical growth rates on the state highway network within the study area.

- **Traffic Turning Count Surveys**

Traffic turning counts at key sites of interest within the study area were undertaken on Thursday 22nd February 2018. The data was used to identify peak hour traffic volumes for use in developing base models and forecasting traffic turning volumes following future development stages.

- **Trip Generation Rates**

Expected trip generation rates for residential dwellings were determined using industry recognised sources including the NZ Trips and Parking Database, the US Institute of Transport Engineers (ITE) Trip Generation Handbook and NZTA's Research Report 453 (Trips and Parking Related to Land Use).

- **Statistics NZ - Census Data²**

The Statistic NZ commuter platform was analysed to provide an indication of existing trip origins and destinations with the study area to inform trip distribution and assignment assumptions.

² <http://archive.stats.govt.nz/datavisualisation/commuterview/index.html?url=/datavisualisation/commuterview/index.html>

- **New Zealand Transport Agency's Crash Analysis System (CAS)**

Crash statistics at key locations of interest within the network were obtained from the Transport Agency's Crash Analysis System database (CAS).

1.5 Report Structure

This remainder of the report has been structured as follows:

- **Section 2** – Provides a summary of the existing road network and local transportation conditions, including traffic volumes, intersection layouts and local crash history;
- **Section 3** – Provides an outline of existing traffic patterns at the key sites of interest, including traffic turning count data, peak period identification and assessment of background traffic growth rates;
- **Section 4** – Provides an outline of the anticipated Growth Precinct 4 development staging and associated trip generation rates, including assumed trip distribution across the transport network;
- **Section 5** – Provides an outline of the findings of the traffic modelling process, including traffic modelling assumptions, assumed performance criteria, and intersection operational performance under existing and future network conditions; and
- **Section 6** – Provides a summary of the key study findings, and presents an outline of the recommended next steps for delivering infrastructure improvements within Feilding.

2 Existing Conditions

This section of the report provides a description of the existing site and local transport network operations, as well as a description of the existing road network, intersection arrangements and road safety record within the sites of interest.

2.1 Road Network

2.1.1 Road Network Description

The existing road hierarchy within the vicinity of the study area is shown within **Figure 2-1**. A brief description of MDC’s road network classification is outlined within **Table 2-1**.



Figure 2-1: Road Hierarchy in Feilding Road Hierarchy (Excerpt of MDC District Plan Appendix 2B)

Table 2-1: Manawatu District Council Road Hierarchy Description (Excerpt from MDC District Plan)

CATEGORY	DESCRIPTION
MAJOR ARTERIAL ROADS	<ul style="list-style-type: none"> Major Arterial Roads are of strategic importance to the Region. They provide interconnections between areas within the District and distribute traffic from major intercity links. Access is generally at grade but may be limited. Urban traffic volumes are typically greater than 20,000 vehicles per day. Typical urban operating speeds are 50 to 70 km/h.
MINOR ARTERIAL ROADS	<ul style="list-style-type: none"> Minor Arterial Roads provide access between Collector and Major Arterial Roads. These roads have a dominant through vehicular movement and carry the major public transport routes. Access to property may be restricted and rear servicing facilities may be required. Urban traffic volumes are typically 8,000 to 20,000 vehicles per day. Typical urban operating speeds are 40 to 60km/h.
COLLECTOR ROADS	<ul style="list-style-type: none"> Collector Roads provide circulation in local areas and links to arterial roads, while balancing these needs with pedestrian and local amenity values. These roads provide access for all modes of transport including public transport. Typical traffic flows are between 3,000 and 10,000 vehicles per day.
LOCAL ROADS	<ul style="list-style-type: none"> Local Roads provide access and connectivity within a local area. Local Roads in urban areas typically carry up to 3,000 vehicles per day, have low vehicle speeds, have two lanes and provide for on-street parking, property access and pedestrian needs.

A summary of the road network characteristics within the vicinity of the study area is summarised within **Table 2-2**. The existing layout and operation of the road network surrounding the site generally reflects its form and function as identified within the MDC District Plan road hierarchy.

Table 2-2: Road Network Description within Study Area (MDC Count Data and NZTA Counts)

ROAD NAME	HIERARCHY	LANES	AADT (% HV)	SPEED LIMIT
SH54 Kimbolton Road (north of North St)	Major Arterial	2	5,400 (4%)	50km/hr ³
SH54 Kimbolton Road (south of North St)	Major Arterial	2	7,100 (3.7%)	50km/hr
North Street (west of Lethbridge Rd)	Major Arterial	2	4,300 (7%)	50km/hr
North Street (east of Lethbridge Rd)	Minor Arterial	2	2,900-3,900 (4%)	50km/hr
Lethbridge Road (south of North St)	Major Arterial	2	4,500 (6%)	50km/hr
Lethbridge Road (north of North St)	Collector Road	2	3,100 (3%)	50km/hr
Makino Road	Collector Road	2	2,600 (2%)	50km/hr
Chamberlain Street	Local Road	2	2,150 (4%)	50km/hr
Denbigh Street	Collector Road	2	990 (6%) ⁴	50km/hr
Churcher Road	Collector Road	2	1,800 (7%)	50km/hr
Pharazyn Street	Collector Road	2	2,050 (6%)	50km/hr
Seddon Street	Local Road	2	630 (6%) ⁵	50km/hr

2.1.2 Site Description

Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street Intersection

The study site is formed of three closely spaced intersections on the western extent of North Street. The intersection layouts are shown within **Figure 2-2**.



Figure 2-2: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street Intersection Layout (MDC IntraMaps)

North Street travels east-west through the site and forms the major approach arm through all intersections. Makino Road, Chamberlain Road and Lethbridge Street follow the alignment of the North Island Main Trunk

³ Transitions to 70 km/hr approximately 200m north of the Pharazyn Street intersection approach.

⁴ ADT and heavy vehicle estimates provided by mobileroad.org

⁵ ADT and heavy vehicle estimates provided by mobileroad.org

(NIMT) railway line and travel north-south through the site. North Street forms an at-grade level crossing with the NIMT railway line and is supported by half-arm barriers plus flashing lights and bells.

Two four-arm priority controlled intersections (North Street/Lethbridge Street to the west and North Street/Makino Street/Chamberlain Street to the east) are located either side of the railway line, separated by a distance of approximately 50m. The Denbigh Street intersection forms a priority controlled intersection with North Street, and is located approximately 30m east of the Makino Street/Chamberlain Street approach.

The Makino Street, Chamberlain Street and Denbigh Street intersection approaches are give-way priority controlled, whilst both Lethbridge Street approaches are stop priority controlled.

Pedestrian zebra crossings are provided on the Makino Road and Lethbridge Street (northern approach). Pedestrian footpaths are provided on the southern side of North Street, with drop-kerbs provided on the Chamberlain Street, Denbigh Street and Lethbridge Street (southern approach).

The site is mainly bounded by residential development, with the Makino Dairy located immediately north of the Denbigh Street approach. On-street parking is provided to support access to the dairy. A bus stop is also located adjacent to Denbigh Street, servicing the Palmerston North to Feilding bus service.

Site 2: North Street / Churcher Street Intersection

The North Street / Churcher Street intersection layout is shown within **Figure 2-3**.



Figure 2-3: North Street / Churcher Street Intersection Layout (MDC IntraMaps)

The North Street / Churcher Street intersection is formed of a three-arm priority controlled intersection. The Churcher Street approach forms the minor approach arm and provides access to residential development to the north, and access to the eastern side of the Feilding High School Campus.

A right-turn bay is provided within the flush median on North Street to support turning movements into Churcher Street. On-street parking is provided within the vicinity of the intersection to support pick-up/drop-off activities associated with the High School. Pedestrian footpaths are provided along both sides of North Street and Churcher Street although no formal pedestrian crossing points are provided.

Site 3: Kimbolton Road (SH54) / North Street / Pharazyn Street / Seddon Street

The Kimbolton Road (SH54) / North Street / Pharazyn Street / Seddon Street intersection layout is shown within **Figure 2-4**.



Figure 2-4: North Street / Pharazyn Street/Kimbolton Road/Seddon Street Intersection Layout (MDC IntraMaps)

The intersection is formed of a five-arm priority controlled intersection, with the Kimbolton Road (SH54) eastern and western approaches forming the major approach arms. Dedicated right-turning bays are provided from Kimbolton Road (SH54) onto Pharazyn Street and Seddon Street. A raised planted flush median is provided on Kimbolton Road (SH54) to the west of the intersection. A zebra controlled pedestrian crossing is located on the Kimbolton Road (SH54) western approach, utilising the raised median as a refuge.

On the northern intersection approach arm, North Street merges with Pharazyn Street to form a stop controlled priority intersection approximately 20m north of Kimbolton Road (SH54). The Pharazyn Street approach then forms a give-way priority controlled intersection with Kimbolton Road.

The Seddon Street (southern) approach forms a priority controlled intersection with Kimbolton Road (SH54), and is off-set approximately 30m west of the Pharazyn Street (northern) approach. Seddon Street is a residential cul-de-sac servicing approximately 50 households.

The existing intersection is bounded by a petrol station (BP) to the northern-east, a Presbyterian Church to the north-west and a takeaway store to the south-east. Formal on-street parking is provided on North Street and Kimbolton Road (SH54) to support access to these facilities. Access to the BP garage is provided from Pharazyn Street and Kimbolton Road (SH54).

2.2 Crash History

A review of the New Zealand Transport Agency Crash Analysis System (CAS) database has been undertaken to identify all reported crashes on North Street and associated intersecting routes within the study area during a ten-year period from 2008 to 2017, as well as to extract any available data from 2018. Crash records extracted from the CAS database are provided within **Appendix A**.

The analysis indicates that a total of 70 crashes have occurred on North Street over the past 10 years. The location of all crashes on North Street within the study area is shown on **Figure 2-5**, with a statistical summary of all crashes provided within **Table 2-3**.

Analysis of the data indicates:

- Of the 70 recorded crashes, 19 resulted in injury and 51 were recorded as non-injury crashes. Of the 19 injury crashes, 2 resulted in serious injury and 17 resulted in minor injury. Between 2013-2017, the corridor has had an annual average recorded crash rate of 6.8 crashes per year.
- 81% of all crashes recorded on the corridor were recorded at intersections. The main crash types recorded on the corridor were crossing/turning makeovers (53%) and rear end/obstruction crashes (24%). The main crash factors were poor observation (60%) and failure to give-way/stop for oncoming traffic (50%). Crashes of this nature are typical of vehicles performing manoeuvres at intersections.
- A total of three recorded crashes involved vehicle collisions with pedestrians. All pedestrian crashes were the result of pedestrians crossing heedless of traffic. Two of the crashes involved children.
- A total of six crashes on the corridor involved vehicles colliding with cyclists. Four of the crashes involved vehicles colliding with cyclists whilst performing turning manoeuvres. In total, 21% of all injury crashes recorded on the corridor involved cyclists.

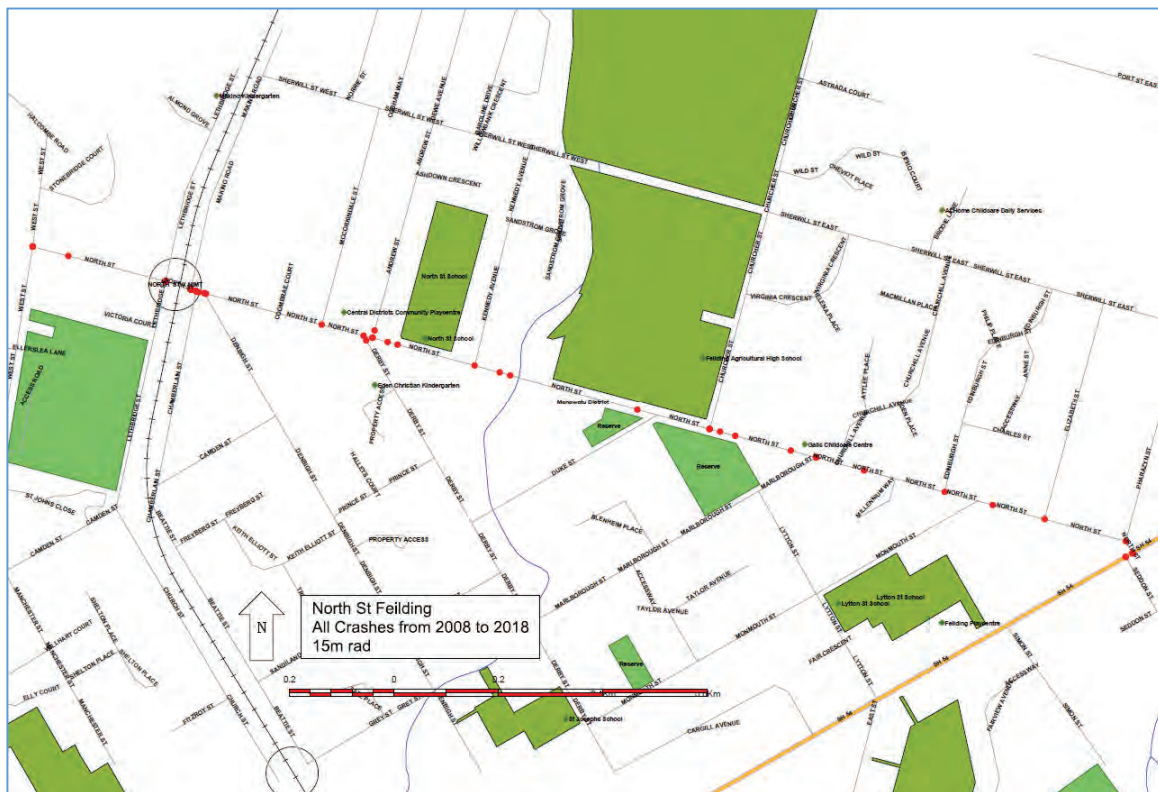


Figure 2-5: Location of Recorded Crashes on North Street, Feilding (2008-2018)

Table 2-3: Crash Analysis Summary – North Street Corridor

YEAR	FATAL	SERIOUS	MINOR	NON INJURY	TOTAL	5 YEAR AVE
2008	0	0	1	6	7	-
2009	0	1	1	8	10	-
2010	0	0	4	5	9	-
2011	0	0	1	2	3	-
2012	0	0	2	5	7	7.2
2013	0	0	2	5	7	7.2
2014	0	1	1	1	3	5.8
2015	0	0	0	10	10	6
2016	0	0	1	7	8	7
2017	0	0	4	2	6	6.8
Total	0	2	17	51	70	-

Table 2-4 provides a summary of recorded crashes at key sites of interest relevant to the traffic impact assessment.

Table 2-4: Crash Analysis Summary – Specific Sites

SITE	OBSERVATIONS
SITE 1: NORTH STREET / LETHBRIDGE STREET / MAKINO ROAD / CHAMBERLAIN STREET / DENBIGH STREET	<ul style="list-style-type: none"> • A total of 31 crashes have been recorded at the intersection since 2008, resulting in one serious injury crash and eight minor injuries. This equates to 44% of recorded crashes on the North Street corridor focused at this intersection. • In total, 58% of recorded crashes at the intersection have occurred since 2013. Over the past five years, the five-year crash average has been 3.6 crashes per year. • The primary crash types were vehicles performing crossing/turning manoeuvres (81%) and rear-end/obstructions (13%). • The primary crash factors were failure to give-way/stop (77%) and poor observation (71%). • Two of the recorded crashes involved cyclists. Both crashes involved cyclists colliding with vehicles performing turning manoeuvres. No recorded crashes have involved pedestrians at this intersection.
SITE 2: NORTH STREET / CHURCHER STREET	<ul style="list-style-type: none"> • A total of 6 crashes have been recorded at the intersection since 2008, resulting in one minor injury. • In total, 58% of recorded crashes at the intersection have occurred since 2013. Over the past five years, the five-year crash average has been 0.4 crashes per year. • The primary crash types were loss of control or head on collisions (50%). • The primary crash factors were poor observation, poor judgement and travelling too fast. Driving under the influence of alcohol was suspected in two of the crashes. • One recorded crash have involved a pedestrian (aged 7) crossing the road from behind a vehicle into incoming traffic, resulting in minor injury.
SITE 3: KIMBOLTON RD (SH54) / NORTH STREET / PHARAZYN STREET / SEDDON STREET	<ul style="list-style-type: none"> • A total of 11 crashes have been recorded at the intersection since 2008, resulting in 3 minor injury crashes. • Two of the recorded crashes have occurred in the last five years (since 2013), both of which resulted in no injuries. Over the past five years, the five-year crash average has been 0.4 crashes per year. • The primary crash types were vehicles performing crossing/turning manoeuvres (45%), loss of control on bends (27%) and rear end/obstructions (18%). • The primary crash factors were poor observation (45%), failure to give-way/stop (36%), travelling with excessive speed (36%) and under the influence of alcohol (36%). • Four of the crashes were focused at the Seddon Street / Kimbolton Road intersection, with a further three focused on the Pharazyn Street / Kimbolton Road intersection. • None of the crashes recorded at the intersection involved pedestrians or cyclists.

3 Existing Traffic Patterns

This section of the report provides a summary of existing peak period traffic flow profiles, associated peak hour traffic turning counts and background traffic growth rates within the study area.

3.1 Traffic Flow Profiles

Traffic turning count surveys were undertaken by TEAM Traffic at each of the identified sites on the 22nd February 2018. Traffic turning count surveys were undertaken during both the AM peak period (06:30-09:30hrs) and the PM peak period (15:00-18:00hrs). The PM peak period was extended to include traffic generated by afternoon pick-up/drop-off activities associated with local educational facilities (i.e. Feilding High School). The traffic surveys included classified turning counts and recorded general traffic, heavy vehicles, buses and cyclists.

The traffic flow profiles at all sites was analysed to confirm the peak hours for use in the traffic models (see **Appendix B**). Analysis of traffic flow profiles at each of the sites identified the following AM and PM peak hours at each of the sites:

- Site 1 – North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street⁶
 - AM Peak Hour – 08:00hrs to 09:00hrs
 - PM Peak Hour – 16:45hrs to 17:45hrs
- Site 2 – North Street / Churcher Street
 - AM Peak Hour – 08:00hrs to 09:00hrs
 - PM Peak Hour – 15:00hrs to 16:00hrs
- Site 3 – Kimbolton Road (SH54) / North Street / Pharazyn Street / Seddon Street
 - AM Peak Hour – 08:00hrs to 09:00hrs
 - PM Peak Hour – 16:45hrs to 17:45hrs

The assessment indicates AM peak hours are consistent across all sites (08:00hrs to 09:00hrs).

The recorded PM peak hour at the North Street / Churcher Street intersection is earlier than other sites, reflecting high traffic demands associated with parents collecting school children at Feilding High School at the end of the day.

The proposed Growth Precinct 4 development is primarily residential, therefore the greatest effects on the network are expected to align with wider commuter demands as shown at other sites during the evening peak period (16:45-17:45). Therefore, for the purpose of this assessment, the PM peak hour for all sites been assumed to be 16:45hrs to 17:45hrs.

Traffic turning counts associated with the AM peak hours (08:00hrs to 09:00hrs) and PM peak hours (16:45hrs to 17:45hrs) have been extracted for use within the base model. The results of the traffic surveys for each of the sites are summarised within **Appendix C**.

3.2 Background Traffic Growth

Average Daily Traffic (ADT) count data has been extracted from RAMM by Manawatu District Council (MDC) on local road network to determine background annual traffic growth rates within Feilding. MDC currently have limited information on historic peak hour traffic volumes within the region, therefore it is has been assumed that peak period traffic growth rates would reflect similar trends to those experienced in the ADT.

A summary of annual ADT traffic growth on the local road network is outlined within **Table 3-1**, with detailed outputs from the background assessment provided within **Appendix D**.

⁶ **Note:** Although peak period traffic at the North Street / Denbigh Street intersection was highest between 15:00hrs - 16:00hrs, for the purposes of this assessment the approach is included within the wider Site 1 operations. As such, the peak period has been assumed to be 16:45-17:45hrs. It should be noted that traffic volumes entering the North Street/Denbigh Street intersection from the Denbigh Street approach were also highest during the 16:45hrs - 17:45hrs period.

Table 3-1: Annual Traffic Growth – Local Road ADT (MDC RAMM Data)

ROAD NAME	HIERARCHY	START NAME	END NAME	GROWTH
PHARAZYN STREET (376)	COLLECTOR ROAD	NORTH ST	FLORENCE PL	1.5%
CHAMBERLAIN STREET (438)	LOCAL ROAD	NORTH ST	CAMDEN ST	2.7%
CHURCHER STREET (360)	COLLECTOR ROAD	NORTH ST	VIRGINIA CRES	1.6%
LETHBRIDGE STREET S (328)	MAJOR ARTERIAL	CAMDEN ST	NORTH ST	1.1%
LETHBRIDGE STREET N (328)	COLLECTOR ROAD	NORTH ST	UNFORMED ST LHS	0.9%
MAKINO ROAD FEILDING (341)	COLLECTOR ROAD	NORTH ST	SHERWILL ST WEST	0.5%
NORTH STREET (327)	MAJOR ARTERIAL	WEST ST	DENBIGH ST	1.4%
NORTH STREET (327)	MINOR ARTERIAL	DENBIGH ST	COOMBRAE CT	0.2%
NORTH STREET (327)	MINOR ARTERIAL	ELIZABETH ST	KIMBOLTON RD	-0.3%
NORTH STREET (327)	MINOR ARTERIAL	CHURCHER ST	CHURCHILL AVE	-1.6%

The annual traffic growth rates indicate that all local roads within the study area have experienced less than 2% growth per annum with the exception of Chamberlain Street, which has seen significant growth over the past few years. The western most section of North Street (between West Street and Denbigh Street) has experienced a minor increase in ADT traffic volumes (+1.4%), whilst the remainder of the North Street corridor has remained stable or experienced some decline in traffic volumes.

In addition to the local road network, traffic growth rates on the State Highway have been reviewed (see **Table 3-2**). Sections of Kimbolton Road/SH54 within the immediate study area are in bold. This indicates that traffic growth within the vicinity of Pharazyn Street intersection has increased by 2.4% north of the site, although they have remained relatively stable south of the intersection.

Table 3-2: Background Traffic Growth – SH54 ADT (NZTA Traffic Data Booklet)

SITE ID	DESCRIPTION	SITE	2016 AADT	GROWTH
11.4	CHELTENHAM	11.4	1,218	1.9%
14.04	ALMADALE RD	14.04	2,533	1.5%
2.41	KIWITEA STREAM NTH OF NORTH ST	2.41	5,372	2.4%
3	KIMBOLTON RD	3	7,092	0.4%
6.17	AORANGI BRIDGE	6.17	15,315	2.6%
11.08	FIELDING - TELEMETRY SITE 106	11.08	7,112	2.5%

Based on the findings of the above, it is proposed that the following background annual traffic growth rates are applied within the model:

Table 3-3: Assumed Background Annual Traffic Growth Rates for Modelling Purposes

ROADS	PROPOSED GROWTH RATE	STREETS	COMMENT
Major Arterial Roads	2% Annual Growth	State Highway 54 North Street West	Accounts for regional growth on key routes into Feilding.
Arterial / Collector Roads	1% Annual Growth	Makino Road North Street (East) Lethbridge Street North Chamberlain Street	Aligns with general local road traffic growth within the study area.
Residential Catchments	0% Annual Growth	Churcher Street Pharazyn Street Seddon Street	Limited through movement function. Future traffic growth driven by residential growth in Precinct 4.

4 Future Network Conditions

This section of the report provides an outline of anticipated future network conditions following the development of the proposed Growth Precinct 4 residential area.

It provides an outline of the assumptions relating to the proposed development, assumed future growth and staging scenarios used within the traffic models, assumed trip generation rates for residential development and trip distribution assumptions. Based on this, the future anticipated future traffic volumes at each of the sites for each of the proposed stages of the development is also summarised.

4.1 Proposed Development

The Growth Precinct 4 was originally identified as a residential growth area within the Feilding Urban Growth Framework Plan (developed in 2013). The proposed Growth Precinct 4 is located on an area of greenfield land (approximately 256ha) to the north of Feilding urban area that currently comprises rural land-use, pockets of rural lifestyle blocks and environmental features including the Makino Stream.

The proposed Growth Precinct 4 is bounded by Port Street East, Pharazyn Street, Reid Line and Makino Road. The proposed masterplan developed for the Growth Precinct 4 site indicates approximately 227 ha of residential and 29 ha of recreational land. The area zoned within Growth Precinct 4 is expected to yield approximately 1,800 residential households.

The proposed Growth Precinct 4 area and indicative roading network is shown in **Figure 4-1**. The local roading network is assumed to be developed on a staged basis to support development within the Growth Precinct. It should be noted that there are limited east-west links across the Makino Stream at present.

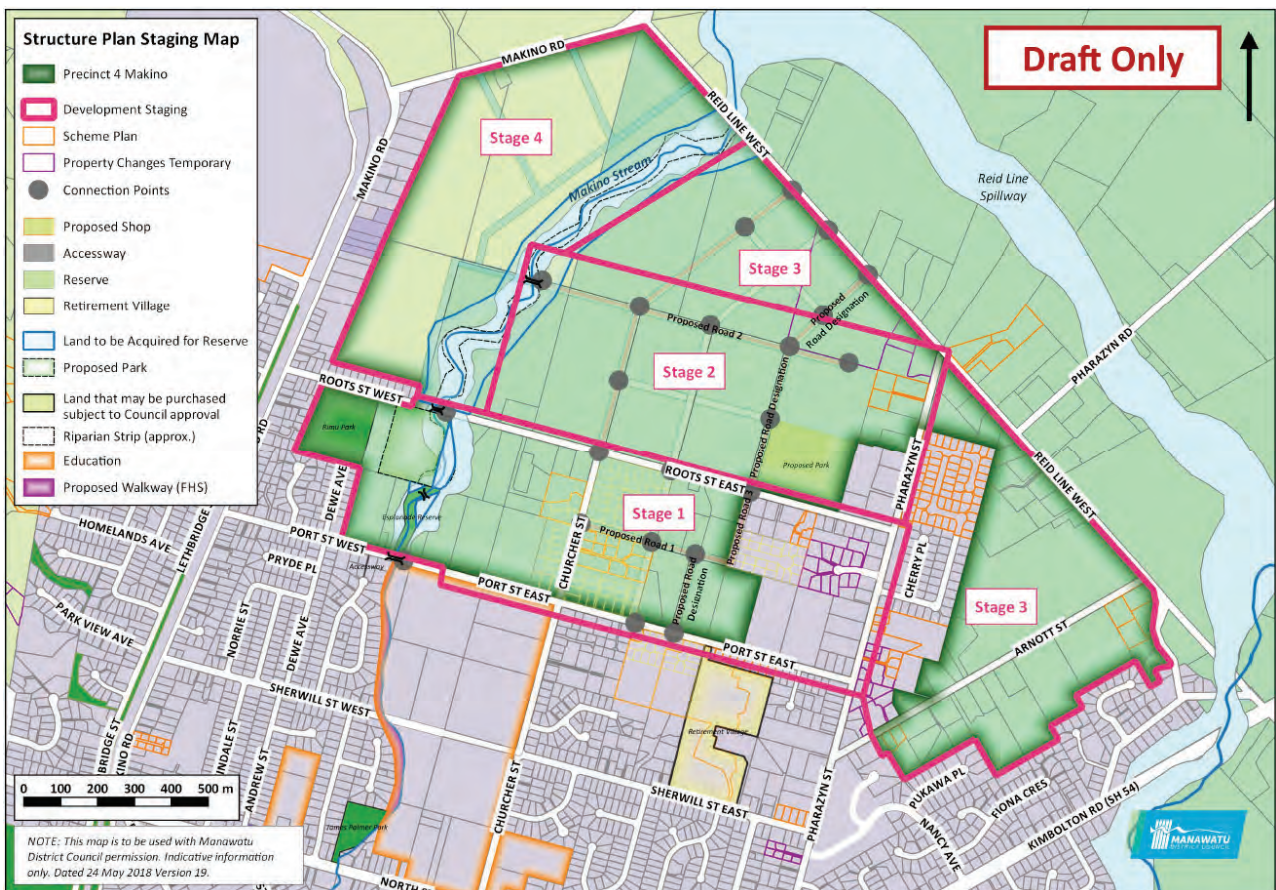


Figure 4-1: Growth Precinct 4 Indicative Development

The majority of the proposed roading connections are currently in place, although roads will need to be “urbanised” to support growth development. Churcher Street and Pharazyn Street will form the primary north-south collector routes through the development. Churcher Street will be extended northwards to connect to Reid Line at its northern extent. A number of new local east-west and north-south local road connections are also proposed to facilitate access to development.

It is understood that the intended growth strategy is to support urban growth radially from south to north through a “staged” development basis, although it is noted that development will be driven by market demand and there is the possibility that development could be accelerated in some areas (i.e. Stage 4). This approach would provide Council with the ability to stage implementation of supporting infrastructure (including “urbanising” the roading network) in a co-ordinated and integrated manner.

There are currently limited east-west roading connections across the Makino Stream to the west; however, bridging connections are proposed as part of the development to provide direct east-west connections to Makino Road. The timing and staging of the road network will limit southbound route choice onto North Street to Churcher Street and Pharazyn Street until these connections are made.

As part of the proposed Growth Precinct 4 development, MDC propose to provide new cycleway connections along the Makino Stream Esplanade Corridor. Providing an integrated network of walking and cycling facilities within Growth Precinct 4 will increase accessibility to (and promote the use of) non-car based modes for students and residents accessing key local destinations (i.e. Feilding High School and the town centre).

It is understood that other identified growth precincts within the area (including Growth Precinct 3 to the west) are not expected to be rezoned to residential at this stage. As such, no growth forecasts or assessment of trip generating effects from these developments are accounted for within the TIA modelling exercise.

4.2 Development Staging

Feilding’s population has experienced steady growth over the last ten years. As indicated by **Figure 4-2**, historic data shows that between 2006 and 2014 the annual growth has been approximately 1.3% with higher growth experienced in more recent years at 2% per annum. Development forecasts provided by MDC indicate that at current levels demand for new households within the region, the Growth Precinct 4 area could be fully occupied by 2038.

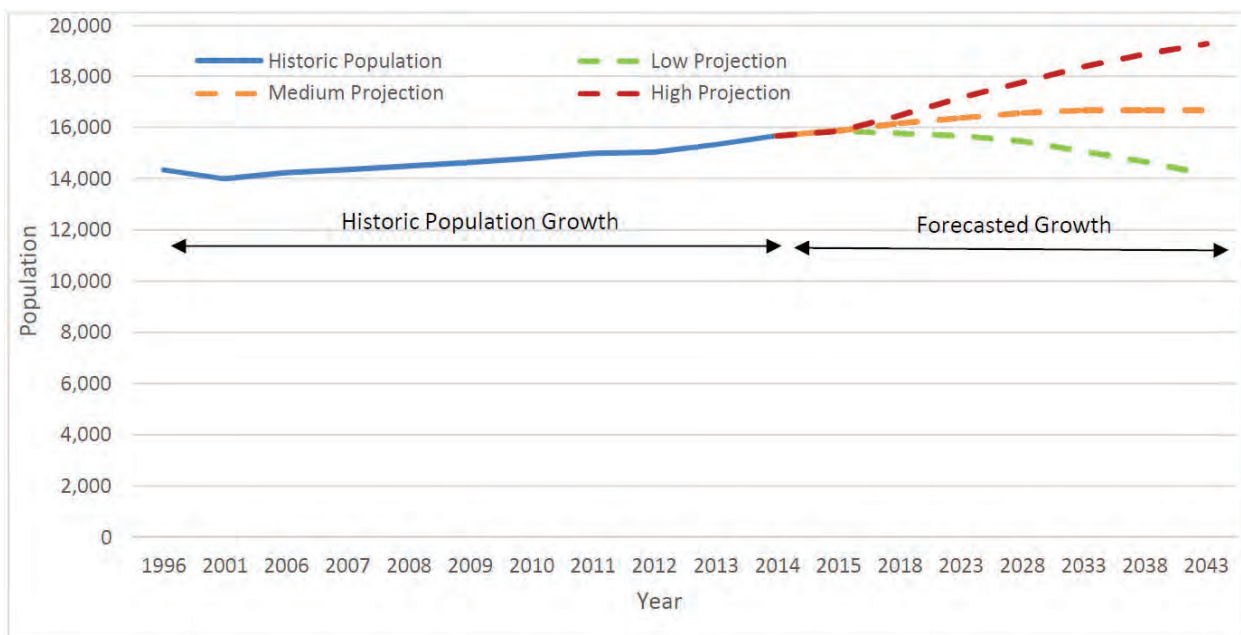


Figure 4-2: Feilding Population Growth – Statistics NZ

For the purpose of modelling the incremental effects of the proposed residential development on network performance, four development stages have been modelled. Although it is acknowledged that development within Feilding is based on market forces and may have periods of accelerated or slower development the future year assessments assume linear growth in development over the next 20 years (by 2038).

On this basis, in addition to the base models (existing 2018 situation) the following scenarios have been tested within the future forecast traffic models:

- **Scenario 1: 2023** – 25% developed (450 Households);
- **Scenario 2: 2028** – 50% developed (900 households);
- **Scenario 3: 2033** – 75% developed (1,350 households); and
- **Scenario 4: 2038** – 100% developed (1,800 households).

4.3 Trip Generation

Trip generation associated with the proposed residential activities within the Growth Precinct 4 site have been determined using data from the following industry recognised guidelines:

- The New Zealand Trips and Parking Database (NZTPD);
- NZTA – Trips and Parking Related to Land Use (November 2011);
- New South Wales and Traffic Authority publication – “Guide to Traffic Generating Developments” (RTA); and
- Institute of Transportation Engineers (ITE) – Trip Generation Manual (Ninth Edition).

The trip generation rates for residential dwellings within each of these sources are shown within **Table 4-1**. The trip generation rates are based on “dwelling housing” rates. It is not expected that the development would include higher density residential development. Trip generation rates for higher density developments are typically lower on a per dwelling basis than lower density residential developments; therefore, using lower density dwelling units provides a conservative assessment in terms of trip generation.

Table 4-1: Trip Generation Rates

SOURCE	AM PEAK	PM PEAK	ALL DAY
NEW ZEALAND TRIPS AND PARKING DATABASE (AVERAGE)	0.99 / Dwelling	1.13 / Dwelling	9.3 / Dwelling
NZTA (REPORT 453) – TRIPS AND PARKING RELATING TO LAND-USE	1.3 / Dwelling	1.3 / Dwelling	10.7 / Dwelling
RTA – GUIDE TO TRAFFIC GENERATING DEVELOPMENTS	0.85 / Dwelling	0.85 / Dwelling	9 / Dwelling
ITE – TRIP GENERATION MANUAL	0.75 / Dwelling	1.01 / Dwelling	9.57 / Dwelling

Note: Trip generation rates within the NZTA Report 453 are 85 percentile rates, whilst other sources are based on average.

Analysis of trip generation rates indicate that both peak period trip generation rates outlined within the RTA and ITE trip generation handbooks are generally lower than those within the NZ Trips and Parking Database. For the basis of this assessment, the following trip generation rates have been used:

- Peak period trip generation rate of 1 vehicle trip per dwelling; and
- All-day trip generation rate of 10 vehicle trips per dwelling are used.

The Institute of Transportation Engineers (ITE) Trip Generation Manual has been used to determine the proportion of trips generated that are inbound and outbound with respect to peak periods and all day traffic volumes generated by the proposed development (see **Table 4-2**).

Table 4-2: Development Inbound / Outbound Split (ITE Trip Generation Handbook)

PERIOD	MOVEMENT	% MOVEMENTS
AM Peak Hour	Arrival Split (Trips In)	25%
	Departure Split (Trips Out)	75%
PM Peak Hour	Arrival Split (Trips In)	63%
	Departure Split (Trips Out)	37%
All Day Traffic	Arrival Split (Trips In)	50%
	Departure Split (Trips Out)	50%

The inbound/outbound splits have been applied to the trip generation rates to determine the peak period and all day traffic movements to/from the proposed Growth Precinct 4 development. The anticipated volume of traffic generated within each of the proposed modelling scenarios is outlined within **Table 4-3**. The assessment indicates the full development has a trip generation potential of **1,800** vehicle trips during each peak hour and **18,000** all day vehicle trips (during a typical weekday)⁷.

⁷ NZ census data from 2013 indicates that existing mode share for walking, cycling and public transport represents approximately 8% of commuter trips within the Feilding North census block. Increased uptake by these modes following the development of the active mode network and bus service improvements may reduce private vehicle trip generation from the development, although this is expected to be marginal. As such, the trip generation rates shown are considered conservative for the purposes of the assessment.

Table 4-3: Trip Generation Rates – Per Development Stage

SCENARIO	PERIOD	TRIP RATE	TRIP GEN	TRIPS IN	TRIPS OUT
25% Development (450HH)	AM Peak	1	450	112	338
	PM Peak	1	450	284	166
	All Day	10	4,500	2,250	2,250
50% Development (900HH)	AM Peak	1	900	225	675
	PM Peak	1	900	567	333
	All Day	10	9,000	4,500	4,500
75% Development (1,350HH)	AM Peak	1	1,350	338	1,012
	PM Peak	1	1,350	850	500
	All Day	10	13,500	6,750	6,750
100% Development (1,800HH)	AM Peak	1	1,800	450	1,350
	PM Peak	1	1,800	1,134	666
	All Day	10	18,000	9,000	9,000

4.4 Trip Distribution

To determine trip distribution across the road network, we have analysed commuter patterns from the 2013 census to determine likely trip origins for movements into the site, and destinations for trips travelling out from the site (see **Appendix F**).

Census block data for Feilding North was considered most representative of typical commuter patterns for future movements from Growth Precinct 4, as the region is predominantly residential and has limited employment zones (unlike Feilding Central and Feilding West).

The percentage of commuter trips with origins and destinations in the Feilding North zones were allocated across six key zones (see **Figure 4-3**). A summary of the distributions for commuter patterns with origins or destinations within these zones is provided in **Table 4-4**. It has been assumed that similar arrival / departure patterns would be experienced within the Growth Precinct 4 development.

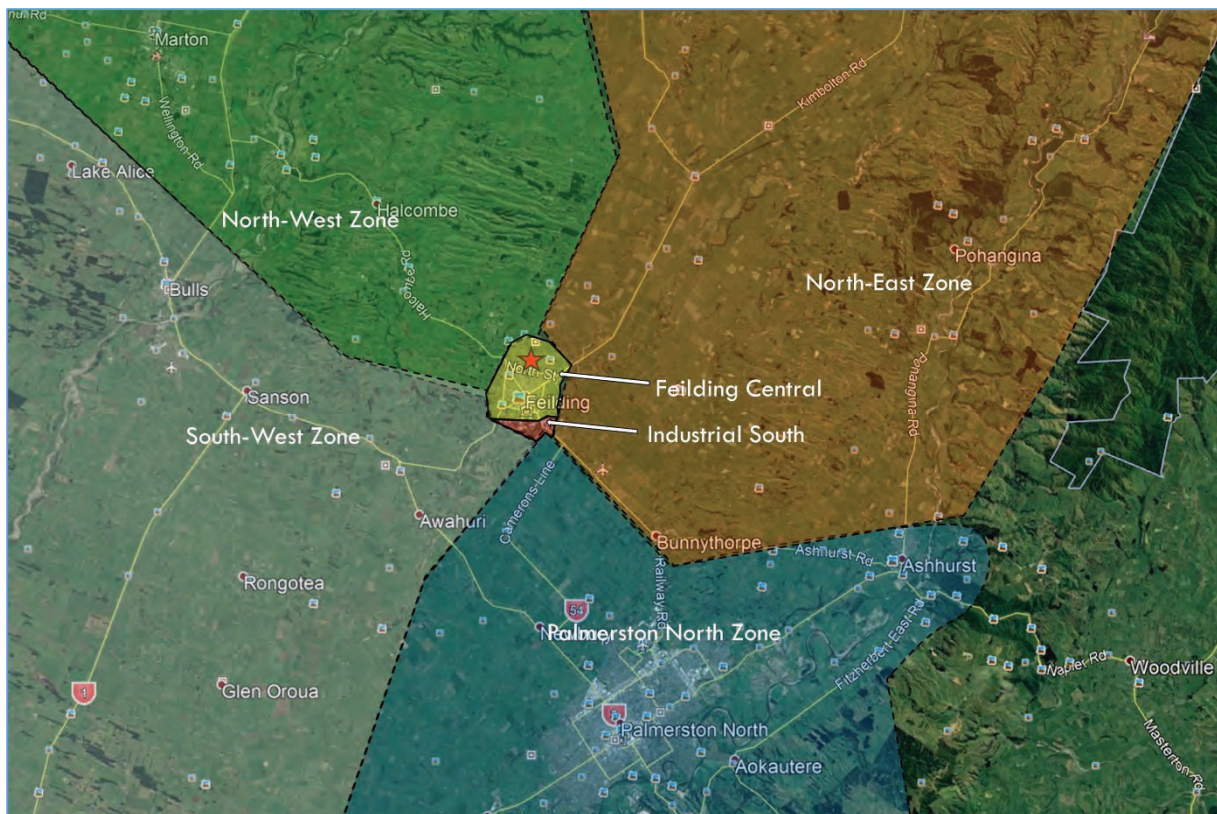


Figure 4-3: Origin Destination Zoning

Table 4-4: Existing Trip Origins / Destinations within Feilding North Census Blocks

	ORIGIN / DESTINATION	IN	OUT
CENSUS COMMUTER TRAVEL PATTERNS	Palmerston North	7%	46%
	Feilding	63%	34%
	Industrial South	0%	11%
	North-West Zone	7%	1%
	North-East Zone	18%	2%
	South-West Zone	5%	6%
Total		100%	100%

4.5 Trip Assignment

Commuter trips to and from the proposed Growth Precinct 4 were assigned to the road network based on the assumptions outlined within **Table 4-4**. The distribution rates were used to determine where traffic movements are expected to travel to/from when accessing Growth Precinct 4, and to allocate turning volumes at key study intersections. The total volume of trips travelling to and from each of the identified zones during morning and evening peak periods are outlined within **Table 4-5**.

Table 4-5: Trip Assignment to Zones – All Periods

PEAK PERIOD	ZONE	25% DEVELOPMENT		50% DEVELOPMENT		75% DEVELOPMENT		100% DEVELOPMENT	
		In	Out	In	Out	In	Out	In	Out
AM Trips	Total	113	338	225	675	338	1013	450	1350
	Palmerston North	8	156	16	311	24	467	32	622
	Feilding	70	113	141	226	211	338	281	451
	Industrial South	0	38	0	75	0	113	0	150
	Northwest	8	4	16	9	24	13	32	17
	Northeast	20	7	40	14	60	21	80	27
	Southwest	6	21	12	41	18	62	24	82
PM Trips	Total	284	167	567	333	851	500	1134	666
	Palmerston North	131	12	261	24	392	36	523	48
	Feilding	95	104	189	208	284	312	379	416
	Industrial South	32	0	63	0	95	0	126	0
	Northwest	4	12	7	24	11	36	14	48
	Northeast	6	30	11	59	17	89	23	119
	Southwest	17	9	34	18	52	27	69	36

As noted previously, there are limited east-west connections currently provided for across the Makino Stream. It is understood that bridging connections across the Makino Stream will be provided for vehicle traffic on Roots Street as part of Stage 3 network development⁸. In the interim, Churcher Street and Pharazyn Street will operate as the primary north-south collector routes from the development, and the 25% to 50% development scenarios have accounted for limited distribution options accordingly.

The assumptions used as a basis for trip distribution for vehicles entering and exiting the Growth Precinct 4 site is summarised within **Appendix G**.

⁸ Based on route network staging plans provided by Brent Holmes at project initiation meeting.

4.6 Forecast Intersection Volumes

Based on the trip generation rates for each stage of development (outlined within **Section 4.3**) and the proposed trip distribution and assignment (outlined within **Section 4.5**), the forecast peak hour traffic turning volumes under future network conditions for both peak hour periods are outlined in **Appendix H**.

The forecast traffic turning counts at each site provide an outline of:

- **Base turning volumes** – Existing turning movements including background traffic growth;
- **New turning volumes** – Additional turning movements generated by the Growth Precinct 4 development; and
- **Total turning volumes** – The sum of both base and new traffic turning movements.

The future forecast traffic volumes have been used within the traffic modelling exercise to assess the performance of intersections under future network conditions (discussed in **Section 5**).

5 Assessment of Effects

This section of the report provides an outline of the assessment approach, the findings of the base modelling exercise and the expected performance of the network under future network conditions.

5.1 Assessment Approach

5.1.1 Modelling Tools

SIDRA v7.0 is an industry standard traffic modelling tool that is used to assess the performance of isolated intersections; however, the package has limited adaptability for assessing more complex intersection layouts. We have used the VISSIM micro-simulation software as the preferred modelling tool for assessing the operational effects of larger intersections with multiple turning movements and/or closely spaced intersections. The modelling packages used within each of the sites is shown within **Table 5-1**.

Table 5-1: Modelling Tools used within Precinct 4 Assessment

SITE	MODEL
North Street / Lethbridge Street / Makino Road / Chamberlain Road / Denbigh Street	VISSIM
North Street / Churcher Street	SIDRA
Kimbolton Road (SH54) / North Street / Pharazyn Street / Seddon Street	VISSIM

Base traffic models (2018) for the AM and PM peak periods were developed using recorded turning count data. The models were calibrated/validated against observed gap acceptance and queue lengths determined from camera footage to ensure the models reflect existing network operations.

Future forecast traffic models for each of the intersections using background traffic growth and proposed trip generation rates / distribution assumptions are outlined within Section 4. Traffic models have been developed for each of the proposed stages of development to assess the incremental effects of the proposed development staging. The assumptions and observations used to develop the base model were applied within the future development scenarios to determine intersection performance under both weekday AM and PM peak conditions.

5.1.2 Modelling Assumptions

SIDRA

The following input assumptions have been made within the SIDRA model:

- **Peak Flow Factor:** Calibrated for each intersection based on 2018 intersection turning count data;
- **Flow Scale (Constant):** 100% on all models;
- **Lane Utilisation Factors:** Calculated by SIDRA;
- **Gap Acceptance:** As per SIDRA standard parameters priority controlled intersections;
- **Approach Speeds:** Both approach and exit speeds set to 50kph for all approaches; and
- **Lane Widths:** Approach lane widths have been input as per existing arrangements.

VISSIM

The following input assumptions have been made within the VISSIM model:

- Traffic demand has been imported directly from count information, in 15 minute intervals over the full 2.5-hour survey. Outputs have been summarised for the peak hour only (identified as 08:00-09:00 and 16:45-17:45 from the surveys at all three intersections);
- Posted speed set as 50kph for both intersections;
- Lane usage and widths input as per observations from camera footage;
- Reduced Speed Areas on turning movements calibrated against observations from camera footage;

- Reduced Speed Areas also applied at Stop and Give-way lines, calibrated against observations from camera footage;
- Gap acceptance and priority control parameters calibrated against observed behaviour; and
- Impact of train movements at North Street / Lethbridge Street / Makino Road / Chamberlain Road / Denbigh Street has been modelled by inserting train movements in the model, as observed from camera footage, including lost times in gate-down periods.

Future Network Assessment

- The future traffic volumes generated by the development have been modelled as light vehicles only; and
- The background traffic growth rates are assumed to be composed of similar lights/heavy vehicles.

5.1.3 Performance Criteria

The purpose of the modelling exercise is to identify the performance of intersections under future conditions, and identify if/where mitigation maybe required. The following performance criteria has been used to assess if/when network deficiencies may occur within the network:

- **Level of Service (LoS):** Average Level of Service (delay) on any approach arm is E or below, or an individual movement operates at a LoS F (see **Table 5-2**);

Table 5-2: Level of Service (LoS) Assessment Criteria – Average Delay (seconds)

Level of Service	Lower (secs)	Upper (secs)
A	0	10
B	10.1	15
C	15.1	25
D	25.1	35
E	35.1	50
F	50.1+	

- **Degree of Saturation⁹:** Intersection reaches practical spare capacity (i.e. volume/capacity ratio greater than 85%); and
- **Maximum Queue Lengths:** Queue lengths impede on the performance of other intersections on the road network.

A full set of modelling results is set out in **Appendix I** for all scenarios.

5.2 Existing Operations

5.2.1 Site 1 – North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street

The existing intersection layout modelled within VISSIM is shown within **Figure 5-2**. The results of the intersection performance under existing network conditions during the AM peak and PM peak periods are shown within **Table 5-3** and **Table 5-4** respectively.

The results of the base modelling indicate that the intersection operates within acceptable levels of delay during the AM and PM peak period. The assessment indicates that no individual turning movement operates with an average Level of Service (LoS) below C during the AM peak period, with overall approach LoS at level A for most arms, and LoS B and C for the Lethbridge Street (South) and Lethbridge Street (North) links respectively.

During the PM peak period, right turning traffic from Lethbridge Street (South) to North Street (East) and from Lethbridge Street (North) onto North Street (West) experiences some delays (LoS D); however, these movements form a relatively minor proportion of overall traffic travelling through the intersection, and overall approach LoS levels are at level C for the two Lethbridge Street approaches, and level A for all other links.

⁹ The degree of saturation is a ratio of traffic volume over capacity (v/c). It is measurement of the operating capacity of a roadway or intersection where the number of vehicles passing through is divided by the number of vehicles that could theoretically pass through when at capacity. If v/c is greater than 85%, it is considered that the approach is suffering from traffic congestion with queues of vehicles starting to form.



Figure 5-1: North Street / Lethbridge Street / Makino Road / Chamberlain Street VISSIM Intersection Layout

Table 5-3: North Street / Lethbridge Street / Makino Road / Chamberlain Street AM Peak – 08:00-09:00hrs (2018)

From	To	Model Flow	Count	Diff (%)	GEH	Average Delay (s)	Max Queue (m)	Max Queue (veh)	Level of Service (Delay)	
North St (West)	Lethbridge (North)	22	20	9%	0.4	1.8	26	4	A	A
	Makino Rd	23	20	16%	0.7	2.7			A	
	North St (East)	260	267	-2%	0.4	4.7			A	
	Denbigh St	22	22	-2%	0.1	5.9			A	
	Chamberlain St	5	5	-8%	0.2	4.4			A	
Lethbridge (North)	Lethbridge (South)	70	69	1%	0.1	3.6	46	8	A	C
	Makino Rd	3	2.0	30%	0.4	1.7			A	
	North St (East)	80	83	-4%	0.3	12.4			B	
	Denbigh St	13	15	-15%	0.6	11.2			B	
	Chamberlain St	14	14	3%	0.1	10.8			B	
	Lethbridge (South)	85	83	3%	0.2	20.4			C	
Makino Rd	North St (West)	13	12	7%	0.2	20.9	30	5	C	A
	North St (East)	49	50	-2%	0.1	4.9			A	
	Denbigh St	11	12	-7%	0.2	5.2			A	
	Chamberlain St	41	42	-3%	0.2	13.6			B	
	Lethbridge (South)	45	43	4%	0.3	12.5			B	
	North St (West)	17	16	5%	0.2	11.6			B	
North St (East)	Lethbridge (North)	4	4	0%	0.0	5.7	9	1	A	A
	Denbigh St	1	1	-40%	0.4	0.3			A	
	Chamberlain St	8	10	-16%	0.5	0.4			A	
	Lethbridge (South)	86	85	1%	0.1	1.1			A	
	North St (West)	116	114	1%	0.1	2.4			A	
	Lethbridge (North)	45	46	-2%	0.1	4.3			A	
	Makino Rd	23	22	5%	0.3	4.4			A	
Denbigh St	Chamberlain St	0	1	-80%	1.0	0.3	12	2	A	A
	Lethbridge (South)	0	1	-60%	0.7	0.3			A	
	North St (West)	10	9	9%	0.3	5.4			A	
	Lethbridge (North)	4	4	-5%	0.1	7.4			A	
	Makino Rd	12	12	0%	0.0	6.6			A	
	North St (East)	15	14	6%	0.2	6.7			A	
Chamberlain St	Lethbridge (South)	2	2	0%	0.0	0.5	11	2	A	A
	North St (West)	4	4	0%	0.0	0.9			A	
	Lethbridge (North)	4	4	0%	0.0	4.9			A	
	Makino Rd	9	7	23%	0.6	8.0			A	
	North St (East)	5	7	-23%	0.6	8.0			A	
	Denbigh St	0	0	-	-	0.0			A	
Lethbridge (South)	North St (West)	44	43	2%	0.2	8.8	22	4	A	B
	Lethbridge (North)	25	27	-8%	0.4	15.3			C	
	Makino Rd	8	7	14%	0.4	22.1			C	
	North St (East)	8	14	-46%	1.9	15.3			C	
	Denbigh St	2	1	60%	0.5	5.5			A	
	Chamberlain St	1	1	40%	0.4	4.4			A	

Table 5-4: North Street / Lethbridge Street / Makino Road / Chamberlain Street PM Peak 16:45-17:45 (2018)

From	To	Model Flow	Count	Diff (%)	GEH	Average Delay (s)	Max Queue (m)	Max Queue (veh)	Level of Service (Delay)	
North St (West)	Lethbridge (North)	73	70	5%	0.4	1.2	34	6	A	A
	Makino Rd	49	48	2%	0.1	1.8			A	
	North St (East)	158	164	-4%	0.5	2.5			A	
	Denbigh St	24	21	14%	0.6	4.5			A	
	Chamberlain St	4	6	-27%	0.7	4.0			A	
	Lethbridge (South)	50	50	-1%	0.1	2.5			A	
Lethbridge (North)	Makino Rd	0	1.0	-100%	1.4	0.0	41	7	A	C
	North St (East)	23	27	-14%	0.8	9.1			A	
	Denbigh St	4	3	27%	0.4	5.7			A	
	Chamberlain St	7	8	-10%	0.3	10.8			B	
	Lethbridge (South)	67	68	-2%	0.2	18.3			C	
	North St (West)	13	11	22%	0.7	25.4			D	
Makino Rd	North St (East)	24	24	-2%	0.1	2.5	26	4	A	A
	Denbigh St	13	12	10%	0.3	3.7			A	
	Chamberlain St	50	54	-8%	0.6	9.1			A	
	Lethbridge (South)	28	27	4%	0.2	8.2			A	
	North St (West)	13	14	-9%	0.3	13.3			B	
	Lethbridge (North)	0	0	-	-	0.0			A	
North St (East)	Denbigh St	4	3	27%	0.4	0.2	4	1	A	A
	Chamberlain St	15	12	25%	0.8	0.8			A	
	Lethbridge (South)	31	32	-4%	0.2	1.1			A	
	North St (West)	120	118	1%	0.1	3.0			A	
	Lethbridge (North)	34	34	-1%	0.0	4.6			A	
	Makino Rd	18	22	-18%	0.9	2.7			A	
Denbigh St	Chamberlain St	2	3	-27%	0.5	0.5	10	2	A	A
	Lethbridge (South)	2	2	-20%	0.3	1.6			A	
	North St (West)	24	25	-2%	0.1	4.3			A	
	Lethbridge (North)	4	5	-12%	0.3	2.5			A	
	Makino Rd	37	36	2%	0.1	5.0			A	
	North St (East)	11	10	10%	0.3	2.6			A	
Chamberlain St	Lethbridge (South)	2	1	80%	0.7	0.6	22	4	A	A
	North St (West)	16	18	-13%	0.6	4.2			A	
	Lethbridge (North)	30	31	-3%	0.1	5.7			A	
	Makino Rd	68	65	4%	0.3	7.6			A	
	North St (East)	15	15	-1%	0.1	5.5			A	
	Denbigh St	0	0	-	-	0.0			A	
Lethbridge (South)	North St (West)	134	127	6%	0.6	11.8	60	10	B	C
	Lethbridge (North)	108	112	-3%	0.4	23.2			C	
	Makino Rd	20	22	-10%	0.5	23.9			C	
	North St (East)	21	25	-18%	0.9	26.9			D	
	Denbigh St	1	1	-20%	0.2	6.4			A	
	Chamberlain St	0	0	-	-	0.0			A	

5.2.2 Site 2 – North Street / Churcher Street

The existing intersection layout modelled within SIDRA is shown within **Figure 5-2**. The results of the intersection performance under existing 2018 network conditions for both the AM and PM peak periods is shown within **Table 5-5**.

The assessment indicates that the intersection operations within practical spare capacity during both peak periods. The modelling indicates the highest delay is experienced by right turning movements on the Churcher Street (northern) approach during the AM peak period. This is primarily due to the higher volume of traffic experienced at the intersection during the Feilding High School drop-off periods.

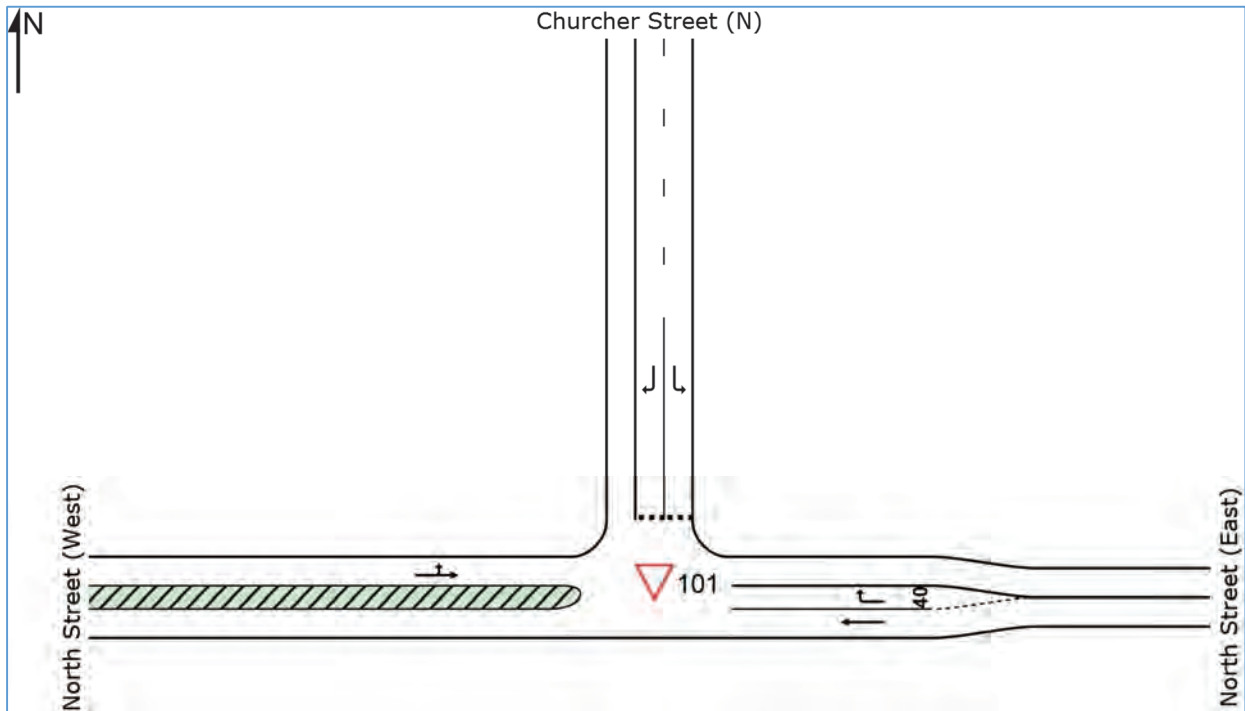


Figure 5-2: North Street / Churcher Street SIDRA Intersection Layout

Table 5-5: North Street / Churcher Street – Base Model Intersection Performance (2018)

APPROACH		AM PEAK (08:00-09:00)				PM PEAK (16:45-17:45)			
		V/C	Average Delay (s)	Level of Service	Max Queue (m)	V/C	Average Delay (s)	Level of Service	Max Queue (m)
North Street (E)	Through	0.14	0.0	A	0.0	0.13	0.0	A	0.0
	Right	0.10	6.6	A	3.0	0.04	5.5	A	1.1
	Approach	0.14	1.9	N/A	3.0	0.13	0.9	N/A	1.1
Churcher Street (N)	Left	0.10	5.9	A	3.0	0.05	5.3	A	1.3
	Right	0.24	12.6	B	6.6	0.10	8.6	A	2.6
	Approach	0.24	9.0	A	6.6	0.10	6.9	A	2.6
North Street (W)	Left	0.25	4.6	A	0.0	0.15	4.6	A	0.0
	Right	0.25	0.0	A	0.0	0.15	0.0	A	0.0
	Approach	0.25	1.2	N/A	0.0	0.15	1.1	N/A	0.0

5.2.3 Site 3 – Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street

The existing intersection layout modelled within VISSIM is shown within **Figure 5-2**. The results of the intersection performance under existing network conditions during the AM peak and PM peak periods are shown within **Table 5-6** and **Table 5-7** respectively.

The results of the base modelling indicate that the intersection operates within acceptable levels of delay during the AM and PM peak period. The assessment indicates that all approaches operate within acceptable levels of delay with all approach LoS operating at level A, except North Street at level B in both peak periods. During both the AM and PM peak period, the greatest delays are experienced by right-turning traffic from North Street to Kimbolton Road (LoS C). Traffic movements on the Pharazyn Street operate at a LoS A within both scenarios tested.



Figure 5-3: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street VISSIM Intersection Layout

Table 5-6: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street AM Peak 08:00-09:00 (2018)

From	To	Model Flow	Count	Diff (%)	GEH	Average Delay (s)	Max Queue (m)	Max Queue (veh)	Level of Service (Delay)	
Kimbolton (West)	North Street	51	54	-5%	0.4	0.7	5	1	A	A
	Pharazyn Street	64	53	21%	1.4	0.8			A	
	Kimbolton (East)	119	126	-5%	0.6	0.5			A	
	Seddon St	6	8	-20%	0.6	2.3			A	
North Street	Pharazyn Street	43	41	5%	0.3	4.6	48	8	A	B
	Kimbolton (East)	36	38	-4%	0.3	14.6			B	
	Seddon St	2	3	-33%	0.6	13.7			B	
	Kimbolton (West)	133	133	0%	0.0	18.0			C	
Pharazyn Street	Kimbolton (East)	8	6	30%	0.7	0.0	28	5	A	A
	Seddon St	0	0	-	-	0.0			A	
	Kimbolton (West)	129	128	1%	0.1	4.2			A	
	North Street	32	35	-9%	0.6	1.0			A	
Kimbolton (East)	Seddon St	3	2	60%	0.7	0.2	13	2	A	A
	Kimbolton (West)	298	292	2%	0.3	0.4			A	
	North Street	61	68	-10%	0.8	3.2			A	
	Pharazyn Street	3	3	0%	0.0	1.6			A	
Seddon St	Kimbolton (West)	26	25	3%	0.2	3.5	13	2	A	A
	North Street	11	11	-2%	0.1	9.9			A	
	Pharazyn Street	1	1	0%	0.0	1.3			A	
	Kimbolton (East)	2	2	-10%	0.1	4.7			A	

Table 5-7: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street PM Peak 16:45-17:45 (2018)

From	To	Model Flow	Count	Diff (%)	GEH	Average Delay (s)	Max Queue (m)	Max Queue (veh)	Level of Service (Delay)	
Kimbolton (West)	North Street	49	53	-7%	0.5	1.1	7	1	A	A
	Pharazyn Street	160	153	5%	0.6	1.3			A	
	Kimbolton (East)	300	303	-1%	0.2	1.0			A	
	Seddon St	22	23	-6%	0.3	2.1			A	
North Street	Pharazyn Street	32	33	-4%	0.2	4.6	48	8	A	B
	Kimbolton (East)	52	47	10%	0.7	15.1			B	
	Seddon St	4	6	-40%	1.1	8.7			A	
	Kimbolton (West)	55	56	-2%	0.2	16.1			C	
Pharazyn Street	Kimbolton (East)	3	3	-7%	0.1	0.0	32	5	A	A
	Seddon St	1	2	-30%	0.5	3.8			A	
	Kimbolton (West)	107	107	0%	0.0	6.3			A	
	North Street	21	22	-5%	0.2	1.7			A	
Kimbolton (East)	Seddon St	3	3	-7%	0.1	0.2	16	3	A	A
	Kimbolton (West)	219	215	2%	0.2	0.2			A	
	North Street	39	42	-8%	0.5	6.3			A	
	Pharazyn Street	7	7	-6%	0.2	3.9			A	
Seddon St	Kimbolton (West)	18	18	2%	0.1	1.9	8	1	A	A
	North Street	1	1	0%	0.0	1.5			A	
	Pharazyn Street	0	1	-60%	0.7	0.8			A	
	Kimbolton (East)	1	1	40%	0.4	0.8			A	

5.3 Future Scenarios

The following sections provide detail on the operation of each of the three intersections, under each development scenario. However, as a summary, **Table 5-8** below shows the LoS predictions on each approach at each intersection under the full set of scenarios.

Table 5-8: Summary of Level of Service Results

Intersection	Approach	AM Peak (08:00-09:00)					PM Peak (16:45-17:45)				
		Base	Stage 1	Stage 2	Stage 3	Stage 4	Base	Stage 1	Stage 2	Stage 3	Stage 4
Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street	Kimbolton (West)	A	A	A	A	A	A	A	A	A	A
	North Street	B	F	F	F	F	B	F	F	F	F
	Pharazyn Street	A	A	C	D	E	A	A	C	D	F
	Kimbolton (East)	A	A	A	A	A	A	A	A	A	C
	Seddon St	A	A	A	B	B	A	A	A	A	F
North Street / Churcher Street	North Street (East)	A	A	A	A	A	A	A	A	A	A
	Churcher Street	A	B	C	F	F	A	A	B	B	C
	North Street (West)	A	A	A	A	A	A	A	A	A	A
North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street	North St (West)	A	A	A	A	A	A	A	A	A	A
	Lethbridge (North)	C	C	D	F	F	C	C	C	D	E
	Makino Rd	A	B	C	F	F	A	A	B	E	F
	North St (East)	A	A	A	A	A	A	A	A	A	A
	Denbigh St	A	A	A	A	B	A	A	A	A	A
	Chamberlain St	A	A	B	C	D	A	A	B	D	F
Lethbridge (South)	B	C	C	F	F	C	D	E	F	F	

5.3.1 Stage 1 and 2 Assessment

Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street

The results in **Table 5-9** below for Stage 1 Development (25% at 2023) show that in both the AM peak and PM peak, the LoS drops from B to C (compared to the 2018 base) on the Lethbridge Street (North) approach. On the Lethbridge Street (South) approach, LoS C is predicted in the AM peak period, and LoS D in the PM peak period, with several individual movements experiencing a level of performance at LoS E. In all cases, this is due to an increase in conflicting traffic movements along North Street (both development and background traffic related), rather than a significant increase in demand on these two Lethbridge Street arms.

Under the 2028 conditions (Stage 2 – 50% Development), movements from both Lethbridge Street approaches are predicted to continue to deteriorate (see **Table 5-10**). The worst operating approach is the Lethbridge Street (North) approach in the AM peak hour, with an average vehicle delay on this approach of 30 seconds equating to a LoS D. In the PM peak hour, the Lethbridge Street (South) is predicted to operate with a LoS E, and average delay of 40 seconds. Relatively low increases in delay (and queues) are predicted on all other approaches in both peak periods.

Table 5-9: Stage 1 Development – North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street (2023)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
North St (West)	Lethbridge (North)	2	A	6	1	A	7
	Makino Rd	3	A		2	A	
	North St (East)	5	A		3	A	
	Denbigh St	6	A		4	A	
	Chamberlain St	4	A		3	A	
	Lethbridge (South)	4	A		4	A	
Lethbridge (North)	Makino Rd	3	A	10	0	A	4
	North St (East)	19	C		9	A	
	Denbigh St	13	B		8	A	
	Chamberlain St	21	C		7	A	
	Lethbridge (South)	30	D		20	C	
	North St (West)	26	D		25	C	
Makino Rd	North St (East)	4	A	4	3	A	4
	Denbigh St	9	A		5	A	
	Chamberlain St	14	B		10	A	
	Lethbridge (South)	18	C		11	B	
	North St (West)	18	C		11	B	
	Lethbridge (North)	4	A		0	A	
North St (East)	Denbigh St	0	A	2	0	A	2
	Chamberlain St	1	A		1	A	
	Lethbridge (South)	2	A		3	A	
	North St (West)	3	A		4	A	
	Lethbridge (North)	5	A		5	A	
	Makino Rd	6	A		4	A	
Denbigh St	Chamberlain St	0	A	2	1	A	2
	Lethbridge (South)	0	A		4	A	
	North St (West)	7	A		4	A	
	Lethbridge (North)	6	A		5	A	
	Makino Rd	9	A		6	A	
	North St (East)	8	A		3	A	
Chamberlain St	Lethbridge (South)	0	A	2	1	A	4
	North St (West)	2	A		6	A	
	Lethbridge (North)	5	A		8	A	
	Makino Rd	10	B		9	A	
	North St (East)	14	B		11	B	
	Denbigh St	0	A		0	A	
Lethbridge (South)	North St (West)	9	A	5	18	C	18
	Lethbridge (North)	23	C		38	E	
	Makino Rd	47	F		41	F	
	North St (East)	23	C		41	F	
	Denbigh St	11	B		14	B	
	Chamberlain St	3	A		0	A	

Table 5-10: Stage 2 Development – North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street (2028)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
North St (West)	Lethbridge (North)	3	A	7	2	A	12
	Makino Rd	5	A		2	A	
	North St (East)	6	A		3	A	
	Denbigh St	9	A		5	A	
	Chamberlain St	8	A		6	A	
	Lethbridge (South)	6	A		6	A	
Lethbridge (North)	Makino Rd	7	A	11	0	A	6
	North St (East)	23	C		15	C	
	Denbigh St	14	B		6	A	
	Chamberlain St	25	C		11	B	
	Lethbridge (South)	38	F		26	D	
	North St (West)	34	D		31	D	
Makino Rd	North St (East)	7	A	8	4	A	6
	Denbigh St	9	A		5	A	
	Chamberlain St	20	C		17	C	
	Lethbridge (South)	21	C		23	C	
	North St (West)	29	D		15	B	
	Lethbridge (North)	7	A		0	A	
North St (East)	Denbigh St	0	A	3	0	A	5
	Chamberlain St	1	A		1	A	
	Lethbridge (South)	2	A		3	A	
	North St (West)	3	A		4	A	
	Lethbridge (North)	4	A		6	A	
	Makino Rd	7	A		4	A	
Denbigh St	Chamberlain St	0	A	2	0	A	2
	Lethbridge (South)	1	A		1	A	
	North St (West)	11	B		5	A	
	Lethbridge (North)	6	A		4	A	
	Makino Rd	7	A		6	A	
	North St (East)	13	B		4	A	
Chamberlain St	Lethbridge (South)	1	A	3	1	A	5
	North St (West)	2	A		9	A	
	Lethbridge (North)	7	A		8	A	
	Makino Rd	19	C		13	B	
	North St (East)	16	C		12	B	
	Denbigh St	0	A		0	A	
Lethbridge (South)	North St (West)	9	A	5	25	D	21
	Lethbridge (North)	25	C		53	F	
	Makino Rd	32	D		48	F	
	North St (East)	37	E		53	F	
	Denbigh St	24	C		14	B	
	Chamberlain St	5	A		0	A	

Site 2: North Street / Churcher Street

The results of the assessment indicate that by 2023 (Stage 1 – 25% Development), the increased volume of right-turn demand on Churcher Street will result in a reduction in from LoS B to a LoS C during the AM peak period (see **Table 5-11**).

Under the 2028 conditions (Stage 2 – 50% Development), during the AM peak period right turn movements from Churcher Street will continue to deteriorate to a LoS E and will exceed practical spare capacity ($v/c > 0.85$). Queue lengths for right-turning movements will also exceed available stacking space by this time. Although right turn movements reach a LoS E, the wider approach will continue to operate with an average LoS C. Sensitivity testing of the incremental growth resulting from the Precinct 4 development indicates that the North Street / Churcher Street intersection will operate within practical spare capacity until 2027 (i.e. 45% of development).

Analysis of the PM peak operations indicates that the intersection will operate within practical spare capacity and acceptable levels of delay during both the 2023 (Stage 1 – 25% Development) and 2028 (Stage 2 – 50% Development) scenarios (see **Table 5-12**). Similarly to the AM peak, the most significant changes to network performance within the PM peak conditions are expected to be right-turning traffic from Churcher Street onto North Street. The intersection will continue to operate within practical spare capacity ($v/c < 0.85$) under both future PM peak scenarios.

Table 5-11: Stage 1 Development – North Street / Churcher Street (2023)

APPROACH		AM PEAK (08:00-09:00)				PM PEAK (16:45-17:45)			
		V/C	Average Delay (s)	Level of Service	Max Queue (m)	V/C	Average Delay (s)	Level of Service	Max Queue (m)
North Street (E)	Through	0.15	0.0	A	0.0	0.14	0.0	A	0.0
	Right	0.14	7.0	A	4.3	0.11	6.0	A	3.5
	Approach	0.15	2.3	N/A	4.3	0.14	2.0	N/A	3.5
Churcher Street (N)	Left	0.21	6.2	A	6.4	0.07	5.4	A	2.1
	Right	0.52	18.5	C	19.1	0.21	10.8	B	5.6
	Approach	0.52	11.8	B	19.1	0.21	8.1	A	5.6
North Street (W)	Left	0.28	4.6	A	0.0	0.20	4.6	A	0.0
	Right	0.28	0.0	A	0.0	0.20	0.0	A	0.0
	Approach	0.28	1.4	N/A	0.0	0.20	1.7	N/A	0.0

Table 5-12: Stage 2 Development – North Street / Churcher Street (2028)

APPROACH		AM PEAK (08:00-09:00)				PM PEAK (16:45-17:45)			
		V/C	Average Delay (s)	Level of Service	Max Queue (m)	V/C	Average Delay (s)	Level of Service	Max Queue (m)
North Street (E)	Through	0.16	0.0	A	0.0	0.15	0.0	A	0.0
	Right	0.19	7.6	A	6.0	0.20	6.7	A	6.6
	Approach	0.19	2.8	N/A	6.0	0.20	2.9	N/A	6.6
Churcher Street (N)	Left	0.32	6.6	A	11.1	0.11	5.5	A	3.1
	Right	0.91	46.0	E	67.3	0.37	15.2	C	11.8
	Approach	0.91	24.4	C	67.3	0.37	10.5	B	11.8
North Street (W)	Left	0.32	4.6	A	0.0	0.25	4.6	A	0.0
	Right	0.32	0.0	A	0.0	0.25	0.0	A	0.0
	Approach	0.32	1.6	N/A	0.0	0.25	2.2	N/A	0.0

Site 3: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street

The results in **Table 5-13** and **Table 5-14** below for both Stage 1 Development (25% at 2023) and Stage 2 Development (50% at 2028) show that in both the AM peak and PM peak, it is predicted that the North Street approach would drop to a LoS F level of operation – representing oversaturated operation on this arm in both peak periods.

This is principally due to additional development trip related traffic movements between Kimbolton Road (West) and Pharazyn Street (in both directions), which traffic exiting North Street must yield to. The additional demand on Pharazyn Street itself (due to added development trips) essentially displaces the capacity currently used by North Street vehicles, and therefore there is not a significant impact on vehicular delay on the Pharazyn Street approach.

Table 5-13: Stage 1 Development – Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street (2023)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
Kimbolton (West)	North Street	1	A	1	2	A	2
	Pharazyn Street	1	A		2	A	
	Kimbolton (East)	1	A		2	A	
	Seddon St	2	A		3	A	
North Street	Pharazyn Street	196	F	55	35	F	21
	Kimbolton (East)	222	F		52	F	
	Seddon St	56	F		45	E	
	Kimbolton (West)	220	F		62	F	
Pharazyn Street	Kimbolton (East)	0	A	11	0	A	4
	Seddon St	0	A		2	A	
	Kimbolton (West)	10	A		10	B	
	North Street	2	A		5	A	
Kimbolton (East)	Seddon St	0	A	2	0	A	3
	Kimbolton (West)	0	A		0	A	
	North Street	4	A		9	A	
	Pharazyn Street	4	A		8	A	
Seddon St	Kimbolton (West)	6	A	3	2	A	1
	North Street	12	B		3	A	
	Pharazyn Street	2	A		3	A	
	Kimbolton (East)	8	A		1	A	

Table 5-14: Stage 2 Development – Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street (2028)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
Kimbolton (West)	North Street	1	A	1	2	A	2
	Pharazyn Street	1	A		2	A	
	Kimbolton (East)	1	A		3	A	
	Seddon St	2	A		2	A	
North Street	Pharazyn Street	853	F	59	223	F	58
	Kimbolton (East)	722	F		271	F	
	Seddon St	146	F		53	F	
	Kimbolton (West)	1013	F		271	F	
Pharazyn Street	Kimbolton (East)	9	A	19	2	A	15
	Seddon St	0	A		12	B	
	Kimbolton (West)	20	C		19	C	
	North Street	5	A		10	B	
Kimbolton (East)	Seddon St	0	A	3	0	A	4
	Kimbolton (West)	0	A		0	A	
	North Street	5	A		19	C	
	Pharazyn Street	5	A		14	B	
Seddon St	Kimbolton (West)	6	A	3	3	A	2
	North Street	16	C		3	A	
	Pharazyn Street	3	A		3	A	
	Kimbolton (East)	9	A		7	A	

5.3.2 Stage 3 and 4 Assessment

Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street

The results in Table 5-15 and Table 5-16 below for Stage 3 Development (75% at 2033) and Stage 4 Development (100% at 2038) show that a LoS F is predicted on Makino Road and both Lethbridge Street approaches in at least one of the two peak periods. This demonstrates that the intersection is unable to accommodate the forecast increase in traffic demand due to the development.

Table 5-15: Stage 3 Development – North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street (2033)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
North St (West)	Lethbridge (North)	3	A	10	2	A	11
	Makino Rd	7	A		3	A	
	North St (East)	7	A		4	A	
	Denbigh St	10	B		8	A	
	Chamberlain St	7	A		2	A	
	Lethbridge (South)	8	A		5	A	
Lethbridge (North)	Makino Rd	58	F	34	0	A	6
	North St (East)	234	F		15	B	
	Denbigh St	230	F		2	A	
	Chamberlain St	213	F		13	B	
	Lethbridge (South)	260	F		36	F	
	North St (West)	240	F		36	F	
Makino Rd	North St (East)	166	F	37	26	D	20
	Denbigh St	132	F		26	D	
	Chamberlain St	189	F		48	F	
	Lethbridge (South)	192	F		54	F	
	North St (West)	197	F		51	F	
	Lethbridge (North)	52	F		0	A	
North St (East)	Denbigh St	0	A	3	0	A	7
	Chamberlain St	3	A		4	A	
	Lethbridge (South)	3	A		6	A	
	North St (West)	4	A		6	A	
	Lethbridge (North)	7	A		11	B	
	Makino Rd	5	A		4	A	
Denbigh St	Chamberlain St	1	A	2	1	A	2
	Lethbridge (South)	1	A		1	A	
	North St (West)	7	A		6	A	
	Lethbridge (North)	7	A		6	A	
	Makino Rd	11	B		10	B	
	North St (East)	11	B		4	A	
Chamberlain St	Lethbridge (South)	5	A	5	7	A	13
	North St (West)	5	A		22	C	
	Lethbridge (North)	7	A		25	D	
	Makino Rd	24	C		26	D	
	North St (East)	22	C		27	D	
	Denbigh St	0	A		0	A	
Lethbridge (South)	North St (West)	79	F	18	189	F	27
	Lethbridge (North)	156	F		235	F	
	Makino Rd	169	F		231	F	
	North St (East)	166	F		259	F	
	Denbigh St	28	D		32	D	
	Chamberlain St	8	A		0	A	

Table 5-16: Stage 4 Development – North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street (2038)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
North St (West)	Lethbridge (North)	6	A	15	2	A	12
	Makino Rd	7	A		2	A	
	North St (East)	9	A		4	A	
	Denbigh St	10	B		7	A	
	Chamberlain St	7	A		6	A	
	Lethbridge (South)	12	B		5	A	
Lethbridge (North)	Makino Rd	102	F	35	0	A	9
	North St (East)	337	F		30	D	
	Denbigh St	330	F		8	A	
	Chamberlain St	304	F		27	D	
	Lethbridge (South)	391	F		49	E	
	North St (West)	374	F		62	F	
Makino Rd	North St (East)	273	F	37	114	F	33
	Denbigh St	209	F		103	F	
	Chamberlain St	365	F		144	F	
	Lethbridge (South)	368	F		150	F	
	North St (West)	370	F		146	F	
	Lethbridge (North)	79	F		0	A	
North St (East)	Denbigh St	0	A	5	0	A	10
	Chamberlain St	2	A		3	A	
	Lethbridge (South)	5	A		5	A	
	North St (West)	5	A		7	A	
	Lethbridge (North)	8	A		8	A	
	Makino Rd	10	A		7	A	
Denbigh St	Chamberlain St	1	A	2	1	A	2
	Lethbridge (South)	1	A		2	A	
	North St (West)	13	B		8	A	
	Lethbridge (North)	7	A		6	A	
	Makino Rd	15	B		12	B	
	North St (East)	15	B		6	A	
Chamberlain St	Lethbridge (South)	6	A	7	0	A	19
	North St (West)	16	C		56	F	
	Lethbridge (North)	31	D		45	E	
	Makino Rd	38	E		58	F	
	North St (East)	30	D		58	F	
	Denbigh St	0	A		0	A	
Lethbridge (South)	North St (West)	167	F	27	258	F	27
	Lethbridge (North)	287	F		326	F	
	Makino Rd	279	F		323	F	
	North St (East)	247	F		324	F	
	Denbigh St	89	F		19	C	
	Chamberlain St	9	A		0	A	

Site 2: North Street / Churcher Street

Analysis of the AM peak period operations indicate that by 2033 (Stage 3 – 75% Development), average delay for right-turn movements from Churcher Street would deteriorate to a LoS F, resulting in excessive queuing (+200m) and right-turn movements exceeding practical spare capacity. The average delay on Churcher Street will also decline to a LoS F. All other approaches would continue to operate within practical spare capacity.

Analysis of the PM peak operations indicates that the intersection will operate within practical spare capacity and acceptable levels of delay under the full development scenario (Stage 4 -100% Development). The performance for right turning vehicles from Churcher Street is expected to reduce (to a LoS D) upon full development, but all other approaches will continue to operate with relatively minor changes in average delay. The intersection will continue to operate within practical spare capacity (v/c <0.85) under all future PM peak scenarios.

The analysis indicates that based on the assumed trip distribution patterns, mitigation options are primarily required to resolve capacity issues at the intersection during the AM peak period; specifically right-turn movements from Churcher Street.

Table 5-17: Stage 3 – 75% Development – North Street / Churcher Street (2033)

APPROACH		AM PEAK (08:00-09:00)				PM PEAK (16:45-17:45)			
		V/C	Average Delay (s)	Level of Service	Max Queue (m)	V/C	Average Delay (s)	Level of Service	Max Queue (m)
North Street (E)	Through	0.17	0.0	A	0.0	0.16	0.0	A	0.0
	Right	0.22	7.9	A	6.6	0.24	7.0	A	7.8
	Approach	0.22	2.9	N/A	6.6	0.24	3.2	N/A	7.8
Churcher Street (N)	Left	0.36	6.9	A	13.4	0.11	5.5	A	3.2
	Right	1.11	150.2	F	214.6	0.45	17.9	C	14.9
	Approach	1.11	71.8	F	214.6	0.45	12.1	B	14.9
North Street (W)	Left	0.39	4.6	A	0.0	0.27	4.6	A	0.0
	Right	0.39	0.0	A	0.0	0.27	0.0	A	0.0
	Approach	0.39	1.7	N/A	0.0	0.27	2.3	N/A	0.0

Table 5-18: Stage 4 – 100% Development – North Street / Churcher Street (2038)

APPROACH		AM PEAK (08:00-09:00)				PM PEAK (16:45-17:45)			
		V/C	Average Delay (s)	Level of Service	Max Queue (m)	V/C	Average Delay (s)	Level of Service	Max Queue (m)
North Street (E)	Through	0.18	0.0	A	0.0	0.17	0.0	A	0.0
	Right	0.27	8.9	A	9.0	0.34	8.1	A	13.0
	Approach	0.27	3.4	N/A	9.0	0.34	4.1	N/A	13.0
Churcher Street (N)	Left	0.45	7.7	A	21.2	0.14	5.6	A	4.0
	Right	1.60	564.1	F	691.8	0.67	27.2	D	26.0
	Approach	1.60	258.7	F	691.8	0.67	17.1	C	26.0
North Street (W)	Left	0.37	4.6	A	0.0	0.31	4.6	A	0.0
	Right	0.37	0.1	A	0.0	0.31	0.0	A	0.0
	Approach	0.37	1.8	N/A	0.0	0.31	2.5	N/A	0.0

Site 3: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street

The results in **Table 5-19** below for Stage 3 Development (75% at 2033) show a continued issue with vehicular delay and oversaturated operation on the North Street approach, for the reasons set out above for Development Stages 1 and 2.

In **Table 5-20**, under the Stage 4 Development (100% at 2038) scenario, additional issues are predicted on Pharazyn Street in both peak periods (but especially the PM peak hour), demonstrating that this link has also reached capacity – and as it has priority over North Street, very little of the North Street demand would actually be served in this scenario. In the PM peak hour, issues are also predicted on the Seddon Street arm – however, the low volume of demand on this arm suggests that, in practice, these vehicles would force their way out onto/across Kimbolton Road without experiencing such a high level of delay.

Table 5-19: Stage 3 Development – Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street (2033)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
Kimbolton (West)	North Street	1	A	1	3	A	2
	Pharazyn Street	1	A		3	A	
	Kimbolton (East)	1	A		3	A	
	Seddon St	2	A		3	A	
North Street	Pharazyn Street	240	F	59	772	F	58
	Kimbolton (East)	384	F		959	F	
	Seddon St	107	F		406	F	
	Kimbolton (West)	897	F		984	F	
Pharazyn Street	Kimbolton (East)	12	B	36	5	A	27
	Seddon St	0	A		4	A	
	Kimbolton (West)	28	D		36	E	
	North Street	6	A		14	B	
Kimbolton (East)	Seddon St	0	A	4	0	A	5
	Kimbolton (West)	1	A		0	A	
	North Street	7	A		28	D	
	Pharazyn Street	6	A		29	D	
Seddon St	Kimbolton (West)	7	A	3	8	A	3
	North Street	19	C		17	C	
	Pharazyn Street	4	A		5	A	
	Kimbolton (East)	8	A		27	D	

Table 5-20: Stage 4 Development – Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street (2038)

From	To	AM Peak (08:00-09:00)			PM Peak (16:45-17:45)		
		Average Delay (s)	Level of Service	Max Queue (veh)	Average Delay (s)	Level of Service	Max Queue (veh)
Kimbolton (West)	North Street	1	A	1	4	A	2
	Pharazyn Street	1	A		4	A	
	Kimbolton (East)	1	A		5	A	
	Seddon St	2	A		3	A	
North Street	Pharazyn Street	967	F	58	947	F	58
	Kimbolton (East)	375	F		1123	F	
	Seddon St	0	A		0	A	
	Kimbolton (West)	1022	F		1133	F	
Pharazyn Street	Kimbolton (East)	21	C	36	14	B	36
	Seddon St	0	A		0	A	
	Kimbolton (West)	38	E		95	F	
	North Street	8	A		24	C	
Kimbolton (East)	Seddon St	0	A	4	9	A	31
	Kimbolton (West)	1	A		5	A	
	North Street	8	A		84	F	
	Pharazyn Street	8	A		80	F	
Seddon St	Kimbolton (West)	9	A	3	51	F	4
	North Street	28	D		79	F	
	Pharazyn Street	2	A		23	C	
	Kimbolton (East)	19	C		112	F	

5.4 Wider Considerations

5.4.1 Timing of Internal East-West Connections

The proposed structure plan indicates that a new east-west link across the Makino Stream will be provided within Stage 3 of the development. The provision of a new east-west link through the site would provide additional access / egress routes from the proposed development, allowing greater distribution of traffic across the network.

Accelerating the provision of a new east-west link may relieve anticipated capacity issues on the Churcher Street / North Street intersection within Stage 2 and delay the need for isolated mitigation measures at this intersection until later in Stage 3 (i.e. beyond 2028); however, redistribution of traffic onto Makino Road may accelerate the need for improvements at the North Street / Makino Road intersection.

The distribution effects of installing a new east-west crossing at the Makino Road in Stage 2 has not been tested within this assessment.

5.4.2 Local Network Effects

The traffic modelling assessment has focused on the effects of the proposed development on three key access sites from the arterial road network. The trip assignment assessment suggests increased volume of traffic will use the local road network (such as Lytton Street and Derby Street) to access key arterial connections including East Street and Kimbolton Road (SH54).

Changing traffic volumes/patterns on the local road network may require modifications to the existing local road network (i.e. provision of turning bays) as well as a review of the existing form of other intersections on Kimbolton Road (SH54) to ensure the continued safe and efficient operation of the network.

5.4.3 Midblock Capacity on Kimbolton Road (SH54)

Kimbolton Road (SH54) is the primary 'Major Arterial' and inter-regional connecting route within Feilding, providing connections to key destinations within Feilding. The trip assignment indicates that peak hour traffic volumes on Kimbolton Road (SH54) south of Pharazyn Street would roughly double from current (2018) traffic volumes upon completion of Stage 4 of the development (by 2038), placing additional pressure on midblock corridor operations (see **Table 5-21**).

Table 5-21: Forecast Midblock Traffic Volumes – Kimbolton Road South of Pharazyn Street

SCENARIO	AM PEAK HOUR		PM PEAK HOUR	
	Northbound	Southbound	Northbound	Southbound
Existing (2018)	241	487	532	387
Stage 1 – 25% Development (2023)	307	674	726	470
Stage 2 – 50% Development (2028)	375	865	924	556
Stage 3 – 75% Development (2033)	421	962	1,050	608
Stage 4 – 100% Development (2038)	484	1,128	1,231	687

The Economic Evaluation Manual (Section A3.8) identifies the typical capacity for midblock road corridors of varying forms. Based on its existing road form and function of Kimbolton Road SH54 (two-lane, two-way arterial corridor with some parking demand, right turning lanes and moderate pedestrian activity), the corridor is best classified as a Class II urban road. The capacity for midblock road corridors on Class II roads is identified as 900 vehicles per hour per lane. The analysis indicates that the midblock sections of Kimbolton Road (SH54) could be approaching capacity upon completion of Stage 2 development (50% Development – 2028).

Changes in traffic patterns and increases in volumes of this scale are also likely to result in other intersections within the network experiencing a deterioration in performance, particularly on approaches to the town centre. This impact has not been identified in this analysis, which has concentrated on the three key access intersections for the development area, but it is considered that additional future analysis may be required over a wider study area to quantify these effects.

5.4.4 *Trip Reassignment*

Additional sensitivity tests could be undertaken based on the re-assignment of trips due to congestion in the network. Currently, the traffic assignment and distribution assumptions are based on current trip patterns and likely routes for development trips (generally, shortest distance), which are allocated as fixed routes through the network. However, due to the congestion forecast at the three sites within the analysis above, a number of alternative routes could become more attractive relative to the existing situation, primarily between Feilding town centre (and beyond to Palmerston North) and the northern areas of Feilding (including the Growth Precinct 4 sites).

North Street at Kimbolton Road Intersection

The modelling assessment indicates the North Street approach will experience a LoS F within the first stage of development. There are numerous other routes available (Monmouth Street, Marlborough Street, Derby Street etc) to filter across the network, which could be used by vehicles avoiding increasing delay at the North Street / Kimbolton Road intersection. However, these routes are generally less appropriate for through trips, and mitigation at the intersection is likely to be a preferable long-term solution.

Lethbridge Road at North Street Intersection

Makino Road and Chamberlain Road offer direct alternatives to the two Lethbridge Road links, albeit it is likely that a re-assignment onto these alternative north-south links through the intersection would just relocate the queues/delay onto these links. Consequently, although some rebalancing of trip assignment would reduce delay in the short-term, in the longer term mitigation is likely to be required at this location.

5.4.5 *Improved Accessibility to Non-Car Based Modes*

The proposed development of enhanced pedestrian, cycling and public transport services with North Feilding is expected to encourage greater uptake of non-car based modes which may reduce vehicle trip generation during peak periods. However, based on existing commuter patterns and mode splits, mode shift to non-car based modes is expected to be marginal and unlikely to be significant enough to delay the need for improvements as concluded within this report.

6 Conclusions

6.1 Key Findings

This Traffic Impact Assessment focuses on the effects of additional traffic generation from Growth Precinct 4 on the arterial road network located within the immediate vicinity of the development, focusing on the following sites:

- Site 1: North Street / Lethbridge Street / Makino Road / Chamberlain Street / Denbigh Street;
- Site 2: North Street / Churcher Street; and
- Site 3: Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street.

The assessment has given consideration to and evaluates the effects of increases in through traffic and trip generation arising from the rezoning change from rural to residential and recreational.

The proposed Growth Precinct 4 site has an expected yield of approximately 1,800 residential households, with a trip generation potential of **1,800** vehicle trips during each peak hour and **18,000** all day vehicle trips (during a typical weekday). Assuming linear growth in development occurs over the next 20 years, the following scenarios were tested within the future forecast traffic models:

- **Scenario 1: 2023** – 25% developed (450 Households);
- **Scenario 2: 2028** – 50% developed (900 households);
- **Scenario 3: 2023** – 75% developed (1,350 households); and
- **Scenario 4: 2038** – 100% developed (1,800 households).

The results of the traffic modelling exercise are summarised within **Table 6-1**.

Table 6-1: Summary of Intersection Performance

SITE	PERFORMANCE										COMMENT
	2018		2023		2028		2033		2038		
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	
SITE 1 – NORTH ST / LETHBRIDGE ST / MAKINO RD / CHAMBERLAIN ST / DENBIGH ST	✓	✓	✓	✓	✓	✓	✗	✗	✗	✗	<ul style="list-style-type: none"> • Movements out of both Lethbridge Street approaches identified as critical movements • Intersection approaches capacity during the PM peak with the implementation of Stage 2 • Mitigation measures likely required by Stage 3 to accommodate increased traffic movements in both peak hour periods
SITE 2 – NORTH ST / CHURCHER ST	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	<ul style="list-style-type: none"> • Right-turn traffic movements from Churcher Street identified as the critical movement • Intersection approaches capacity during the AM peak towards the second half of Stage 2 (2028) • Mitigation measures likely required by Stage 3 • Intersection operates satisfactorily during the PM peak period in all scenarios (>2038)
SITE 3 – KIMBOLTON RD (SH54) / NORTH ST / PHARAZYN ST / SEDDON ST	✓	✓	✗	✗	✗	✗	✗	✗	✗	✗	<ul style="list-style-type: none"> • Movements out of North Street identified as the critical movement • North Street predicted to have LoS F at Stage 1 (2023) • Mitigation measures likely to be required for implementation of Stage 1

The results of the modelling assessment indicates that:

- **Site 1 – North St / Lethbridge St / Makino Rd / Chamberlain St / Denbigh St**

The intersection will generally perform within acceptable levels of delay and during the first two stages of the development, although some growing deficiencies will be experienced on Lethbridge Street (South) during the PM peak period during Stage 2 of the development; however, it is noted that the availability of alternative north-south routes (Chamberlain Street or West Street) may permit redistribution of these movements to avoid excessive queuing or delay. However, during Stage 3 of the development numerous approaches are expected to operate at a LoS F, and is likely to warrant intersection upgrades.

- **Site 2 – North St / Churcher St**

The intersection will perform within acceptable levels of delay and congestion until the latter part of the Stage 2 development, when excessive queues and delay on Churcher Street during the AM peak hour may warrant mitigation measures to be in place by 2028. Under its existing layout, the intersection will operate within acceptable levels of delay and congestion during the PM peak hour following full development of the site.

- **Site 3 – Kimbolton Rd (SH54) / North St / Pharazyn St / Seddon St**

The North Street approach to the Kimbolton Road (SH54) intersection is significantly affected by the addition of development traffic (largely to and from Pharazyn Street) at the intersection, with mitigation required at an early stage (unless significant traffic re-assignment onto alternative routes through local streets is experienced). The Pharazyn Street approach is expected to operate within acceptable levels of delay until Stage 4 of the of the development.

Whilst the modelling indicates significant delays on the North Street approach, it is likely that traffic volumes will redistribute through the network given the availability of alternative routes. As such, the intersection may not need to be upgraded to support the performance of the Pharazyn Street approach in the short-term, however, the impact of redistributing North Street traffic to other local road connections needs to be considered. This includes the suitability of the local residential network in supporting increasing traffic volumes and the relative performance of other intersections with Kimbolton Road (SH54) (i.e. Derby Street / Lytton Street) in supporting increased traffic demands. This analysis has not been undertaken as part of this assessment.

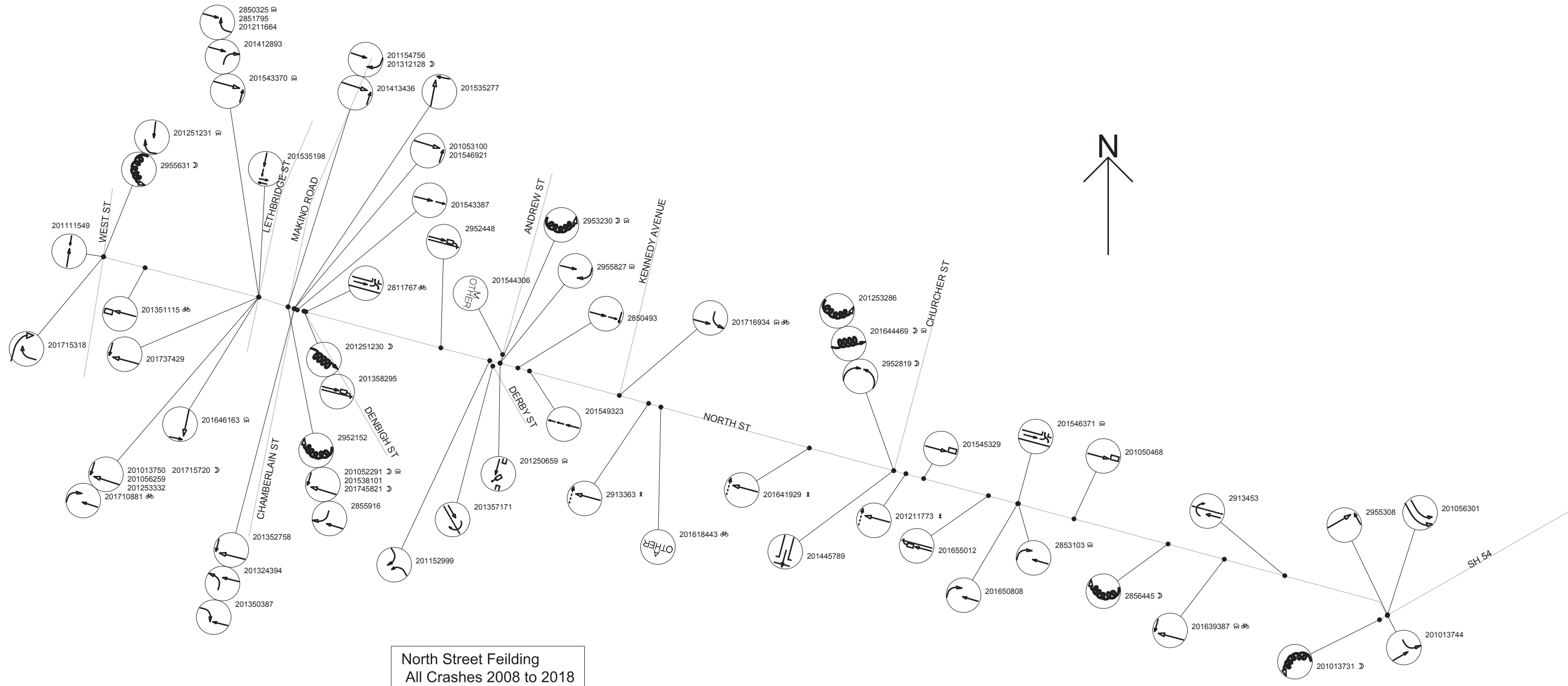
6.2 Recommendations

Based on the findings of the transport assessment, it is recommended that MDC:

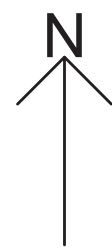
- Develops an annual traffic monitoring programme on the arterial road network and key interconnecting routes to establish future traffic growth generated from the development of Growth Precinct 4. This will allow MDC to determine the pace of growth against forecast traffic assumptions which have been used as a basis for traffic modelling within this assessment;
- Considers accelerating the development of the proposed east-west roading link across the Makino Stream from its current staging proposal (Stage 3) to reduce congestion at the North Street / Churcher Street intersection, although the impacts of short-term redistribution at the North Street / Makino Road intersection need to be assessed;
- Discuss the findings of the modelling assessment with relevant funding and investment partners within NZTA to identify and confirm preferred options for upgrading the Kimbolton Road (SH54) / Pharazyn Street / North Street intersection to support future network operations. Given that the Growth Precinct 4 site is expected to have wider impacts beyond the Pharazyn Street intersection, a holistic review of corridor operations is recommended. Upgrades to the Kimbolton Road (SH54) corridor are expected to be delivered through NZTA's business case approach; and
- Undertake an option assessment for upgrades to the North Street / Lethbridge Street / Makino Road / Denbigh Street / Chamberlain Street and North Street / Churcher Street intersections to identify preferred mitigation options and test the ability of options in resolving capacity issues on the network. This will enable solutions to be identified, appraised, costed and suitable protection measures identified (if required).

Appendix A – Crash History (CAS)

Appendix B – Traffic Flow Profiles (2017)



North Street Feilding
All Crashes 2008 to 2018



Crash List: North St MDC All Crashes 08 to 18

Overall Crash Statistics

Crash Severity	Number	%	Social cost (\$m)
Fatal	0	0	0
Serious	2	3	1.43
Minor Injury	17	24	1.55
Non-injury	51	73	1.26
	70	100	4.23

Crash Numbers

Year	Fatal	Serious	Minor	Non-inj
2013	0	0	2	5
2014	0	1	1	1
2015	0	0	0	10
2016	0	0	1	7
2017	0	0	4	2
TOTAL	0	1	8	25
Percent	0	3	24	74

Note: Last 5 years of crashes shown

Overall Casualty Statistics

Injury Severity	Number	% all casualties
Death	0	0
Serious Injury	2	10
Minor Injury	19	90
	21	100

Casualty Numbers

Year	Fatal	Serious	Minor
2013	0	0	2
2014	0	1	1
2015	0	0	0
2016	0	0	1
2017	0	0	4
TOTAL	0	1	8
Percent	0	11	89

Note: Last 5 years of casualties shown

Crash Type and Cause Statistics

Crash Type	All crashes	% All crashes
Overtaking Crashes	1	1
Straight Road Lost Control/Head On	3	4
Bend - Lost Control/Head On	9	13
Rear End/Obstruction	17	24
Crossing/Turning	37	53
Pedestrian Crashes	3	4
Miscellaneous Crashes	0	0
TOTAL	70	100

Crash factors (*)

Crash factors (*)	All crashes	% All crashes
Alcohol	8	11
Too fast	7	10
Failed Giveaway/Stop	35	50
Failed Keep Left	2	3
Overtaking	1	1
Incorrect Lane/posn	10	14
Poor handling	2	3
Poor Observation	42	60
Poor judgement	10	14
Fatigue	2	3
Disabled/old/ill	1	1
Pedestrian factors	3	4
Vehicle factors	1	1
Road factors	3	4
Weather	2	3
Other	1	1
TOTAL	130	183

Crashes with a:

Driver factor	120	170
Environmental factor	5	7

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigued crash factor.

Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007.

This will influence numbers and percentages.

Note: % represents the % of crashes in which the cause factor appears

Number of parties in crash

Number of parties in crash	All crashes	% All crashes
Single party	8	11
Multiple party	62	89
TOTAL	70	100

Driver and Vehicle Statistics

Note: Driver information is not computerised for non-injury crashes

Drivers at fault or part fault in injury crashes

Age	Male	%	Female	%	Total	%
15-19	2	25	1	11	3	18
20-24	1	13	0	0	1	6
25-29	0	0	0	0	0	0
30-39	1	13	2	22	3	18
40-49	1	13	0	0	1	6
50-59	1	13	2	22	3	18
60-69	2	25	3	33	5	29
70+	0	0	1	11	1	6
TOTAL	8	100	9	100	17	100

Drivers at fault or part fault in injury crashes

Licence	Male	Female	Total	%
Full	5	6	11	65
Learner	1	0	1	6
Restricted	2	0	2	12
Never licensed	0	1	1	6
Disqualified	0	1	1	6
Overseas	0	0	0	0
Expired	0	0	0	0
Other/Unknown	0	1	1	6
TOTAL	8	9	17	100

Vehicles involved in injury crashes

	No.of vehicles	% Injury crashes
SUV	3	11
Car/Stn Wagon	23	84
Motor Cycle	1	5
Moped	1	5
Bicycle	4	21
Van Or Utility	3	16
TOTAL	35	142

Note: % represents the % of injury crashes in which the vehicle appears

Crash List: North St MDC All Crashes 08 to 18

Road Environment Statistics

Road Type	Local road	%	State highway	%	Total	%
Urban	65	93	5	7	70	100
Open Road	0	0	0	0	0	0
TOTAL	65	93	5	7	70	100

Conditions	Injury	Non-injury	Total	%
Light/overcast	15	42	57	81
Dark/twilight	4	8	12	17
TOTAL	19	50	69	99

Conditions	Injury	Non-injury	Total	%
Dry	18	38	56	80
Wet	1	13	14	20
Ice/snow	0	0	0	0
TOTAL	19	51	70	100

Intersection/mid-block	All crashes	% All crashes
Intersection	57	81
Midblock	13	19
TOTAL	70	100

Objects Struck	Injury crashes	%	Non-injury crashes	%
Crashes w/obj.struck	2	11	12	24

Object Struck	Injury crashes	%	Non-injury crashes	%
Fence	2	11	5	10
Guard Rail	0	0	1	2
House Or Bldg	0	0	1	2
Kerb	0	0	1	2
Parked Vehicle	0	0	5	10
Post Or Pole	0	0	2	4
Traffic Sign	0	0	1	2
Tree	0	0	1	2
Other	0	0	1	2
TOTAL	2		18	

Note: % represents the % of crashes in which the object is struck

Time Period Statistics

Day/Period	All crashes	% All crashes
Weekday	48	69
Weekend	22	31
TOTAL	70	100

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Weekday	0	2	6	6	6	20	5	3	48
Weekend	0	1	2	4	3	8	3	1	22
TOTAL	0	3	8	10	9	28	8	4	70

Note: Weekend runs from 6 pm on Friday to 6 am on Monday

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Mon	0	0	1	0	1	6	0	0	8
Tue	0	0	0	3	4	6	2	1	16
Wed	0	0	2	2	0	2	0	1	7
Thu	0	2	1	1	0	5	2	0	11
Fri	0	0	2	0	1	1	1	1	6
Sat	0	0	1	2	1	4	2	1	11
Sun	0	1	1	2	2	4	1	0	11
TOTAL	0	3	8	10	9	28	8	4	70

Month	Injury	%	Non-injury	%	Total	%
Jan	1	5	3	6	4	6
Feb	1	5	2	4	3	4
Mar	1	5	2	4	3	4
Apr	2	11	9	18	11	16
May	3	16	4	8	7	10
Jun	1	5	3	6	4	6
Jul	2	11	2	4	4	6
Aug	1	5	6	12	7	10
Sep	1	5	7	14	8	11
Oct	1	5	6	12	7	10
Nov	3	16	3	6	6	9
Dec	2	11	4	8	6	9
TOTAL	19	100	51	100	70	100

Crash List details for : 2897000 North St MDC All Crashes 08 to 18

Query is LIMITED by Map Co-Ordinates

Non-police-reported crashes EXCLUDED

Crash Severity in : Fatal and Injury, Non-Injury, Unknown

Crashes between the years of : '2008' and '2018'

Crashes in the TLA(s) of : Manawatu District

List Created by : OPUS09

Number of Crashes in List : 106

Number of Vehicles in List : 0

Number of People in List : 0

List Created on : 31/01/18

No.of Crashes in List after deletions : 70

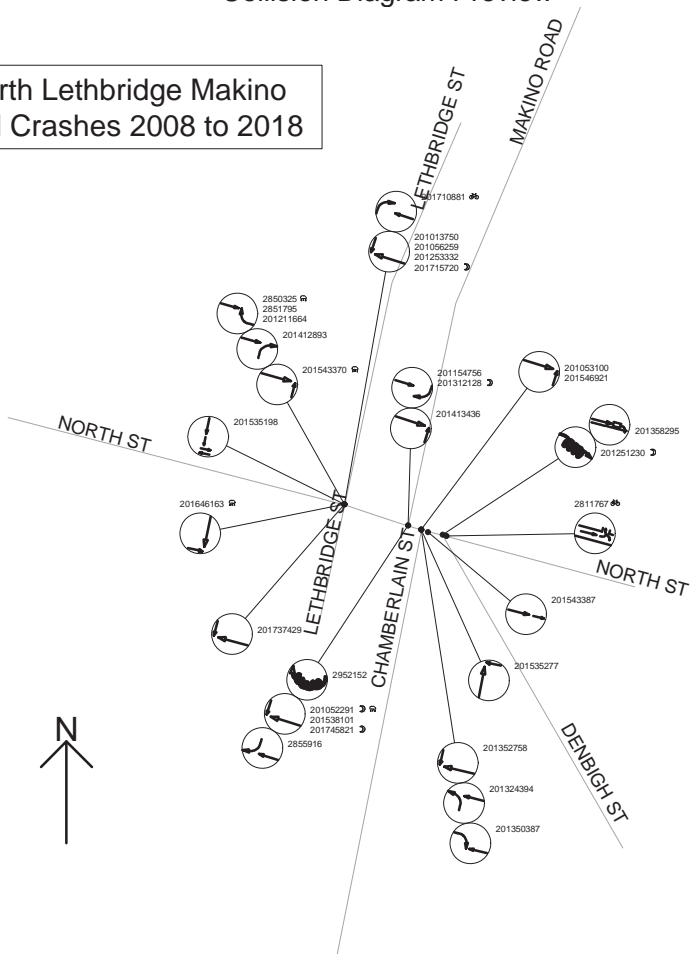
Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N
1	NORTH ST	I MAKINO ROAD	201745821	05/08/2017	Sat	2015	VAN1 WBD on NORTH ST hit CAR2 crossing at right angle from right	VAN1 alcohol test below limit CAR2 alcohol test below limit, Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Dark	Fine	X Type Junction	Give Way Sign	
2	LETHBRIDGE ST	I NORTH ST	201737429	23/04/2017	Sun	1025	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 did not stop at stop sign, attention diverted by cell phone, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Stop Sign	
3	NORTH ST	I KENNEDY AVENUE	201716934	10/08/2017	Thu	0740	CYCLIST1 (Age 13) EBD on NORTH ST hit CAR2 merging from the left	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Overcast	Fine	T Type Junction	Give Way Sign	1
4	NORTH ST	I LETHBRIDGE ST	201715720	11/07/2017	Tue	1715	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR1 inattentive	Dry	Twilight	Light Rain	X Type Junction	Stop Sign	1
5	WEST ST	I NORTH ST	201715318	08/07/2017	Sat	1000	CAR1 WBD on NORTH ST turning right hit CAR2 turning right into NORTH ST	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Overcast	Fine	T Type Junction	Give Way Sign	1
6	NORTH ST	I LETHBRIDGE ST	201710881	11/02/2017	Sat	1140	CYCLIST1 (Age 70) WBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Stop Sign	1
7	NORTH ST	50W MARLBOROUGH ST	201655012	28/11/2016	Mon	1705	CAR1 WBD on NORTH ST hit rear of CAR2 turning right from centre line	CAR1 following too closely, failed to notice car slowing	Dry	Bright	Fine	Driveway	Nil	
8	NORTH ST	I MARLBOROUGH ST	201650808	20/10/2016	Thu	1100	CAR1 WBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left	CAR2 Failed to give way At a priority traffic control, attention diverted by cell phone	Dry	Bright	Fine	T Type Junction	Give Way Sign	
9	NORTH ST	I LETHBRIDGE ST	201646163	14/08/2016	Sun	1300	CAR1 SBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 did not stop at stop sign, Did not check / notice another party	Wet	Overcast	Light Rain	X Type Junction	Stop Sign	
10	NORTH ST	I CHURCHER ST	201644469	01/08/2016	Mon	1720	CAR1 EBD on NORTH ST lost control; went off road to left, CAR1 hit Post Or Pole	CAR1 lost control due to road conditions ENV: road slippery (rain)	Wet	Dark	Light Rain	T Type Junction	Give Way Sign	
11	NORTH ST	40W DUKE ST	201641929	04/07/2016	Mon	1515	SUV1 WBD on NORTH ST hit PEDESTRIAN2 crossing road from left side	PEDESTRIAN2 crossing heedless of traffic	Dry	Overcast	Light Rain	Unknown	N/A	
12	SH 54	I SEDDON ST	201639549	24/05/2016	Tue	1645	CAR1 EBD on SH 54 hit CAR2 crossing at right angle from right	CAR2 failed to give way when priority defined by road markings, Did not check / notice another party	Wet	Overcast	Heavy Rain	T Type Junction	Give Way Sign	
13	NORTH ST	30E MONMOUTH ST	201639387	31/05/2016	Tue	0930	CYCLIST1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CYCLIST1 Driving or Riding in pedestrian space	Wet	Overcast	Fine	Driveway	Nil	
14	NORTH ST	70E KENNEDY AVENUE	201618443	22/11/2016	Tue	1530	CAR1 WBD on NORTH ST overtaking CYCLIST2 (Age 17)	CAR1 too far left/right	Dry	Overcast	Fine	Unknown	N/A	1
15	NORTH ST	50E ANDREW ST	201549323	02/11/2015	Mon	1525	CAR1 WBD on NORTH ST hit rear end of CAR2 stop/slow for queue	CAR1 failed to notice car slowing, attention diverted	Dry	Overcast	Fine	Unknown	N/A	
16	NORTH ST	I CHAMBERLAIN ST	201546921	15/09/2015	Tue	1203	CAR1 EBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign	
17	NORTH ST	I MARLBOROUGH ST	201546371	17/09/2015	Thu	1630	MOPED1 EBD on NORTH ST hit VAN2 doing driveway manoeuvre	VAN2 failed to give way to a pedestrian, Did not check / notice another party behind ENV: entering or leaving private house / farm	Wet	Overcast	Fine	Driveway	Give Way Sign	
18	NORTH ST	50E CHURCHER ST	201545329	07/09/2015	Mon	1750	VAN1 EBD on NORTH ST hit parked veh, VAN1 hit Parked Vehicle	VAN1 too far left/right, lost control	Dry	Overcast	Fine	Unknown	N/A	
19	ANDREW ST	15N NORTH ST	201544306	08/09/2015	Tue	1915	CAR1 SBD on ANDREW ST hit Parked Vehicle while manoeuvring	CAR1 Did not check / notice another party behind	Dry	Bright	Fine	T Type Junction	Give Way Sign	
20	NORTH ST	5E CHAMBERLAIN ST	201543387	16/08/2015	Sun	1530	CAR1 EBD on NORTH ST hit rear end of CAR2 stopped/moving slowly	CAR1 following too closely, failed to notice car slowing	Dry	Bright	Fine	X Type Junction	Give Way Sign	

Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N
21	NORTH ST	I LETHBRIDGE ST	201543370	04/08/2015	Tue	1330	CAR1 EBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Overcast	Light Rain	X Type Junction	Stop Sign	
22	NORTH ST	I MAKINO ROAD	201538101	23/03/2015	Mon	1540	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, attention diverted by other traffic, Did not check / notice another party	Dry	Unknown	Fine	T Type Junction	Give Way Sign	
23	NORTH ST	I CHAMBERLAIN ST	201535277	24/01/2015	Sat	0855	CAR1 NBD on CHAMBERLAIN ST hit CAR2 crossing at right angle from right	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign	
24	LETHBRIDGE ST	I NORTH ST	201535198	02/04/2015	Thu	1645	CAR1 SBD on LETHBRIDGE ST hit rear end of CAR2 stop/slow for cross traffic	CAR1 following too closely	Dry	Overcast	Fine	X Type Junction	Stop Sign	
25	CHURCHER ST	I NORTH ST	201445789	26/10/2014	Sun	0852	SUV1 SBD on CHURCHER ST missed inters or end of road, SUV1 hit Fence	SUV1 alcohol test above limit or test refused, too fast on straight, attention diverted by cigarette etc	Dry	Overcast	Fine	T Type Junction	Give Way Sign	
26	NORTH ST	I MAKINO ROAD	201413436	13/06/2014	Fri	1559	MOTOR CYCLE1 EBD on NORTH ST hit VAN2 crossing at right angle from right	VAN2 Failed to give way At a priority traffic control ENV: dazzling sun	Dry	Bright	Fine	X Type Junction	Give Way Sign	1
27	NORTH ST	I LETHBRIDGE ST	201412893	06/05/2014	Tue	0915	CAR1 EBD on NORTH ST hit CAR2 merging from the right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party, new driver / under instruction	Dry	Bright	Fine	X Type Junction	Stop Sign	1
28	NORTH ST	I DENBIGH ST	201358295	15/12/2013	Sun	1800	CAR1 EBD on NORTH ST hit rear of CAR2 turning right from centre line	CAR1 failed to notice car slowing, attention diverted	Dry	Bright	Fine	T Type Junction	Give Way Sign	
29	DERBY ST	10S NORTH ST	201357171	10/12/2013	Tue	1420	CAR1 SBD on DERBY ST hit CAR2 U-turning from same direction of travel	CAR2 Did not check / notice another party behind	Dry	Bright	Fine	T Type Junction	Give Way Sign	
30	NORTH ST	I CHAMBERLAIN ST	201352758	23/07/2013	Tue	1515	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, defective vision	Dry	Overcast	Fine	X Type Junction	Give Way Sign	
31	NORTH ST	70E WEST ST	201351115	14/04/2013	Sun	1250	CYCLIST1 WBD on NORTH ST hit parked veh, CYCLIST1 hit Parked Vehicle	CYCLIST1 misjudged speed of own vehicle	Dry	Overcast	Fine	Unknown	Nil	
32	NORTH ST	I CHAMBERLAIN ST	201350387	13/02/2013	Wed	1122	VAN2 turning right hit by oncoming CAR1 WBD on NORTH ST	VAN2 failed to give way when turning to non-turning traffic, emotionally upset/road rage, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign	
33	NORTH ST	I CHAMBERLAIN ST	201324394	17/12/2013	Tue	1729	CAR1 WBD on NORTH ST hit CAR2 merging from the left	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign	1
34	NORTH ST	I MAKINO ROAD	201312128	16/05/2013	Thu	0530	MOPED1 EBD on NORTH ST hit VAN2 turning right onto NORTH ST from the left	VAN2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Dark	Fine	T Type Junction	Give Way Sign	1
35	NORTH ST	I LETHBRIDGE ST	201253332	19/09/2012	Wed	0920	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Overcast	Fine	X Type Junction	Stop Sign	
36	NORTH ST	I CHURCHER ST	201253286	07/09/2012	Fri	2030	CAR1 EBD on NORTH ST lost control turning left, CAR1 hit Fence, House Or Bldg, Kerb	CAR1 Entering / On curve, new driver / under instruction	Dry	Overcast	Heavy Rain	T Type Junction	Give Way Sign	
37	NORTH ST	I WEST ST	201251231	12/04/2012	Thu	1558	CAR1 SBD on WEST ST hit CAR2 turning right onto WEST ST from the left	CAR2 Failed to give way At a priority traffic control, didnt see/look when visibility obstructed by other vehicles	Wet	Overcast	Fine	T Type Junction	Give Way Sign	
38	NORTH ST	I DENBIGH ST	201251230	15/04/2012	Sun	0515	CAR1 EBD on NORTH ST lost control; went off road to right, CAR1 hit Traffic Sign, Tree	CAR1 alcohol test above limit or test refused, too far left/right, fatigue (drowsy, tired, fell asleep)	Dry	Twilight	Fine	T Type Junction	Give Way Sign	

Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N
39	ANDREW ST	I NORTH ST	201250659	12/03/2012	Mon	0850	CAR1 SBD on ANDREW ST hit CAR2 parking/unparking	CAR1 Did not check / notice another party behind CAR2 misjudged intentions of another party	Wet	Overcast	Fine	X Type Junction	Give Way Sign	
40	NORTH ST	20E CHURCHER ST	201211773	03/05/2012	Thu	1505	CAR1 WBD on NORTH ST hit PEDESTRIAN2 (Age 7) crossing road from left side	PEDESTRIAN2 stepped out from behind vehicle, pedestrian attention diverted eg cigarette, cell phone, music player	Dry	Bright	Fine	Unknown	Nil	1
41	NORTH ST	I LETHBRIDGE ST	201211664	07/04/2012	Sat	1710	CAR2 turning right hit by oncoming CAR1 EBD on NORTH ST	CAR2 failed to give way when turning to non-turning traffic, attention diverted by driver dazzled by sun/lights ENV: dazzling sun	Dry	Bright	Fine	X Type Junction	Stop Sign	1
42	NORTH ST	I MAKINO ROAD	201154756	27/10/2011	Thu	1514	CAR1 EBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left	CAR2 Failed to give way At a priority traffic control, misjudged intentions of another party	Dry	Overcast	Unknow	T Type Junction	Give Way Sign	
43	NORTH ST	I DERBY ST	201152999	08/08/2011	Mon	1433	CAR1 NBD on DERBY ST merging hit CAR2 also merging	CAR1 failed to give way when turning left	Dry	Overcast	Fine	X Type Junction	Give Way Sign	
44	WEST ST	I NORTH ST	201111549	15/01/2011	Sat	1643	SUV1 NBD on WEST ST hit SUV2 headon on straight	SUV1 Too far right, attention diverted by passengers SUV2 misjudged intentions of another party	Dry	Bright	Fine	T Type Junction	Give Way Sign	2
45	NORTH ST	I SH 54	201056301	11/12/2010	Sat	1800	VAN1 and CAR2 both EBD on NORTH ST and turning; collided	VAN1 long vehicle tracked outside lane CAR2 overtaking at an intersection, misjudged intentions of another party	Dry	Bright	Fine	T Type Junction	Give Way Sign	
46	NORTH ST	I LETHBRIDGE ST	201056259	08/12/2010	Wed	0825	VAN1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Stop Sign	
47	NORTH ST	I CHAMBERLAIN ST	201053100	05/05/2010	Wed	1640	CAR1 EBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign	
48	NORTH ST	I MAKINO ROAD	201052291	22/04/2010	Thu	0330	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Twilight	Light Rain	T Type Junction	Give Way Sign	
49	NORTH ST	50E CHURCHILL AVENUE	201050468	28/01/2010	Thu	1920	CAR1 EBD on NORTH ST hit parked veh, CAR1 hit Parked Vehicle	CAR1 alcohol test above limit or test refused, too far left/right	Dry	Bright	Fine	Unknown	Nil	
50	NORTH ST	I LETHBRIDGE ST	201013750	30/10/2010	Sat	1345	SUV1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, fatigue due to long trip	Dry	Overcast	Fine	X Type Junction	Stop Sign	1
51	SH 54	I NORTH ST	201013744	28/09/2010	Tue	1655	CAR1 EBD on SH 54 hit CAR2 merging from the left	CAR2 Failed to give way At a priority traffic control	Dry	Bright	Fine	T Type Junction	Give Way Sign	1
52	SH 54 KIMBOLTON	I SEDDON ST	201013731	21/12/2010	Tue	2210	CAR1 WBD on SH 54 KIMBOLTON lost control turning left, CAR1 hit Fence	CAR1 alcohol test above limit or test refused, Inappropriate speed, evading enforcement, vehicle caught fire	Dry	Dark	Fine	Multi Rd Join	Give Way Sign	1
53	SEDDON ST	I SH 54	201012067	17/04/2010	Sat	2210	CAR1 WBD on SEDDON ST lost control turning right, CAR1 hit Fence on right hand bend	CAR1 alcohol test above limit or test refused, Entering / On curve, lost control when turning	Dry	Dark	Fine	T Type Junction	Nil	2
54	NORTH ST	I ANDREW ST	2955827	27/10/2009	Tue	1305	CAR1 EBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left, CAR1 hit Fence	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party, new driver / under instruction	Wet	Overcast	Light Rain	X Type Junction	Give Way Sign	
55	WEST ST	I NORTH ST	2955631	16/10/2009	Fri	2210	CAR1 SBD on WEST ST lost control turning left, CAR1 hit Parked Vehicle	CAR1 Inappropriate speed, lost control due to road conditions ENV: road surface deep loose metal, road surface under construction or maintenance	Dry	Dark	Fine	T Type Junction	Give Way Sign	

Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N
56	SH 54	I NORTH ST	2955308	05/09/2009	Sat	1550	CAR1 NBD on SH 54 hit CAR2 crossing at right angle from right	CAR1 too fast on straight CAR2 Failed to give way At a priority traffic control, another vehicle	Dry	Overcast	Fine	T Type Junction	Give Way Sign	
57	PHARAZYN ST	I SH 54	2953231	05/04/2009	Sun	1535	VAN1 NBD on PHARAZYN ST merging hit CAR2 also merging	VAN1 alcohol test above limit or test refused, Did not check / notice another party	Dry	Bright	Fine	Y Type Junction	Give Way Sign	
58	ANDREW ST	I NORTH ST	2953230	14/06/2009	Sun	1719	SUV1 EBD on NORTH ST lost control turning left	SUV1 alcohol test above limit or test refused	Wet	Twilight	Fine	X Type Junction	Give Way Sign	
59	CHURCHER ST	I NORTH ST	2952819	04/06/2009	Thu	1845	CAR1 EBD on NORTH ST cutting corner hit CAR2 head on	CAR1 cutting corner at intersection, attention diverted by cigarette etc	Dry	Dark	Fine	T Type Junction	Give Way Sign	
60	NORTH ST	I MCCORKINDALE ST	2952448	26/05/2009	Tue	1800	CAR1 EBD on NORTH ST hit rear of SUV2 turning right from centre line	CAR1 failed to notice indication of vehicle in front ENV: entering or leaving private house / farm	Dry	Overcast	Fine	Driveway	Nil	
61	NORTH ST	I MAKINO ROAD	2952152	05/04/2009	Sun	1127	CAR1 WBD on NORTH ST lost control turning right, CAR1 hit Fence, Guard Rail on right hand bend	CAR1 lost control due to road conditions ENV: road slippery (loose material on seal), road surface under construction or maintenance, signs / signals ineffective or inadequate	Dry	Bright	Fine	T Type Junction	Give Way Sign	
62	NORTH ST	I ELIZABETH ST	2913453	25/11/2009	Wed	0815	CAR1 WBD on NORTH ST hit VAN2 U-turning from same direction of travel	VAN2 Did not check / notice another party behind	Dry	Bright	Fine	T Type Junction	Nil	1
63	NORTH ST	50E KENNEDY AVENUE	2913363	06/11/2009	Fri	0830	CAR1 WBD on NORTH ST hit PEDESTRIAN2 (Age 15) crossing road from left side	PEDESTRIAN2 crossing heedless of traffic	Dry	Bright	Fine	Unknown	Nil	1
64	NORTH ST	I EDINBURGH ST	2856445	26/11/2008	Wed	2225	CAR1 WBD on NORTH ST lost control turning right, CAR1 hit Fence, Post Or Pole, Other on right hand bend	CAR1 alcohol test above limit or test refused, Entering / On curve	Dry	Dark	Fine	T Type Junction	Give Way Sign	
65	NORTH ST	I MAKINO ROAD	2855916	17/10/2008	Fri	0836	CAR1 WBD on NORTH ST hit CAR2 merging from the right	CAR2 Failed to give way At a priority traffic control	Dry	Overcast	Fine	T Type Junction	Give Way Sign	
66	NORTH ST	I MARLBOROUGH ST	2853103	24/06/2008	Tue	1050	CAR1 WBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Overcast	Heavy Rain	T Type Junction	Give Way Sign	
67	NORTH ST	I LETHBRIDGE ST	2851795	09/04/2008	Wed	1600	CAR2 turning right hit by oncoming CAR1 EBD on NORTH ST	CAR2 failed to give way when turning to non-turning traffic, attention diverted by driver dazzled by sun/lights	Dry	Bright	Fine	X Type Junction	Stop Sign	
68	NORTH ST	30E ANDREW ST	2850493	18/01/2008	Fri	1208	CAR1 EBD on NORTH ST hit rear end of CAR2 stop/slow for PEDESTRIAN	CAR1 failed to notice car slowing, attention diverted	Dry	Bright	Fine	Unknown	Nil	
69	NORTH ST	I LETHBRIDGE ST	2850325	10/02/2008	Sun	1645	TRUCK2 turning right hit by oncoming CAR1 EBD on NORTH ST	TRUCK2 failed to give way when turning to non-turning traffic, misjudged intentions of another party	Wet	Overcast	Fine	X Type Junction	Stop Sign	
70	NORTH ST	30E MAKINO ROAD	2811767	22/03/2008	Sat	1655	CYCLIST1 EBD on NORTH ST hit CAR2 doing driveway manoeuvre	CYCLIST1 Driving or Riding in pedestrian space, did not see or look for other party until too late ENV: entering or leaving other commercial	Dry	Overcast	Fine	Driveway	Nil	1

North Lethbridge Makino
All Crashes 2008 to 2018



Crash List: North Lethbridge Makino All Crashes 08-18 15m_rad

Overall Crash Statistics

Crash Severity	Number	%	Social cost (\$m)
Fatal	0	0	0
Serious	1	3	0.7
Minor Injury	8	26	0.74
Non-injury	22	71	0.55
TOTAL	31	100	1.99

Crash Numbers

Year	Fatal	Serious	Minor	Non-inj
2013	0	0	2	3
2014	0	1	1	0
2015	0	0	0	6
2016	0	0	0	1
2017	0	0	2	2
TOTAL	0	1	5	12
Percent	0	6	28	67

Note: Last 5 years of crashes shown

Overall Casualty Statistics

Injury Severity	Number	% all casualties
Death	0	0
Serious Injury	1	11
Minor Injury	8	89
TOTAL	9	100

Casualty Numbers

Year	Fatal	Serious	Minor
2013	0	0	2
2014	0	1	1
2015	0	0	0
2016	0	0	0
2017	0	0	2
TOTAL	0	1	5
Percent	0	17	83

Note: Last 5 years of casualties shown

Crash Type and Cause Statistics

Crash Type	All crashes	% All crashes
Overtaking Crashes	0	0
Straight Road Lost Control/Head On	1	3
Bend - Lost Control/Head On	1	3
Rear End/Obstruction	4	13
Crossing/Turning	25	81
Pedestrian Crashes	0	0
Miscellaneous Crashes	0	0
TOTAL	31	100

Crash factors (*)

Crash factors (*)	All crashes	% All crashes
Alcohol	1	3
Failed Giveaway/Stop	24	77
Incorrect Lane/posn	4	13
Poor Observation	22	71
Poor judgement	3	10
Fatigue	2	6
Disabled/old/ill	1	3
Road factors	1	3
Weather	2	6
TOTAL	60	192

Crashes with a:

Driver factor	57	183
Environmental factor	3	9

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigue crash factor.

Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007. This will influence numbers and percentages.

Note: % represents the % of crashes in which the cause factor appears

Number of parties in crash

Number of parties in crash	All crashes	% All crashes
Single party	2	6
Multiple party	29	94
TOTAL	31	100

Driver and Vehicle Statistics

Note: Driver information is not computerised for non-injury crashes

Drivers at fault or part fault in injury crashes

Age	Male	%	Female	%	Total	%
15-19	2	40	0	0	2	22
20-24	1	20	0	0	1	11
25-29	0	0	0	0	0	0
30-39	0	0	0	0	0	0
40-49	1	20	0	0	1	11
50-59	0	0	1	25	1	11
60-69	1	20	3	75	4	44
70+	0	0	0	0	0	0
TOTAL	5	100	4	100	9	100

Drivers at fault or part fault in injury crashes

Licence	Male	Female	Total	%
Full	2	4	6	67
Learner	1	0	1	11
Restricted	2	0	2	22
Never licensed	0	0	0	0
Disqualified	0	0	0	0
Overseas	0	0	0	0
Expired	0	0	0	0
Other/Unknown	0	0	0	0
TOTAL	5	4	9	100

Vehicles involved in injury crashes

	No.of vehicles	% Injury crashes
SUV	1	11
Car/Stn Wagon	12	78
Motor Cycle	1	11
Moped	1	11
Bicycle	2	22
Van Or Utility	2	22
TOTAL	19	155

Note: % represents the % of injury crashes in which the vehicle appears

Crash List: North Lethbridge Makino All Crashes 08-18 15m_rad

Road Environment Statistics

Road Type	Local road	%	State highway	%	Total	%
Urban	31	100	0	0	31	100
Open Road	0	0	0	0	0	0
TOTAL	31	100	0	0	31	100

Conditions	Injury	Non-injury	Total	%
Light/overcast	7	18	25	81
Dark/twilight	2	3	5	16
TOTAL	9	21	30	97

Conditions	Injury	Non-injury	Total	%
Dry	9	18	27	87
Wet	0	4	4	13
Ice/snow	0	0	0	0
TOTAL	9	22	31	100

Intersection/mid-block	All crashes	% All crashes
Intersection	30	97
Midblock	1	3
TOTAL	31	100

Objects Struck	Injury crashes	%	Non-injury crashes	%
Crashes w/obj.struck	0	0	2	9

Object Struck	Injury crashes	%	Non-injury crashes	%
Fence	0	0	1	5
Guard Rail	0	0	1	5
Traffic Sign	0	0	1	5
Tree	0	0	1	5
TOTAL	0		4	

Note: % represents the % of crashes in which the object is struck

Time Period Statistics

Day/Period	All crashes	% All crashes
Weekday	18	58
Weekend	13	42
TOTAL	31	100

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Weekday	0	2	2	3	2	9	0	0	18
Weekend	0	1	1	3	2	4	2	0	13
TOTAL	0	3	3	6	4	13	2	0	31

Note: Weekend runs from 6 pm on Friday to 6 am on Monday

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Mon	0	0	0	0	0	1	0	0	1
Tue	0	0	0	1	2	3	0	0	6
Wed	0	0	1	2	0	2	0	0	5
Thu	0	2	0	0	0	2	0	0	4
Fri	0	0	1	0	0	1	0	0	2
Sat	0	0	1	1	1	2	1	0	6
Sun	0	1	0	2	1	2	1	0	7
TOTAL	0	3	3	6	4	13	2	0	31

Month	Injury	%	Non-injury	%	Total	%
Jan	0	0	1	5	1	3
Feb	1	11	2	9	3	10
Mar	1	11	1	5	2	6
Apr	1	11	6	27	7	23
May	2	22	1	5	3	10
Jun	1	11	0	0	1	3
Jul	1	11	1	5	2	6
Aug	0	0	4	18	4	13
Sep	0	0	2	9	2	6
Oct	1	11	2	9	3	10
Nov	0	0	0	0	0	0
Dec	1	11	2	9	3	10
TOTAL	9	100	22	100	31	100

Crash List details for : 2897036 North Lethbridge Makino All Crashes 08-18 15m_rad

Query is LIMITED by Map Co-Ordinates

Non-police-reported crashes EXCLUDED

Crash Severity in : Fatal and Injury, Non-Injury, Unknown

Crashes between the years of : '2008' and '2018'

Crashes in the TLA(s) of : Manawatu District

List Created by : OPUS09

Number of Crashes in List : 31

Number of Vehicles in List : 0

Number of People in List : 0

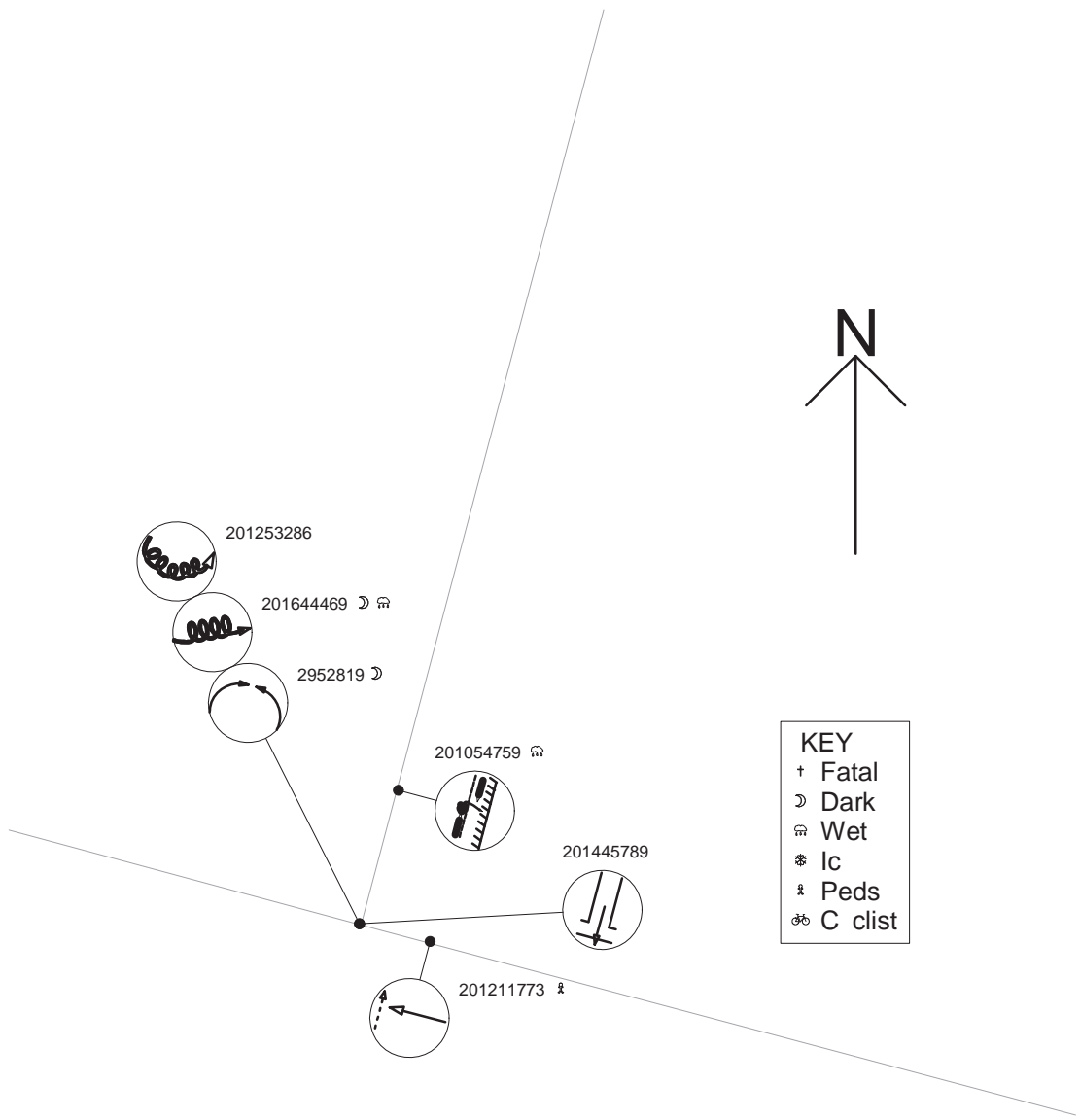
List Created on : 31/01/18

No.of Crashes in List after deletions : 31

Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N	Map Coordinates Easting Northing
1	NORTH ST	I MAKINO ROAD	201745821	05/08/2017	Sat	2015	VAN1 WBD on NORTH ST hit CAR2 crossing at right angle from right	VAN1 alcohol test below limit CAR2 alcohol test below limit, Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Dark	Fine	X Type Junction	Give Way Sign		1818031 5545417
2	LETHBRIDGE ST	I NORTH ST	201737429	23/04/2017	Sun	1025	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 did not stop at stop sign, attention diverted by cell phone, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Stop Sign		1817983 5545433
3	NORTH ST	I LETHBRIDGE ST	201715720	11/07/2017	Tue	1715	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR1 inattentive	Dry	Twilight	Light Rain	X Type Junction	Stop Sign	1	1817983 5545433
4	NORTH ST	I LETHBRIDGE ST	201710881	11/02/2017	Sat	1140	CYCLIST1 (Age 70) WBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Stop Sign	1	1817983 5545433
5	NORTH ST	I LETHBRIDGE ST	201646163	14/08/2016	Sun	1300	CAR1 SBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 did not stop at stop sign, Did not check / notice another party	Wet	Overcast	Light Rain	X Type Junction	Stop Sign		1817983 5545433
6	NORTH ST	I CHAMBERLAIN ST	201546921	15/09/2015	Tue	1203	CAR1 EBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign		1818041 5545414
7	NORTH ST	5E CHAMBERLAIN ST	201543387	16/08/2015	Sun	1530	CAR1 EBD on NORTH ST hit rear end of CAR2 stopped/moving slowly	CAR1 following too closely, failed to notice car slowing	Dry	Bright	Fine	X Type Junction	Give Way Sign		1818046 5545412
8	NORTH ST	I LETHBRIDGE ST	201543370	04/08/2015	Tue	1330	CAR1 EBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Overcast	Light Rain	X Type Junction	Stop Sign		1817983 5545433
9	NORTH ST	I MAKINO ROAD	201538101	23/03/2015	Mon	1540	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, attention diverted by other traffic, Did not check / notice another party	Dry	Unknown	Fine	T Type Junction	Give Way Sign		1818031 5545417
10	NORTH ST	I CHAMBERLAIN ST	201535277	24/01/2015	Sat	0855	CAR1 NBD on CHAMBERLAIN ST hit CAR2 crossing at right angle from right	CAR1 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign		1818041 5545414
11	LETHBRIDGE ST	I NORTH ST	201535198	02/04/2015	Thu	1645	CAR1 SBD on LETHBRIDGE ST hit rear end of CAR2 stop/slow for cross traffic	CAR1 following too closely	Dry	Overcast	Fine	X Type Junction	Stop Sign		1817983 5545433
12	NORTH ST	I MAKINO ROAD	201413436	13/06/2014	Fri	1559	MOTOR CYCLE1 EBD on NORTH ST hit VAN2 crossing at right angle from right	VAN2 Failed to give way At a priority traffic control ENV: dazzling sun	Dry	Bright	Fine	X Type Junction	Give Way Sign	1	1818031 5545417
13	NORTH ST	I LETHBRIDGE ST	201412893	06/05/2014	Tue	0915	CAR1 EBD on NORTH ST hit CAR2 merging from the right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party, new driver / under instruction	Dry	Bright	Fine	X Type Junction	Stop Sign	1	1817983 5545433
14	NORTH ST	I DENBIGH ST	201358295	15/12/2013	Sun	1800	CAR1 EBD on NORTH ST hit rear of CAR2 turning right from centre line	CAR1 failed to notice car slowing, attention diverted	Dry	Bright	Fine	T Type Junction	Give Way Sign		1818057 5545410
15	NORTH ST	I CHAMBERLAIN ST	201352758	23/07/2013	Tue	1515	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, defective vision	Dry	Overcast	Fine	X Type Junction	Give Way Sign		1818041 5545414

Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N	Map Coordinates Easting Northing
16	NORTH ST	I CHAMBERLAIN ST	201350387	13/02/2013	Wed	1122	VAN2 turning right hit by oncoming CAR1 WBD on NORTH ST	VAN2 failed to give way when turning to non-turning traffic, emotionally upset/road rage, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign		1818041 5545414
17	NORTH ST	I CHAMBERLAIN ST	201324394	17/12/2013	Tue	1729	CAR1 WBD on NORTH ST hit CAR2 merging from the left	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign	1	1818041 5545414
18	NORTH ST	I MAKINO ROAD	201312128	16/05/2013	Thu	0530	MOPED1 EBD on NORTH ST hit VAN2 turning right onto NORTH ST from the left	VAN2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Dark	Fine	T Type Junction	Give Way Sign	1	1818031 5545417
19	NORTH ST	I LETHBRIDGE ST	201253332	19/09/2012	Wed	0920	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Overcast	Fine	X Type Junction	Stop Sign		1817983 5545433
20	NORTH ST	I DENBIGH ST	201251230	15/04/2012	Sun	0515	CAR1 EBD on NORTH ST lost control; went off road to right, CAR1 hit Traffic Sign, Tree	CAR1 alcohol test above limit or test refused, too far left/right, fatigue (drowsy, tired, fell asleep)	Dry	Twilight	Fine	T Type Junction	Give Way Sign		1818057 5545410
21	NORTH ST	I LETHBRIDGE ST	201211664	07/04/2012	Sat	1710	CAR2 turning right hit by oncoming CAR1 EBD on NORTH ST	CAR2 failed to give way when turning to non-turning traffic, attention diverted by driver dazzled by sun/lights ENV: dazzling sun	Dry	Bright	Fine	X Type Junction	Stop Sign	1	1817983 5545433
22	NORTH ST	I MAKINO ROAD	201154756	27/10/2011	Thu	1514	CAR1 EBD on NORTH ST hit CAR2 turning right onto NORTH ST from the left	CAR2 Failed to give way At a priority traffic control, misjudged intentions of another party	Dry	Overcast	Unknow	T Type Junction	Give Way Sign		1818031 5545417
23	NORTH ST	I LETHBRIDGE ST	201056259	08/12/2010	Wed	0825	VAN1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Stop Sign		1817983 5545433
24	NORTH ST	I CHAMBERLAIN ST	201053100	05/05/2010	Wed	1640	CAR1 EBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Dry	Bright	Fine	X Type Junction	Give Way Sign		1818041 5545414
25	NORTH ST	I MAKINO ROAD	201052291	22/04/2010	Thu	0330	CAR1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, Did not check / notice another party	Wet	Twilight	Light Rain	T Type Junction	Give Way Sign		1818031 5545417
26	NORTH ST	I LETHBRIDGE ST	201013750	30/10/2010	Sat	1345	SUV1 WBD on NORTH ST hit CAR2 crossing at right angle from right	CAR2 Failed to give way At a priority traffic control, fatigue due to long trip	Dry	Overcast	Fine	X Type Junction	Stop Sign	1	1817983 5545433
27	NORTH ST	I MAKINO ROAD	2952152	05/04/2009	Sun	1127	CAR1 WBD on NORTH ST lost control turning right, CAR1 hit Fence, Guard Rail on right hand bend	CAR1 lost control due to road conditions ENV: road slippery (loose material on seal), road surface under construction or maintenance, signs / signals ineffective or inadequate	Dry	Bright	Fine	T Type Junction	Give Way Sign		1818031 5545417
28	NORTH ST	I MAKINO ROAD	2855916	17/10/2008	Fri	0836	CAR1 WBD on NORTH ST hit CAR2 merging from the right	CAR2 Failed to give way At a priority traffic control	Dry	Overcast	Fine	T Type Junction	Give Way Sign		1818031 5545417
29	NORTH ST	I LETHBRIDGE ST	2851795	09/04/2008	Wed	1600	CAR2 turning right hit by oncoming CAR1 EBD on NORTH ST	CAR2 failed to give way when turning to non-turning traffic, attention diverted by driver dazzled by sun/lights	Dry	Bright	Fine	X Type Junction	Stop Sign		1817983 5545433

Key	First Street	D Second street I or landmark	Crash Number	Date DD/MM/YYYY	Day	Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj	Map Coordinates Easting Northing
30	NORTH ST	I LETHBRIDGE ST	2850325	10/02/2008	Sun	1645	TRUCK2 turning right hit by oncoming CAR1 EBD on NORTH ST	TRUCK2 failed to give way when turning to non-turning traffic, misjudged intentions of another party	Wet	Overcast	Fine	X Type Junction	Stop Sign		1817983 5545433
31	NORTH ST	30E MAKINO ROAD	2811767	22/03/2008	Sat	1655	CYCLIST1 EBD on NORTH ST hit CAR2 doing driveway manoeuvre	CYCLIST1 Driving or Riding in pedestrian space, did not see or look for other party until too late ENV: entering or leaving other commercial	Dry	Overcast	Fine	Driveway	Nil	1	1818060 5545409



KEY
 † Fatal
 ☽ Dark
 ☼ Wet
 ⚡ Ic
 † Peds
 🚲 C clist

Crash List: Churcher North

Overall Crash Statistics

Crash Severity	Number	%	Social cost (\$m)
Fatal	0	0	0
Serious	0	0	0
Minor Injury	1	17	0.09
Non-injury	5	83	0.12
	6	100	0.21

Crash Numbers

Year	Fatal	Serious	Minor	Non-inj
2009	0	0	0	1
2010	0	0	0	1
2012	0	0	1	1
2014	0	0	0	1
2016	0	0	0	1
TOTAL	0	0	1	5
Percent	0	0	17	83

Note: Last 5 years of crashes shown

Overall Casualty Statistics

Injury Severity	Number	% all casualties
Death	0	0
Serious Injury	0	0
Minor Injury	1	100
	1	100

Casualty Numbers

Year	Fatal	Serious	Minor
2009	0	0	0
2010	0	0	0
2012	0	0	1
2014	0	0	0
2016	0	0	0
TOTAL	0	0	1
Percent	0	0	100

Note: Last 5 years of casualties shown

Crash Type and Cause Statistics

Crash Type	All crashes	% All crashes
Overtaking Crashes	0	0
Straight Road Lost Control/Head On	1	17
Bend - Lost Control/Head On	3	50
Rear End/Obstruction	1	17
Crossing/Turning	0	0
Pedestrian Crashes	1	17
Miscellaneous Crashes	0	0
TOTAL	6	100

Crash factors (*)

Crash factors (*)	All crashes	% All crashes
Alcohol	2	33
Too fast	2	33
Failed Keep Left	1	17
Poor Observation	2	33
Poor judgement	2	33
Pedestrian factors	1	17
Road factors	1	17
Weather	1	17
TOTAL	12	200

Crashes with a:

Driver factor	9	149
Environmental factor	2	34

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigued crash factor.

Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007.

This will influence numbers and percentages.

Note: % represents the % of crashes in which the cause factor appears

Number of parties in crash

Number of parties in crash	All crashes	% All crashes
Single party	3	50
Multiple party	3	50
TOTAL	6	100

Driver and Vehicle Statistics

Note: Driver information is not computerised for non-injury crashes

Drivers at fault or part fault in injury crashes

Age	Male	%	Female	%	Total	%
15-19	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-39	0	0	0	0	0	0
40-49	0	0	0	0	0	0
50-59	0	0	0	0	0	0
60-69	0	0	0	0	0	0
70+	0	0	0	0	0	0
TOTAL	0	0	0	0	0	100

Drivers at fault or part fault in injury crashes

Licence	Male	Female	Total	%
Full	0	0	0	0
Learner	0	0	0	0
Restricted	0	0	0	0
Never licensed	0	0	0	0
Disqualified	0	0	0	0
Overseas	0	0	0	0
Expired	0	0	0	0
Other/Unknown	0	0	0	0
TOTAL	0	0	0	100

Vehicles involved in injury crashes

	No.of vehicles	% Injury crashes
Car/Stn Wagon	1	100
TOTAL	1	100

Note: % represents the % of injury crashes in which the vehicle appears

Crash List: Churcher North

Road Environment Statistics

Road Type	Local road	%	State highway	%	Total	%
Urban	6	100	0	0	6	100
Open Road	0	0	0	0	0	0
TOTAL	6	100	0	0	6	100

Conditions	Injury	Non-injury	Total	%
Light/overcast	1	3	4	67
Dark/twilight	0	2	2	33
TOTAL	1	5	6	100

Conditions	Injury	Non-injury	Total	%
Dry	1	3	4	67
Wet	0	2	2	33
Ice/snow	0	0	0	0
TOTAL	1	5	6	100

Intersection/mid-block	All crashes	% All crashes
Intersection	4	67
Midblock	2	33
TOTAL	6	100

Objects Struck	Injury crashes	%	Non-injury crashes	%
Crashes w/obj.struck	0	0	3	60

Object Struck	Injury crashes	%	Non-injury crashes	%
Fence	0	0	2	40
House Or Bldg	0	0	1	20
Kerb	0	0	1	20
Post Or Pole	0	0	1	20
TOTAL	0		5	

Note: % represents the % of crashes in which the object is struck

Time Period Statistics

Day/Period	All crashes	% All crashes
Weekday	5	83
Weekend	1	17
TOTAL	6	100

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Weekday	0	0	0	0	0	3	2	0	5
Weekend	0	0	1	0	0	0	0	0	1
TOTAL	0	0	1	0	0	3	2	0	6

Note: Weekend runs from 6 pm on Friday to 6 am on Monday

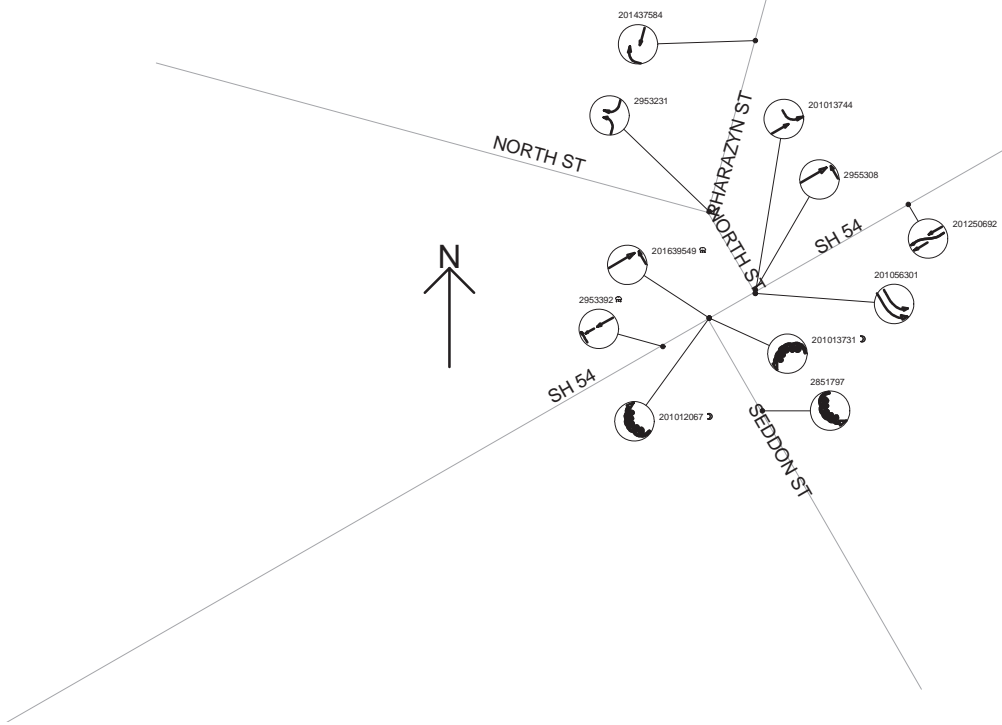
Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Mon	0	0	0	0	0	1	0	0	1
Tue	0	0	0	0	0	0	0	0	0
Wed	0	0	0	0	0	0	0	0	0
Thu	0	0	0	0	0	2	1	0	3
Fri	0	0	0	0	0	0	1	0	1
Sat	0	0	0	0	0	0	0	0	0
Sun	0	0	1	0	0	0	0	0	1
TOTAL	0	0	1	0	0	3	2	0	6

Month	Injury	%	Non-injury	%	Total	%
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	0	0	0	0
Apr	0	0	0	0	0	0
May	1	100	0	0	1	17
Jun	0	0	1	20	1	17
Jul	0	0	0	0	0	0
Aug	0	0	1	20	1	17
Sep	0	0	2	40	2	33
Oct	0	0	1	20	1	17
Nov	0	0	0	0	0	0
Dec	0	0	0	0	0	0
TOTAL	1	100	5	100	6	100

First Street	D Second street I or landmark Distance R	Crash Number	Date DD/MM/YYYY	Day Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road	Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N	Map Coordinates Easting Northing
CHURCHER ST	I NORTH ST	2952819	04/06/2009	Thu 1845	CAR1 EBD on NORTH ST cutting corner hit CAR2 head on	CAR1 cutting corner at intersection, attention diverted by cigarette etc	Dry	Dark	Fine	T Type Junction	Give Way Sign		1819022 5545149
CHURCHER ST	40N NORTH ST	201054759	02/09/2010	Thu 1730	CAR1 SBD on CHURCHER ST hit CAR2 turning into angle park	CAR1 alcohol suspected CAR2 another vehicle ENV: heavy rain	Wet	Overcast	Heavy Rain	Unknown	Nil		1819033 5545187
NORTH ST	20E CHURCHER ST	201211773	03/05/2012	Thu 1505	CAR1 WBD on NORTH ST hit PEDESTRIAN2 (Age 7) crossing road from left side	PEDESTRIAN2 stepped out from behind vehicle, pedestrian attention diverted eg cigarette, cell phone, music player	Dry	Bright	Fine	Unknown	Nil	1	1819042 5545144
NORTH ST	I CHURCHER ST	201253286	07/09/2012	Fri 2030	CAR1 EBD on NORTH ST lost control turning left, CAR1 hit Fence, House Or Bldg, Kerb	CAR1 Entering / On curve, new driver / under instruction	Dry	Overcast	Heavy Rain	T Type Junction	Give Way Sign		1819022 5545149
CHURCHER ST	I NORTH ST	201445789	26/10/2014	Sun 0852	SUV1 SBD on CHURCHER ST missed inters or end of road, SUV1 hit Fence	SUV1 alcohol test above limit or test refused, too fast on straight, attention diverted by cigarette etc	Dry	Overcast	Fine	T Type Junction	Give Way Sign		1819022 5545149
NORTH ST	I CHURCHER ST	201644469	01/08/2016	Mon 1720	CAR1 EBD on NORTH ST lost control; went off road to left, CAR1 hit Post Or Pole	CAR1 lost control due to road conditions ENV: road slippery (rain)	Wet	Dark	Light Rain	T Type Junction	Give Way Sign		1819022 5545149

Collision Diagram Preview

North SH54 Pharazyn
All Crashes 08 to 18



Crash List: North SH54 Pharazyn Feilding All Crashes 08 to 18

Overall Crash Statistics

Crash Severity	Number	%	Social cost (\$m)
Fatal	0	0	0
Serious	0	0	0
Minor Injury	3	27	0.26
Non-injury	8	73	0.19
	11	100	0.45

Crash Numbers

Year	Fatal	Serious	Minor	Non-inj
2009	0	0	0	3
2010	0	0	3	1
2012	0	0	0	1
2014	0	0	0	1
2016	0	0	0	1
TOTAL	0	0	3	7
Percent	0	0	30	70

Note: Last 5 years of crashes shown

Overall Casualty Statistics

Injury Severity	Number	% all casualties
Death	0	0
Serious Injury	0	0
Minor Injury	4	100
	4	100

Casualty Numbers

Year	Fatal	Serious	Minor
2009	0	0	0
2010	0	0	4
2012	0	0	0
2014	0	0	0
2016	0	0	0
TOTAL	0	0	4
Percent	0	0	100

Note: Last 5 years of casualties shown

Crash Type and Cause Statistics

Crash Type	All crashes	% All crashes
Overtaking Crashes	1	9
Straight Road Lost Control/Head On	0	0
Bend - Lost Control/Head On	3	27
Rear End/Obstruction	2	18
Crossing/Turning	5	45
Pedestrian Crashes	0	0
Miscellaneous Crashes	0	0
TOTAL	11	100

Crash factors (*)

Crash factors (*)	All crashes	% All crashes
Alcohol	4	36
Too fast	4	36
Failed Giveaway/Stop	4	36
Overtaking	1	9
Incorrect Lane/posn	1	9
Poor handling	1	9
Poor Observation	5	45
Poor judgement	2	18
Vehicle factors	1	9
Other	1	9
TOTAL	24	216

Crashes with a:

Driver factor	22	198
Environmental factor	0	0

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigue crash factor.

Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007. This will influence numbers and percentages.

Note: % represents the % of crashes in which the cause factor appears

Number of parties in crash

Number of parties in crash	All crashes	% All crashes
Single party	3	27
Multiple party	8	73
TOTAL	11	100

Driver and Vehicle Statistics

Note: Driver information is not computerised for non-injury crashes

Drivers at fault or part fault in injury crashes

Age	Male	%	Female	%	Total	%
15-19	0	0	1	33	1	33
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-39	0	0	2	67	2	67
40-49	0	0	0	0	0	0
50-59	0	0	0	0	0	0
60-69	0	0	0	0	0	0
70+	0	0	0	0	0	0
TOTAL	0	0	3	100	3	100

Drivers at fault or part fault in injury crashes

Licence	Male	Female	Total	%
Full	0	1	1	33
Learner	0	0	0	0
Restricted	0	0	0	0
Never licensed	0	1	1	33
Disqualified	0	1	1	33
Overseas	0	0	0	0
Expired	0	0	0	0
Other/Unknown	0	0	0	0
TOTAL	0	3	3	100

Vehicles involved in injury crashes

	No.of vehicles	% Injury crashes
Car/Stn Wagon	4	100
TOTAL	4	100

Note: % represents the % of injury crashes in which the vehicle appears

Crash List: North SH54 Pharazyn Feilding All Crashes 08 to 18

Road Environment Statistics

Road Type	Local road	%	State highway	%	Total	%
Urban	4	36	7	64	11	100
Open Road	0	0	0	0	0	0
TOTAL	4	36	7	64	11	100

Conditions	Injury	Non-injury	Total	%
Light/overcast	1	8	9	82
Dark/twilight	2	0	2	18
TOTAL	3	8	11	100

Conditions	Injury	Non-injury	Total	%
Dry	3	6	9	82
Wet	0	2	2	18
Ice/snow	0	0	0	0
TOTAL	3	8	11	100

Intersection/mid-block	All crashes	% All crashes
Intersection	7	64
Midblock	4	36
TOTAL	11	100

Objects Struck	Injury crashes	%	Non-injury crashes	%
Crashes w/obj.struck	2	67	1	13

Object Struck	Injury crashes	%	Non-injury crashes	%
Fence	2	67	1	13
TOTAL	2		1	

Note: % represents the % of crashes in which the object is struck

Time Period Statistics

Day/Period	All crashes	% All crashes
Weekday	6	55
Weekend	5	45
TOTAL	11	100

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Weekday	0	0	0	1	1	3	0	1	6
Weekend	0	0	0	0	1	2	1	1	5
TOTAL	0	0	0	1	2	5	1	2	11

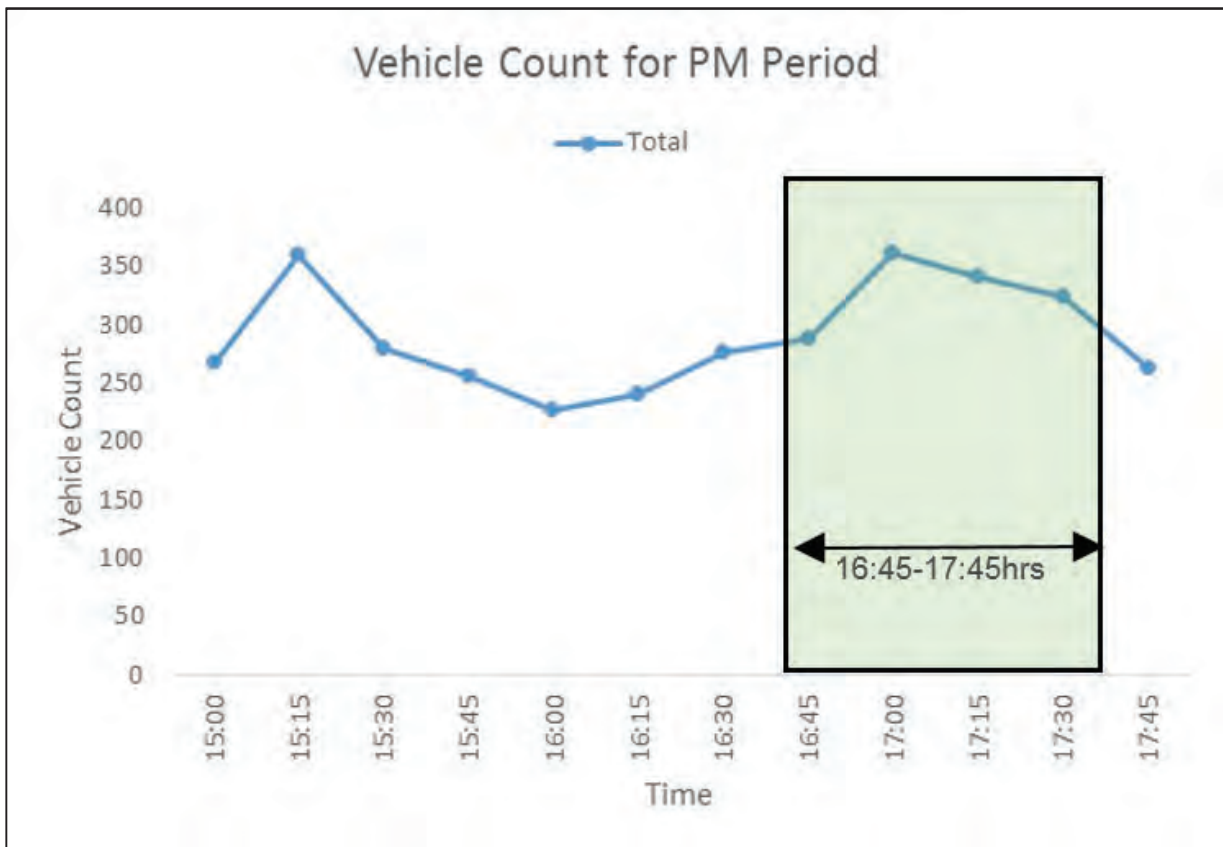
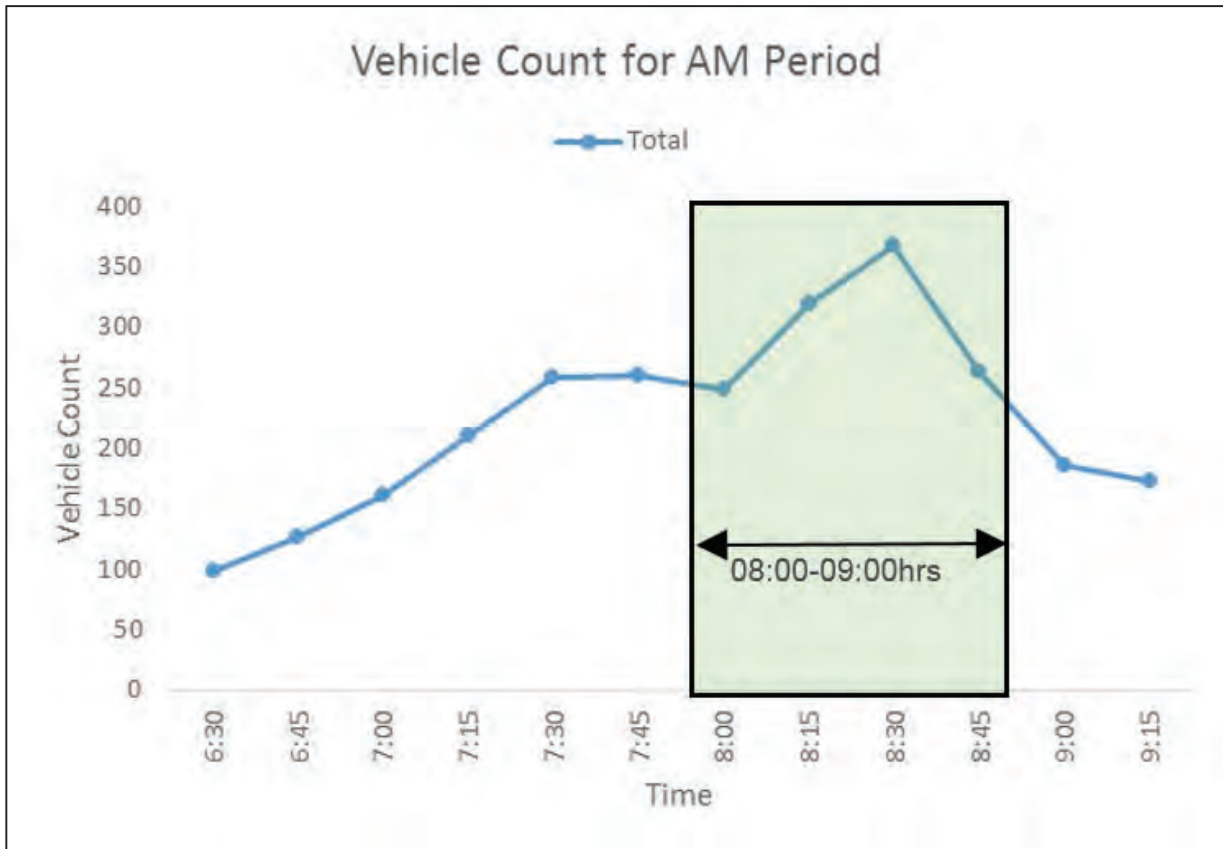
Note: Weekend runs from 6 pm on Friday to 6 am on Monday

Day/Period	0000-0259	0300-0559	0600-0859	0900-1159	1200-1459	1500-1759	1800-2059	2100-2400	Total
Mon	0	0	0	0	0	0	0	0	0
Tue	0	0	0	1	1	2	0	1	5
Wed	0	0	0	0	0	0	0	0	0
Thu	0	0	0	0	0	1	0	0	1
Fri	0	0	0	0	0	0	0	0	0
Sat	0	0	0	0	1	1	1	1	4
Sun	0	0	0	0	0	1	0	0	1
TOTAL	0	0	0	1	2	5	1	2	11

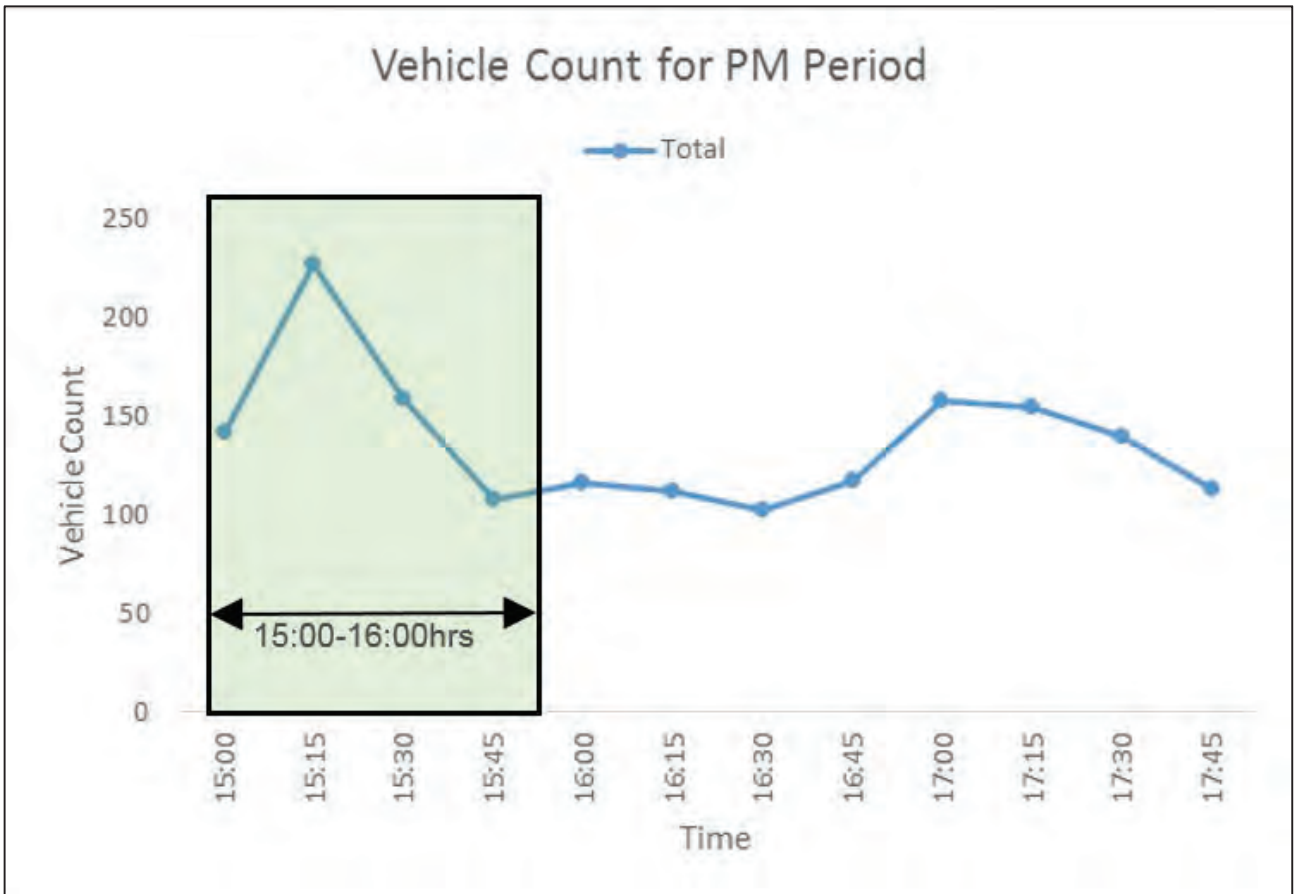
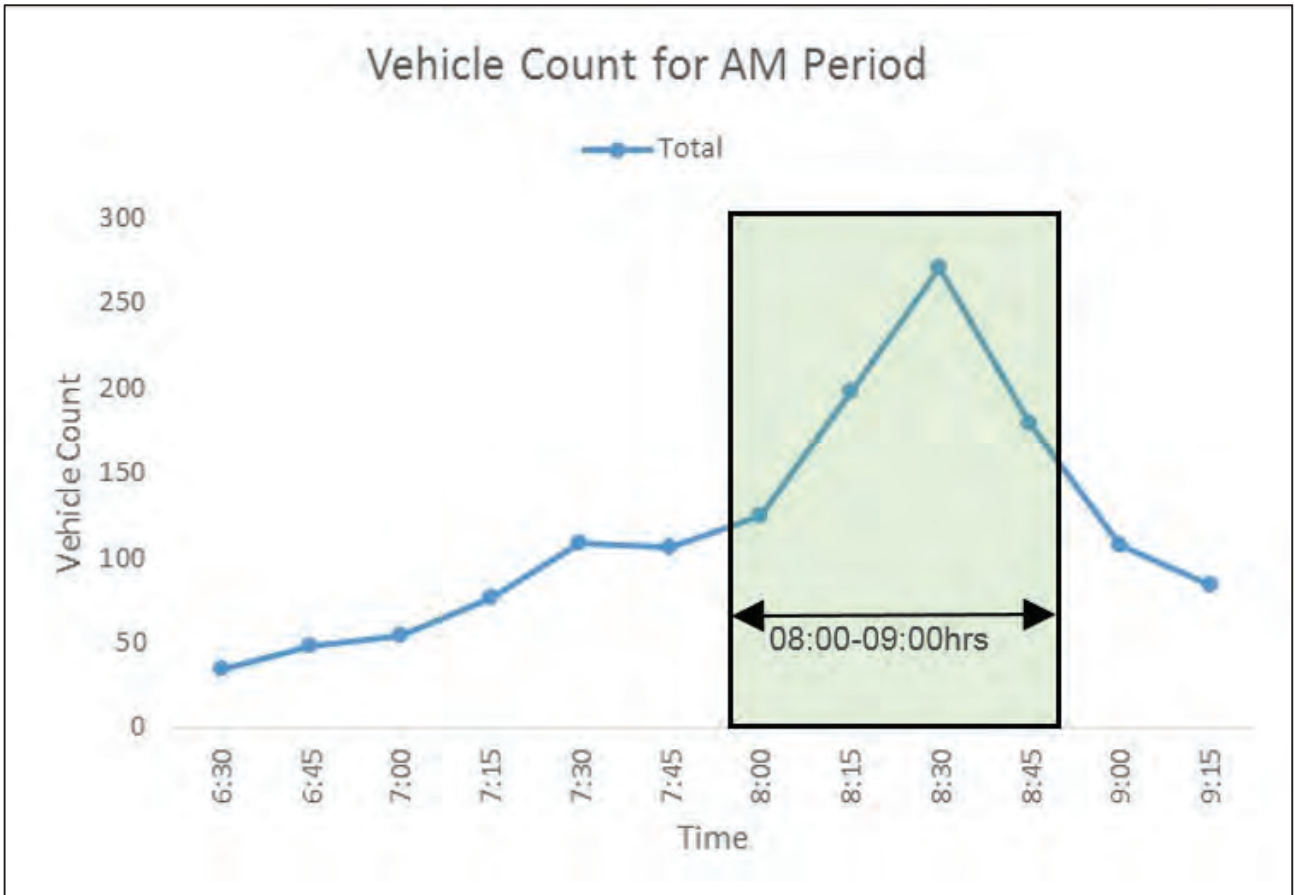
Month	Injury	%	Non-injury	%	Total	%
Jan	0	0	0	0	0	0
Feb	0	0	0	0	0	0
Mar	0	0	1	13	1	9
Apr	1	33	2	25	3	27
May	0	0	1	13	1	9
Jun	0	0	1	13	1	9
Jul	0	0	1	13	1	9
Aug	0	0	0	0	0	0
Sep	1	33	1	13	2	18
Oct	0	0	0	0	0	0
Nov	0	0	0	0	0	0
Dec	1	33	1	13	2	18
TOTAL	3	100	8	100	11	100

First Street	D Second street I or landmark Distance R	Crash Number	Date DD/MM/YYYY	Day Time DDD HHMM	Description of Events	Crash Factors (ENV = Environmental factors)	Road Natural Light	Weather	Junction	Cntrl	Tot Inj F S M A E I T R N	
54/38/2.68	I SEDDON ST	201639549	24/05/2016	Tue 1645	CAR1 EBD on SH 54 hit CAR2 crossing at right angle from right	CAR2 failed to give way when priority defined by road markings, Did not check / notice another party	Wet	Overcast	Heavy Rain	T Type Junction	Give Way Sign	
PHARAZYN ST	50W NORTH ST	201437584	07/06/2014	Sat 1220	CAR1 SBD on PHARAZYN ST hit CAR2 turning right onto PHARAZYN ST from the left	CAR2 failed to give way at driveway, didnt see/look when visibility obstructed by other vehicles ENV: entering or leaving service station	Dry	Overcast	Fine	Driveway	Nil	
54/38/2.615 KIMBOLTON	50N NORTH ST	201250692	13/03/2012	Tue 0937	MOPED1 SBD on SH 54 KIMBOLTON changing lanes/overtaking to right hit SUV2	MOPED1 Did not check / notice another party behind	Dry	Overcast	Fine	Unknown	Nil	
NORTH ST	I 54/38/2.665	201056301	11/12/2010	Sat 1800	VAN1 and CAR2 both EBD on NORTH ST and turning; collided	VAN1 long vehicle tracked outside lane CAR2 overtaking at an intersection, misjudged intentions of another party	Dry	Bright	Fine	T Type Junction	Give Way Sign	
54/38/2.665	I NORTH ST	201013744	28/09/2010	Tue 1655	CAR1 EBD on SH 54 hit CAR2 merging from the left	CAR2 Failed to give way At a priority traffic control	Dry	Bright	Fine	T Type Junction	Give Way Sign	1
54/38/2.68 KIMBOLTON	I SEDDON ST	201013731	21/12/2010	Tue 2210	CAR1 WBD on SH 54 KIMBOLTON lost control turning left, CAR1 hit Fence	CAR1 alcohol test above limit or test refused, Inappropriate speed, evading enforcement, vehicle caught fire	Dry	Dark	Fine	Multi Rd Join	Give Way Sign	1
SEDDON ST	I 54/38/2.68	201012067	17/04/2010	Sat 2210	CAR1 WBD on SEDDON ST lost control turning right, CAR1 hit Fence on right hand bend	CAR1 alcohol test above limit or test refused, Entering / On curve, lost control when turning	Dry	Dark	Fine	T Type Junction	Nil	2
54/38/2.664	I NORTH ST	2955308	05/09/2009	Sat 1550	CAR1 NBD on SH 54 hit CAR2 crossing at right angle from right	CAR1 too fast on straight CAR2 Failed to give way At a priority traffic control, another vehicle	Dry	Overcast	Fine	T Type Junction	Give Way Sign	
54/38/2.694	15W SEDDON ST	2953392	07/07/2009	Tue 1215	CAR1 WBD on SH 54 hit rear end of VAN2 stop/slow for PEDESTRIAN	CAR1 failed to notice car slowing, attention diverted by other traffic	Wet	Overcast	Light Rain	Unknown	Nil	
PHARAZYN ST	I SH 54	2953231	05/04/2009	Sun 1535	VAN1 NBD on PHARAZYN ST merging hit CAR2 also merging	VAN1 alcohol test above limit or test refused, Did not check / notice another party	Dry	Bright	Fine	Y Type Junction	Give Way Sign	
SEDDON ST	30S SH 54	2851797	03/04/2008	Thu 1627	CAR1 SBD on SEDDON ST lost control turning left, CAR1 hit Fence	CAR1 alcohol test above limit or test refused, Entering / On curve	Dry	Bright	Fine	Unknown	Nil	

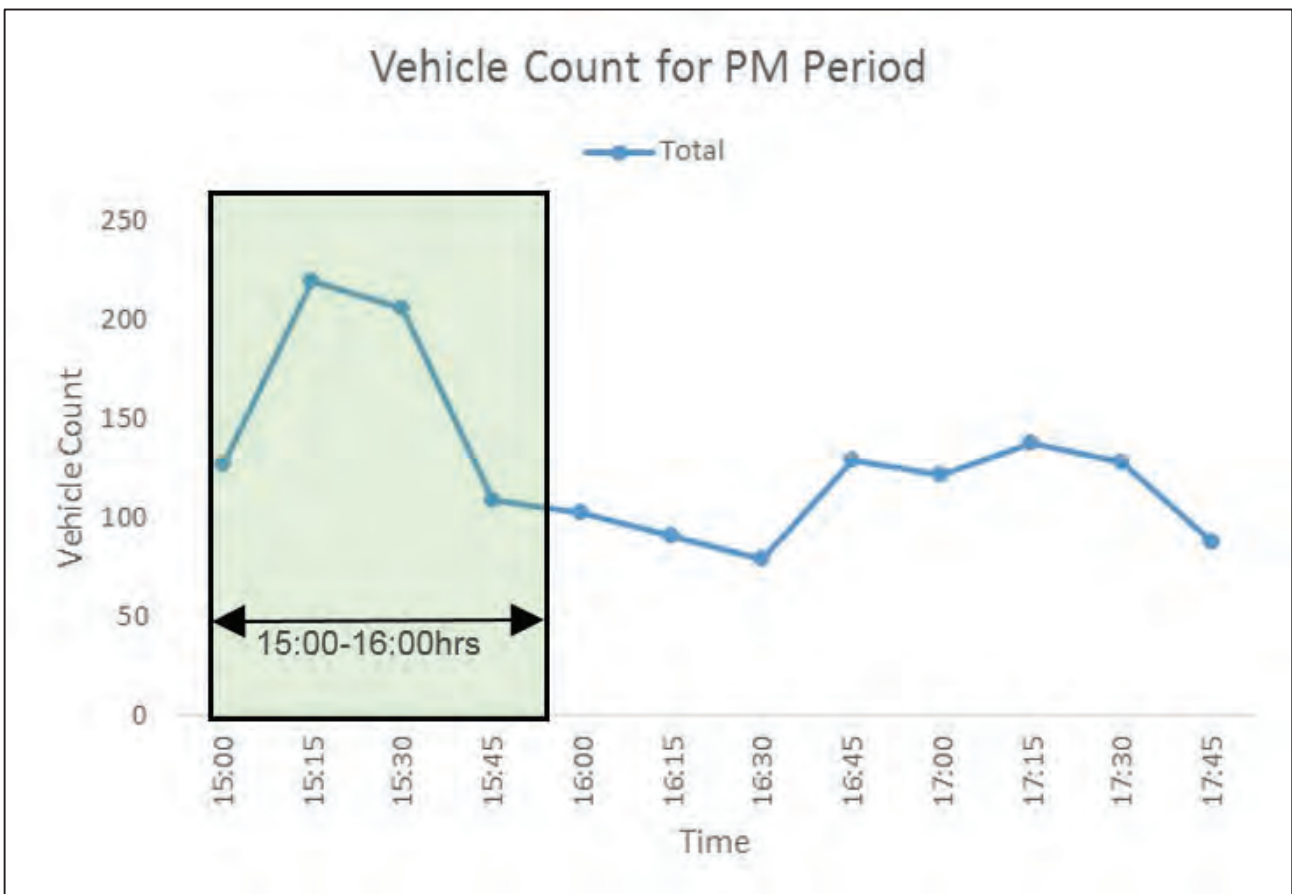
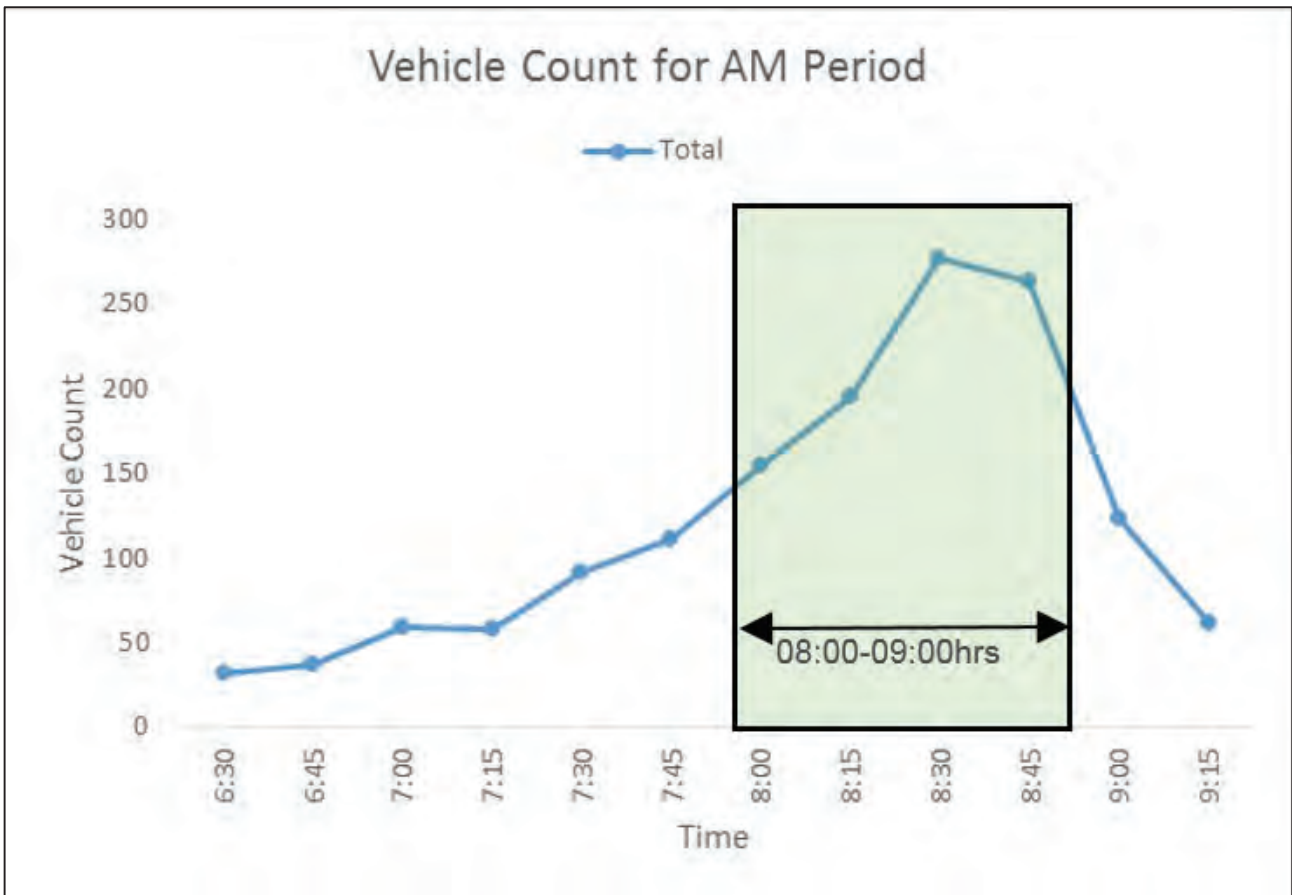
Site 1 - North Street / Makino Road / Lethbridge Street / Chamberlain Street Peak Period Traffic Flow Profiles



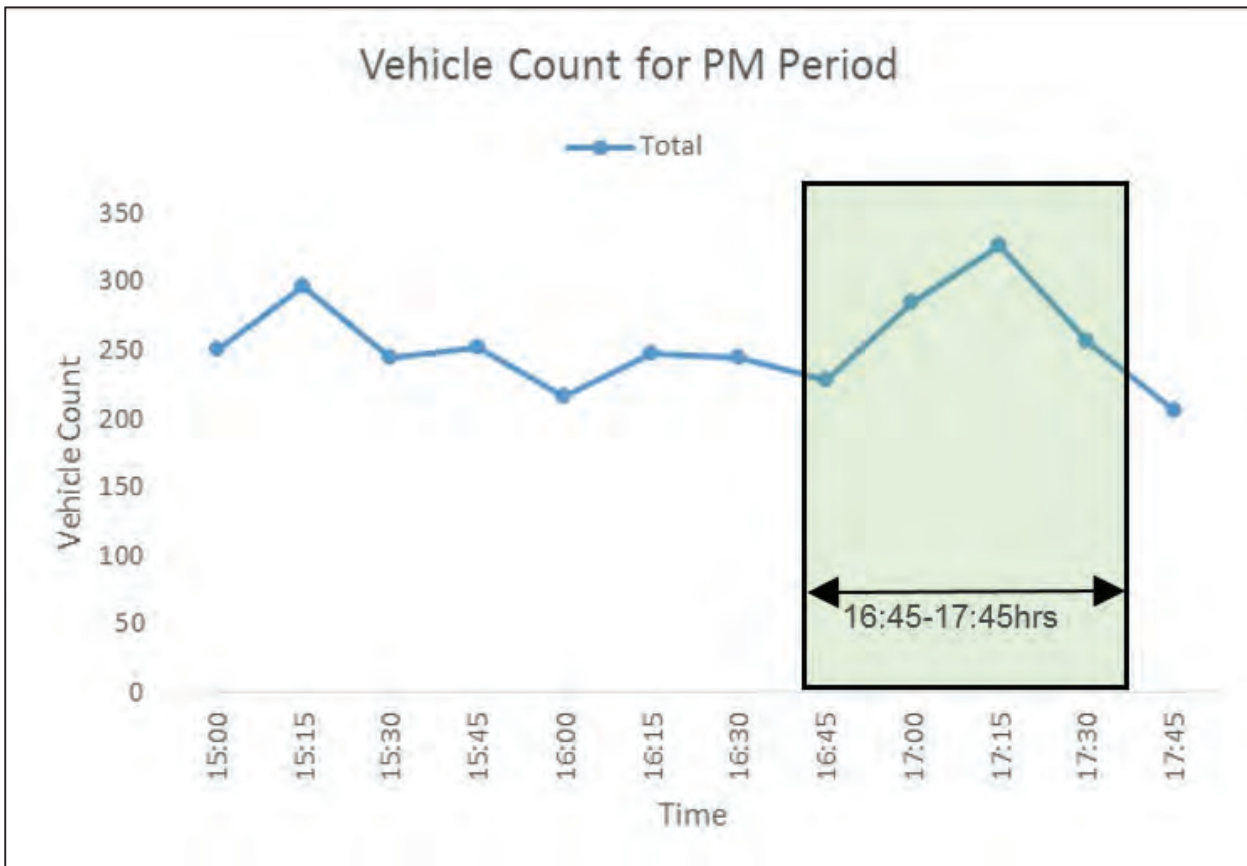
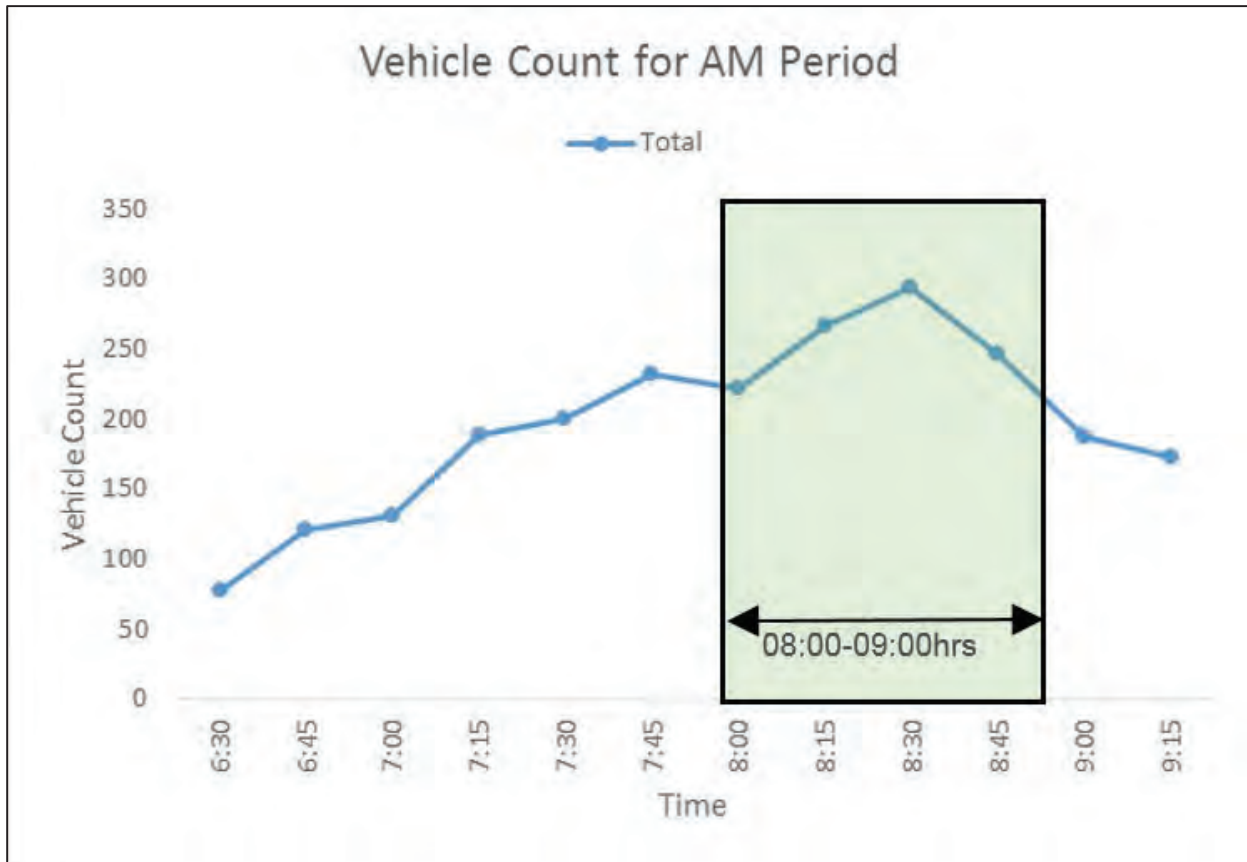
Site 1 – North Street/Denbigh Street – Peak Period Traffic Flow Profiles



Site 2 - North Street / Churcher Street Peak Period Traffic Flow Profiles



Site 3 – Kimbolton Road (SH54) / North Street / Pharazyn Street / Seddon Street Intersection – Peak Period Traffic Flow Profiles



Appendix C – Traffic Turning Counts (2017)

Site 1 –Peak Period Traffic Turning Counts

Intersection Approach	AM (08:00-09:00)				AM Total	PM (16:45-17:45)				PM Total
	Cars	Trucks	Buses	Cyclists		Cars	Trucks	Buses	Cyclists	
Lethbridge St (North)	206	3	0	0	209	113	2	0	3	118
To Makino Rd	2	0	0	0	2	0	0	0	1	1
To North St (East)	82	1	0	0	83	26	0	0	1	27
To Denbigh St	15	0	0	0	15	3	0	0	0	3
To Chamberlain St	14	0	0	0	14	7	1	0	0	8
To Lethbridge St (South)	83	0	0	0	83	66	1	0	1	68
To North St (West)	10	2	0	0	12	11	0	0	0	11
Makino Rd	164	2	1	0	167	127	1	0	3	131
To North St (East)	47	2	1	0	50	23	0	0	1	24
To Denbigh St	12	0	0	0	12	12	0	0	0	12
To Chamberlain St	42	0	0	0	42	52	0	0	2	54
To Lethbridge St (South)	43	0	0	0	43	27	0	0	0	27
To North St (West)	16	0	0	0	16	13	1	0	0	14
To Lethbridge St (North)	4	0	0	0	4	0	0	0	0	0
North St (East)	269	8	1	0	278	213	7	0	1	221
To Denbigh St	1	0	0	0	1	3	0	0	0	3
To Makino Rd	21	1	0	0	22	21	0	0	1	22
To Chamberlain St	9	1	0	0	10	11	1	0	0	12
To Lethbridge St (South)	81	4	0	0	85	32	0	0	0	32
To North St (West)	111	2	1	0	114	113	5	0	0	118
To Lethbridge St (North)	46	0	0	0	46	33	1	0	0	34
Denbigh Street	41	0	0	0	41	80	0	0	1	81
To Chamberlain St	1	0	0	0	1	3	0	0	0	3
To Lethbridge St (South)	1	0	0	0	1	2	0	0	0	2
To North St (West)	9	0	0	0	9	25	0	0	0	25
To Lethbridge St (North)	4	0	0	0	4	5	0	0	0	5
To Makino Rd	12	0	0	0	12	36	0	0	0	36
To North St (East)	14	0	0	0	14	9	0	0	1	10
Chamberlain St	23	1	0	0	24	127	3	0	0	130
To Makino Rd	6	1	0	0	7	64	1	0	0	65
To North St (East)	7	0	0	0	7	14	1	0	0	15
To Lethbridge St (South)	2	0	0	0	2	1	0	0	0	1
To Denbigh	0	0	0	0	0	0	0	0	0	0
To North St (West)	4	0	0	0	4	17	1	0	0	18
To Lethbridge St (North)	4	0	0	0	4	31	0	0	0	31
Lethbridge St (South)	76	10	2	5	93	279	7	0	1	287
To Makino Rd	7	0	0	0	7	21	1	0	0	22
To North St (East)	8	0	1	5	14	25	0	0	0	25
To Denbigh	1	0	0	0	1	1	0	0	0	1
To Chamberlain St	1	0	0	0	1	0	0	0	0	0
To North St (West)	34	8	1	0	43	122	5	0	0	127
To Lethbridge St (North)	25	2	0	0	27	110	1	0	1	112
North St (West)	382	16	4	1	403	348	10	1	0	359
To Makino Rd	17	3	0	0	20	47	1	0	0	48
To North St (East)	257	5	4	1	267	160	3	1	0	164
To Denbigh	22	0	0	0	22	21	0	0	0	21
To Chamberlain St	5	0	0	0	5	6	0	0	0	6
To Lethbridge St (South)	61	8	0	0	69	45	5	0	0	50
To Lethbridge St (North)	20	0	0	0	20	69	1	0	0	70
Grand Total	1161	40	8	6	1215	1287	30	1	9	1327

Site 2 – Peak Period Traffic Turning Counts

Intersection Approach	AM (08:00-09:00)				AM Total	PM (16:45-17:45)				PM Total
	Cars	Trucks	Buses	Cyclists		Cars	Trucks	Buses	Cyclists	
Churcher St	181	3	0	0	184	97	1	0	1	99
Left into North St (E)	96	3	0	0	99	43	1	0	1	45
Right into North St (W)	85	0	0	0	85	54	0	0	0	54
North St (East)	302	7	2	0	311	176	4	0	0	180
Thru to North St (W)	218	5	1	0	224	132	4	0	0	136
Right into Churcher St	84	2	1	0	87	44	0	0	0	44
North St (West)	375	5	9	5	394	231	5	0	2	238
Left into Churcher St	101	2	0	1	104	64	0	0	0	64
Thru to North St (E)	274	3	9	4	290	167	5	0	2	174
Grand Total	858	15	11	5	889	504	10	0	3	517

Site 3 – Peak Period Traffic Turning Counts

Intersection Approach	AM (08:00-09:00)				AM Total	PM (16:45-17:45)				PM Total
	Cars	Trucks	Buses	Cyclists		Cars	Trucks	Buses	Cyclists	
Pharyzyn St	163	4	2	0	169	126	6	0	2	134
Left into Kimbolton Rd (E)	5	1	0	0	6	3	0	0	0	3
Thru to Seddon St	0	0	0	0	0	2	0	0	0	2
Right into Kimbolton Rd (W)	125	2	1	0	128	100	5	0	2	107
Right into North St	33	1	1	0	35	21	1	0	0	22
Kimbolton Rd (East)	357	6	2	0	365	256	11	0	0	267
Right into North St	68	0	0	0	68	37	5	0	0	42
Left into Seddon St	2	0	0	0	2	3	0	0	0	3
Thru to Kimbolton Rd (W)	284	6	2	0	292	210	5	0	0	215
Pharyzyn St	3	0	0	0	3	6	1	0	0	7
Seddon St	38	1	0	0	39	21	0	0	0	21
Left into Kimbolton Rd (W)	25	0	0	0	25	18	0	0	0	18
Thru to North St	11	0	0	0	11	1	0	0	0	1
Thru to Pharyzyn St	1	0	0	0	1	1	0	0	0	1
Right into Kimbolton Rd (E)	1	1	0	0	2	1	0	0	0	1
Kimbolton Rd (West)	228	13	0	0	241	523	8	0	1	532
left into North St	53	1	0	0	54	52	1	0	0	53
Left into Pharyzyn St	51	2	0	0	53	151	1	0	1	153
Thru to Kimbolton Rd (E)	116	10	0	0	126	298	5	0	0	303
Right into Seddon St	8	0	0	0	8	22	1	0	0	23
North St	200	7	8	0	215	136	4	1	1	142
Thru to Seddon St	3	0	0	0	3	6	0	0	0	6
Right into Kimbolton Rd (W)	126	2	5	0	133	55	0	1	0	56
Left into Pharyzyn St	37	3	1	0	41	30	2	0	1	33
Thru to Kimbolton Rd (E)	34	2	2	0	38	45	2	0	0	47
Grand Total	986	31	12	0	1029	1062	29	1	4	1096

Appendix D – Background Traffic Growth Analysis

PRECINCT 4 TRAFFIC IMPACT ASSESSMENT - GROWTH RATES

SUMMARY

Road #	Road Name	Start Name	End Name	Growth
376	PHARAZYN STREET (376)	NORTH STREET	FLORENCE PLACE	1.5%
438	CHAMBERLAIN STREET (438)	NORTH STREET	CAMDEN STREET	2.7%
360	CHURCHER STREET (360)	NORTH STREET	VIRGINIA CRESCENT	1.0%
328	LETHBRIDGE STREET (328)	CAMDEN STREET	NORTH STREET	0.5%
328	LETHBRIDGE STREET (328)	NORTH STREET	UNIFORMED STREET LHS	0.9%
341	MAKINO ROAD FIELDING (341)	NORTH STREET	SHERWILL STREET WEST	0.9%
327	NORTH STREET (327)	WEST STREET	DENBIGH STREET	1.4%
327	NORTH STREET (327)	DENBIGH STREET	COOMBRAE COURT	0.2%
327	NORTH STREET (327)	ELIZABETH STREET	KIMBOLTON ROAD	0.3%
327	NORTH STREET (327)	CHURCHER STREET	CHURCHILL AVENUE	-1.6%

DETAILED GROWTH COUNTS

Road	Count Site	Road Name	Location	Start Name	End Name	Count Status	Load Method	Latest	Count Date	ADT	% Cars	% LCV	% Heavy Vehicles	VKT	Urban/Rural	Urban/Rural
376	290	PHARAZYN STREET (376)	104	NORTH STREET	FLORENCE PLACE	Count	Classifier	Latest	24/12/2010	2050	95	3	2	U	Urban	
376		PHARAZYN STREET (376)	104	NORTH STREET	FLORENCE PLACE	Count	Classifier	Not latest	19/10/2005	1878	98	0	1	U	Urban	
376		PHARAZYN STREET (376)	144	NORTH STREET	FLORENCE PLACE	Count	Classifier	Not latest	23/10/2005	1911	98	0	2	U	Urban	
376		PHARAZYN STREET (376)	104	NORTH STREET	FLORENCE PLACE	Count	Classifier	Not latest	17/06/2004	1817	97	0	1	U	Urban	
376		PHARAZYN STREET (376)	50	NORTH STREET	FLORENCE PLACE	Count	Classifier	Not latest	12/04/2002	1855	95	0	2	U	Urban	
376		PHARAZYN STREET (376)	50	NORTH STREET	FLORENCE PLACE	Count	Classifier	Not latest	26/01/1999	1583	95	0	2	U	Urban	
376		PHARAZYN STREET (376)	104	NORTH STREET	FLORENCE PLACE	Count	Classifier	Not latest	27/02/1997	1546	95	0	2	U	Urban	

Trendline	
Future Year	Volumes
1/01/2018	2316.814302
1/01/2023	2491.94245
1/01/2028	2667.00598
1/01/2033	2842.29464
1/01/2038	3017.422882
20	700.6385

Trendline	
Future Year	Volumes
1/01/2018	1858.078138
1/01/2023	2106.647862
1/01/2028	2355.216586
1/01/2033	2603.922297
1/01/2038	2852.491651
20	994.415421

Trendline	
Future Year	Volumes
1/01/2018	1901.944298
1/01/2023	2051.998802
1/01/2028	2200.633307
1/01/2033	2348.388802
1/01/2038	2496.143306
20	592.2590981

Trendline	
Future Year	Volumes
1/01/2018	4382.648206
1/01/2023	4614.546471
1/01/2028	4846.461117
1/01/2033	5078.365613
1/01/2038	5310.270117
20	927.728647

Trendline	
Future Year	Volumes
1/01/2018	3444.338479
1/01/2023	3686.461117
1/01/2028	3928.584762
1/01/2033	4170.708407
1/01/2038	4412.832052
20	583.1036855

Trendline	
Future Year	Volumes
1/01/2018	2577.250506
1/01/2023	2635.403617
1/01/2028	2693.556728
1/01/2033	2751.709839
1/01/2038	2809.862950
20	583.1036855

Trendline	
Future Year	Volumes
1/01/2018	2577.250506
1/01/2023	2635.403617
1/01/2028	2693.556728
1/01/2033	2751.709839
1/01/2038	2809.862950
20	583.1036855

Trendline	
Future Year	Volumes
1/01/2018	5057.899217
1/01/2023	5433.819461
1/01/2028	5770.599706
1/01/2033	6127.573388
1/01/2038	6484.555582
20	1427.316365

Trendline	
Future Year	Volumes
1/01/2018	3829.204416
1/01/2023	3842.840318
1/01/2028	3876.47622
1/01/2033	3910.112122
1/01/2038	3943.748024
20	134.5620277

Trendline	
Future Year	Volumes
1/01/2018	2535.961977
1/01/2023	2493.03805
1/01/2028	2450.114192
1/01/2033	2407.190334
1/01/2038	2364.266479
20	-171.790777

Trendline	
Future Year	Volumes
1/01/2018	3084.861621
1/01/2023	2832.21558
1/01/2028	2579.681516
1/01/2033	2326.953183
1/01/2038	2074.303981
20	-3010.49854

State Highway 54

Region	SH	IS	RP	Site Ref	Description	NZMG East	NZMG North	Lane	Equipment	2012	2013	2014	2015	2016	% Heavy	Accepted Days	Growth Trend
08 - Manawatu-Wanganui	54	17	11.4	ID-05400028	Chertemham	2726103	6115827	Both	Dual Loop	1137	1187	1222	1256	1218	34.4	30	1.9%
08 - Manawatu-Wanganui	54	17	14.04	ID-05400031	Almadike Rd	2726795	6113986	Both	Single Loop	2424	2536	2628	2717	2533	39.3	30	1.9%
08 - Manawatu-Wanganui	54	38	2.41	ID-05400040	Witea Stream Nth of Rth	2726060	6106740	Both	Dual Loop	4841	4843	4911	5053	5372	4	30	2.4%
08 - Manawatu-Wanganui	54	38	3	ID-05400041	Kimbolton Rd	2726553	6104638	Both	Single Loop	7089	6994	6888	6768	7002	3.7	32	0.4%
08 - Manawatu-Wanganui	54	38	6.17	ID-05400044	Aorangi Bridge	2729427	6104210	Both	Dual Loop	13003	13330	14450	14686	15315	4.7	32	2.6%
08 - Manawatu-Wanganui	54	38	11.08	ID-05400049	LDING - Telemetr Site 3	2727552	6100384	Both	Telemetr	6496	6517	6559	6911	7113	3.6	313	2.9%

Appendix E – Trip Generation Rate Calculations

PRECINCT 4 TRAFFIC IMPACT ASSESSMENT - TRIP GENERATION RATES

Trip Generation Rates		
AM Peak	1	Per Dwelling
In Trips	25%	
Out Trips	75%	
PM Peak	1	Per Dwelling
In Trips	63%	
Out Trips	37%	
All Day	10	Per Dwelling
In Trips	50%	
Out Trips	50%	

Assumptions

Trip Generation - Per Stage														
Full Site	1800	Dwellings	25%	450	Dwellings	50%	450	Dwellings	75%	450	Dwellings	100%	450	Dwellings
AM Peak	1800	Total Trips	AM Peak	450	Total Trips	AM Peak	450	Total Trips	AM Peak	450	Total Trips	AM Peak	450	Total Trips
In Trips	450	Trips In	In Trips	112.5	Trips In	In Trips	112.5	Trips In	In Trips	112.5	Trips In	In Trips	112.5	Trips In
Out Trips	1350	Trips Out	Out Trips	337.5	Trips Out	Out Trips	337.5	Trips Out	Out Trips	337.5	Trips Out	Out Trips	337.5	Trips Out
PM Peak	1800	Total Trips	PM Peak	450	Total Trips	PM Peak	450	Total Trips	PM Peak	450	Total Trips	PM Peak	450	Total Trips
In Trips	1134	Trips In	In Trips	283.5	Trips In	In Trips	283.5	Trips In	In Trips	283.5	Trips In	In Trips	283.5	Trips In
Out Trips	666	Trips Out	Out Trips	166.5	Trips Out	Out Trips	166.5	Trips Out	Out Trips	166.5	Trips Out	Out Trips	166.5	Trips Out
All Day	18000	Total Trips	All Day	4500	Total Trips	All Day	4500	Total Trips	All Day	4500	Total Trips	All Day	4500	Total Trips
In Trips	9000	Trips In	In Trips	2250	Trips In	In Trips	2250	Trips In	In Trips	2250	Trips In	In Trips	2250	Trips In
Out Trips	9000	Trips Out	Out Trips	2250	Trips Out	Out Trips	2250	Trips Out	Out Trips	2250	Trips Out	Out Trips	2250	Trips Out

Trip Generation - Cumulative														
Full Site	1800	Dwellings	25%	450	Dwellings	50%	900	Dwellings	75%	1350	Dwellings	100%	1800	Dwellings
AM Peak	1800	Total Trips	AM Peak	450	Total Trips	AM Peak	900	Total Trips	AM Peak	1350	Total Trips	AM Peak	1800	Total Trips
In Trips	450	Trips In	In Trips	112.5	Trips In	In Trips	225	Trips In	In Trips	337.5	Trips In	In Trips	450	Trips In
Out Trips	1350	Trips Out	Out Trips	337.5	Trips Out	Out Trips	675	Trips Out	Out Trips	1012.5	Trips Out	Out Trips	1350	Trips Out
PM Peak	1800	Total Trips	PM Peak	450	Total Trips	PM Peak	900	Total Trips	PM Peak	1350	Total Trips	PM Peak	1800	Total Trips
In Trips	1134	Trips In	In Trips	283.5	Trips In	In Trips	567	Trips In	In Trips	850.5	Trips In	In Trips	1134	Trips In
Out Trips	666	Trips Out	Out Trips	166.5	Trips Out	Out Trips	333	Trips Out	Out Trips	499.5	Trips Out	Out Trips	666	Trips Out
All Day	18000	Total Trips	All Day	4500	Total Trips	All Day	9000	Total Trips	All Day	13500	Total Trips	All Day	18000	Total Trips
In Trips	9000	Trips In	In Trips	2250	Trips In	In Trips	4500	Trips In	In Trips	6750	Trips In	In Trips	9000	Trips In
Out Trips	9000	Trips Out	Out Trips	2250	Trips Out	Out Trips	4500	Trips Out	Out Trips	6750	Trips Out	Out Trips	9000	Trips Out

Appendix F – Census Data and Trip Distribution (2013)

PRECINCT 4 TRAFFIC IMPACT ASSESSMENT - TRIP DISTRIBUTION RATES (CENSUS)

RAW CENSUS DATA

Feilding East, (560740)				
Area Unit	Area Unit Name	Flow	2006	2013
563300	Aokautere	out	0	12
562320	Cloverlea	out	27	30
560730	Feilding Central	out	57	66
560730	Feilding Central	in	57	42
560710	Feilding North	in	66	69
560710	Feilding North	out	33	36
560720	Feilding West	in	54	51
560720	Feilding West	out	240	189
560421	Halcombe	in	0	9
562710	Highbury	out	0	6
563102	Hokowhitu Lagoon	out	0	9
563101	Hokowhitu West	in	0	9
561901	Kauwhata	in	6	6
561901	Kauwhata	out	15	12
562200	Kelvin Grove	in	6	12
562200	Kelvin Grove	out	30	24
559700	Kiwitea	in	6	6
559230	Lake Alice	out	6	15
561820	Linton Military Camp	out	12	9
560412	Maewa	in	0	12
559500	Marton	out	0	15
561813	Massey University	out	15	27
562100	Mison	out	33	48
561421	Ohakea	out	21	30
560411	Oroua Bridge	out	24	24
561422	Oroua Downs-Waitohi	out	12	18
561422	Oroua Downs-Waitohi	in	6	9
562800	Palmerston North Central	in	0	6
562800	Palmerston North Central	out	108	126
562401	Palmerston North Hospital	out	69	63
562402	Papaoia	out	27	18
561410	Rakiraki	out	51	48
562500	Roslyn	in	0	6
562500	Roslyn	out	36	42
562310	Takaro	out	9	12
560422	Tokorangi-Hiwinui	in	9	21
560422	Tokorangi-Hiwinui	out	18	12
561902	Turitea	out	21	9
563000	West End	out	9	9

Feilding West, (560720)				
Area Unit	Area Unit Name	Flow	2006	2013
563300	Aokautere	in	9	9
560200	Ashhurst	in	12	15
562910	Awapuni North	in	9	12
562922	Awapuni South	in	9	12
558900	Bulls	out	12	12
558900	Bulls	in	12	12
562320	Cloverlea	in	6	15
562320	Cloverlea	out	33	36
560730	Feilding Central	out	72	54
560730	Feilding Central	in	168	171
560740	Feilding East	out	54	51
560740	Feilding East	in	240	189
560710	Feilding North	in	234	240
560710	Feilding North	out	30	33
560421	Halcombe	in	24	39
562710	Highbury	in	0	6
563200	Hokowhitu East	in	15	21
563102	Hokowhitu Lagoon	out	12	9
563101	Hokowhitu West	in	15	18
561811	Kairanga	in	12	15
561901	Kauwhata	out	12	12
561901	Kauwhata	in	18	24
562200	Kelvin Grove	out	18	36
562200	Kelvin Grove	in	21	33
559700	Kiwitea	out	0	9
559700	Kiwitea	in	42	36
559230	Lake Alice	out	0	24
559230	Lake Alice	in	15	18
561820	Linton Military Camp	out	18	6
560412	Maewa	in	48	75
559500	Marton	in	12	18
559500	Marton	out	12	9
561813	Massey University	out	15	30
562100	Mison	out	42	63
562100	Mison	in	33	45
561421	Ohakea	out	27	51

Feilding North, (560710)				
Area Unit	Area Unit Name	Flow	2006	2013
562320	Cloverlea	out	36	27
560730	Feilding Central	in	42	36
560730	Feilding Central	out	72	87
560740	Feilding East	out	66	69
560740	Feilding East	in	33	36
560720	Feilding West	in	30	33
560720	Feilding West	out	234	240
560421	Halcombe	in	0	6
562710	Highbury	out	12	12
563200	Hokowhitu East	out	0	6
561901	Kauwhata	out	18	12
562200	Kelvin Grove	out	39	39
559700	Kiwitea	in	9	6
559230	Lake Alice	out	12	27
561820	Linton Military Camp	out	18	12
561812	Longburn	out	9	12
560412	Maewa	in	9	15
560412	Maewa	out	12	6
559500	Marton	in	0	6
559500	Marton	out	12	15
561813	Massey University	out	9	21
562100	Mison	in	0	6
562100	Mison	out	51	54
561421	Ohakea	out	27	36
560411	Oroua Bridge	out	36	48
561422	Oroua Downs-Waitohi	in	9	9
561422	Oroua Downs-Waitohi	out	33	9
562800	Palmerston North Central	out	123	132
562401	Palmerston North Hospital	out	72	81
562402	Papaoia	out	15	27
561410	Rakiraki	out	69	84
562500	Roslyn	out	48	63
562310	Takaro	out	6	21
560422	Tokorangi-Hiwinui	in	9	9
560422	Tokorangi-Hiwinui	out	12	18
561902	Turitea	out	21	15
563000	West End	out	12	6
563000	West End	in	6	6
560302	Whakarongo	out	0	6

TOTAL IN / OUT PER ZONE

Flow	Area Unit	2006	2013
In	Palmerston North	12	39
	Feilding	177	162
	Industrial South	0	0
	NorthWest	0	9
	NorthEast	15	39
SouthWest	6	9	
Total		210	258
Out	Palmerston North	411	456
	Feilding	330	291
	Industrial South	75	72
	NorthWest	0	15
	NorthEast	18	12
SouthWest	39	63	
Total		873	909

Flow	Area Unit	2006	2013
In	Palmerston North	159	225
	Feilding	642	600
	Industrial South	0	0
	NorthWest	36	57
	NorthEast	90	111
SouthWest	27	30	
Total		954	1023
Out	Palmerston North	150	192
	Feilding	156	138
	Industrial South	0	0
	NorthWest	12	9
	NorthEast	0	9
SouthWest	39	87	
Total		357	435

Flow	Area Unit	2006	2013
In	Palmerston North	6	12
	Feilding	105	105
	Industrial South	0	0
	NorthWest	0	12
	NorthEast	27	30
SouthWest	9	9	
Total		147	168
Out	Palmerston North	489	546
	Feilding	372	396
	Industrial South	105	132
	NorthWest	12	15
	NorthEast	24	24
SouthWest	72	72	
Total		1074	1185

Flow	Area Unit	2006 %	2013 %
In	Palmerston North	6%	15%
	Feilding	84%	63%
	Industrial South	0%	0%
	NorthWest	0%	3%
	NorthEast	7%	15%
SouthWest	3%	3%	
Total		100%	100%
Out	Palmerston North	47%	50%
	Feilding	38%	32%
	Industrial South	9%	8%
	NorthWest	0%	2%
	NorthEast	2%	1%
SouthWest	4%	7%	
Total		100%	100%

Flow	Area Unit	2006 %	2013 %
In	Palmerston North	17%	22%
	Feilding	67%	59%
	Industrial South	0%	0%
	NorthWest	4%	6%
	NorthEast	9%	11%
SouthWest	3%	3%	
Total		100%	100%
Out	Palmerston North	43%	44%
	Feilding	44%	32%
	Industrial South	0%	0%
	NorthWest	3%	2%
	NorthEast	0%	2%
SouthWest	11%	20%	
Total		100%	100%

Flow	Area Unit	2006 %	2013 %
In	Palmerston North	4%	7%
	Feilding	71%	63%
	Industrial South	0%	0%
	NorthWest	0%	7%
	NorthEast	18%	18%
SouthWest	6%	5%	
Total		100%	100%
Out	Palmerston North	46%	46%
	Feilding	35%	33%
	Industrial South	10%	11%
	NorthWest	1%	1%
	NorthEast	2%	2%
SouthWest	7%	6%	
Total		100%	100%

AVERAGE IN / OUT - NORTH FEILDING ZONE

Flow	Area Unit	2006	2013
In	Palmerston North	6	12
	Feilding	105	105
	Industrial South	0	0
	NorthWest	0	12
	NorthEast	27	30
SouthWest	9	9	
Total		147	168
Out	Palmerston North	489	546
	Feilding	372	396
	Industrial South	105	132
	NorthWest	12	15
	NorthEast	24	24
SouthWest	72	72	
Total		1074	1185

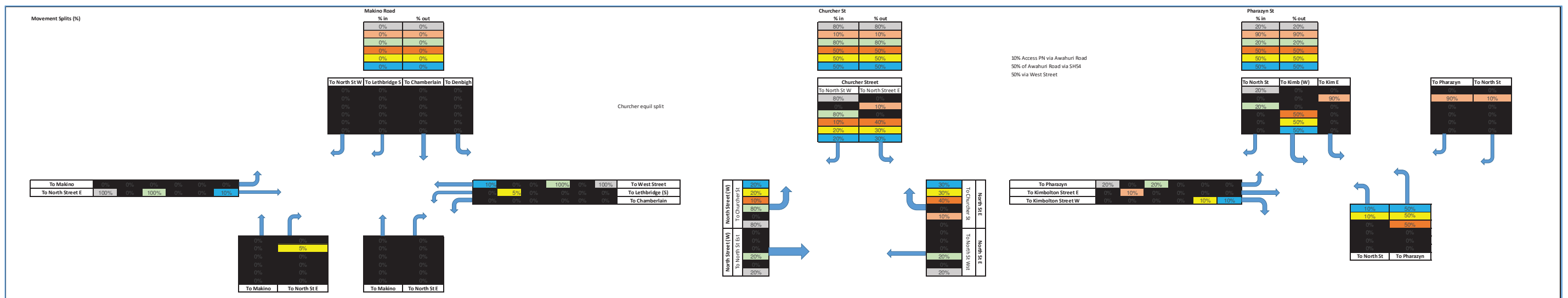
Flow	Area Unit	2006 %	2013 %
In	Palmerston North	4%	7%
	Feilding	71%	63%
	Industrial South	0%	0%
	NorthWest	0%	7%
	NorthEast	18%	18%
SouthWest	6%	5%	
Total		100%	100%
Out	Palmerston North	46%	46%
	Feilding	35%	33%
	Industrial South	10%	11%
	NorthWest	1%	1%
	NorthEast	2%	2%
SouthWest	7%	6%	
Total		100%	100%

Appendix G – Trip Distribution / Assignment Assumptions

Traffic Assignment Assumptions – Stages 1 and 2

REGION	ASSUMPTIONS
General Assumptions	<ul style="list-style-type: none"> No east-west connections provided across the Makino Stream No new connections provided onto Makino Road All traffic enters/exits the site from Churcher Street and Pharazyn Street
Palmerston North	<ul style="list-style-type: none"> Traffic movements to/from Palmerston North are expected to be evenly split between Churcher Street and Pharazyn Street. All traffic travelling to/from Palmerston North via Pharazyn Street will travel north-south on Kimbolton Road (SH54). Of the 50% of traffic travelling to/from Palmerston North via Churcher Street, traffic has been distributed as follows: <ul style="list-style-type: none"> 30% travel eastbound on North Street, with 20% accessing Kimbolton Road via the Lytton Street / East Street intersection and 10% accessing Kimbolton Road via North Street / Pharazyn Street intersection 20% would travel westbound on North Street, with 10% southwards via West Street/Awahuri-Feilding Road, and a further 10% using Duke Street to access Kimbolton Road at Derby Street.
Feilding	<ul style="list-style-type: none"> Traffic movements to/from Feilding are expected to be evenly split between Churcher Street and Pharazyn Street. All traffic travelling to/from Feilding via Pharazyn Street will travel north-south on Kimbolton Road (SH54). Of the 50% of traffic travelling to/from Feilding via Churcher Street, traffic has been distributed as follows: <ul style="list-style-type: none"> 30% travel eastbound on North Street, with 20% accessing Feilding centre via the local road network and 10% accessing Kimbolton Road via North Street / Pharazyn Street intersection 20% would travel westbound on North Street, with 5% travel southwards via Lethbridge Road (South), and a further 15% using the local road network.
Industrial South	<ul style="list-style-type: none"> Traffic movements to/from the industrial employment zones are expected to be evenly split between Churcher Street and Pharazyn Street. All traffic travelling to/from industrial employment zones via Pharazyn Street will travel north-south on Kimbolton Road (SH54). Of the 50% of traffic travelling to/from the industrial employment zones via Churcher Street, traffic has been distributed as follows: <ul style="list-style-type: none"> 40% travel eastbound on North Street, accessing Kimbolton Road via the Lytton Street / East Street intersection and other local roads. 10% would travel westbound on North Street and continue southward using the local road network.
North-West Zone	<ul style="list-style-type: none"> 80% of traffic movements to/from the north-west zone is expected to use Churcher Street to access North Street, with the remaining 20% of traffic using Pharazyn Street. All traffic travelling to/from the north-west is expected to travel on West Street, to access SH3 via Awahuri-Feilding Road or Halcombe Road.
North-East Zone	<ul style="list-style-type: none"> 90% of traffic movements to/from the north-east zone is expected to use Pharazyn Street to access North Street, with the remaining 10% of traffic using Churcher Street. All traffic travelling to/from the north-east is expected to access Kimbolton Road (SH54) via the Pharazyn Street / Kimbolton Road intersection.
South-West Zone	<ul style="list-style-type: none"> 80% of traffic travelling to/from the south-west zone is expected to use Churcher Street to access North Street, with the remaining 20% of traffic using Pharazyn Street. All traffic travelling to/from the south-west is expected to travel on West Street, to access SH3 via Awahuri-Feilding Road or Halcombe Road.

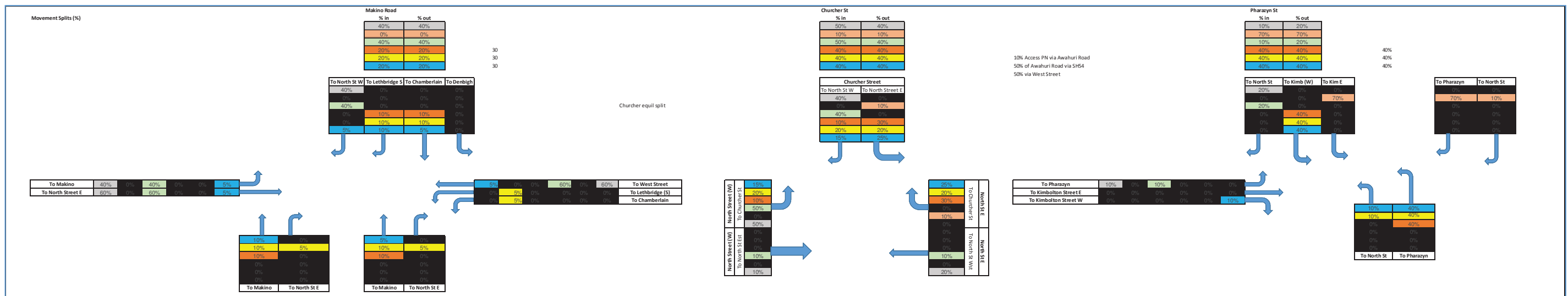
Traffic Assignment – Stage 1 and Stage 2



Traffic Assignment Assumptions – Stages 3 and 4

REGION	ASSUMPTIONS
General Assumptions	<ul style="list-style-type: none"> East-west connections are provided across the Makino Stream at Roots Street by end of Stage 3 Traffic entering/exiting the site has been distributed across from Makino Road (via Roots Street), Churcher Street, and Pharazyn Street accesses.
Palmerston North	<ul style="list-style-type: none"> 80% of traffic movements to/from Palmerston North are expected to be evenly split between Churcher Street and Pharazyn Street, with 20% of traffic using Makino Road. All traffic travelling to/from Palmerston North via Pharazyn Street will travel north-south on Kimbolton Road (SH54). Of the 40% of traffic travelling to/from Palmerston North via Churcher Street, traffic has been distributed as follows: <ul style="list-style-type: none"> 25% travel eastbound on North Street, with 15% accessing Kimbolton Road via the Lytton Street / East Street intersection and 10% accessing Kimbolton Road via North Street / Pharazyn Street intersection 15% would travel westbound on North Street, with 5% southwards via West Street/Awahuri-Feilding Road, and a further 10% using Duke Street to access Kimbolton Road at Derby Street. Of the 20% of traffic travelling to/from Palmerston North via Makino Road, traffic has been distributed as follows: <ul style="list-style-type: none"> 5% travel southbound on Chamberlain Street to access SH54 via Kimbolton Road / Aorangi Street (via Grey Street) 5% would travel westbound on North Street to continue southwards via West Street/Awahuri-Feilding Road 10% would southward on Lethbridge Road South to access SH54 via Aorangi Street / Kimbolton Road roundabout.
Feilding	<ul style="list-style-type: none"> 80% of traffic movements to/from Feilding are expected to be evenly split between Churcher Street and Pharazyn Street, with 20% of traffic using Makino Road. All traffic travelling to/from Feilding via Pharazyn Street will travel north-south on Kimbolton Road (SH54). Of the 40% of traffic travelling to/from Feilding via Churcher Street, traffic has been distributed as follows: <ul style="list-style-type: none"> 20% travel eastbound on North Street, with 20% accessing Kimbolton Road via the Lytton Street / East Street intersection and 10% accessing Kimbolton Road via North Street / Pharazyn Street intersection 20% would travel westbound on North Street, with 10% southwards via Lethbridge Street (S) and Chamberlain Road, and a further 10% using other local roads. Of the 20% of traffic travelling to/from Palmerston North via Makino Road, traffic has been distributed as follows: <ul style="list-style-type: none"> 10% travel southbound on Chamberlain Street to access SH54 via Kimbolton Road / Aorangi Street (via Grey Street) 10% would southward on Lethbridge Road South to access SH54 via Aorangi Street / Kimbolton Road roundabout.
Industrial South	<ul style="list-style-type: none"> 80% of traffic movements to/from industrial employment zones are expected to be evenly split between Churcher Street and Pharazyn Street, with 20% of traffic using Makino Road. All traffic travelling to/from industrial employment zones via Pharazyn Street will travel north-south on Kimbolton Road (SH54). Of the 40% of traffic travelling from the industrial employment zone via Churcher Street, traffic has been distributed as follows: <ul style="list-style-type: none"> 30% travel eastbound on North Street, accessing Kimbolton Road via the Lytton Street / East Street intersection and other local roads 10% would travel westbound on North Street, and continue southward using the local road network. Of the 20% of traffic travelling to/from industrial employment zone via Makino Road, traffic has been distributed as follows: <ul style="list-style-type: none"> 10% travel southbound on Chamberlain Street to access SH54 via Kimbolton Road / Aorangi Street (via Grey Street) 10% would southward on Lethbridge Road South to access SH54 via Aorangi Street / Kimbolton Road roundabout.
North-West Zone	<ul style="list-style-type: none"> 80% of traffic travelling to/from the north-west zone is expected to be evenly split on Churcher Street and Makino Road to access North Street, with the remaining 20% of traffic using Pharazyn Street. All traffic travelling to/from the north-west is expected to travel on West Street, to access SH3 via Awahuri-Feilding Road or Halcombe Road. It has been assumed that additional traffic will return via Churcher Street as opposed to Pharazyn Street given modelled delays on the North Street approach established within the Stage 1 / 2 assessment.
North-East Zone	<ul style="list-style-type: none"> 70% of traffic movements to/from the north-east zone is expected to use Pharazyn Street to access North Street, with 10% of traffic using Churcher Street. 20% of traffic is expected to travel northbound using Reid Line / Norfolk Crescent to access Kimbolton Road (SH54) All traffic travelling to/from the north-east on North Street expected to access Kimbolton Road (SH54) via the Pharazyn Street / Kimbolton Road intersection.
South-West Zone	<ul style="list-style-type: none"> 80% of traffic travelling to/from the south-west zone is expected to be evenly split on Churcher Street and Makino Road to access North Street, with the remaining 20% of traffic using Pharazyn Street. All traffic travelling to/from the south-west is expected to travel on West Street, to access SH3 via Awahuri-Feilding Road or Halcombe Road. It has been assumed that additional traffic will return via Churcher Street as opposed to Pharazyn Street given modelled delays on the North Street approach established within the Stage 1 / 2 assessment.

Traffic Assignment – Stage 3 and Stage 4



Appendix H – Future Forecast Traffic Volumes

Site 1 – AM Peak Hour Intersection Turning Volumes (Stages 1 to 4)

Intersection Approach	Stage 1 - 25% Development			Stage 2 - 50% Development			Stage 3 - 75% Development			Stage 4 - 100% Development		
	Base	New	Total	Base	New	Total	Base	New	Total	Base	New	Total
Lethbridge St (North)												
To Makino Rd	2	0	2	2	0	2	2	0	2	2	0	2
To North St (East)	87	0	87	92	0	92	96	0	96	101	0	101
To Denbigh St	16	0	16	17	0	17	17	0	17	18	0	18
To Chamberlain St	15	0	15	15	0	15	16	0	16	17	0	17
To Lethbridge St (South)	87	0	87	92	0	92	96	0	96	101	0	101
To North St (West)	13	0	13	13	0	13	14	0	14	15	0	15
Makino Rd												
To North St (East)	53	0	53	55	0	55	58	0	58	61	0	61
To Denbigh St	13	0	13	13	0	13	14	0	14	15	0	15
To Chamberlain St	44	0	44	46	0	46	49	68	117	51	91	143
To Lethbridge St (South)	45	0	45	47	0	47	50	92	142	52	122	175
To North St (West)	17	0	17	18	0	18	19	53	72	20	71	90
To Lethbridge St (North)	4	0	4	4	0	4	5	0	5	5	0	5
North St (East)												
To Denbigh St	1	0	1	1	0	1	1	0	1	1	0	1
To Makino Rd	23	0	23	24	0	24	26	0	26	27	0	27
To Chamberlain St	11	0	11	11	0	11	12	17	29	12	23	35
To Lethbridge St (South)	89	6	95	94	11	105	99	17	116	104	23	126
To North St (West)	120	40	160	126	81	207	132	68	200	139	91	230
To Lethbridge St (North)	48	0	48	51	0	51	53	0	53	56	0	56
Denbigh Street												
To Chamberlain St	1	0	1	1	0	1	1	0	1	1	0	1
To Lethbridge St (South)	1	0	1	1	0	1	1	0	1	1	0	1
To North St (West)	9	0	9	10	0	10	10	0	10	11	0	11
To Lethbridge St (North)	4	0	4	4	0	4	5	0	5	5	0	5
To Makino Rd	13	0	13	13	0	13	14	0	14	15	0	15
To North St (East)	15	0	15	15	0	15	16	0	16	17	0	17
Chamberlain St												
To Makino Rd	7	0	7	8	0	8	8	22	30	9	30	38
To North St (East)	7	0	7	8	0	8	8	11	19	9	14	23
To Lethbridge St (South)	0	0	0	0	0	0	0	0	0	0	0	0
To Denbigh	2	0	2	2	0	2	2	0	2	2	0	2
To North St (West)	4	0	4	4	0	4	5	0	5	5	0	5
To Lethbridge St (North)	4	0	4	4	0	4	5	0	5	5	0	5
Lethbridge St (South)												
To Makino Rd	7	0	7	8	0	8	8	24	32	9	31	40
To North St (East)	15	4	18	15	7	22	16	11	27	17	14	31
To Denbigh	1	0	1	1	0	1	1	0	1	1	0	1
To Chamberlain St	1	0	1	1	0	1	1	0	1	1	0	1
To North St (West)	47	0	47	52	0	52	58	0	58	64	0	64
To Lethbridge St (North)	28	0	28	30	0	30	31	0	31	33	0	33
North St (West)												
To Makino Rd	21	0	21	22	0	22	23	18	41	24	24	49
To North St (East)	281	15	295	295	30	325	310	27	336	326	35	361
To Denbigh	23	0	23	24	0	24	26	0	26	27	0	27
To Chamberlain St	5	0	5	6	0	6	6	0	6	6	0	6
To Lethbridge St (South)	76	0	76	84	0	84	93	0	93	103	0	103
To Lethbridge St (North)	21	0	21	22	0	22	23	0	23	24	0	24
Grand Total	1283	64	1347	1355	129	1484	1431	427	1858	1512	569	2081

Site 1 – PM Peak Hour Intersection Turning Volumes (Stages 1 to 4)

Intersection Approach	Stage 1 - 25% Development			Stage 2 - 50% Development			Stage 3 - 75% Development			Stage 4 - 100% Development		
	Base	New	Total	Base	New	Total	Base	New	Total	Base	New	Total
Lethbridge St (North)												
To Makino Rd	1	0	1	1	0	1	1	0	1	1	0	1
To North St (East)	28	0	28	30	0	30	31	0	31	33	0	33
To Denbigh St	3	0	3	3	0	3	3	0	3	4	0	4
To Chamberlain St	8	0	8	9	0	9	9	0	9	10	0	10
To Lethbridge St (South)	71	0	71	75	0	75	79	0	79	83	0	83
To North St (West)	12	0	12	12	0	12	13	0	13	13	0	13
Makino Rd												
To North St (East)	25	0	25	27	0	27	28	0	28	29	0	29
To Denbigh St	13	0	13	13	0	13	14	0	14	15	0	15
To Chamberlain St	57	0	57	60	0	60	63	33	96	66	44	110
To Lethbridge St (South)	28	0	28	30	0	30	31	35	66	33	46	79
To North St (West)	15	0	15	15	0	15	16	27	43	17	36	53
To Lethbridge St (North)	0	0	0	0	0	0	0	0	0	0	0	0
North St (East)												
To Denbigh St	3	0	3	3	0	3	3	0	3	4	0	4
To Makino Rd	23	0	23	24	0	24	26	0	26	27	0	27
To Chamberlain St	13	0	13	13	0	13	14	16	30	15	21	35
To Lethbridge St (South)	34	5	39	35	10	46	37	16	53	39	21	60
To North St (West)	124	21	145	130	42	172	137	37	174	144	50	194
To Lethbridge St (North)	36	0	36	38	0	38	39	0	39	41	0	41
Denbigh Street												
To Chamberlain St	3	0	3	3	0	3	3	0	3	4	0	4
To Lethbridge St (South)	2	0	2	2	0	2	2	0	2	2	0	2
To North St (West)	26	0	26	28	0	28	29	0	29	31	0	31
To Lethbridge St (North)	5	0	5	6	0	6	6	0	6	6	0	6
To Makino Rd	38	0	38	40	0	40	42	0	42	44	0	44
To North St (East)	11	0	11	11	0	11	12	0	12	12	0	12
Chamberlain St												
To Makino Rd	68	0	68	72	0	72	75	57	133	79	77	156
To North St (East)	16	0	16	17	0	17	17	14	32	18	19	37
To Lethbridge St (South)	0	0	0	0	0	0	0	0	0	0	0	0
To Denbigh	1	0	1	1	0	1	1	0	1	1	0	1
To North St (West)	19	0	19	20	0	20	21	0	21	22	0	22
To Lethbridge St (North)	33	0	33	34	0	34	36	0	36	38	0	38
Lethbridge St (South)												
To Makino Rd	23	0	23	24	0	24	26	77	103	27	103	130
To North St (East)	26	5	31	28	9	37	29	14	43	31	19	49
To Denbigh	1	0	1	1	0	1	1	0	1	1	0	1
To Chamberlain St	0	0	0	0	0	0	0	0	0	0	0	0
To North St (West)	140	0	140	155	0	155	171	0	171	189	0	189
To Lethbridge St (North)	118	0	118	124	0	124	130	0	130	137	0	137
North St (West)												
To Makino Rd	50	0	50	53	0	53	56	45	100	59	59	118
To North St (East)	172	21	193	181	42	223	190	37	228	200	50	250
To Denbigh	22	0	22	23	0	23	24	0	24	26	0	26
To Chamberlain St	6	0	6	7	0	7	7	0	7	7	0	7
To Lethbridge St (South)	55	0	55	61	0	61	67	0	67	74	0	74
To Lethbridge St (North)	74	0	74	77	0	77	81	0	81	85	0	85
Grand Total	1404	52	1456	1486	103	1589	1573	408	1982	1666	544	2211

Site 2 – AM Peak Hour Intersection Turning Volumes (Stages 1 to 4)

Intersection Approach	Stage 1 - 25% Development			Stage 2 - 50% Development			Stage 3 - 75% Development			Stage 4 - 100% Development		
	Base	New	Total	Base	New	Total	Base	New	Total	Base	New	Total
Churcher St												
Left into North St (E)	99	96	195	99	192	291	99	220	319	99	294	393
Right into North St (W)	85	77	162	85	154	239	85	179	264	85	238	323
North St (East)												
Thru to North St (W)	235	3	238	247	6	253	260	15	275	273	20	293
Right into Churcher St	91	26	117	96	51	147	101	54	155	106	72	178
North St (West)												
Left into Churcher St	109	27	136	115	54	169	121	67	188	127	89	216
Thru to North St (E)	305	3	308	320	6	326	337	4	341	354	6	359
Grand Total	925	232	1156	963	463	1426	1002	539	1541	1044	719	1763

Site 2 – PM Peak Hour Intersection Turning Volumes (Stages 1 to 4)

Intersection Approach	Stage 1 - 25% Development			Stage 2 - 50% Development			Stage 3 - 75% Development			Stage 4 - 100% Development		
	Base	New	Total	Base	New	Total	Base	New	Total	Base	New	Total
Churcher St												
Left into North St (E)	53	38	91	53	76	129	53	80	133	53	107	160
Right into North St (W)	57	40	97	57	80	137	57	93	150	57	124	181
North St (East)												
Thru to North St (W)	253	4	257	266	8	275	280	6	286	294	9	303
Right into Churcher St	47	81	128	50	162	211	52	185	237	55	247	302
North St (West)												
Left into Churcher St	67	65	132	71	130	200	74	156	231	78	208	287
Thru to North St (E)	211	4	215	222	8	230	233	6	240	245	8	254
Grand Total	689	232	921	719	463	1182	750	527	1277	782	703	1485

Site 3 – AM Peak Hour Intersection Turning Volumes (Stages 1 to 4)

Intersection Approach	Stage 1 - 25% Development			Stage 2 - 50% Development			Stage 3 - 75% Development			Stage 4 - 100% Development		
	Base	New	Total	Base	New	Total	Base	New	Total	Base	New	Total
Pharazyn St												
Left into Kimbolton Rd (E)	6	6	12	6	12	18	6	14	20	6	19	25
Thru to Seddon St	0	0	0	0	0	0	0	0	0	0	0	0
Right into Kimbolton Rd (W)	128	153	281	128	306	434	128	367	495	128	489	617
Right into North St	35	5	40	35	10	45	35	15	50	35	20	55
Kimbolton Rd (East)												
Right into North St	71	2	73	75	4	79	79	6	85	83	8	91
Left into Seddon St	2	0	2	2	0	2	2	0	2	2	0	2
Thru to Kimbolton Rd (W)	322	0	322	356	0	356	393	0	393	434	0	434
Pharazyn St	3	18	21	3	36	39	3	42	46	4	56	60
Seddon St												
Left into Kimbolton Rd (W)	25	0	25	25	0	25	25	0	25	25	0	25
Thru to North St	11	0	11	11	0	11	11	0	11	11	0	11
Thru to Pharazyn St	1	0	1	1	0	1	1	0	1	1	0	1
Right into Kimbolton Rd (E)	2	0	2	2	0	2	2	0	2	2	0	2
Kimbolton Rd (West)												
Left into North St	57	8	65	60	16	75	63	24	86	66	31	97
Left into Pharazyn St	56	39	95	59	78	137	62	94	156	65	125	190
Thru to Kimbolton Rd (E)	139	0	139	154	0	154	170	0	170	187	0	187
Right into Seddon St	8	0	8	9	0	9	9	0	9	10	0	10
North St												
Thru to Seddon St	3	0	3	3	0	3	3	0	3	4	0	4
Right into Kimbolton Rd (W)	140	23	162	147	45	192	154	47	201	162	62	224
Left into Pharazyn St	43	3	46	45	6	51	48	4	52	50	6	56
Thru to Kimbolton Rd (E)	44	2	46	46	4	50	49	0	49	51	0	51
Grand Total	1097	259	1356	1167	517	1684	1243	613	1856	1326	817	2143

Site 3 – PM Peak Hour Intersection Turning Volumes (Stages 1 to 4)

Intersection Approach	Stage 1 - 25% Development			Stage 2 - 50% Development			Stage 3 - 75% Development			Stage 4 - 100% Development		
	Base	New	Total	Base	New	Total	Base	New	Total	Base	New	Total
Pharazyn St												
Left into Kimbolton Rd (E)	3	27	30	3	54	57	3	62	65	3	83	86
Thru to Seddon St	2	0	2	2	0	2	2	0	2	2	0	2
Right into Kimbolton Rd (W)	107	58	165	107	116	223	107	139	246	107	186	293
Right into North St	22	4	26	22	8	30	22	12	34	22	17	39
Kimbolton Rd (East)												
Right into North St	44	1	45	46	1	48	49	2	50	51	2	54
Left into Seddon St	3	0	3	3	0	3	3	0	3	4	0	4
Thru to Kimbolton Rd (W)	237	0	237	262	0	262	289	0	289	319	0	319
Pharazyn St	7	5	13	8	10	18	8	12	20	9	16	25
Seddon St												
Left into Kimbolton Rd (W)	18	0	18	18	0	18	18	0	18	18	0	18
Thru to North St	1	0	1	1	0	1	1	0	1	1	0	1
Thru to Pharazyn St	1	0	1	1	0	1	1	0	1	1	0	1
Right into Kimbolton Rd (E)	1	0	1	1	0	1	1	0	1	1	0	1
Kimbolton Rd (West)												
Left into North St	56	23	78	59	45	104	62	68	129	65	90	155
Left into Pharazyn St	161	128	289	169	257	426	178	308	486	187	411	598
Thru to Kimbolton Rd (E)	335	0	335	369	0	369	408	0	408	450	0	450
Right into Seddon St	24	0	24	25	0	25	27	0	27	28	0	28
North St												
Thru to Seddon St	6	0	6	7	0	7	7	0	7	7	0	7
Right into Kimbolton Rd (W)	59	11	70	62	21	83	65	4	69	68	5	73
Left into Pharazyn St	35	4	39	36	8	45	38	6	45	40	8	49
Thru to Kimbolton Rd (E)	49	1	50	52	1	53	55	0	55	57	0	57
Grand Total	1171	261	1433	1254	522	1776	1343	614	1957	1441	818	2259

Appendix I – Traffic Modelling Outputs

VISSIM MODEL OUTPUTS

SITE 1 – NORTH ST / LETHBRIDGE ST / MAKINO RD / CHAMBERLAIN ST / DENBIGH ST

AM Peak Hour – All Stages

AM Peak Hour (08:00-09:00) - North Street / Lethbridge Street / Makino Road / Chamberlain Street																															
From	To	Model Flow (veh/h)				Average Delay (s)				Maximum Queue (veh)				Level of Service (Delay) - per movement				Average Delay (s) - per approach				Level of Service (Delay) - per approach									
		Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4					
North St (West)	Lethbridge (North)	22	24	24	25	25	2	2	3	3	6						A	A	A	A	A						A	A	A	A	A
	Makino Rd	23	22	24	42	47	3	3	5	7	7						A	A	A	A	A						A	A	A	A	A
	North St (East)	260	287	318	326	352	5	5	6	7	9	4	6	7	10	15	A	A	A	A	A	4	4	6	7	9	A	A	A	A	A
	Denbigh St	22	23	24	26	25	6	6	9	10	10						A	A	A	B	B										
	Chamberlain St	5	5	6	4	4	4	4	8	7	7						A	A	A	A	A										
	Lethbridge (South)	70	75	81	90	97	4	4	6	8	12						A	A	A	A	B										
Lethbridge (North)	Makino Rd	3	2	3	3	4	2	3	7	58	102						A	A	A	F	F										
	North St (East)	80	84	86	88	86	12	19	23	234	337	8	10	11	34	35	B	C	C	F	F	16	24	30	242	358	C	C	D	F	F
	Denbigh St	13	13	15	16	13	11	13	14	230	330						B	B	B	F	F										
	Chamberlain St	14	14	14	14	13	11	21	25	213	304						B	C	C	F	F										
	Lethbridge (South)	85	90	96	105	103	20	30	38	260	391						C	D	E	F	F										
	North St (West)	13	13	15	15	17	21	26	34	240	374						C	D	D	F	F										
Makino Rd	North St (East)	49	54	55	41	21	5	4	7	166	273	5	4	8	37	37	A	A	A	F	F	10	12	16	185	352	A	B	C	F	F
	Denbigh St	11	10	11	11	11	5	9	9	132	209						A	A	A	F	F										
	Chamberlain St	41	43	44	100	84	14	14	20	189	365						B	B	C	F	F										
	Lethbridge (South)	45	48	52	126	107	13	18	21	192	368						B	C	C	F	F										
	North St (West)	17	17	16	58	52	12	18	29	197	370						B	C	D	F	F										
	Lethbridge (North)	4	3	3	3	2	6	4	7	52	79						A	A	A	F	F										
North St (East)	Denbigh St	1	1	0	1	1	0	0	0	0	0						A	A	A	A	A										
	Chamberlain St	8	7	8	26	32	0	1	1	3	2						A	A	A	A	A										
	Lethbridge (South)	86	94	103	111	124	1	2	2	3	5	1	2	3	3	5	A	A	A	A	A	2	3	3	4	5	A	A	A	A	A
	North St (West)	116	162	209	197	223	2	3	3	4	5						A	A	A	A	A										
	Lethbridge (North)	45	47	51	54	59	4	5	4	7	8						A	A	A	A	A										
	Makino Rd	23	23	24	26	27	4	6	7	5	10						A	A	A	A	A										
Denbigh St	Chamberlain St	0	0	0	1	1	0	0	0	1	1						A	A	A	A	A										
	Lethbridge (South)	0	0	2	2	2	0	0	1	1	1						A	A	A	A	A										
	North St (West)	10	10	10	10	10	5	7	11	7	13	2	2	2	2	2	A	A	B	A	B	6	8	10	9	13	A	A	A	A	B
	Lethbridge (North)	4	4	4	4	3	7	6	6	7	7						A	A	A	A	A										
	Makino Rd	12	12	12	14	17	7	9	7	11	15						A	A	A	B	B										
	North St (East)	15	15	17	15	15	7	8	13	11	15						A	A	B	B	B										
Chamberlain St	Lethbridge (South)	2	2	2	2	2	1	0	1	5	6						A	A	A	A	A										
	North St (West)	4	4	4	5	5	1	2	2	5	16						A	A	A	A	C										
	Lethbridge (North)	4	4	4	4	4	5	5	7	7	31	2	2	3	5	7	A	A	A	A	D	6	8	12	20	33	A	A	B	C	D
	Makino Rd	9	9	9	32	39	8	10	19	24	38						A	B	C	C	F										
	North St (East)	5	5	6	15	21	8	14	16	22	30						A	B	C	C	D										
	Denbigh St	0	0	0	0	0	0	0	0	0	0						A	A	A	A	A										
Lethbridge (South)	North St (West)	44	46	49	54	52	9	9	9	79	167						A	A	A	F	F										
	Lethbridge (North)	25	28	30	28	26	15	23	25	156	287	4	5	5	18	27	C	C	C	F	F	12	17	19	126	228	B	C	C	F	F
	Makino Rd	8	6	7	28	32	22	47	32	169	279						C	D	D	F	F										
	North St (East)	8	12	12	20	21	15	23	37	166	247						C	C	E	F	F										
	Denbigh St	2	2	2	1	1	5	11	24	28	89						A	B	C	D	F										
	Chamberlain St	1	1	1	1	1	4	3	5	8	9						A	A	A	A	A										

PM Peak Hour – All Stages

PM Peak Hour (16:45-17:45) - North Street / Lethbridge Street / Makino Road / Chamberlain Street																															
From	To	Model Flow (veh/h)				Average Delay (s)				Maximum Queue (veh)				Level of Service (Delay) - per movement				Average Delay (s) - per approach				Level of Service (Delay) - per approach									
		Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4					
North St (West)	Lethbridge (North)	73	77	79	86	88	1	1	2	2	2						A	A	A	A	A										
	Makino Rd	49	51	55	101	119	2	2	2	3	2						A	A	A	A	A										
	North St (East)	158	184	210	217	237	3	3	3	4	4						A	A	A	A	A										
	Denbigh St	24	24	26	23	27	4	4	5	8	7						A	A	A	A	A										
	Chamberlain St	4	5	7	7	7	4	3	6	2	6						A	A	A	A	A										
	Lethbridge (South)	50	54	58	63	65	2	4	6	5	5						A	A	A	A	A										
Lethbridge (North)	Makino Rd	0	0	0	0	0	0	0	0	0	0						A	A	A	A	A										
	North St (East)	23	26	28	32	32	9	9	15	15	30						A	A	C	B	D										
	Denbigh St	4	4	2	2	1	6	8	6	2	8						A	A	A	A	A										
	Chamberlain St	7	6	9	8	10	11	7	11	13	27						B	A	B	B	D										
	Lethbridge (South)	67	69	72	75	77	18	20	26	36	49						C	C	D	E	E										
	North St (West)	13	12	12	13	15	25	25	31	36	62						D	C	D	E	F										
Makino Rd	North St (East)	24	25	24	26	23	2	3	4	26	114						A	A	A	D	F										
	Denbigh St	13	13	11	13	15	4	5	5	26	103						A	A	A	D	F										
	Chamberlain St	50	53	57	89	94	9	10	17	48	144						A	A	C	E	F										
	Lethbridge (South)	28	29	32	66	70	8	11	23	54	150						A	B	C	F	F										
	North St (West)	13	12	16	43	50	13	11	15	51	146						B	B	B	F	F										
	Lethbridge (North)	0	0	0	0	0	0	0	0	0	0						A	A	A	A	A										
North St (East)	Denbigh St	4	3	4	4	3	0	0	0	0	0						A	A	A	A	A										
	Chamberlain St	15	13	13	31	38	1	1	1	4	3						A	A	A	A	A										
	Lethbridge (South)	31	37	50	51	54	1	3	3	6	5						A	A	A	A	A										
	North St (West)	120	145	169	172	195	3	4	4	6	7						A	A	A	A	A										
	Lethbridge (North)	34	36	40	41	42	5	5	6	11	8						A	A	A	B	A										
	Makino Rd	18	20	18	21	24	3	4	4	4	7						A	A	A	A	A										
Denbigh St	Chamberlain St	2	3	2	3	2	0	1	0	1	1						A	A	A	A	A										
	Lethbridge (South)	2	2	2	2	2	2	4	1	1	2						A	A	A	A	A										
	North St (West)	24	25	30	30	29	4	4	5	6	8						A	A	A	A	A										
	Lethbridge (North)	4	4	4	4	6	3	5	4	6	6						A	A	A	A	A										
	Makino Rd	37	39	39	42	46	5	6	6	10	12						A	A	A	B	B										
	North St (East)	11	10	10	11	9	3	3	4	4	6						A	A	A	A	A										
Chamberlain St	Lethbridge (South)	2	1	1	1	0	1	1	1	7	0						A	A	A	A	A										
	North St (West)	16	15	17	17	17	4	6	9	22	56						A	A	A	C	F										
	Lethbridge (North)	30	33	34	33	34	6	8	8	25	45						A	A	A	D	E										
	Makino Rd	68	71	74	137	161	8	9	13	26	58						A	A	B	D	F										
	North St (East)	15	14	15	31	35	6	11	12	27	58						A	B	B	D	F										
	Denbigh St	0	0	0	0	0	0	0	0	0	0						A	A	A	A	A										
Lethbridge (South)	North St (West)	134	144	150	102	71	12	18	25	189	258						B	C	D	F	F										
	Lethbridge (North)	108	116	119	68	44	23	38	53	235	326						C	E	F	F	F										
	Makino Rd	20	20	22	78	83	24	41	48	231	323						C	E	E	F	F										
	North St (East)	21	25	31	26	25	27	41	53	259	324						D	E	F	F	F										
	Denbigh St	1	1	2	0	0	6	14	14	32	19						A	B	B	D	C										
	Chamberlain St	0	0	0	0	0	0	0	0	0	0						A	A	A	A	A										

SIDRA MODEL OUTPUTS

SITE 2 – NORTH ST / CHURCHER ST

AM Peak Hour – All Stages

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - AM PEAK 2018]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	270	2.7	0.141	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	195	3.4	0.098	6.6	LOS A	0.4	3.0	0.51	0.67	45.2
Approach		375	2.9	0.141	1.9	NA	0.4	3.0	0.14	0.19	48.5
North: Churcher Street (N)											
7	L2	119	3.0	0.104	5.9	LOS A	0.4	3.0	0.41	0.61	45.6
9	R2	102	0.0	0.240	12.6	LOS B	0.9	6.6	0.70	0.89	41.9
Approach		222	1.8	0.240	9.0	LOS A	0.9	6.6	0.55	0.74	43.8
West: North Street (West)											
10	L2	125	2.9	0.254	4.6	LOS A	0.0	0.0	0.00	0.14	48.6
11	T1	348	5.5	0.254	0.0	LOS A	0.0	0.0	0.00	0.14	49.1
Approach		475	4.8	0.254	1.2	NA	0.0	0.0	0.00	0.14	49.0
All Vehicles		1071	3.5	0.254	3.1	NA	0.9	6.6	0.16	0.28	47.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - AM PEAK - Stage 1 2023 (25% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	287	2.7	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	141	3.4	0.141	7.0	LOS A	0.6	4.3	0.55	0.72	45.0
Approach		428	2.9	0.150	2.3	NA	0.6	4.3	0.18	0.24	48.2
North: Churcher Street (N)											
7	L2	235	3.0	0.209	6.2	LOS A	0.9	6.4	0.46	0.65	45.5
9	R2	195	0.0	0.524	18.5	LOS C	2.7	19.1	0.82	1.07	39.3
Approach		430	1.7	0.524	11.8	LOS B	2.7	19.1	0.62	0.84	42.5
West: North Street (West)											
10	L2	158	1.9	0.262	4.6	LOS A	0.0	0.0	0.00	0.16	48.5
11	T1	371	4.2	0.262	0.0	LOS A	0.0	0.0	0.00	0.16	49.0
Approach		529	3.5	0.262	1.4	NA	0.0	0.0	0.00	0.16	48.9
All Vehicles		1387	2.8	0.524	4.9	NA	2.7	19.1	0.25	0.40	46.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - AM PEAK - Stage 2 2028 (50% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	305	2.7	0.159	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	177	3.4	0.194	7.6	LOS A	0.8	6.0	0.59	0.78	44.7
Approach		482	3.0	0.194	2.8	NA	0.8	6.0	0.22	0.29	47.9
North: Churcher Street (N)											
7	L2	351	3.0	0.320	6.6	LOS A	1.5	11.1	0.51	0.71	45.4
9	R2	288	0.0	0.907	46.0	LOS E	9.6	67.3	0.97	1.77	30.3
Approach		639	1.7	0.907	24.4	LOS C	9.6	67.3	0.71	1.19	37.1
West: North Street (West)											
10	L2	204	1.9	0.318	4.6	LOS A	0.0	0.0	0.00	0.18	48.4
11	T1	393	4.2	0.318	0.0	LOS A	0.0	0.0	0.00	0.18	48.9
Approach		596	3.4	0.318	1.6	NA	0.0	0.0	0.00	0.18	48.7
All Vehicles		1717	2.6	0.907	10.4	NA	9.6	67.3	0.33	0.59	43.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - AM PEAK - Stage 3 2033 (75% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
East: North Street (East)												
5	T1	331	2.1	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	50.0	
6	R2	187	2.7	0.215	7.9	LOS A	0.9	6.6	0.61	0.80	44.5	
Approach		518	2.3	0.215	2.9	NA	0.9	6.6	0.22	0.29	47.9	
North: Churcher Street (N)												
7	L2	384	2.3	0.355	6.9	LOS A	1.9	13.4	0.53	0.74	45.3	
9	R2	318	0.0	1.112	150.2	LOS F	30.7	214.6	1.00	3.26	16.1	
Approach		702	1.3	1.112	71.8	LOS F	30.7	214.6	0.74	1.88	24.9	
West: North Street (West)												
10	L2	227	1.5	0.338	4.6	LOS A	0.0	0.0	0.00	0.19	48.4	
11	T1	411	3.2	0.338	0.0	LOS A	0.0	0.0	0.00	0.19	48.8	
Approach		637	2.6	0.338	1.7	NA	0.0	0.0	0.00	0.19	48.7	
All Vehicles		1858	2.0	1.112	28.5	NA	30.7	214.6	0.34	0.86	35.6	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Argevik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - AM PEAK - Stage 4 2038 (100% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
East: North Street (East)												
5	T1	353	2.7	0.184	0.0	LOS A	0.0	0.0	0.00	0.00	50.0	
6	R2	214	3.4	0.272	8.9	LOS A	1.2	9.0	0.64	0.86	44.0	
Approach		567	3.0	0.272	3.4	NA	1.2	9.0	0.24	0.33	47.5	
North: Churcher Street (N)												
7	L2	473	3.0	0.453	7.7	LOS A	2.9	21.2	0.58	0.84	44.8	
9	R2	389	0.0	1.596	564.1	LOS F	98.8	691.8	1.00	6.27	5.6	
Approach		863	1.7	1.596	258.7	LOS F	98.8	691.8	0.77	3.29	10.9	
West: North Street (West)												
10	L2	260	1.9	0.370	4.6	LOS A	0.0	0.0	0.00	0.20	48.3	
11	T1	433	4.2	0.370	0.1	LOS A	0.0	0.0	0.00	0.20	48.8	
Approach		693	3.3	0.370	1.8	NA	0.0	0.0	0.00	0.20	48.6	
All Vehicles		2123	2.6	1.596	106.6	NA	98.8	691.8	0.38	1.49	20.1	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Argevik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

PM Peak Hour – All Stages

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - PM PEAK]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	256	2.1	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	49	2.2	0.035	5.5	LOS A	0.2	1.1	0.37	0.55	45.6
Approach		304	2.1	0.133	0.9	NA	0.2	1.1	0.06	0.09	49.2
North: Churcher Street (N)											
7	L2	61	1.8	0.045	5.3	LOS A	0.2	1.3	0.30	0.53	45.9
9	R2	61	0.0	0.099	8.6	LOS A	0.4	2.6	0.55	0.76	43.9
Approach		121	0.9	0.099	6.9	LOS A	0.4	2.6	0.43	0.64	44.9
West: North Street (West)											
10	L2	68	1.6	0.150	4.6	LOS A	0.0	0.0	0.00	0.13	46.7
11	T1	214	5.0	0.150	0.0	LOS A	0.0	0.0	0.00	0.13	49.2
Approach		282	4.2	0.150	1.1	NA	0.0	0.0	0.00	0.13	49.1
All Vehicles		707	2.7	0.150	2.0	NA	0.4	2.6	0.10	0.20	46.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - PM PEAK - Stage 1 2023 (25% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	273	2.1	0.142	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	136	2.2	0.110	6.0	LOS A	0.5	3.5	0.45	0.62	45.4
Approach		410	2.1	0.142	2.0	NA	0.5	3.5	0.15	0.21	46.4
North: Churcher Street (N)											
7	L2	97	1.9	0.074	5.4	LOS A	0.3	2.1	0.32	0.55	45.8
9	R2	103	0.0	0.208	10.8	LOS B	0.8	5.6	0.64	0.84	42.8
Approach		200	0.9	0.208	6.1	LOS A	0.8	5.6	0.49	0.70	44.2
West: North Street (West)											
10	L2	137	1.6	0.196	4.6	LOS A	0.0	0.0	0.00	0.20	46.3
11	T1	229	5.0	0.196	0.0	LOS A	0.0	0.0	0.00	0.20	46.8
Approach		366	3.7	0.196	1.7	NA	0.0	0.0	0.00	0.20	46.6
All Vehicles		976	2.5	0.208	3.2	NA	0.8	5.6	0.16	0.31	47.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - PM PEAK - Stage 2 2028 (50% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	268	2.1	0.150	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	224	2.2	0.202	6.7	LOS A	0.9	6.6	0.53	0.70	45.2
Approach		513	2.1	0.202	2.9	NA	0.9	6.6	0.23	0.31	47.6
North: Churcher Street (N)											
7	L2	137	1.9	0.106	5.5	LOS A	0.4	3.1	0.34	0.56	45.8
9	R2	147	0.0	0.372	15.2	LOS C	1.7	11.8	0.76	0.97	40.7
Approach		284	0.9	0.372	10.5	LOS B	1.7	11.8	0.56	0.77	43.0
West: North Street (West)											
10	L2	213	1.6	0.245	4.6	LOS A	0.0	0.0	0.00	0.25	46.0
11	T1	245	5.0	0.245	0.0	LOS A	0.0	0.0	0.00	0.25	48.5
Approach		457	3.4	0.245	2.2	NA	0.0	0.0	0.00	0.25	48.3
All Vehicles		1254	2.3	0.372	4.4	NA	1.7	11.8	0.22	0.39	46.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - PM PEAK - Stage 3 2033 (75% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Seg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	304	2.1	0.158	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	252	2.2	0.240	7.0	LOS A	1.1	7.6	0.56	0.74	45.0
Approach		556	2.1	0.240	3.2	NA	1.1	7.6	0.25	0.33	47.6
North: Churcher Street (N)											
7	L2	141	1.9	0.110	5.5	LOS A	0.5	3.2	0.35	0.57	45.8
9	R2	160	0.0	0.450	17.9	LOS C	2.1	14.9	0.81	1.03	39.5
Approach		301	0.9	0.450	12.1	LOS B	2.1	14.9	0.59	0.81	42.2
West: North Street (West)											
10	L2	246	1.6	0.269	4.6	LOS A	0.0	0.0	0.00	0.26	48.0
11	T1	255	5.0	0.269	0.0	LOS A	0.0	0.0	0.00	0.26	48.4
Approach		501	3.3	0.269	2.3	NA	0.0	0.0	0.00	0.26	48.2
All Vehicles		1359	2.3	0.450	4.8	NA	2.1	14.9	0.24	0.41	46.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Churcher Street - Feilding - PM PEAK - Stage 4 2038 (100% Dev)]

Churcher Street / North Street
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Total veh/h	Demand Flows HV %	Seg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: North Street (East)											
5	T1	322	2.1	0.168	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
6	R2	321	2.2	0.338	8.1	LOS A	1.8	13.0	0.62	0.86	44.4
Approach		644	2.1	0.338	4.1	NA	1.8	13.0	0.31	0.43	47.0
North: Churcher Street (N)											
7	L2	170	1.9	0.135	5.6	LOS A	0.6	4.0	0.37	0.58	45.7
9	R2	193	0.0	0.665	27.2	LOS D	3.7	26.0	0.90	1.20	35.9
Approach		363	0.9	0.665	17.1	LOS C	3.7	26.0	0.65	0.91	39.9
West: North Street (West)											
10	L2	305	1.6	0.309	4.6	LOS A	0.0	0.0	0.00	0.29	47.8
11	T1	270	5.0	0.309	0.0	LOS A	0.0	0.0	0.00	0.29	48.3
Approach		576	3.2	0.309	2.5	NA	0.0	0.0	0.00	0.29	48.1
All Vehicles		1582	2.2	0.665	6.5	NA	3.7	26.0	0.28	0.48	45.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

VISSIM MODEL OUTPUTS

SITE 3 – KIMBOLTON RD (SH54) / NORTH ST / PHARAZYN ST / SEDDON ST

AM Peak Hour – All Stages

AM Peak Hour (08:00-09:00) - Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street																															
From	To	Model Flow (veh/h)					Average Delay (s)					Maximum Queue (veh)					Level of Service (Delay) - per movement					Average Delay (s) - per approach					Level of Service (Delay) - per approach				
		Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4
Kimbolton (West)	North Street	51	61	74	84	93	1	1	1	1	1	1	1	1	1	1	A	A	A	A	A	1	1	1	1	1	A	A	A	A	A
	Pharazyn Street	64	102	143	162	198	1	1	1	1	1						A	A	A	A	A										
	Kimbolton (East)	119	130	142	158	167	0	1	1	1	1						A	A	A	A	A										
	Seddon St	6	7	6	6	8	2	2	2	2	2						A	A	A	A	A										
North Street	Pharazyn Street	43	41	8	3	1	5	196	853	240	967	8	55	59	59	58	A	F	F	F	F	15	214	912	628	891	B	F	F	F	F
	Kimbolton (East)	36	37	13	8	0	15	222	722	384	375						B	F	F	F	A										
	Seddon St	2	2	1	1	0	14	56	146	107	0						C	F	F	F	F										
	Kimbolton (West)	133	135	38	13	1	18	220	1013	897	1022						A	A	A	A	A										
Pharazyn Street	Kimbolton (East)	8	15	20	20	15	0	0	9	12	21	5	11	19	36	36	A	A	A	B	C	3	9	19	26	35	A	A	C	D	E
	Seddon St	0	0	0	0	0	0	0	0	0	0						A	A	A	A	A										
	Kimbolton (West)	129	280	429	423	404	4	10	20	28	38						A	A	C	D	E										
	North Street	32	37	37	41	32	1	2	5	6	8						A	A	A	A	A										
Kimbolton (East)	Seddon St	3	2	2	3	2	0	0	0	0	0	2	2	3	4	4	A	A	A	A	A	1	1	2	2	3	A	A	A	A	A
	Kimbolton (West)	298	325	349	378	406	0	0	0	1	1						A	A	A	A	A										
	North Street	61	69	77	85	91	3	4	5	7	8						A	A	A	A	A										
	Pharazyn Street	3	20	39	42	57	2	4	5	6	8						A	A	A	A	A										
Seddon St	Kimbolton (West)	26	26	26	26	26	3	6	6	7	9	2	3	3	3	3	A	A	A	A	A	5	8	8	10	14	A	A	A	B	B
	North Street	11	11	11	11	11	10	12	16	19	28						A	B	C	C	D										
	Pharazyn Street	1	1	1	1	1	1	2	3	4	2						A	A	A	A	A										
	Kimbolton (East)	2	2	2	2	2	5	8	9	8	19						A	A	A	A	C										

PM Peak Hour – All Stages

PM Peak Hour (16:45-17:45) - Kimbolton Rd (SH54) / North Street / Pharazyn Street / Seddon Street																															
From	To	Model Flow (veh/h)					Average Delay (s)					Maximum Queue (veh)					Level of Service (Delay) - per movement					Average Delay (s) - per approach					Level of Service (Delay) - per approach				
		Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4	Base	Dev 1	Dev 2	Dev 3	Dev 4
Kimbolton (West)	North Street	49	74	108	128	151	1	2	2	3	4	1	2	2	2	2	A	A	A	A	A	1	2	2	3	4	A	A	A	A	A
	Pharazyn Street	160	290	423	495	606	1	2	2	3	4						A	A	A	A	A										
	Kimbolton (East)	300	333	359	381	410	1	2	3	3	5						A	A	A	A	A										
	Seddon St	22	22	23	25	26	2	3	2	3	3						A	A	A	A	A										
North Street	Pharazyn Street	32	33	23	14	3	5	35	223	772	947	8	21	58	58	58	A	F	F	F	F	13	53	253	905	1049	B	F	F	F	F
	Kimbolton (East)	52	52	40	28	2	15	52	271	959	1123						A	F	F	F	A										
	Seddon St	4	5	5	3	0	9	45	53	406	0						C	F	F	F	F										
	Kimbolton (West)	55	69	50	23	2	16	62	271	984	1133						A	A	A	A	A										
Pharazyn Street	Kimbolton (East)	3	35	55	61	50	0	0	2	5	14	5	4	15	27	36	A	A	A	A	B	5	8	15	28	72	A	A	C	D	F
	Seddon St	1	1	2	2	0	4	2	12	4	0						A	A	B	A	A										
	Kimbolton (West)	107	161	222	224	169	6	10	19	36	95						A	B	C	F	F										
	North Street	21	23	25	30	20	2	5	10	14	24						A	A	B	B	C										
Kimbolton (East)	Seddon St	3	3	3	3	3	0	0	0	0	9	3	3	4	5	31	A	A	A	A	A	1	2	3	6	20	A	A	A	A	C
	Kimbolton (West)	219	238	259	279	296	0	0	0	0	5						A	A	A	A	A										
	North Street	39	41	43	46	49	6	9	19	28	84						A	A	C	D	F										
	Pharazyn Street	7	9	15	19	19	4	8	14	29	80						A	A	B	D	F										
Seddon St	Kimbolton (West)	18	18	19	18	19	2	2	3	8	51	1	1	2	3	4	A	A	A	A	F	2	2	3	10	56	A	A	A	A	F
	North Street	1	1	1	1	1	1	3	3	17	79						A	A	A	C	F										
	Pharazyn Street	0	0	0	0	0	1	3	3	5	23						A	A	A	A	C										
	Kimbolton (East)	1	1	1	1	2	1	1	7	27	112						A	A	A	D	F										



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Manawatu District Council
Precinct 4
Servicing Concept Design

June 2017

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Appendices

- Appendix A – Precinct 4 Growth Area
- Appendix B – Proposed Stormwater Layouts and Calculations
- Appendix C – Proposed Wastewater Layouts and Calculations
- Appendix D – Proposed Water Supply Layout
- Appendix E – Stopbank flows

1. Introduction

1.1 Background

Manawatu District Council (MDC) has identified Precinct 4 as one of five growth areas for Feilding. MDC is in the process of rezoning Precinct 4 from a rural to residential area. GHD has previously completed a concept design for this precinct. Since then, a number of design parameters have been modified / clarified and therefore the design requires updating.

GHD have been engaged by MDC to carry out a refined concept design of the three waters for the Precinct 4 growth area. The key design parameter modifications are:

- A new roading layout has been provided by MDC.
- Precinct 4's lot sizes reduced to an average size of 600 m² per lot.
- The Precinct 4 growth area shall be extended to include the undeveloped land on the west side of the Makino Stream, bounded by Makino Road and Reid Line.
- The proposed stormwater system is to allow for runoff from the catchment north of the Reid Line stop bank to enter the Precinct 4 catchment via the culverts through the stop bank. It is understood that these culverts will be closed during larger (1:30 year plus) rainfall events.

1.2 Purpose of this report

The purpose of this report is to refine the concept design of the three waters for the Precinct 4 growth area taking into account the modified parameters. The report is accompanied with high-level concept design layouts and cost estimates of each service indicating pipe sizing and overland flow paths.

This report also provides comments on how the refined concept design would interact with any existing infrastructure and details the assumptions and design considerations carried out on this project. The report also list recommendations regarding the refined concept design of the three waters for Precinct 4.

1.3 Scope and limitations

This report: has been prepared by GHD for Manawatu District Council and may only be used and relied on by Manawatu District Council for the purpose agreed between GHD and the Manawatu District Council as set out above.

GHD otherwise disclaims responsibility to any person other than Manawatu District Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Manawatu District Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has prepared the preliminary cost estimate set out in section 5 of this report (“Cost Estimate”) using information reasonably available to the GHD employee(s) who prepared this report; and based on assumptions and judgments made by

The Cost Estimate has been prepared for budgetary purposes and must not be used for any other purpose.

The Cost Estimate is a preliminary estimate only. Actual prices, costs and other variables may be different to those used to prepare the Cost Estimate and may change. Unless as otherwise specified in this report, no detailed quotation has been obtained for actions identified in this report. GHD does not represent, warrant or guarantee that the works can or will be undertaken at a cost which is the same or less than the Cost Estimate.

1.4 Assumptions

The analysis carried out as part of this refined conceptual design is based on the following key assumptions:

General

- Contours provided and information on MDC IntraMaps are correct and complete.
- All hydraulic calculations were carried out on a high-level only (as requested by MDC) and as such, the concept design is subject to change during detailed design.
- Average lot size for the Precinct 4 growth area reduced to 600 m².
- Precinct 4 growth area is as per Figure 10 in Appendix A and of residential type only.

Stormwater

- Runoff coefficients have been defined using Table 1 of “Compliance Document for New Zealand Building Code – Clause E1, Surface Water” and have been reduced by 0.05 to allow for the flat grades (less than 1%) in the area to result in the following:
 - Residential developed surface = 0.5 (residential area in which imperviousness area is 36 to 50 % of gross area).
 - Natural pre-developed surface type = 0.3 (pasture and scrub cover of medium soakage soil types).
- The proposed stormwater system is to allow for runoff from the catchment north of the Reid Line stop bank to enter the Precinct 4 catchment via the culverts through the stop bank. It is understood that these culverts will be closed during larger (1 in 30 year plus) rainfall events.
- Catchments and flow paths were delineated based on current knowledge of lot layouts and as such might be altered once the final subdivision layout have been finalised.
- Rainfall frequency data for Precinct 4 were obtained from the High Intensity Rainfall Design System (HIRDS v3) for storms excluding and including 2.3°C climate change as illustrated in Appendix B – Table 7 and Table 8.
- Proposed stormwater pipes have a Manning’s roughness coefficient (n) of 0.012 (upper bound of NZS 4404:2010, table 4.2 – circular concrete pipes).

- Pre-developed surfaces have a Manning's roughness coefficient (n) of 0.045 (average grassed surface as per Building Code – Clause E1, Figure 1).
- Post-development grassed berms have a Manning's roughness coefficient (n) of 0.035.
- Post-development paved surfaces (including kerb and channel and road surface) have a Manning's roughness coefficient (n) of 0.015.
- Precinct 4 roads to be standard urban profile with 9 m – 11 m carriageways and 4.5 m – 5 m berms sloping to a kerb and channel.
- Overland flow to be conveyed via the roadway corridors.
- No onsite hydraulic neutrality is to be achieved; as a result, no additional runoff will be stored on site.
- A free outlet exist between any proposed stormwater pipe outlets discharging into the Makino Stream.
- For the 1 in 10-year event, it was assumed that 65% of the 1 in 30-year flows would be flowing through the stopbank entering Precinct 4.

Wastewater

- Average dry weather flow (ADWF) from the developed Precinct 4 area will be 250 l/h/d - (Upper bounds of the design parameters given in NZS 4404:2010).
- Dry weather peaking factor = 2.5 x ADWF - (Design parameter given in NZS 4404:2010).
- Wet weather peaking factor = 2 x PDWF - (Design parameter given in NZS 4404:2010).
- Fully developed, the Precinct 4 area will have an average occupancy rate of 2.6 people per property – average for Manawatu District & Feilding North area unit (2013 census).
- Proposed wastewater pipes have a Manning's roughness coefficient (n) of 0.012.
- No flow monitoring have been carried out to confirm any existing flows in the catchments downstream of Precinct 4.

Water supply

- Development within Precinct 4 is of residential type only, therefore the firewater requirements of Precinct 4 is classified as FW 2 (25 l/s), as per SNZ PAS 4509 – table 1.
- Fully developed, the Precinct 4 area will have an average occupancy rate of 2.6 people per property – average for Manawatu District & Feilding North area unit (2013 census).
- Peaking Factor (PF) – peak day demand = 1.5 for populations above 10 000, as is the case for the Precinct 4 growth area.
- Peaking Factor (PF) – peak hourly demand = 2 for populations above 10 000, as is the case for the Precinct 4 growth area.
- Average Daily Demand = 250 l/h/d (Demand from other growth areas has not been included in the analysis).
- The Colebrook-White formula with a roughness (k) value of 0.1 were used to calculate head loss within the pipes.

2. Stormwater Concept

2.1 Subdivision topography

Precinct 4 is divided into two distinct catchments by the Makino Stream. The subdivision's topography on the eastern side of the stream falls generally from north in a south-western direction, while the topography on the western side of the stream is generally sloped in an eastern direction. Both catchments ultimately drain towards the Makino Stream and the Oroua River.

Precinct 4 and its surrounding area is relatively flat with slopes generally less than 1%. The contours (provided by MDC) indicates that a portion of the western side of Precinct 4's western catchment between Roots Street West and Proposed Road 2 West are steeper with slopes of around 5%. The steeper slopes did not have any converse effects on the outcome of the hydraulic analysis.

2.2 Existing stormwater infrastructure

The majority of the subdivision currently relies on overland flow / open drains for stormwater conveyance with a piped system along Pharazyn Street, Port Street, and Arnott Street. The main along Pharazyn Street drains in a southern direction picking up flows from mains along Arnott Street and a short section of Port Street East before discharging into the Oroua River near Seddon Street. The existing stormwater infrastructure is shown in Figure 1 below.



Figure 1 - Existing stormwater infrastructure

It should be noted that the existing stormwater main along Pharazyn Street appears to have not been designed to include any additional runoff associated with development and / or flows coming through the stopbank culverts. Any additional runoff will therefore be conveyed by overland flow paths. There are existing stormwater mains along Accolade Street, Port Street East and Arnott Street connecting to the Pharazyn Street main.

2.3 Proposed stormwater concept

The subdivision's stormwater mains are designed to follow the roading layout and are proposed to be located within the road reserve at the standard location of 3 m from the boundary. The subdivision's roading network are proposed to form a series of overland flow paths conveying any secondary flow to the Makino Stream or the existing piped network along Pharazyn Street.

Precinct 4's western catchment is anticipated to have pipe diameters of up to 1350 mm while the eastern catchment consist of pipes up to 2100 mm along Proposed Road 2 East. Details of the subdivision's overland flow and piped flow are discussed further in section 2.4 and 2.5 of this report.

The rational method was used to calculate stormwater runoff associated with each catchment. A reduced lot size of 600 m² have been utilised. Times of concentration (T_c) that were used to determine rainfall intensities for pre and post-development catchments were obtained as follow:

- NZ Building Code – Figure 1 were used for pre-developed catchment areas;
- Entry time of 10 min together with network flow times were used for post-developed catchment areas.

Precinct 4's concept design layout together with catchment maps and calculations are shown in Appendix B.

2.4 Overland flow

A secondary system consisting of open channels, controlled flood plains and flow paths capable of handling the 1 in 100-year storm event is required by MDC. Precinct 4's secondary drainage system are proposed to utilise the road corridor, which will carry flows in excess of the primary drainage system.

Overland flow paths along flatter sections of the roading layout will need to become a series of saw tooth profiles while retaining minimal fall to a single outlet point. In large events, these saw tooth sections would fill as shallow detention features while slowly decanting to the draining points provided for. For smaller events, these saw tooth sections would be drained by the primary piped network. Overland flow of the subdivision's western and eastern catchments are discussed below.

2.4.1 Western catchment

Pre-development

Precinct 4's western catchment was delineated into four sub-catchments that are anticipated to discharge into the Makino Stream as shown in Appendix B – Figure 11. The rational method was used to determine the surface runoff for each catchment. Table 1 below summarises the total pre-development overland flow discharging into the Makino Stream with and without climate change for the 1 in 10-year and 1 in 100-year events.

Table 1 - Western catchment pre-development overland flows

Return Period	Flow – No climate change (m ³ /s)	Flow – 2.3°C climate change (m ³ /s)	Additional flow due to climate change (m ³ /s)
1 in 10-years	1.64	1.91	0.27
1 in 100-years	2.96	3.47	0.51

Post-development

Flows associated with the 100-year event less the 10-year event are proposed to be conveyed via the proposed roadways and includes climate change of 2.3° C. Although Precinct 4's western roading layout have not been finalised, it is assumed that the roads in an eastern direction will be graded no less than 0.4%, and no less than 0.2% in a southern direction.

It is proposed to discharge Precinct 4's western overland flows into the Makino Stream at Port Street West, Root Street West and Proposed Road 2 West. The lane widths along the three routes are assumed 5 m wide with 4.5 m berms on each side. The total overland flow expected to accumulate along these roads are 1.69 m³/s along Proposed Road 2 West, 0.78 m³/s along Root Street West and 0.51 m³/s along Port Street West as shown in Appendix B – Table 12. The flow capacities of these road corridors graded at 0.4% are 3.1 m³/s as illustrated in Appendix B – Table 11, therefore the capacity of the proposed roadways are sufficient to convey overland flows to the Makino Stream. Proposed overland flow paths of the western catchment are shown in Appendix B – DWG 51-33090-01-SK008C.

2.4.2 Eastern catchment

Precinct 4 east is essentially separated into two catchments by a ridge along Pharazyn Street. Overland flow on the western side of Pharazyn Street are proposed to drain to the Makino Stream while the eastern side of the ridge will drain along Pharazyn Street and Arnott Street.

Flows from the stopbank culverts upstream of Precinct 4 up to the 1 in 30-year event will enter Precinct 4. The culvert flows as per the memo by John Philpott dated 17 October 2016 were used as part of the hydraulic analysis and are shown in Appendix D – Figure 17. Proposed overland flow paths and calculations of the eastern catchment are shown in Appendix B.

Makino Stream Catchment

GHD has previously completed a high-level catchment analysis for Precinct 4 east of which the findings of the overland flows are presented in a memo to MDC dated 12 October 2016. The analysis was revised as part of the scope of this report to include reduced lot sizes of 600 m², stopbank flows and climate change of 2.3° C.

Flows associated with the 100-year event less the 10-year event will be conveyed via the proposed roading layout. Precinct 4 east between the Makino Stream and Pharazyn Street have been divided into 4 main catchments which were further delineated into 16 smaller catchments as illustrated in Appendix B – Figure 14.

The primary overland flow paths are along Proposed Road 2 East, Roots Street East and Port Street East. Proposed Road 2 East is proposed to have a lane width of 5.5 m, and graded at 0.1% while Roots Street East and Port Street East have lane widths of 5 m, and are graded at 0.2% and 0.25% respectively. These overland flow paths are proposed to discharge into the Makino Stream.

For the 1 in 100-year event, the revised flows expected to flow along the western end of Precinct 4's eastern roadways, just prior to discharging into the Makino Stream are shown in Table 2 below. Road corridor capacities were calculated based on standard berm widths of 4.5 m and a 4% fall, with maximum ponding heights of 280 mm measured from the bottom of the kerb to boundary level.

Table 2 – Makino Stream overland flow path capacities

Road Name	Original Flows 100-10yr (m ³ /s)	Revised Flows 100-10yr (m ³ /s)	Road Capacity (m ³ /s)	Slope (%)
Road 2 East	1.55	1.14	1.54	0.1
Root Street East	2.13	1.38	2.17	0.2
Port Street East	2.55	3.19	2.51	0.25

The revised flows tabled above, indicates that the road corridor proposed in the previous iteration of design have capacities that are sufficient with the exception of Port Street East, which is not sufficient to convey the flows associated with the 1 in 100-year event to the Makino Stream without ponding heights exceeding property boundary levels. However, the piped network discussed in section 2.5.2 together with a reduced RL of 35mm of Port Street East will have a combined capacity, which are sufficient to cater for the excess overland flows as shown in Appendix B – Table 11.

Flows associated with the western stopbank culverts, that are expected to enter Precinct 4 in the case of the 30-year event, are approximately 2.05 m³/s. These flows are to be discharged into the Makino Stream via the stormwater network along Proposed Road 2 East. The capacity of Proposed Road 2 East (1.54 m³/s) and associated pipe network (5.95 m³/s) is sufficient to convey overland flows associated with the 30-year event (7.2 m³/s).

Proposed Road 2 East between Churcher Street and the Makino Stream does however not have sufficient capacity to convey overland flow associated with the 1 in 30-year event plus stopbank flows. The excess overland flows were calculated as 1.7 m³/s. If the stopbank flows are unable to be diverted to the Makino Stream via an alternative route, it is proposed to increase the capacity of Proposed Road 2 East to be sufficient to convey the excess overland flow of 1.7 m³/s associated with the 1 in 30-year event. This could be achieved by either increasing the pipe size, increasing road capacity by reducing the road level or creating a swale / channel along the road median.

Pharazyn Street Catchment

Precinct 4 East between Reid Line and Pharazyn Street have been divided into 7 sub-catchments as shown in Appendix B – Figure 15. Flows associated with the 100-year less the 10-year event will be conveyed via Pharazyn Street and Arnott Street in a southern direction towards the existing piped system from Sherwill Street onwards. Pharazyn Street is graded steeper than 0.4 % and is proposed to have lane widths of 5.5 m after being fully developed. Arnott Street is also graded steeper than 0.4 % and is proposed to have lane widths of 5 m after development.

The overland flows for the 1 in 100-year event (stopbank culverts closed) along Pharazyn Street North of Arnott, Arnott Street, and Pharazyn Street South of Arnott were calculated as 3.1 m³/s, 1.3 m³/s and 6.4 m³/s respectively. The roadway capacities for Pharazyn Street and Arnott Street graded to at least 0.4% are 3.18 m³/s and 3.08 m³/s, which are sufficient to convey the overland flows up to Arnott Street. From Arnott Street to Sherwill Street the road capacity is not sufficient to convey the combined Pharazyn and Arnott Street flows to the 1800 mm diameter

piped network. It is recommended that this section be investigated further. It is also noted that grate inlets to the 1800 mm diameter pipe are insufficient to allow flow to enter and needs to be upgraded.

Flows associated with the eastern stopbank culverts that are expected to enter Precinct 4 for the 1 in 30-year event is 0.89 m³/s and are proposed to flow along Pharazyn Street. The combined stopbank and overland flow along Pharazyn Street north of Arnott is 3 m³/s, which is less than the capacity of Pharazyn Street, however the section between Arnott and Sherwill Street is not sufficient and needs to be investigated further.

It should be noted that it is anticipated that it will be some time before this area is fully developed and the density of development may never reach the assumed average lot size of 600 m². As such, MDC could consider deferring investigation and physical works in this area.

2.5 Piped flow

Precinct 4's piped stormwater systems are generally designed to convey flows associated with the 1 in 10-year storm event without surcharging. For the purpose of this report, it was assumed that a free drainage outlet exists for any pipe interface discharging into the Makino Stream and Oroua River.

Precinct 4's post-development land use type is assumed residential, in which the impervious area is 36% to 50% of the gross area, with an average ground slope of no more than 5%. From NZ Building code clause E1 Surface water, Table 1 and Table 2, the post-development runoff coefficient for Precinct 4 is specified as 0.5. Piped flow of the subdivision's western and eastern catchments are discussed below.

2.5.1 Western catchment

Precinct 4's western catchment was delineated into 3 main catchments each consisting of a trunk main that discharge into the Makino Stream. For the 1 in 10-year event the time of concentrations for the trunk mains were calculated as 19 minutes, 15 minutes and 14 minutes with rainfall intensities of 53 mm/h, 59 mm/h and 60 mm/h respectively. The 3 catchments were further delineated into 12 sub-catchments as shown in Appendix B – Figure 13.

The three trunk mains are designed to follow the proposed roading layout, which primarily runs parallel to the Makino Stream. The three trunk mains will pick up flows from the various collector mains, which are ultimately draining in a south-eastern direction and discharging into the Makino Stream at Proposed Road 2 West, Root Street West and Port Street West.

The total combined post-development runoff that will be discharged into the Makino Stream through the piped network was calculated as 4.9 m³/s. The proposed pipe network of the western catchment, with preliminary sizing and gradients are shown in Appendix B – DWG 51-33090-01-SK008C.

2.5.2 Eastern catchment

Precinct 4's eastern piped drainage network primarily consist of two sub-catchments. The first catchment drains towards the Makino Stream in a western direction and the second catchments drains along Pharazyn Street in a southern direction towards the Oroua River. Both catchments were further delineated into various smaller catchments to break down the pipe sizing along each road layout more accurately. The proposed sub-catchments and preliminary piped network are shown in Appendix B.

Makino Stream Catchment

GHD has previously completed a high-level catchment analysis for Precinct 4 east of which the findings of the piped flows are presented in a memo to MDC dated 12 October 2016. The analysis was reviewed as part of the scope of this report to include adjusted lot sizes of 600 m² and allowance for climate change of 2.3° C.

The piped system of the Makino catchment are graded to the Makino Stream along Port Street East and Root Street East at 0.2% and Proposed Road 2 East at 0.1%. For the 1 in 10-year event, the revised peak flows in the trunk mains along Port Street East, Root Street East and Proposed Road 2 East were calculated as 3.44 m³/s, 3.07 m³/s and 4.50 m³/s respectively.

The revised hydraulic analysis indicated that various mains along Port Street East, Root Street East and Proposed Road 2 East have to be upsized. A comparison between the original and revised pipe sizes are shown in Table 3 below.

Table 3 – Trunk main size comparison Makino Stream catchment

Road Name		Pipe size (mm) from Makino Stream to Pharazyn Street			
Port Street East	Original	1350	1200	750	600
	Revised	1500	1500	1050	750
Root Street East	Original	1350	1050	750	600
	Revised	1650	1200	900	525
Proposed Road 2 East	Original	1350	1500	750	300
	Revised	2100	1350	1050	525

Although Port Street East, Roots Street East, and Proposed Road 2 East are graded in a western direction to the Makino Stream, a short section of pipe along each street's eastern side are proposed to be laid in an eastern direction connecting into the Pharazyn Street trunk main. A 750 mm diameter main along Port Street East connecting to the Pharazyn Street main has already been constructed.

Pharazyn Street Catchment

At present the Pharazyn Street stormwater main discharges into the Oroua River via an 1800 mm diameter discharge main near Seddon Street. The main is 1800 mm in diameter from the discharge up to the Sherwill Street intersection. From there it decrease to a 1350 mm diameter until Arnott Street where it again reduces down to a 1200 mm main up to Accolade Grove. At Accolade Grove the main reduces to 1050 mm diameter up to Root Street where it reduces to a 900 mm diameter and ultimately terminates in a 525 mm diameter main at Reid Line.

A short section of 1050 mm diameter main connecting to the Pharazyn Street main is installed along Arnott Street up to Bella Court. A section of 750 mm diameter main draining in an eastern direction towards Pharazyn Street along Port Street East is installed as well as 525 mm and 300 mm diameter pipes along Accolade Street.

The Pharazyn Street catchment was evaluated in order to comment on the suitability of the existing infrastructure. Additional flow from the stopbank culverts of 65 % (0.89 m³/s) of the 1 in 30-year event were included in the analysis of the revised pipe sizing.

For this analysis it was assumed that flow from the stopbank culverts will contribute to the peak runoff of the Pharazyn Street catchment. However, it should be noted the time of concentration of the catchment above the stopbanks is much longer than the time of concentration of the

catchment below the stopbank. As such, it is unlikely that the peak flow from both catchments will occur at the same time.

Revised pipe sizes of the existing infrastructure along Pharazyn Street up to the outfall at the Oroua River are shown in Table 4 below.

Table 4 – Pharazyn Street and Arnott Street mains

Pipe upstream and downstream locations		Revised Q ₁₀ Flows (m ³ /s)	Existing Pipe Size (mm)	Revised Pipe Size (mm)
Pharazyn Street Main				
Reid Line	Road 2	0.96	525	750
Road 2	Root Str	2.75	900	1050
Root Str	Accolade Grove	3.36	1050	1200
Accolade Grove	Arnott Str	5.21	1200	1500
Arnott	Sherwill Str	6.81	1350	1650
Shewill Str	Oroua Outfall	11.70 ⁽¹⁾	1800	1800
Arnott Street Main				
Bella Court	Pharazyn Str	2.23	1050	1050

Table notes: ⁽¹⁾ Q100 year flow.

The above table indicates that with the inclusion of the stopbank flows, the existing stormwater main along Pharazyn Street is undersized from Reid Line to Sherwill Street. The excess stopbank flows will however be conveyed via the roading network up to Arnott Street. This means that surface flooding of the road corridor is likely to occur at a higher frequency than the 1 in 10-year guideline given in NZS 4404. However, the road corridor has sufficient capacity for stormwater protection up to and including a 1 in 100-year event.

From Sherwill Street onwards the 1800 mm diameter stormwater main appears to have been designed to include any flow up to the 1 in 100-year event via an 1800 mm diameter main. The revised catchment calculations indicated that the 1800 mm diameter main from Sherwill Street to Florence Place is not sufficient to convey the 1 in 100-year flow of 11.70 m³/s.

A 1950 mm diameter pipe would be required between Sherwill Street and Florence Place. As-built drawings indicates that a 1200 mm diameter main is connected to the 1800 mm diameter main at Florence Place. From this point onwards the 1800 mm diameter main is sufficient to convey the 1 in 100-year overland flows provided that 1200 mm and 1800 mm are interconnected.

It is recommended that MDC investigate upgrading / duplicating the stormwater pipeline on Pharazyn Street from Sherwill Street to Florence Place. It should be noted that it is anticipated that it will be some time before this area is fully developed and the density of development may never reach the assumed average lot size of 600 m². As such, MDC could consider deferring investigation and physical works in this area.

3. Wastewater Concept

3.1 Existing wastewater infrastructure

Feilding's wastewater drains primarily via two gravity trunk mains in a southern direction towards the treatment plant. The Makino Stream bisects the town's wastewater system into an eastern and western catchment area, with the eastern catchment being the larger of the two. The trunk main system of the western catchment services predominantly smaller residential catchments, while the town's CBD, commercial, and industrial catchments are being serviced by the eastern trunk main system.

The two trunk main systems ultimately converge into the outfall sewer main near Kawakawa Road, just prior to discharging into the treatment plant. The existing capacities of the two trunk main systems were assessed using high-level calculations for the purpose of this report. The western trunk main was evaluated up to the end of the existing residential area just prior to increasing to a 680 Ø main. The eastern trunk main was evaluated up to the Precinct 4 boundary. The two trunk mains are shown in Figure 2 below.



Figure 2 - Existing wastewater infrastructure

The western trunk main system progressively increases from a 300 Ø main along Lethbridge Street to a 450 Ø main along Awahuri Road. Ultimately, the total Peak Wet Weather Flow

(PWWF) for the existing western system was calculated as 160 l/s based on a gross area (including road reserves) of 340 ha and an average lot size of 800 m². It was estimated that the 450 Ø pipe on the downstream side of the catchment is flowing 74% full, at design PWWF.

The eastern trunk main system consists of various branches feeding into a single trunk main at the Precinct 5 boundary. The eastern trunk system progressively increases from a 300 Ø main along Kimbolton Road to a 525 Ø along Denbigh Street. At Carthew Street, the main reduces to a 375 Ø crossing the railway line and ultimately increasing to a 450 Ø at the northern end of Kawakawa Road before picking up the industrial flows from Precinct 5. For the purpose of this report, the analysis terminated at this point.

The main along Kawakawa Road has not been assessed, as a more detailed understanding of the flows from the wet industries of Precinct 5 would be required. Ultimately, the total PWWF for the existing eastern system was calculated as 167 l/s based on a gross area of 355 ha and an average lot size of 800 m². It was estimated that the 450 Ø pipe on the downstream side of the Precinct 5 boundary is flowing 76% full. PWWF calculations for the existing infrastructure is shown in Appendix C – Table 15 & 16.

It should be noted that the above assessment is based on the flow guidelines provided in NZS 4404 as quoted in section 1.4 of this report. GHD's experience shows that it is not uncommon for wastewater catchments to exhibit peak wet weather flows higher than the design flows provided in NZS 4404. Inflow and Infiltration rates of stormwater runoff entering the wastewater network can vary greatly from catchment to catchment as it is a function of the condition of the wastewater network, and ground water levels among other factors.

To accurately determine the available capacity of the existing network it is recommended that MDC conduct a flow monitoring programme coupled with an Inflow and Infiltration assessment and/or hydraulic modelling of the network.

If the peak flows are found to be higher than estimated, a well planned Inflow and/or Infiltration remedial programme can be effective at returning peak flow to approximately those derived from NZS 4404.

3.2 Proposed wastewater concept

3.2.1 General configuration

It is proposed that generally all wastewater mains be laid in the road reserves unless stated otherwise. The alignment of the proposed wastewater mains have been selected as the road centre line for the purpose of the concept design.

A detailed alignment selection has not been conducted as part of the concept design and as such, the design is subject to change during detailed design. The configuration has been selected such that it minimises the depth of proposed wastewater mains while meeting pipe capacity and self-cleansing velocity requirements. The proposed wastewater concept is shown in Appendix C – DWG 51-33090-02-SK008A to SK008C.

3.2.2 Precinct 4 – eastern catchment

Precinct 4's eastern wastewater is proposed to be subdivided into two main catchments. One of the catchments is proposed to predominantly drain along Churcher Street while the other is proposed to drain along Pharazyn Street. The two catchments are discussed further below.

Churcher Street Catchment

GHD has previously completed a concept design for Precinct 4's eastern catchment (Makino to Pharazyn Street). The design allowed the proposed wastewater network to tie into an existing

wastewater main on the lower reaches of Churcher Street. This enabled the upstream network to be built prior to the downstream section needing to be re-laid. The previously completed concept design has been reviewed as part of the scope of this report. The revised concept design incorporated a reduced average lot size of 600 m² into the analysis. As a result, a number of pipes of the previous concept design were upsized.

Table 5 shows a summary of the Churcher Street catchment's spine mains and the corresponding upsized pipes. A schematic layout and calculations of the revised eastern catchment is shown in Appendix C.

Table 5 - Eastern catchment revised pipe sizes

Pipe Reference	PWWF (l/s)	Pipe Size (mm)	Revised PWWF (l/s)	Revised Pipe Size (mm)	Upsized (Yes/No)
Pipe 1	55.8	300	76.5	375	Yes
Pipe 2	49.8	300	70.5	375	Yes
Pipe 3	24.1	225	34.2	225	No
Pipe 4	19.2	225	27.2	225	No
Pipe 5	22.5	225	31.9	225	No
Pipe 6	19.1	225	27.0	225	No
Pipe 7	15.2	150	21.5	225	Yes
Pipe 8	11.8	150	16.8	225	Yes

All other pipes that have not been referenced in Table 5 are capable of conveying their associated catchment's PWWF via a 150 Ø pipe laid at, at least the minimum grade of 1 in 180.

It should be noted that a 300 Ø sewer main along Churcher Street (Pipe 2), between North Street and Port Street, has already been constructed. This pipe is not sufficiently sized to convey the revised PWWF without surcharging. The depth of the pipe's manhole at the intersection with Port Street is proposed to be approximately 3.5 m deep, therefore it is unlikely that the manhole would surcharge to lid level at PWWF as shown in Figure 3 below.

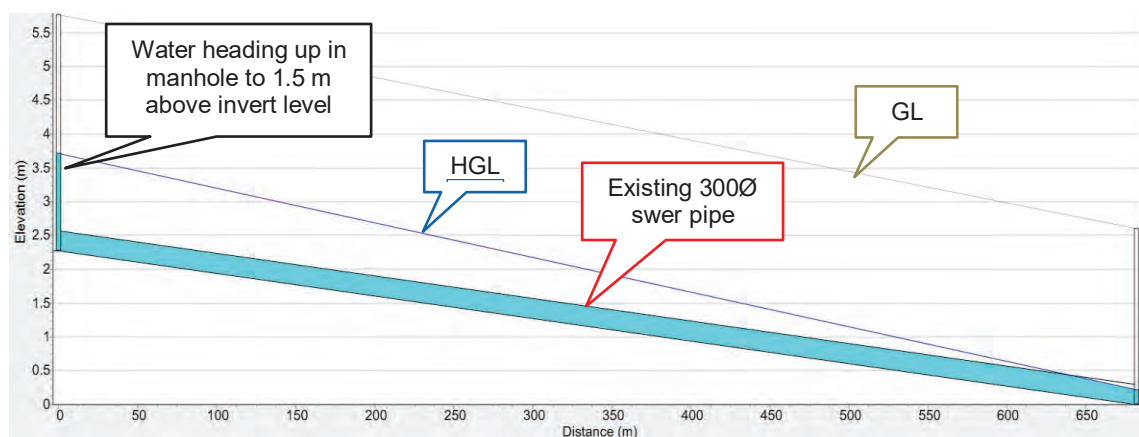


Figure 3 - Manhole surcharge depth

The above figure indicated that the manhole at the intersection with Port Street would head up to approximately 1.5 m above inlet level during PWWF. It is therefore anticipated that while the main will surcharge during PWWF flow events it is unlikely to cause frequent wastewater spilling issues and as such is unlikely to need to be augmented.

Pharazyn Street Catchment

The Pharazyn Street catchment is proposed to pick up flows from properties adjacent to Pharazyn Street and Arnott Street up to Reid Line as shown in Appendix C – Figure 16.

MDC IntraMaps indicates that the existing infrastructure along Pharazyn Street is a 300 Ø PVC main from Kimbolton Road to Arnott Street laid at a grade of 1:304. A 225 Ø main is laid from Arnott Street to Root Street East at a grade of 1:160 and along the majority of Arnott Street at a grade of 1:107.

The total revised PWWF of the Pharazyn Street catchment was calculated as 40 l/s based on a gross area of 66 ha and an average lot size of 600m². The capacity of the 300 Ø main at a grade of 1:304 is 60 l/s. It is clear that this main is sufficient to convey flows from the fully developed Pharazyn Street catchment. PWWF calculations are shown in Appendix C – Table 17.

It should be noted that the main downstream of Pharazyn Street along Kimbolton road up to Lytton Street is a 225 Ø main. The grade of this main is not indicated but a 225 Ø main at a grade of 1:180 has a capacity of 36 l/s. It is therefore recommended that the capacity of this main be investigated before the Pharazyn Street catchment is fully developed as the fully develop Pharazyn Street catchments has a PWWF of 40 l/s.

Combined Pharazyn and Churcher Catchments (Precinct 4 eastern catchment)

The total revised PWWF of Precinct 4's eastern catchment was calculated as 116 l/s based on a gross area of 184 ha and an average lot size of 600 m². The flow will be conveyed into the existing reticulation system via a 300 Ø main along Pharazyn Street and ultimately a 375 Ø main along Churcher Street.

The calculations indicate that the existing 375 Ø main crossing the railway line and the 450 Ø main along Kawakawa Road would need to be upgraded in order to cope with the combined existing and revised additional flows from Precinct 4's eastern catchment. Precinct 4's proposed eastern layout and PWWF calculations are illustrated in Appendix C. The extent of the upgrades required to the existing network are shown in Figure 4 below.

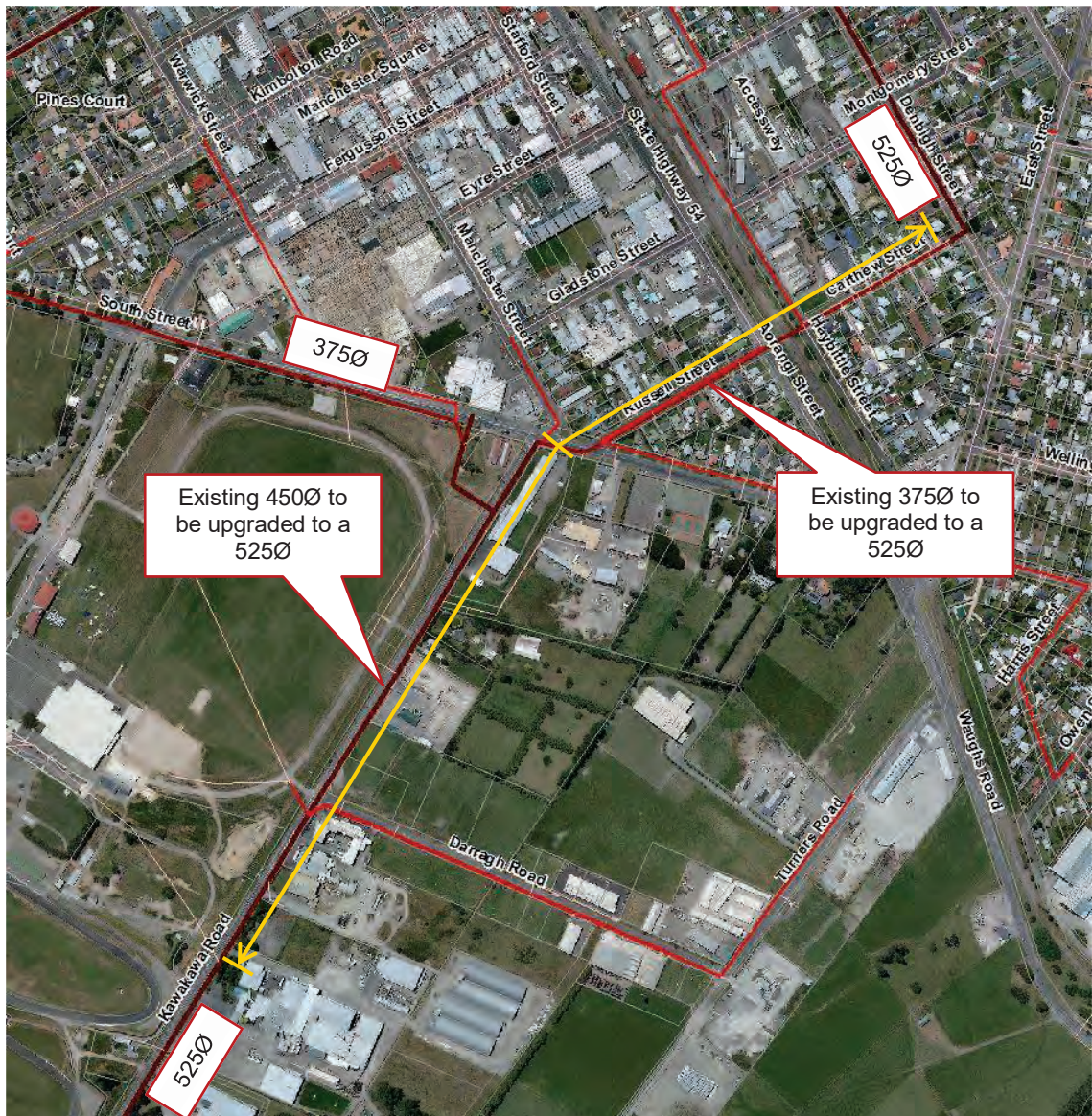


Figure 4 - Existing eastern trunk main upgrades

3.2.3 Precinct 4 - western catchment

Design flows

The total PWWF for Precinct 4's western catchment was calculated as 32 l/s based on a gross area of 50 ha and an average lot size of 600 m².

Proposed layout

It is proposed to convey Precinct 4's western wastewater flows via gravity mains to the existing western catchment's trunk main system. The existing 450 Ø trunk main along Awahuri Road is estimated to flow 74 % full. The additional flow from Precinct 4's western catchment would bring the pipe to its full capacity. Therefore, the 450 Ø main would ultimately have to be upgraded before the whole of Precinct 4 west has been fully developed as shown if Figure 5 below.

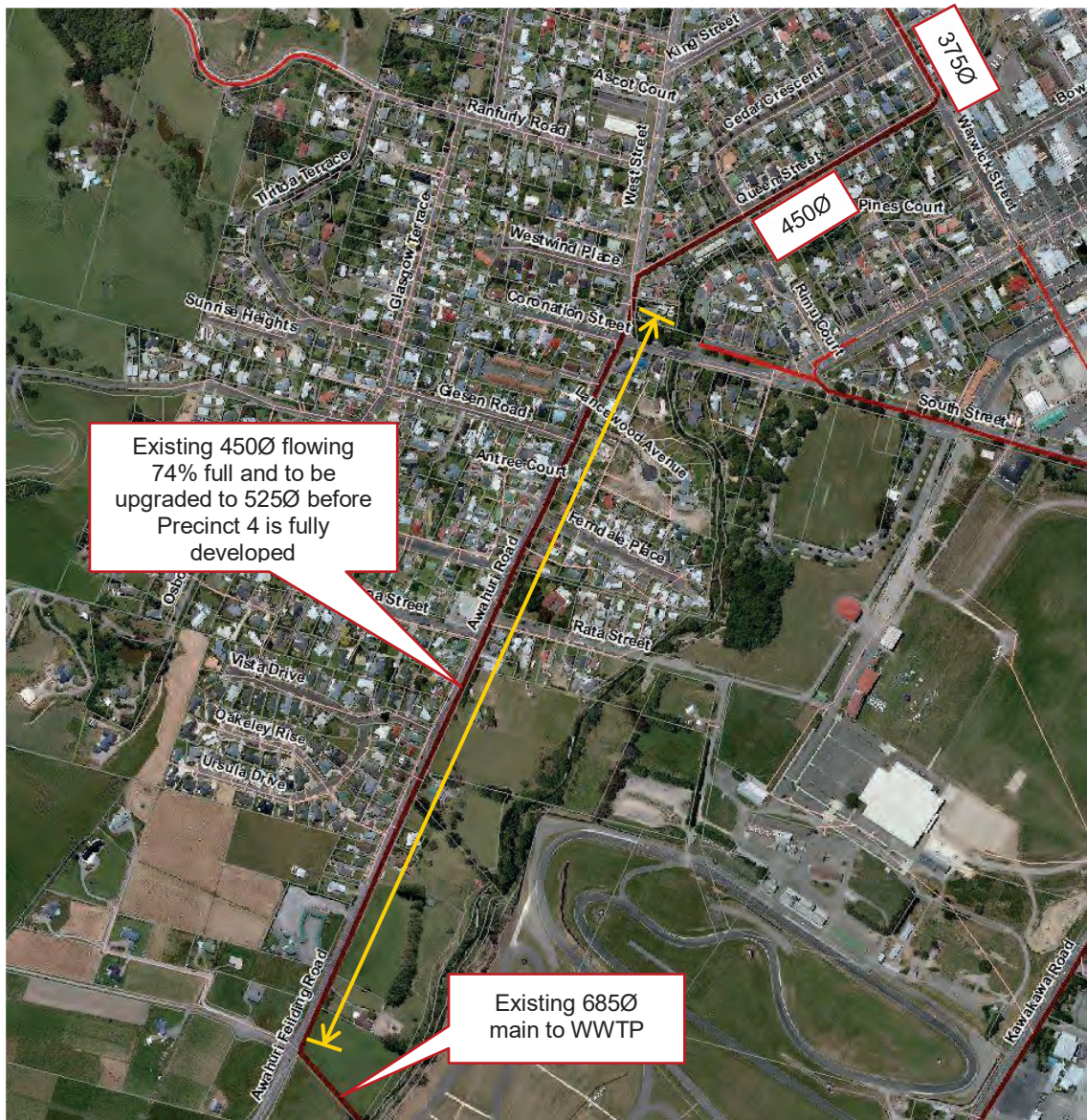


Figure 5 – Existing western trunk main upgrades (Awahuri Road)

The option of directing Precinct 4's western flows to the eastern catchment has also been considered. The following points motivates why this option is not preferred:

- The 300 Ø main along Churcher Street would not be able to accommodate any additional flow other than the designated flows from Precinct 4's eastern catchments.
- The existing downstream trunk mains (375 Ø along Carthew Street and 450 Ø along the northern end of Kawakawa Road) currently does not have sufficient capacity to convey the flows from Precinct 4's eastern and western catchments without being upgraded.
- The wastewater system from the western catchment would have to cross the Makino Stream to tie into the eastern catchment. Due to the existing ground levels, a gravity system, without the need for pumping, would not be attainable, without an inverted syphon. These typically cause maintenance issues.
- Wet industry flows from Precinct 5 is also discharging into the eastern catchment's system that further limits the capacity of the eastern trunk main system.

Following the points listed above, Precinct 4's western catchment is proposed to drain to the existing western catchment via gravity mains. Details of the selected option only, are discussed

further for the purpose of this report. Precinct 4's proposed western layout is illustrated in Appendix C.

Pipe design

Precinct 4's western catchment will be drained in a southern direction via a gravity spine main running from the upper reaches of Precinct 4 west to the intersection with Derby Street and North Street downstream of Precinct 4, where it will tie into the existing trunk main system. A hydraulic analysis was carried out such that the pipes are sized and graded sufficiently to convey PWWF without surcharging. The spine main is proposed to consist of an 530 m long 150 Ø main, an 1180 m long 225 Ø main and a 1000 m long 300 Ø main as shown in Appendix C – DWG 51-33090-02-SK010 to SK012.

The spine main are designed such that the grades are steeper than the absolute minimum grade limits presented in Table 5.4 of NZS 4404:2010. The mains are designed to not require pipe cover in excess of 3 m and to have sufficient fall to meet self-cleansing velocity requirements of 0.7 m/s at PDWFs. A section of the existing main from the intersection with Derby and North Street (where Precinct 4's flows converges with the existing flows) up to Prince Street would however be required to be upgraded to a 375 Ø main as shown in Figure 6 below.



Figure 6 – Existing trunk main upgrades (Derby Street)

Precinct 4 west was further divided into catchments by following the roading layout. No single catchment was found to have more than 250 dwellings. NZS 4404 states that any catchment not exceeding 250 dwellings, 150 Ø pipes laid within the bounds of the minimum gradient (1 in 180) provided in NZS 4404 will be adequate without specific hydraulic design. Therefore, all other branches draining into the spine main were selected as 150 Ø mains laid at a minimum grade of 1 in 180. The layout and long section of Precinct 4's western spine main is shown in Appendix C – DWG 51-33090-02-SK010 to SK012.

4. Water Supply Concept

4.1 Existing water supply infrastructure

Feilding's water reticulation network is essentially supplied from the north by a 450 Ø trunk main along Kimbolton Road and from the south by a 375 Ø bore main along Campbell Road. The 450 Ø main is Feilding's main water supply source while the 375 Ø main acts as a secondary water supply source and supplements Feilding's main water source through a connection at the corner of North Street and Kimbolton Road. A reservoir located at MacDonald Heights is filled by the Feilding's reticulation system and currently acts as a balance tank and contributes to the conveyance of water in an event of high water demand. Feilding's existing infrastructure is shown in Figure 7 below.



Figure 7 - Existing water supply infrastructure

At present Precinct 4 is mainly supplied by a 150 Ø main along Pharazyn Street at the eastern side of the subdivision and a 150 Ø main along Makino Road on the western side of the subdivision. Arnott Street and Port Street East are both being supplied via 150 Ø mains branching off the Pharazyn Street main. A short section of 250 Ø main has been constructed

along Roots Street East, which also feeds off the Pharazyn Street main. The 150 Ø main along Pharazyn Street is supplied by the 450 Ø trunk main.

No pressure logging was carried out to determine the working pressures in the existing mains supplying Precinct 4. For the purpose of this report previous pressure logger test conducted by GHD on Feilding's network downstream of Precinct 4 were used to get a better understanding of the pressures within the network. The logger tests indicated that the pressure in the network ranges from 600 kPa to 900 kPa.

4.2 Proposed water supply concept

4.2.1 Proposed servicing layout

The proposed water layout is based around the construction of the proposed 300 Ø trunk main to be installed from Kimbolton Road. The trunk main is proposed to run from Reid Line, along Pharazyn to Root Street and along Root Street, under the Makino Stream to connect to the existing 300 Ø trunk main along Lethbridge Street. This main effectively creates a trunk main loop adding resilience to the Feilding reticulation network.

Principal mains are proposed to follow the roading layout, be placed within the berm where possible, and fitted with fire hydrants as per SNZ PAS 4509. At a minimum, various 150 Ø mains are proposed to form loops within Precinct 4. While 100 Ø mains would be sufficient for the remaining principal mains, it is recommended that these also be 150 Ø as discussed in section 4.2.5 of this report. Rider mains shall be laid along the road frontage of all lots not fronted by the principal main. The proposed water reticulation layout of Precinct 4 is shown in Appendix D – DWG 51-33090-03-SK009A to SK009C.

4.2.2 Water demand

Precinct 4 is a residential area and therefore the water demand was based on 2.6 people per dwelling unit or lot. The average demand on the maximum day was based on 250 l/p/day. Precinct 4 east comprises of approximately 3067 dwellings while Precinct 4 west only consist of approximately 917 dwellings.

- The average daily demand was calculated as:

$$Q_{avg} = 250 \text{ l/p/d} \times (\text{population}) / 86400 \text{ sec/d} = 23 \text{ l/s} - \text{Precinct 4 east}$$

$$Q_{avg} = 250 \text{ l/p/d} \times (\text{population}) / 86400 \text{ sec/d} = 7 \text{ l/s} - \text{Precinct 4 west}$$

- The annual peak demand on the maximum day was calculated as:

$$Q_{peak} = ADD \times PF = 69 \text{ l/s} - \text{Precinct 4 east}$$

$$Q_{peak} = ADD \times PF = 21 \text{ l/s} - \text{Precinct 4 west}$$

4.2.3 Fire flow

MDC requires all lots to have fire-protection in accordance with SNZ PAS 4509, which indicates that residential areas have a water supply classification of FW 2. This classification requires a total firefighting water supply of 25 l/s (12.5 l/s within 135 m and an additional 12.5 l/s within 270 m from the fire).

4.2.4 Design flows

It is recommended that water supply systems be designed to provide 66% of annual peak consumer demand in addition to the fire flow requirements, while maintaining a minimum residual pressure of 100 kPa within the reticulation system.

The design flows were calculated as follow:

$$Q_{\text{design}} = 2/3 \times 69 + 25 \text{ l/s} = \mathbf{71 \text{ l/s}} - \text{Precinct 4 East}$$

$$Q_{\text{design}} = 2/3 \times 21 + 25 \text{ l/s} = \mathbf{39 \text{ l/s}} - \text{Precinct 4 West}$$

4.2.5 Pipe design

Peak flows and fire flows were evaluated and the worst-case scenario was considered to determine pipe sizing. The Colebrook-White formula with a roughness (k) value of 0.1 were used to calculate head loss within the pipes. The roughness value takes future wear of the pipes into consideration. Only standard pipe sizes acceptable by MDC were taken into account.

The nature of Precinct 4's layout is such that 150 Ø mains ringing the outside of the subdivision together with 100 Ø interconnected mains will be sufficient to convey Precinct 4's design flows. Due to the marginal price difference between 150 Ø and 100 Ø mains, it has been decided to provide 150 Ø mains throughout the subdivision with the exception of no-exit roads where a 100 Ø main and a rider main will be installed. This will increase the resilience of the network.

4.2.6 Network pressures

A high-level hydraulic analysis was conducted to determine the effect of Precinct 4's additional demand on the existing Feilding water supply network. Precinct 4 is situated at a higher elevation than the existing Feilding network and therefore the working pressures within Precinct 4 are expected be lower than those of the existing network, but not lower than the minimum of 250 kPa required by MDC. The existing Feilding network pressures are shown in Figure 8 below.

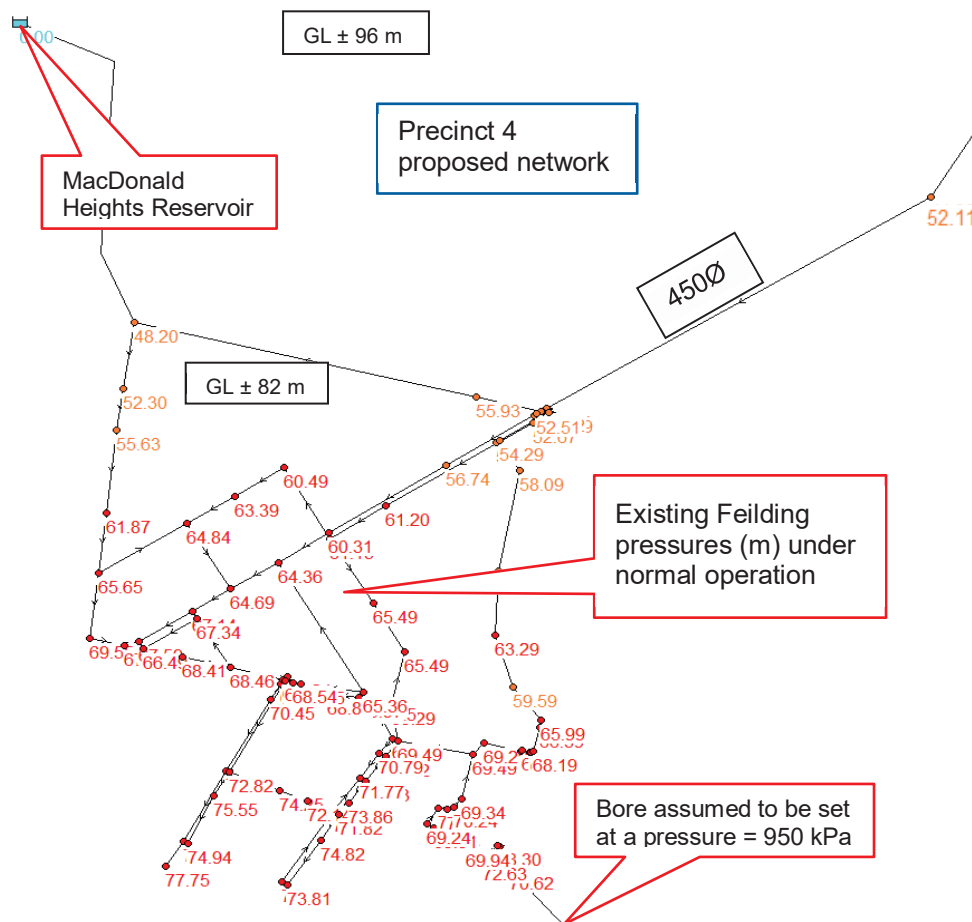


Figure 8 - Existing network pressures (excluding Precinct 4 demand)

The above figure shows that the existing Feilding reticulation network pressures ranges roughly between 480 kPa and 750 kPa at peak demand.

For the purpose of this analysis, Precinct 4's fully developed demand of 110 l/s was assumed to be drawn off the 300 Ø trunk main while fire flows of 25 l/s were drawn off a point in Precinct 4 with the lowest pressure in the network as shown in Figure 9 below.

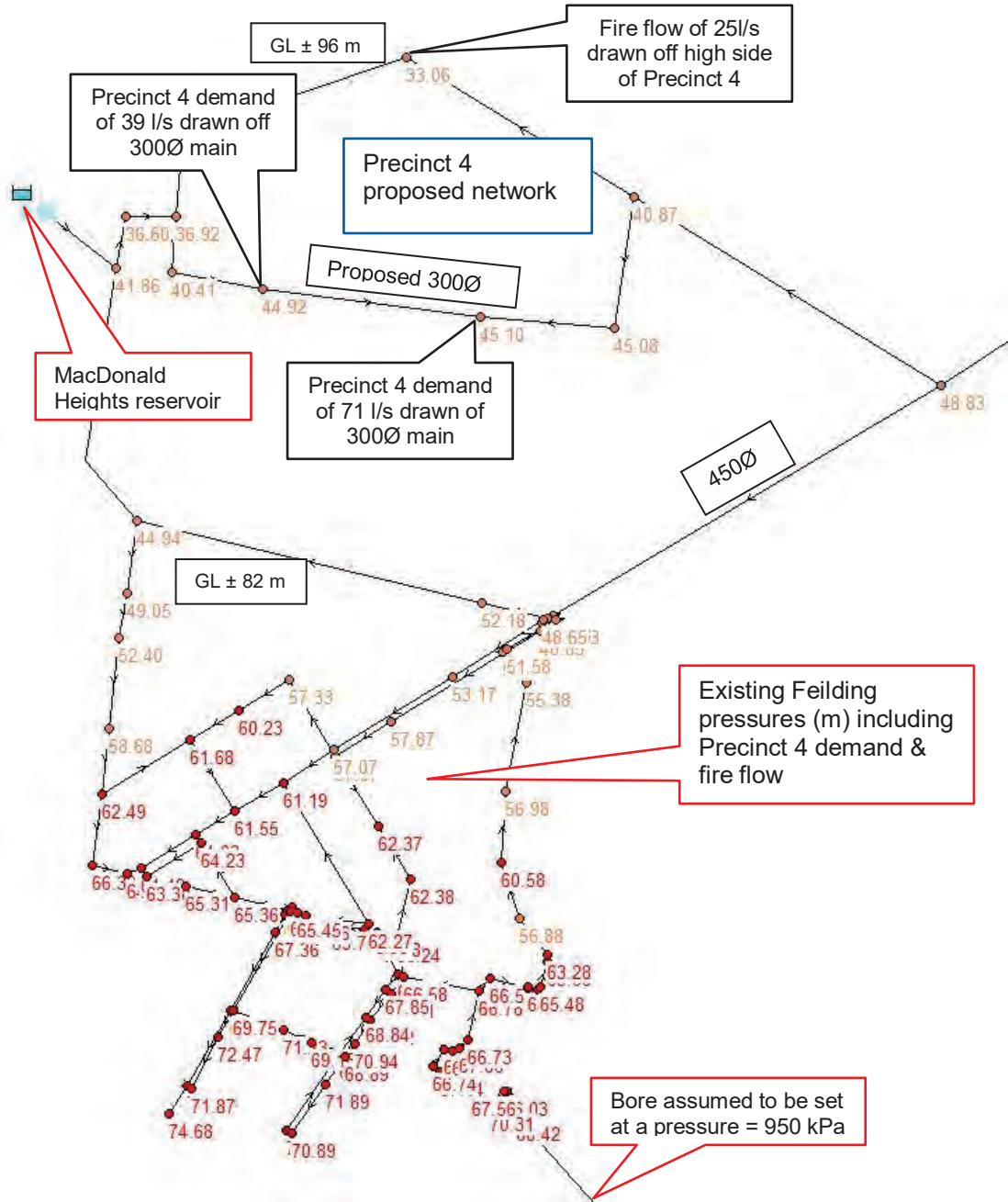


Figure 9 - Feilding existing network pressures (including Precinct 4 demand)

The above figure indicates that the existing Feilding network will experience a reduction in pressure of approximately 3 – 5 m head due to the additional Precinct 4 demand and fire flows. This reduction in pressure is not substantial. Analysis of peak demand alone has not been conducted as the above shows that the minimum pressure requirement of 250 kPa is not exceeded in the larger fire flow event.

5. Cost Estimate

A high-level cost estimate was prepared for Precinct 4's proposed three waters infrastructure requirements, which is shown in Table 6 below.

Table 6 – Precinct 4's proposed infrastructure cost estimate

	Cost (\$)
Stormwater infrastructure	\$7,339,691
Precinct 4 West	\$1,516,848
Precinct 4 East	\$5,822,843
Wastewater Infrastructure	\$5,535,344
Precinct 4 Trunk Main	\$743,798
Precinct 4 Reticulation West	\$497,840
Precinct 4 Reticulation East	\$3,091,336
Existing Infrastructure Upgrades	1,202,370
Water Supply	\$6,171,564
Precinct 4 Bulk Supply Line	\$1,139,175
Precinct 4 Reticulation West	\$1,596,875
Precinct 4 Reticulation East	\$3,435,514
Sub-Total	\$19,046,599
Preliminary and General (10%)	\$190,465.99
Contingency (10%)	\$190,465.99
Design Fees (8%)	\$152,372.79
Total	\$19,579,904

6. Conclusions

6.1 Stormwater

Stormwater runoff associated with Precinct 4's western catchment is proposed to be discharged into the Makino Stream at Proposed Road 2 West, Root Street West and Port Street West. The additional flow to be added to the Makino due to development for the 1 in 10-year event is 3 m³/s and 5.2 m³/s for the 1 in 100-year event. The proposed roading layout is sufficient to convey overland flow while pipe sizes up to 1350 mm diameter are expected along Proposed Road 2 West.

Stormwater runoff associated with Precinct 4's eastern catchment west of Pharazyn Street is proposed to drain to the Makino Stream. The main overland flow paths are along Proposed Road 2 East, Root Street East and Port Street East. In order to convey overland flow without ponding heights reaching boundary levels, alterations to the original concept design is required and includes the deduction in RL of Port Street East by at least 35 mm. Pipe sizes up to 2100 mm diameter are expected along Proposed Road 2 East, 1650 mm diameter along Root Street East and 1500 mm diameter along Port Street East.

Stormwater runoff associated with Precinct 4's eastern catchment east of Pharazyn Street is proposed to drain to the Oroua River. GHD's review, which included reduced lot sizes of 600 m², flows from the stopbank culverts, and climate change of 2.3 ° C, indicated that the existing piped infrastructure along Pharazyn Street is undersized to cope with a 1 in 10-year event. The excess overland flow will be conveyed overland by Pharazyn Street, however the section between Sherwill and Arnott Street will have to be investigated further as the capacity of that section is not sufficient to convey the required flows.

6.2 Wastewater

Precinct 4's western catchment is proposed to drain in a southern direction and tie in with the existing wastewater system at the intersection of Andrew Street and North Street via a 300 mm diameter trunk main. The high-level hydraulic analysis conducted shows that approximately 260 m of the exiting trunk main along Derby Street would have to be upgraded to a 375 mm diameter main. The analysis also shows that the additional flow from Precinct 4's western catchment will bring the existing 450 mm diameter trunk main along Awahuri Road to its full capacity and is therefore required to be upgraded before the whole of Precinct 4 West is developed. The option of directing Precinct 4's western flows to the eastern catchment has also been considered but was found not to be preferable.

GHD's review indicated that various pipes of the eastern catchment of Precinct 4's original concept design have to be upsized in order to meet the revised demand of the fully developed Precinct 4 subdivision. The existing 375 mm diameter main along Carthew Street as well as the 450 mm diameter main along Kawakawa Road needs to be upgraded before Precinct 4 is fully developed.

6.3 Water Supply

Precinct 4's water reticulation is based around the construction of the proposed 300 mm diameter trunk main to be installed between Kimbolton Road and Lethbridge Street. Principal mains are proposed to be 150 mm diameter mains throughout the network with the exception of no-exit roads, which will be 100 mm diameter mains. The network will have sufficient fire-protection in accordance with SNZ PAS 4509, and will meet MDC's minimum pressure requirement of 250 kPa at peak demand.

7. Recommendations

Following the review and redesign of the Precinct 4 servicing concept, the following recommendations have been made:

7.1 Stormwater

It is recommended that:

- Pipe sizing and alignments of this concept design, as presented in DWG 51-33090-01-SK008A to SK008C, are to be developed further during detailed design to optimise pipe sizing and grades.
- An investigation be carried out around the option of diverting the flow from the western stopbank culverts to the Makino Stream along Reid Line, as the capacity of Road 2 East is not sufficient to convey the combined stopbank and 30-year less 10-year overland flows. An additional capacity of 1.7 m³/s is required along Proposed Road 2 East between Churcher Street and the Makino Stream.
- As alternatives to the above, the cross sectional area of Proposed Road 2 East be increased by reducing the design level of the road, or by constructing a culvert / swale along the median of the road to assist with the drainage of the excess overland flows.
- The land for Proposed Road 2 East be secured as it is proposed to be a crucial overland flow path that would convey a large portion of Precinct 4's flows as well as stopbank flows to the Makino Stream.
- Modify the proposed RL of Port Street East between Churcher Street and the Makino Stream by at least -35 mm to achieve the required overland flow capacity of the whole catchment between Root Street and Port Street East.
- Proposed Road 1 up to Churcher Street be secured, as for the purpose of this report it was utilised as an overland flow path. If this road were not to be constructed, the pipe sizing along Proposed Road 3 and Port Street East up to Churcher Street would have to be revised.
- The kerb inlet capacity at the low point along Pharazyn Street, at the intersection with Sherwill Street, be increased by means of a Hynds megapit or similar, that can take flows up to 800 l/s in order to drain overland flow into the 1800 mm diameter pipe at the required flow rate. It is likely that if Proposed Road 1 were not to be constructed, that the pipe along Port Street East between Churcher Street and Proposed Road 3 be upsized to a 1200 mm diameter pipe.
- Investigate upgrading / duplicating the stormwater main along Pharazyn Street from Sherwill Street to Florence Place as future development dictates.
- Investigate upgrading / duplicating the stormwater main along Pharazyn Street from Arnott to Sherwill Street as future development dictates.

7.2 Wastewater

It is recommended that:

- Pipe sizing and alignments of this concept design, as presented in DWG 51-33090-02-SK008A to SK008C and DWG 51-33090-02-SK010 to SK012, are to be developed further during detailed design.

- A flow-monitoring programme coupled with an Inflow and Infiltration assessment and/or hydraulic modelling of the wastewater network be conducted to refine the available capacity estimates of the existing network.
- Proposed Road 3 between Reid Line and Port Street East, as proposed in this report, be secured as this road forms the basis of one of the spine mains of Precinct 4's eastern catchments.
- The existing 375 mm diameter main crossing the railway line and the 450 mm diameter main along Kawakawa Road be upgraded to 525 mm diameter main in order to cope with the combined existing and revised additional flows from Precinct 4's eastern catchment (unless refined analysis following flow monitoring shows otherwise).
- The 450 mm diameter be upgraded to a 525 mm diameter main in the future before the whole of Precinct 4 west has been fully developed, as the additional flow from Precinct 4's western catchment would bring the pipe to its full capacity (unless refined analysis following flow monitoring shows otherwise).
- A section of the existing 300 mm diameter main from the intersection with Derby and North Street (where Precinct 4's flows converges with the existing flows) up to Prince Street be upgraded to a 375 mm diameter main.
- The capacity of the 225 mm diameter main downstream of Pharazyn Street be investigated and if found to be inadequate, be upgraded in the future before the Pharazyn Street catchment is fully developed. High-level calculations indicated that the fully developed Pharazyn Street catchment has a PWWF of 40 l/s, which is likely in excess of the capacity of the 225 mm diameter main.

7.3 Water Supply

It is recommended that:

- Pipe sizing and alignments of this concept design, as presented in DWG 51-33090-03-SK009A to SK009C, are to be developed further during detailed design.
- Install the proposed 300 mm diameter trunk main between Kimbolton Road and Lethbridge Street as future development dictates.
- Install 150 mm diameter principal mains throughout the network, although 100 mm mains will be sufficient throughout the majority of the network, as installation cost difference between the two sizes is marginal.

Appendices

Appendix A – Precinct 4 Growth Area

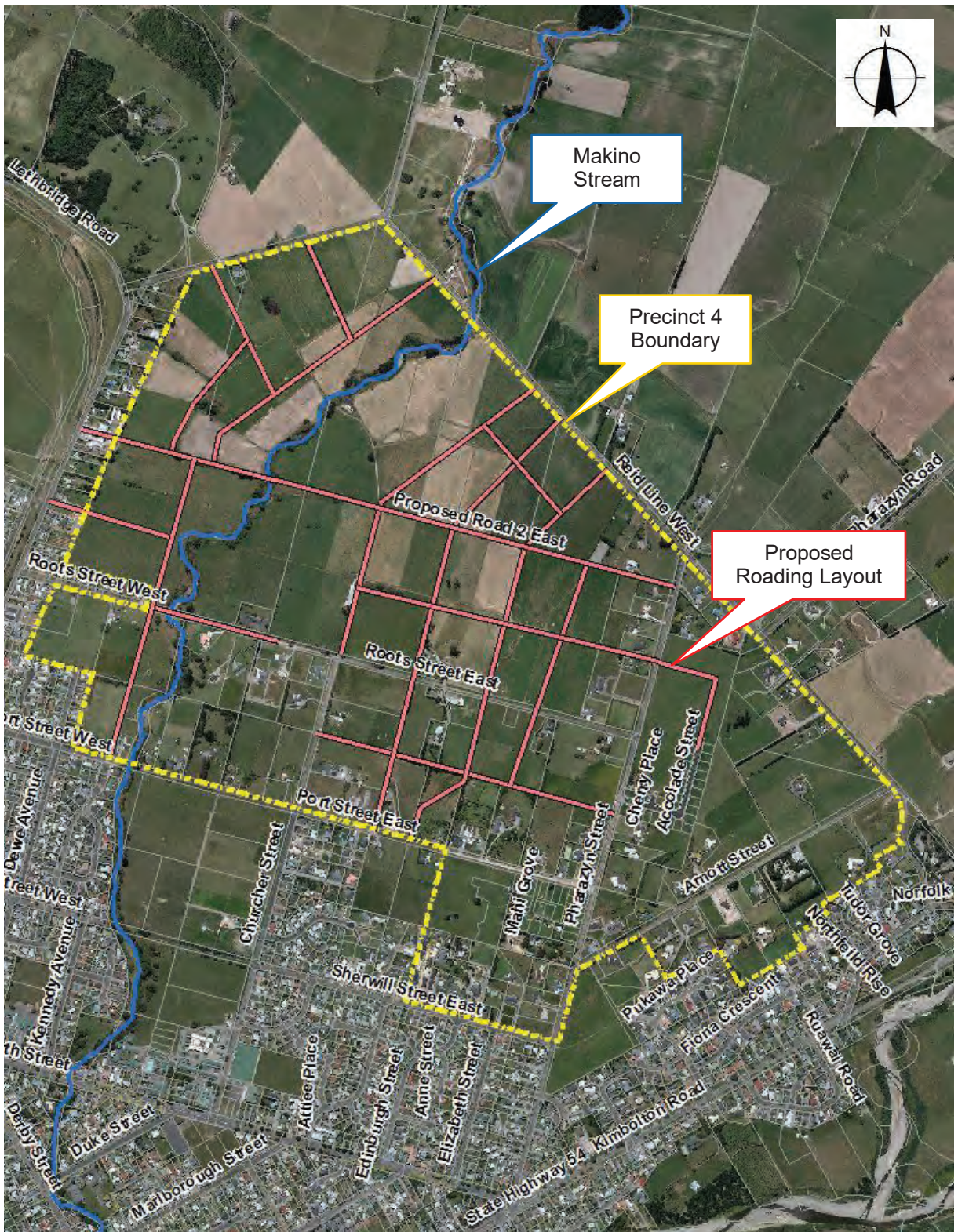
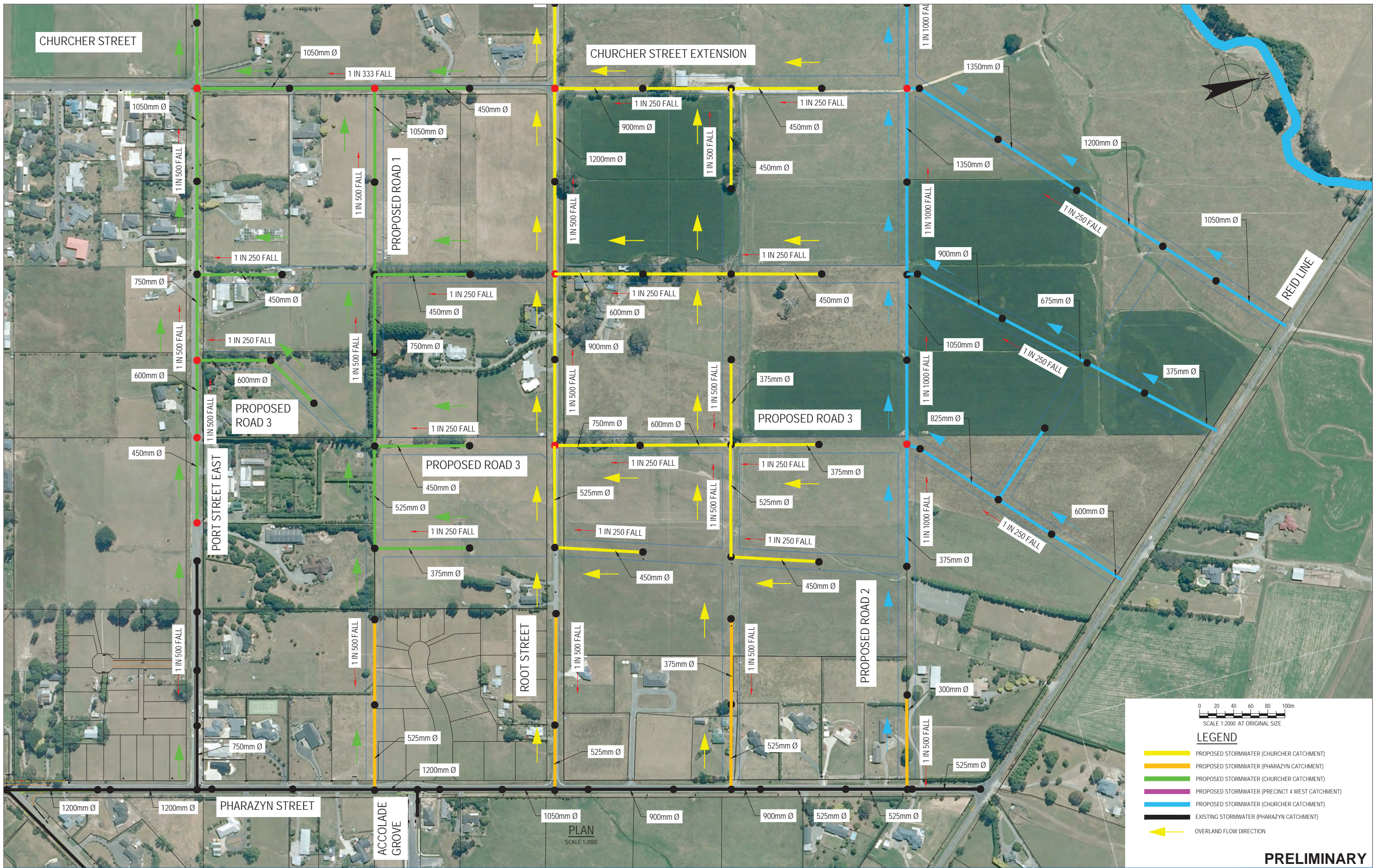


Figure 10 - Precinct 4 growth area

Appendix B – Proposed Stormwater Layouts and Calculations



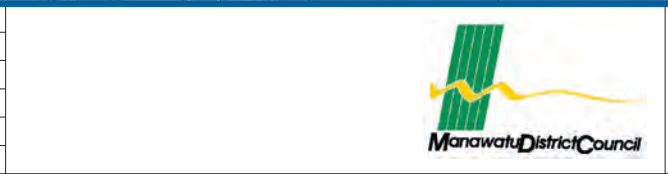
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- PROPOSED STORMWATER (PHARAZYN CATCHMENT)
- PROPOSED STORMWATER (CHURCHER CATCHMENT)
- PROPOSED STORMWATER (PRECINCT 4 WEST CATCHMENT)
- PROPOSED STORMWATER (CHURCHER CATCHMENT)
- EXISTING STORMWATER (PHARAZYN CATCHMENT)
- OVERLAND FLOW DIRECTION

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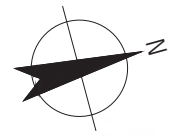
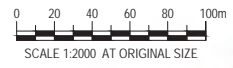
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PO Box 447 Palmerston North
T 64 6 353 1800 F 64 6 353 1801
E palmall@ghd.com W www.ghd.com

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Rev:	B

LEGEND

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- PROPOSED STORMWATER (PHARAZYN CATCHMENT)
- PROPOSED STORMWATER (CHURCHER CATCHMENT)
- PROPOSED STORMWATER (PRECINCT 4 WEST CATCHMENT)
- PROPOSED STORMWATER (CHURCHER CATCHMENT)
- EXISTING STORMWATER (PHARAZYN CATCHMENT)
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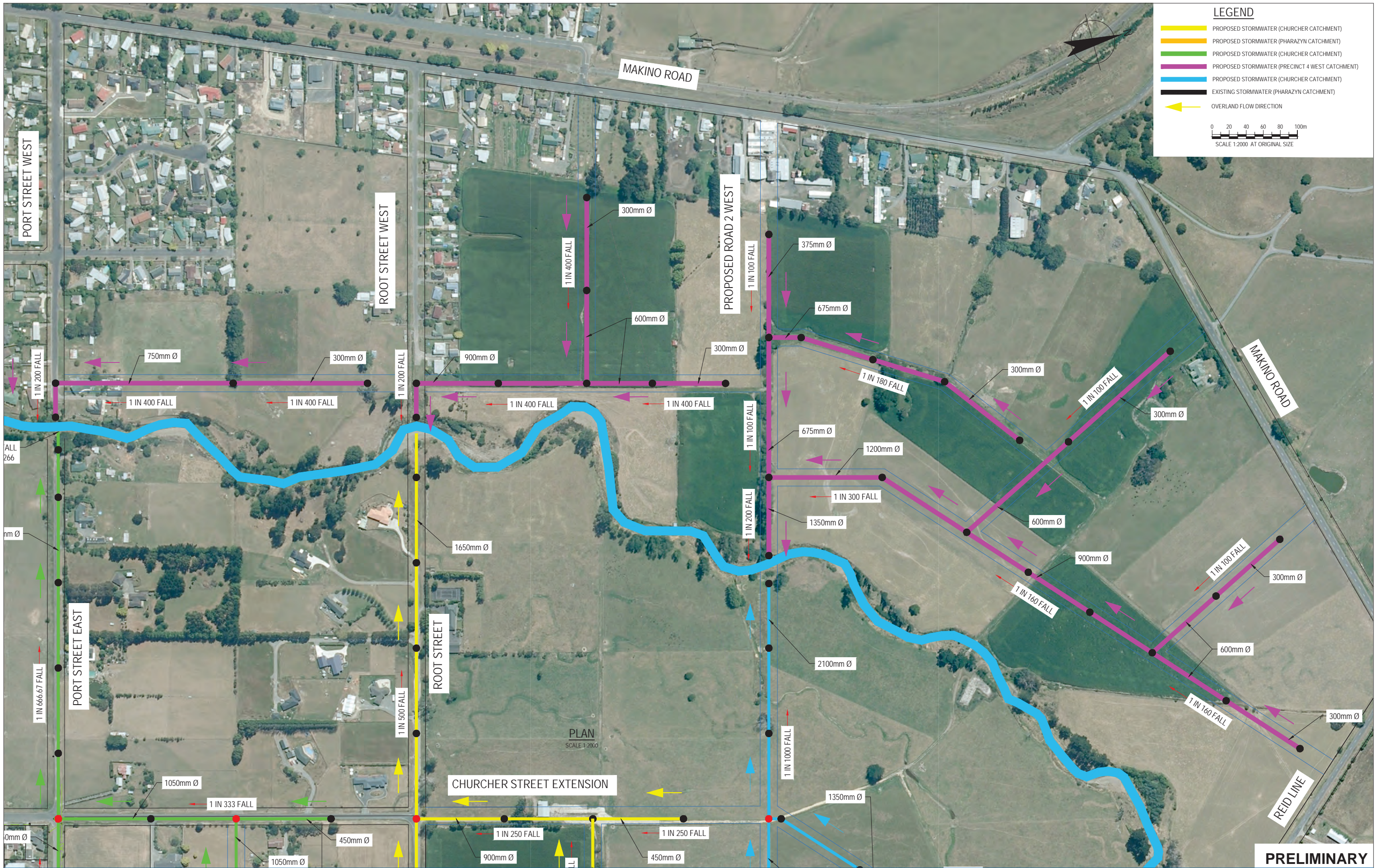
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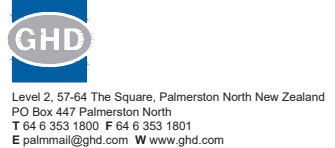
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- EXISTING STORMWATER (PHARAZYN CATCHMENT)
- ↔ OVERLAND FLOW DIRECTION

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PLAN
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Rev:	A

Table 7 - HIRDS rainfall data (no climate change)

Rainfall Intensities (mm/h)										
ARI	10 min	20 min	30 min	60 min	120 min	360 min	720 min	1440 min	2880 min	4320 min
5	70.8	48.0	38.2	25.8	16.8	8.5	5.5	3.6	2.1	1.6
10	85.8	58.5	46.2	31.4	20.3	10.1	6.5	4.2	2.5	1.8
30	130.8	89.1	71.0	48.4	30.7	14.9	9.5	6.0	3.6	2.6
100	156.0	106.2	85.0	57.9	36.4	17.4	10.9	6.9	4.1	3.0

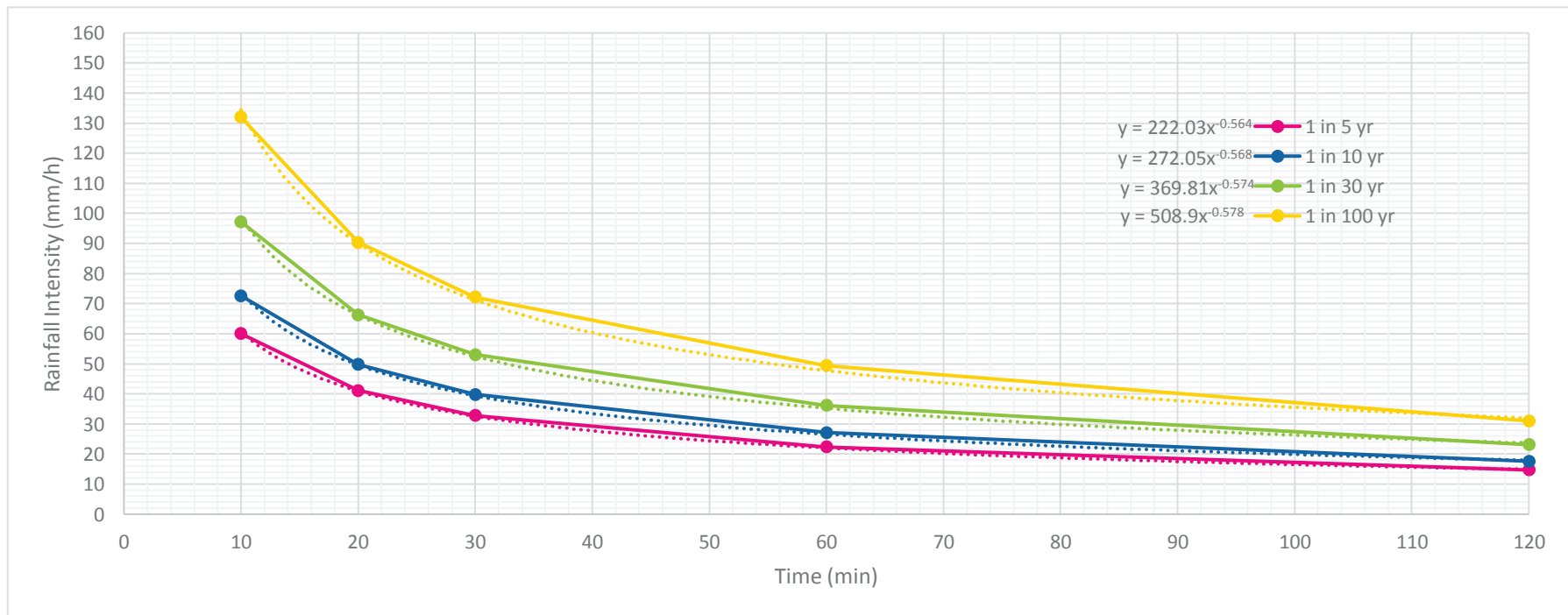
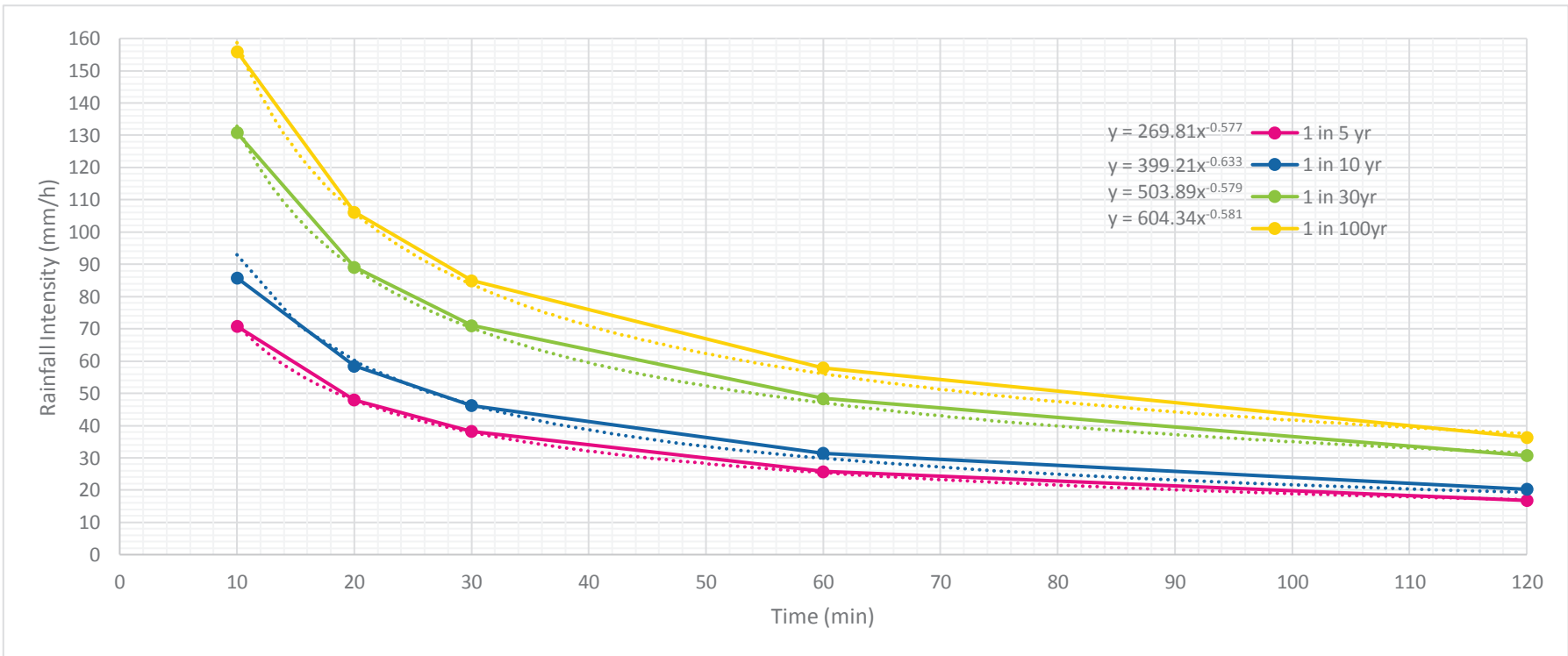


Table 8 - HIRDS rainfall data (climate change of 2.3°)

Rainfall Intensities (mm/h)										
ARI	10 min	20 min	30 min	60 min	120 min	360 min	720 min	1440 min	2880 min	4320 min
5	70.8	48.0	38.2	25.8	16.8	8.5	5.5	3.6	2.1	1.6
10	85.8	58.5	46.2	31.4	20.3	10.1	6.5	4.2	2.5	1.8
30	130.8	89.1	71.0	48.4	30.7	14.9	9.5	6.0	3.6	2.6
100	156.0	106.2	85.0	57.9	36.4	17.4	10.9	6.9	4.1	3.0



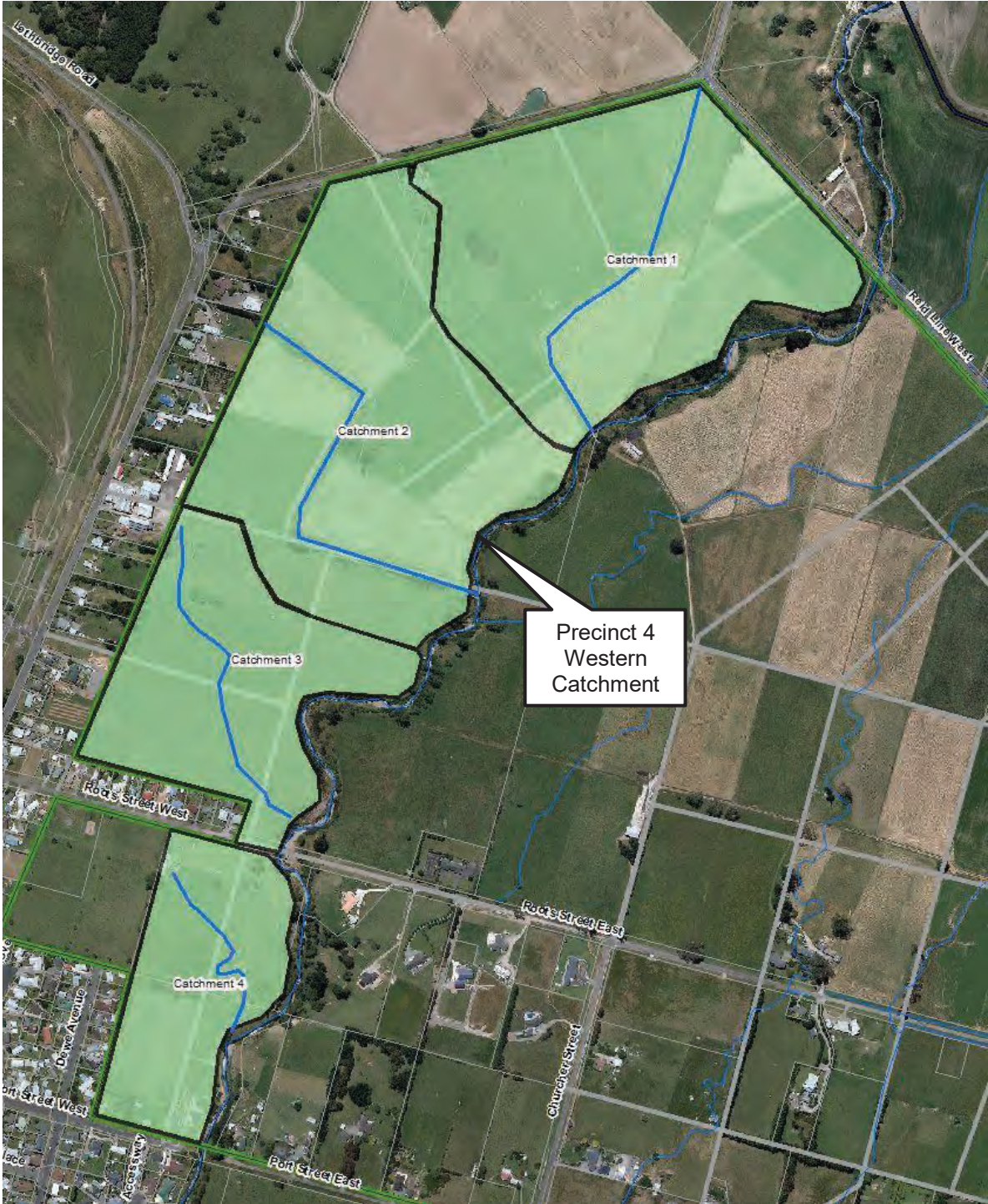


Figure 11 - Precinct 4 West pre-development catchments

Table 9 - Precinct 4 West pre-development discharge (excluding climate change)

Description	Area (ha)	Length (m)	Slope (%)	Time of Concentration (Tc)	Runoff Coefficient	Rainfall Intensity I ₁₀ (mm/h)	Discharge Q ₁₀ (m ³ /s)	Rainfall Intensity I ₁₀₀ (mm/h)	Discharge Q ₁₀₀ (m ³ /s)
Catchment 1	17.6	556	1.5	35	0.3	36.1	65.2	0.530	0.956
Catchment 2	18.4	634	1	40	0.3	33.5	60.3	0.513	0.925
Catchment 3	9.94	464	4.5	25	0.3	43.7	79.2	0.362	0.656
Catchment 4	6.77	296	1.5	28	0.3	41.0	74.2	0.231	0.418
Totals							1.636		2.956

Table 10 - Precinct 4 West pre-development discharge (including climate change of 2.3°)

Description	Area (ha)	Length (m)	Slope (%)	Time of Concentration (Tc)	Runoff Coefficient	Rainfall Intensity I ₁₀ (mm/h)	Discharge Q ₁₀ (m ³ /s)	Rainfall Intensity I ₁₀₀ (mm/h)	Discharge Q ₁₀₀ (m ³ /s)
Catchment 1	17.6	556	1.5	35	0.3	42.1	76.6	0.617	1.123
Catchment 2	18.4	634	1	40	0.3	38.6	70.9	0.593	1.087
Catchment 3	9.94	464	4.5	25	0.3	52.0	93.1	0.431	0.771
Catchment 4	6.77	296	1.5	28	0.3	48.4	87.2	0.273	0.492
Totals							1.914		3.473

Table 11 - Road corridor capacities

Road corridor overland flow capacity (m ³ /s)				
Lane width				
Grade	4.0 m	4.5 m	5 m	5.5 m
1:250 (0.4%)	2.797	2.948	3.075	3.180
1:400 (0.25%)	2.211	2.330	2.431	2.514 / 3.262 ⁽¹⁾
1:500 (0.2%)	1.978	2.084	2.174	2.249
1:1000 (0.1%)	1.398	1.474	1.538	1.590

Table Notes: ⁽¹⁾ Capacity of Port Street East with reduced RL of 35 mm.

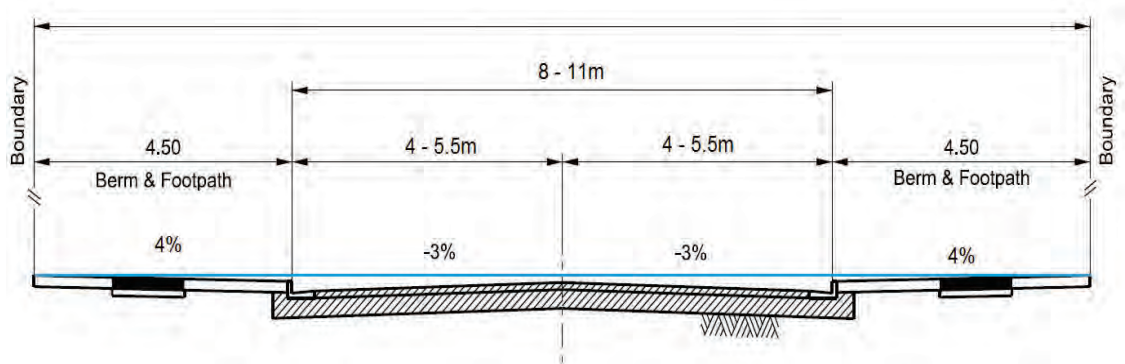


Figure 12 - Typical road cross section

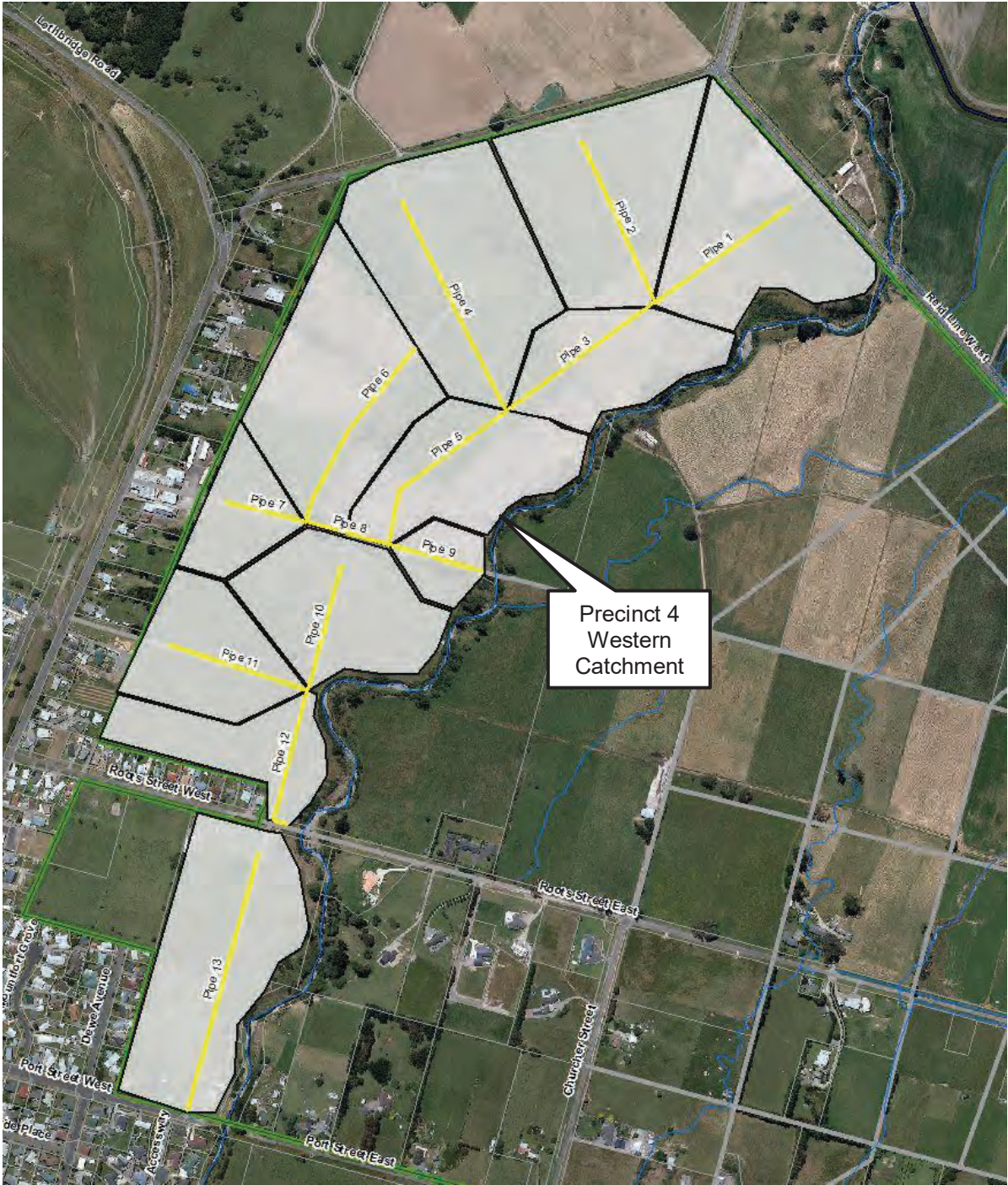


Figure 13 - Precinct 4 West post development catchments

Table 12 - Precinct 4 West pipe and road corridor capacities

Pipe Ref	Catchment Cumulative Area (ha)	Time of Concentration (Tc)	Runoff Coefficient "C"	Rainfall Intensity I ₁₀ (mm/h)	Discharge Q ₁₀ (m ³ /s)	Rainfall Intensity I ₁₀₀ (mm/h)	Discharge Q ₁₀₀ (m ³ /s)	Pipe Slope (1 : x)	Diameter Required (mm)	Diameter Selected (mm)	Capacity Pipe (m ³ /s)	Road flow (m ³ /s)
Pipe 1	5.51	16.2	0.5	68.5	0.524	119.8	0.917	160	599	600	0.526	0.391
Pipe 2	5.78	16.2	0.5	68.5	0.550	119.8	0.962	100	558	600	0.666	0.296
Pipe 3	14.72	16.2	0.5	68.5	1.400	119.8	2.450	160	866	900	1.552	0.898
Pipe 4	6.84	16.2	0.5	68.5	0.651	119.8	1.138	100	595	600	0.666	0.472
Pipe 5	25.56	16.2	0.5	68.5	2.431	119.8	4.254	300	1198	1200	2.441	1.813
Pipe 6	6.17	16.2	0.5	68.5	0.587	119.8	1.027	180	639	675	0.679	0.347
Pipe 7	1.89	16.2	0.5	68.5	0.180	119.8	0.315	100	367	375	0.190	0.124
Pipe 8	8.06	16.2	0.5	68.5	0.767	119.8	1.341	100	633	675	0.912	0.430
Pipe 9	34.72	16.2	0.5	68.5	3.302	119.8	5.778	200	1246	1350	4.093	1.685
Pipe 10	4.19	15.02	0.5	71.8	0.418	125.2	0.729	400	653	600	0.333	0.396
Pipe 11	3.21	15.02	0.5	71.8	0.320	125.2	0.558	400	591	600	0.333	0.225
Pipe 12	10.13	15.02	0.5	71.8	1.011	125.2	1.762	400	910	900	0.982	0.780
Pipe 13	6.25	14.49	0.5	73.5	0.638	127.8	1.110	400	766	750	0.604	0.506



Figure 14 - Precinct 4 East (Makino catchment)

Table 13 - Precinct 4 East pipe and road corridor capacities (Makino catchment)

Pipe Ref	Catchment Cumulative Area (ha)	Time of Concentration (Tc)	Runoff Coefficient "C"	Rainfall Intensity I ₁₀ (mm/h)	Discharge Q ₁₀ (m ³ /s)	Rainfall Intensity I ₁₀₀ (mm/h)	Discharge Q ₁₀₀ (m ³ /s)	Pipe Slope (1 : x)	Diameter Required (mm)	Diameter Selected (mm)	Capacity Pipe (m ³ /s)	Road flow (m ³ /s)
Pipe D1a	0.970	25	0.50	52	0.018	93	0.125	1000	239	375	0.060	0.013
Pipe C1	18.395	25	0.50 / 0.3	52	0.984	93	2.379	1000	1027	1050	0.936	0.416
Pipe B1	29.520	25	0.50 / 0.3	52	1.738	93	3.818	1000	1293	1350	1.830	0.806
Pipe A1	56.972	25	0.50 / 0.3	52	4.713	93	7.369	1000	1893	2100	5.576	1.136
Pipe D2a	7.725	23	0.50	55	0.173	98	1.049	500	489	525	0.209	0.424
Pipe C2	17.368	23	0.50	55	0.907	98	2.358	500	911	900	0.878	1.064
Pipe B2	29.438	23	0.50	55	1.827	98	3.997	500	1185	1200	1.891	1.690
Pipe A2	45.794	23	0.50	55	3.073	98	6.217	500	1440	1650	4.420	1.381
Pipe D3a	2.798	24	0.50	53	0.207	95	0.371	500	524	525	0.001	0.163
Pipe C3	9.637	24	0.50	53	0.508	95	1.276	500	733	750	0.540	0.529
Pipe B3	14.977	24	0.50	53	0.904	95	1.984	500	910	1050	1.324	0.452
Pipe A3	23.471	24	0.50	53	1.534	95	3.109	500	1109	1200	1.891	1.368
Pipe D4a	10.081	24	0.50	53	0.138	95	1.335	500	449	450	0.138	0.587
Pipe C4	15.343	24	0.50	53	0.528	95	2.032	500	744	750	0.540	0.882
Pipe B4	21.002	24	0.50	53	0.948	95	2.782	500	926	1050	1.324	0.847
Pipe A4	54.579	24	0.50	53	3.438	95	7.229	500	1502	1500	3.428	3.191

Table notes: Flow from the stopbank of 1.33 m³/s has been added to the Q₁₀ flow along Pipe A1.

Runoff coefficients "C" of 0.3 have been used for the undeveloped areas above Reid Line.

Flows from the pipes draining to the Pharazyn Street main have been subtracted from the Q₁₀ flows.

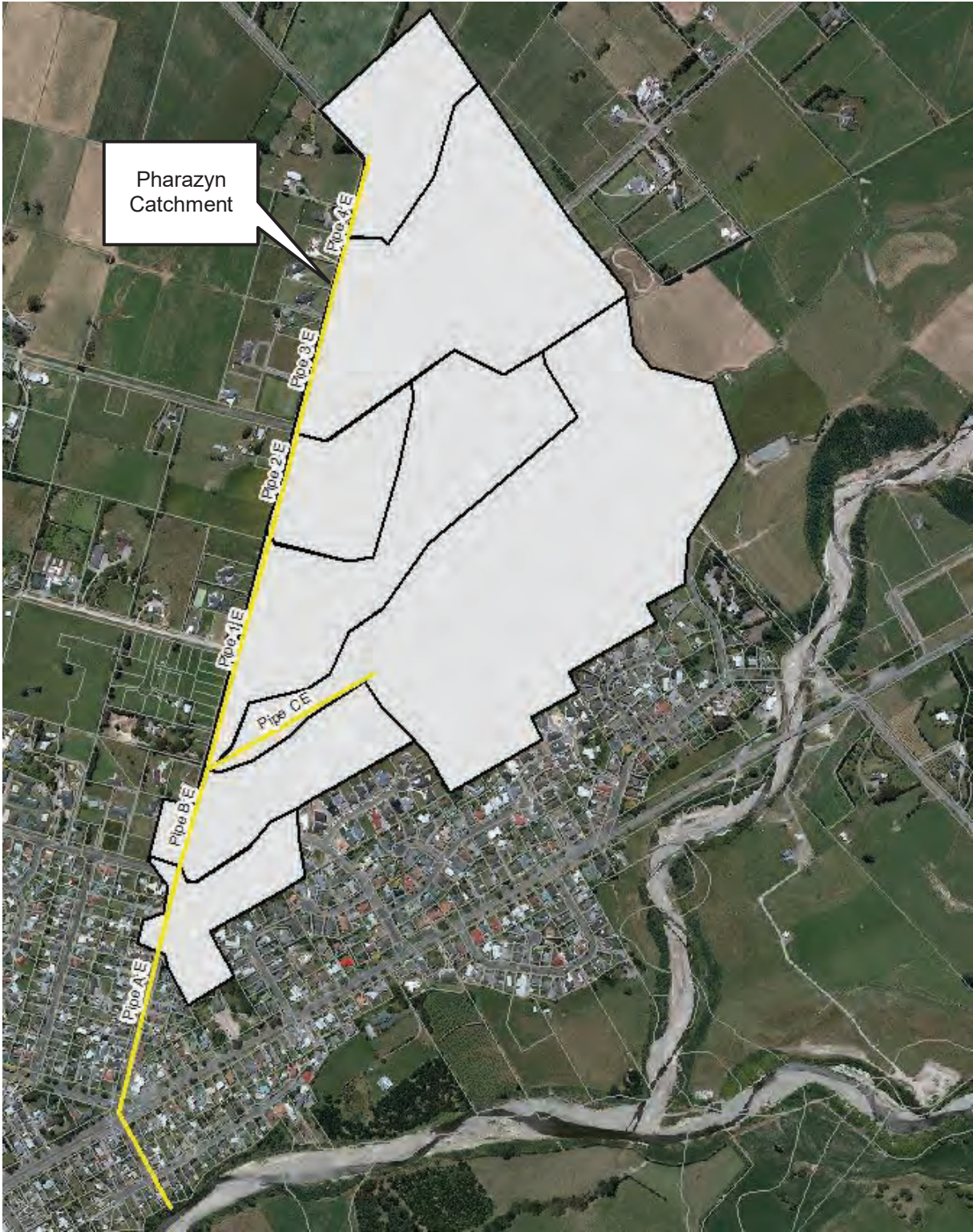


Figure 15 - Precinct 4 East (Pharazyn catchment)

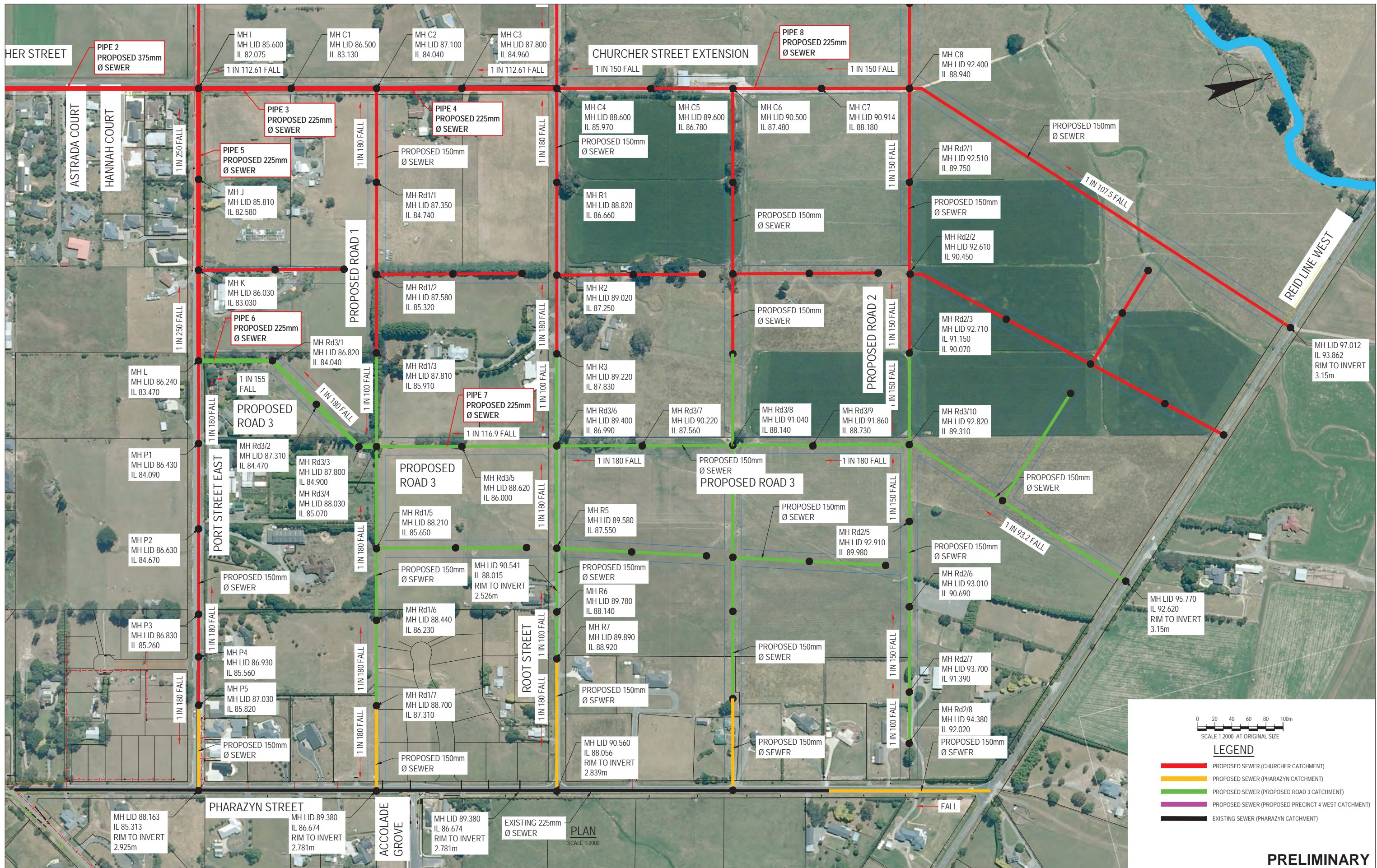
Table 14 - Precinct 4 East pipe and road corridor capacities (Pharazyn catchment)

Pipe Ref	Catchment Cumulative Area (ha)	Time of Concentration (Tc)	Runoff Coefficient "C"	Rainfall Intensity I ₁₀ (mm/h)	Discharge Q ₁₀ (m ³ /s)	Rainfall Intensity I ₁₀₀ (mm/h)	Discharge Q ₁₀₀ (m ³ /s)	Pipe Slope (1 : x)	Diameter Required (mm)	Diameter Existing (mm)	Capacity Pipe (m ³ /s)	Road flow (m ³ /s)
Pipe 4 E	6.10	21.5	0.34 ⁽¹⁾	57.2	0.960	101.5	0.212	156	748	525	0.373	0.212
Pipe 3 E	24.0	21.5	0.50	57.2	2.745	101.5	1.292	88	996	900	2.093	1.292
Pipe 2 E	29.1	21.5	0.50	57.2	3.358	101.5	1.733	156	1196	1050	2.371	1.733
Pipe 1 E	43.0	21.5	0.50	57.2	5.209	101.5	3.075	200	1478	1200	2.990	3.075
Pipe B E	49.6	21.5	0.50	57.2	6.815	101.5	6.440	156	1560	1350	4.634	6.440
Pipe A E	54.0	21.5	0.50	57.2	7.164	101.5	1.715	156	1590	1800	9.980	1.715
Pipe Arnott	31.3	21.5	0.46 ⁽¹⁾	57.2	2.297	101.5	4.079	112	975	1050	2.798	1.281

Table notes: ⁽¹⁾ Runoff coefficients calculated pro-rata to take undeveloped land to the north of Reid Line into account.

Flow from the stopbank of 0.58 m³/s has been added to the Q₁₀ flows of Pipe 4E to Pipe AE.

Appendix C – Proposed Wastewater Layouts and Calculations



No.	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Project Director	Date
B	CHANGED TITLE TO OVERALL SCHEME PLAN AND SHEET 8A					

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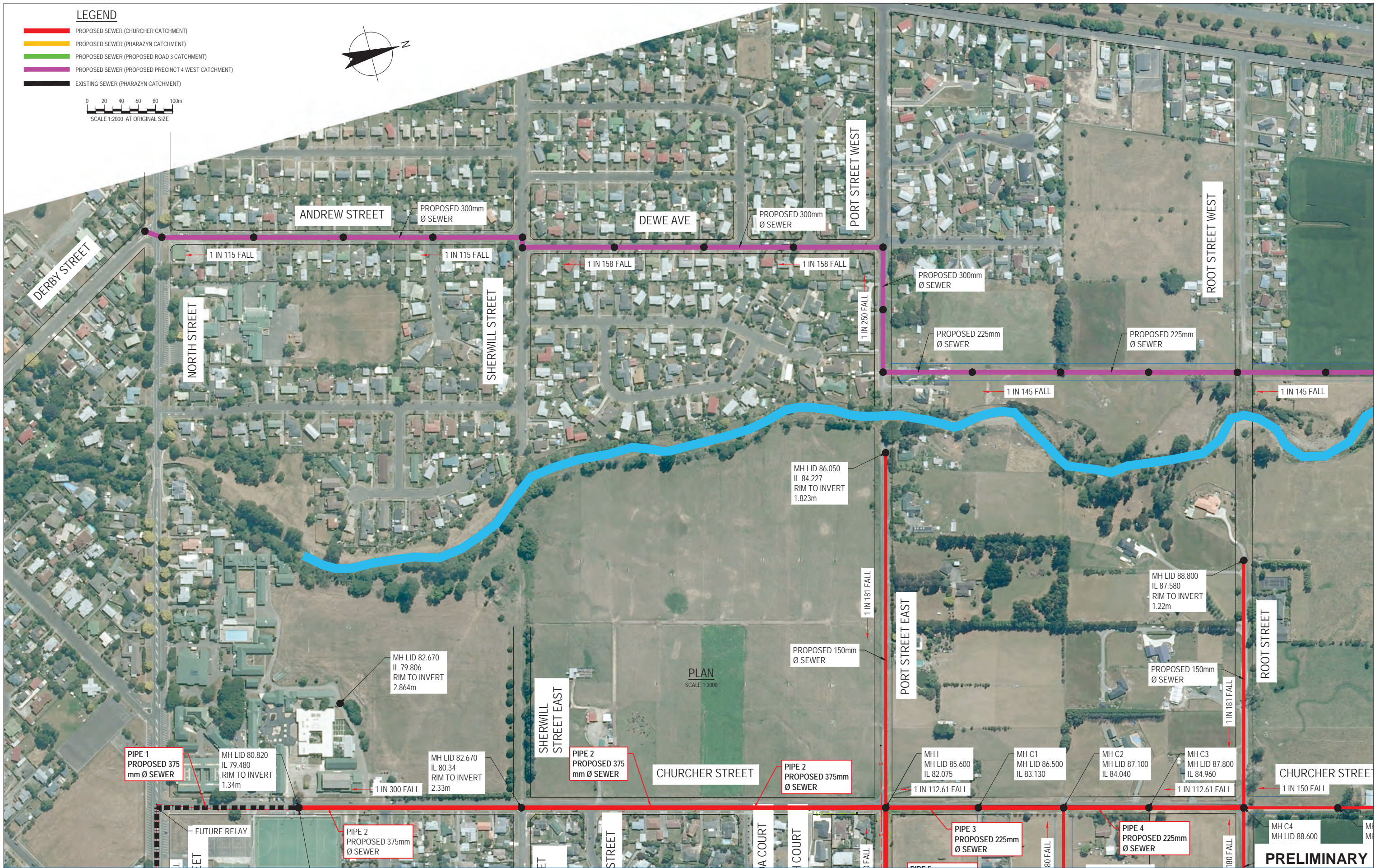
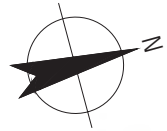
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Title	OVERALL SEWER SCHEME PLAN
Original Size	A1
Drawing No:	51-33090-02-SK008A
Rev:	B

LEGEND

- PROPOSED SEWER (CHURCHER CATCHMENT)
- PROPOSED SEWER (PHARAZYN CATCHMENT)
- PROPOSED SEWER (PROPOSED ROAD 3 CATCHMENT)
- PROPOSED SEWER (PROPOSED PRECINCT 4 WEST CATCHMENT)
- EXISTING SEWER (PHARAZYN CATCHMENT)



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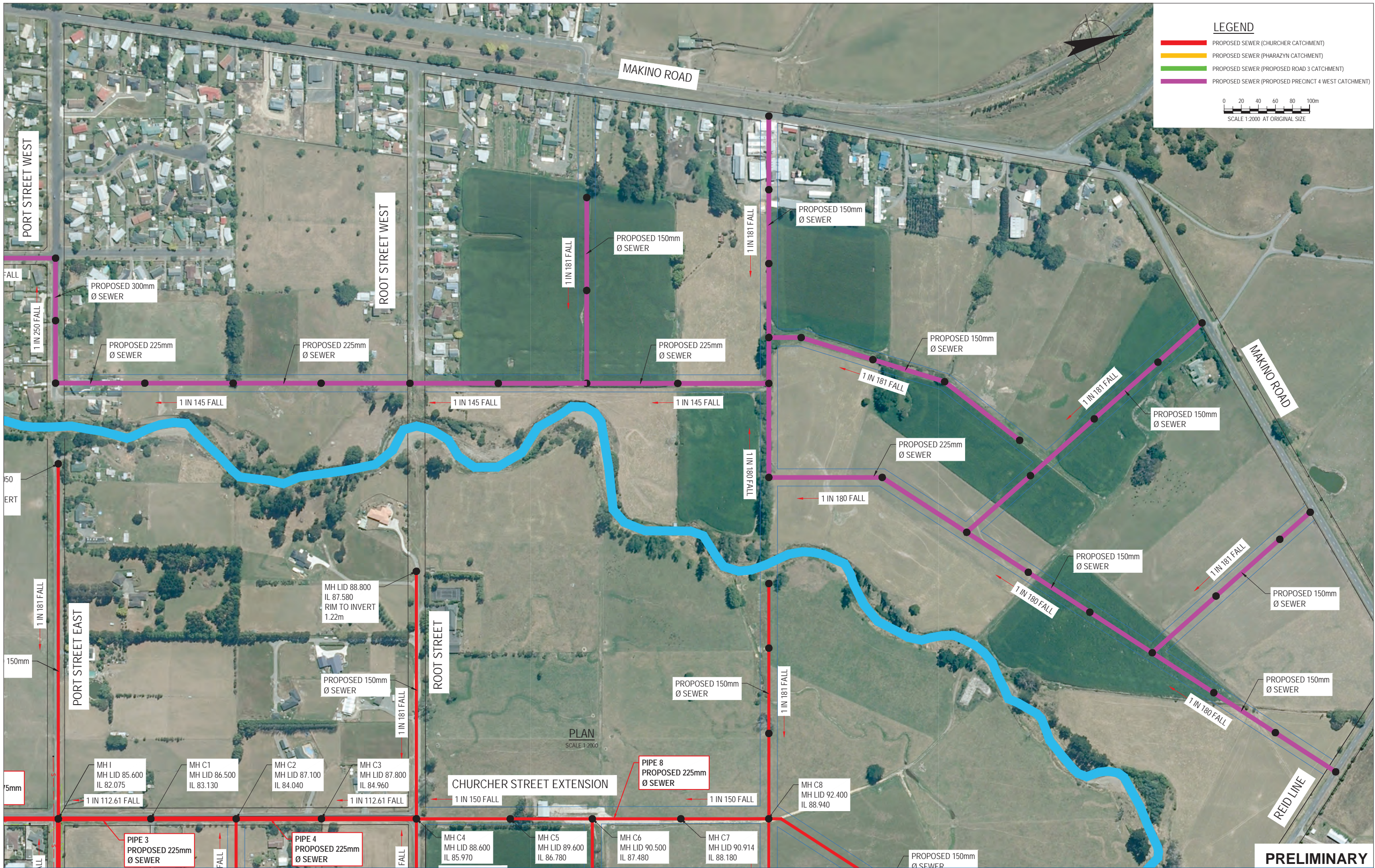
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Drawing No:	51-33090-02-SK008B
Rev:	A



No	Revision	Note	Drawn	Job Manager	Project Director	Date

Plot Date: 19 June 2017 - 10:05 a.m. Plotted by: Wessel Wagner

MH I MH LID 85.600 IL 82.075	MH C1 MH LID 86.500 IL 83.130	MH C2 MH LID 87.100 IL 84.040	MH C3 MH LID 87.800 IL 84.960	MH C4 MH LID 88.600 IL 85.970	MH C5 MH LID 89.600 IL 86.780	MH C6 MH LID 90.500 IL 87.480	MH C7 MH LID 90.914 IL 88.180	MH C8 MH LID 92.400 IL 88.940
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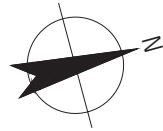


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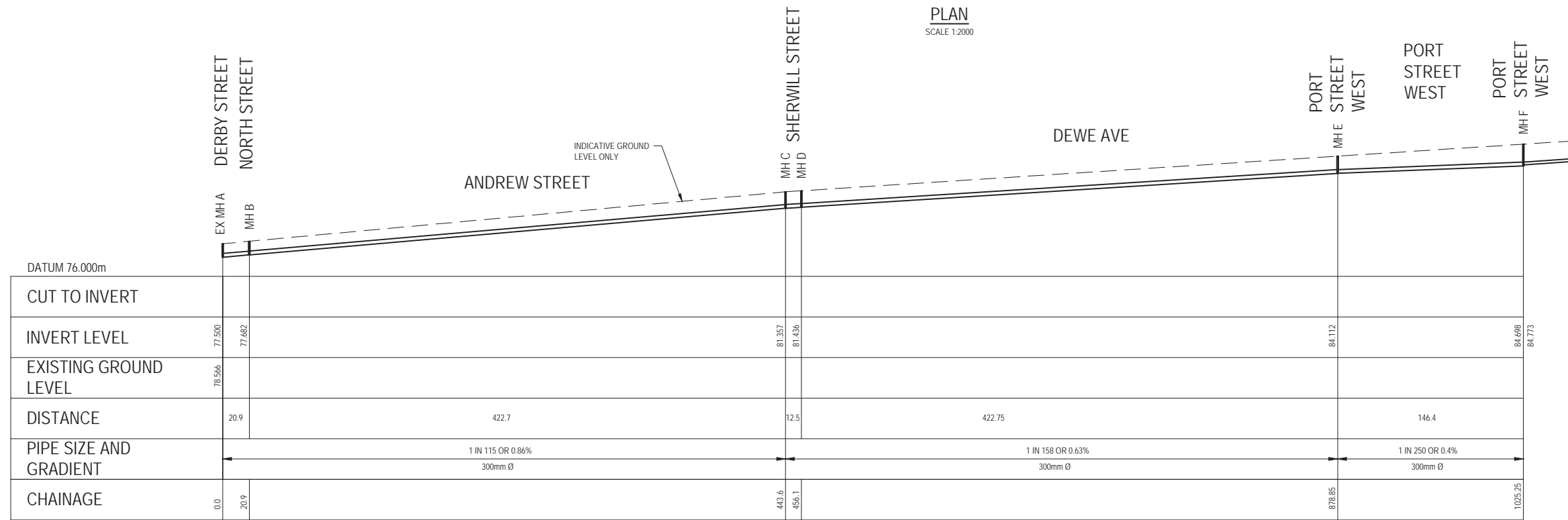
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Project	PRECINCT 4
Title	OVERALL SEWER SCHEME PLAN
Original Size	A1
Drawing No:	51-33090-02-SK008C
Rev:	A

LEGEND

- PROPOSED SEWER (CHURCHER CATCHMENT)
- PROPOSED SEWER (PHARAZYN CATCHMENT)
- PROPOSED SEWER (PROPOSED ROAD 3 CATCHMENT)
- PROPOSED SEWER (PROPOSED PRECINCT 4 WEST CATCHMENT)

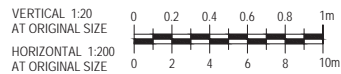


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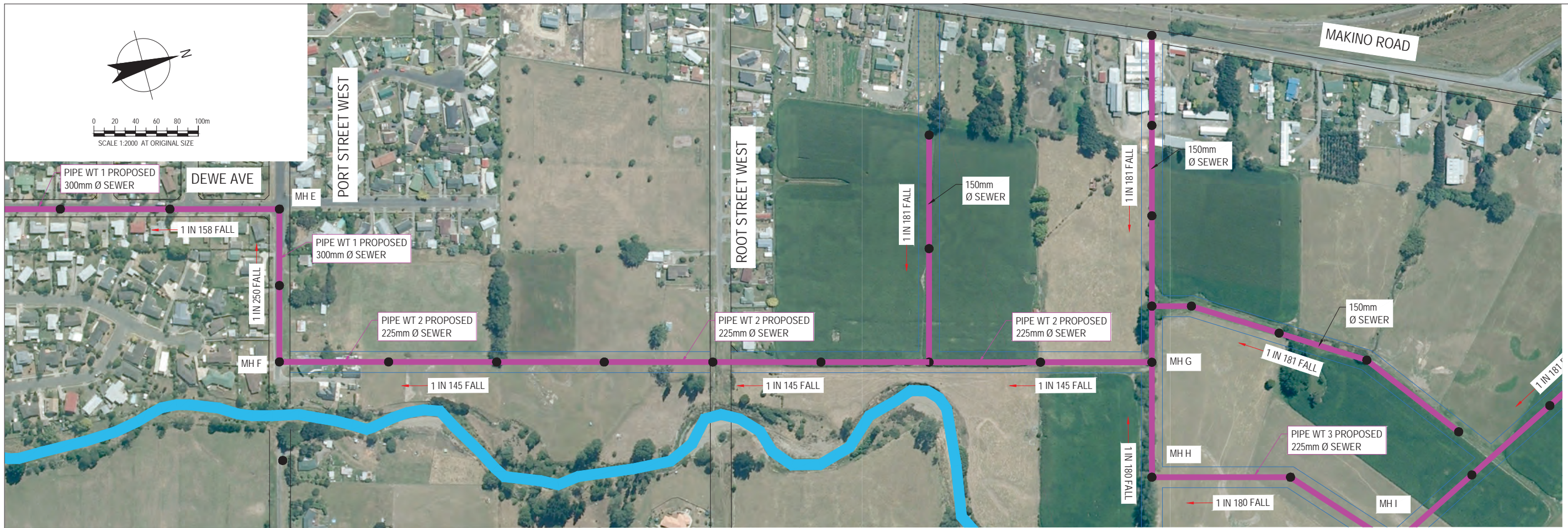
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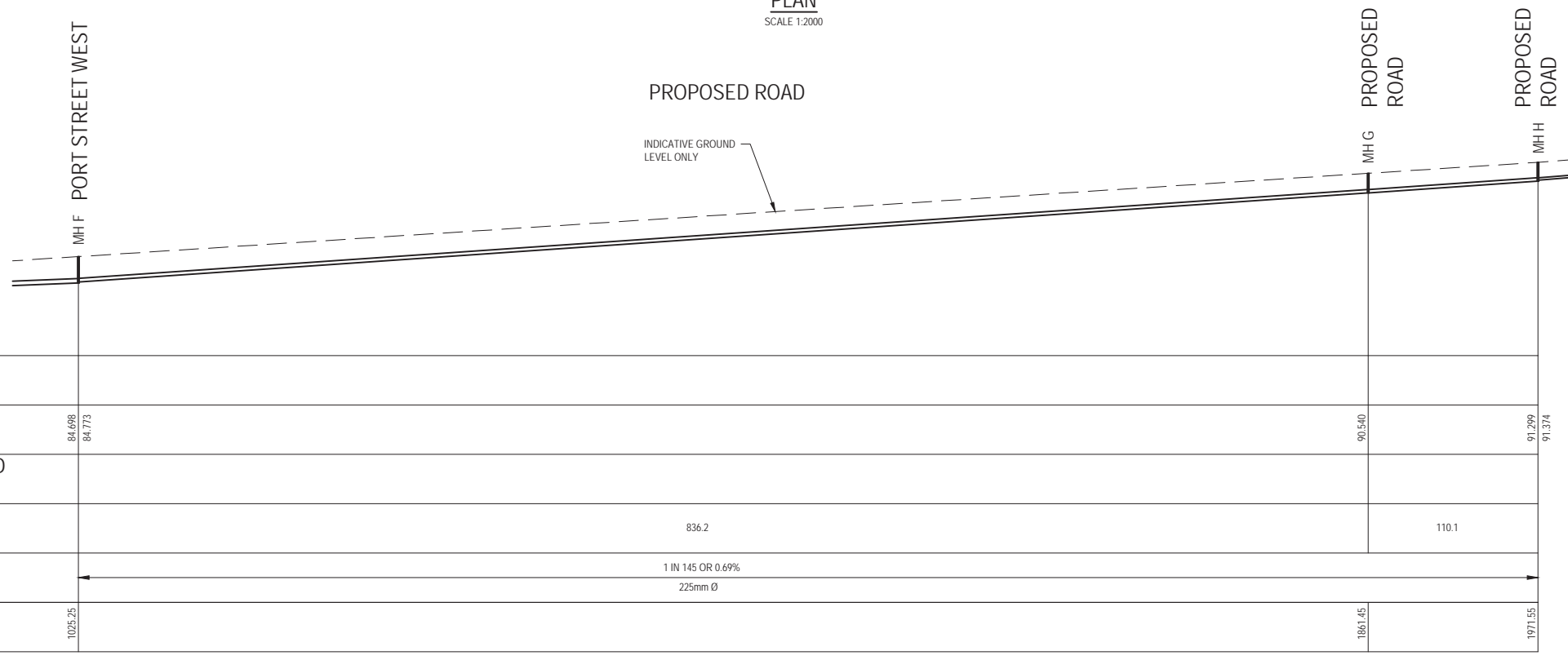
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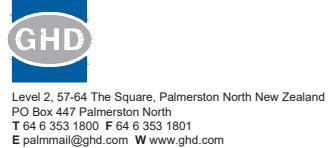
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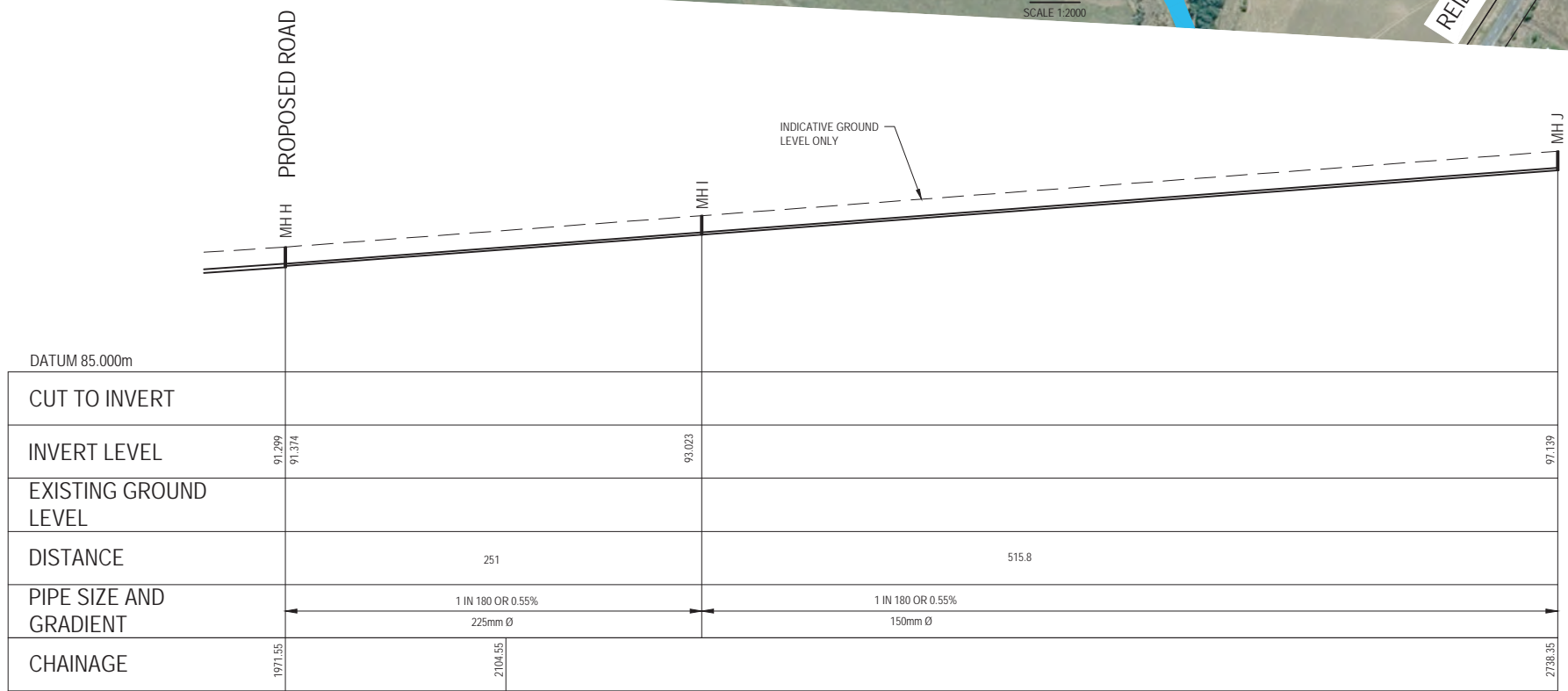
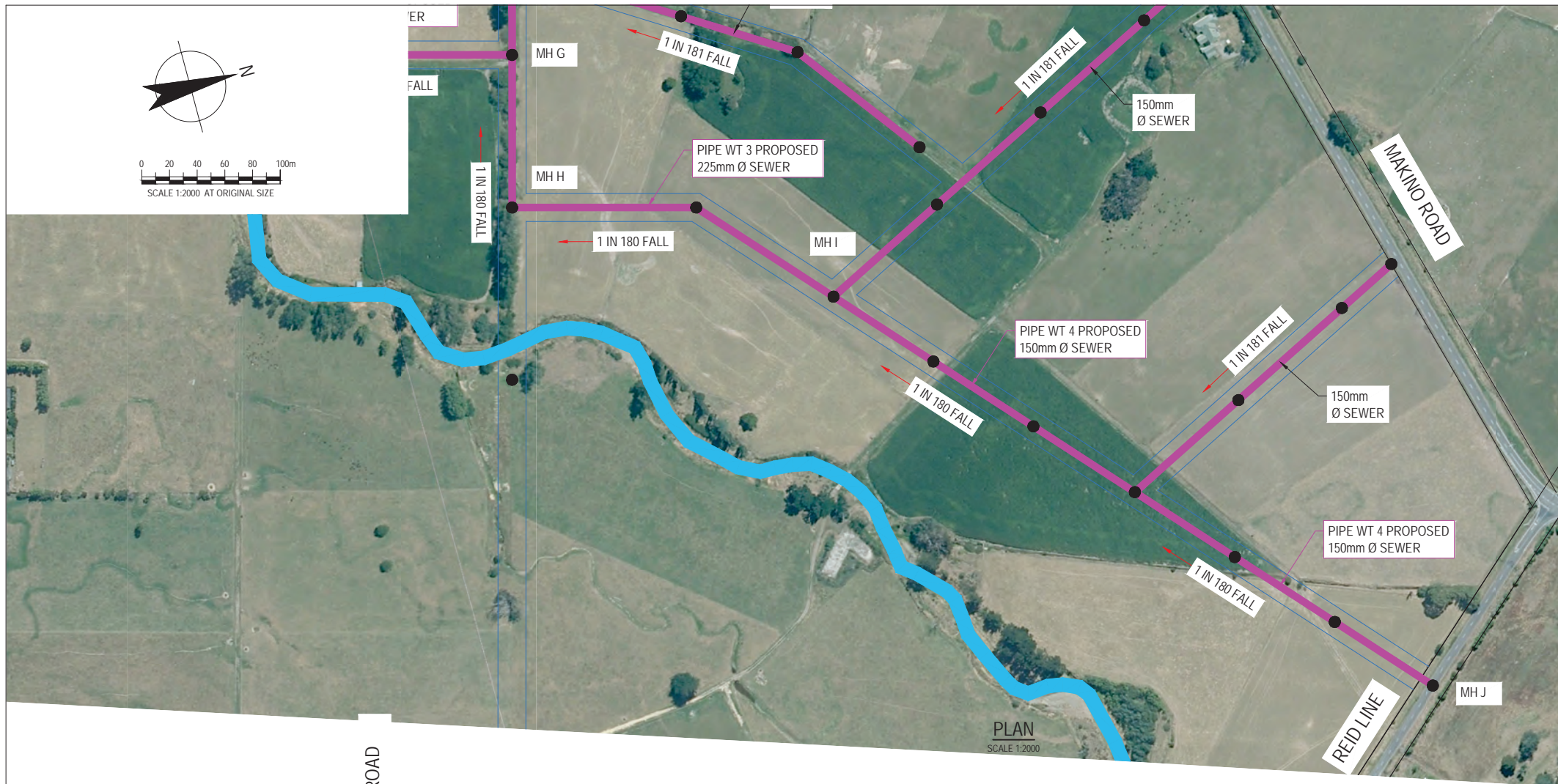
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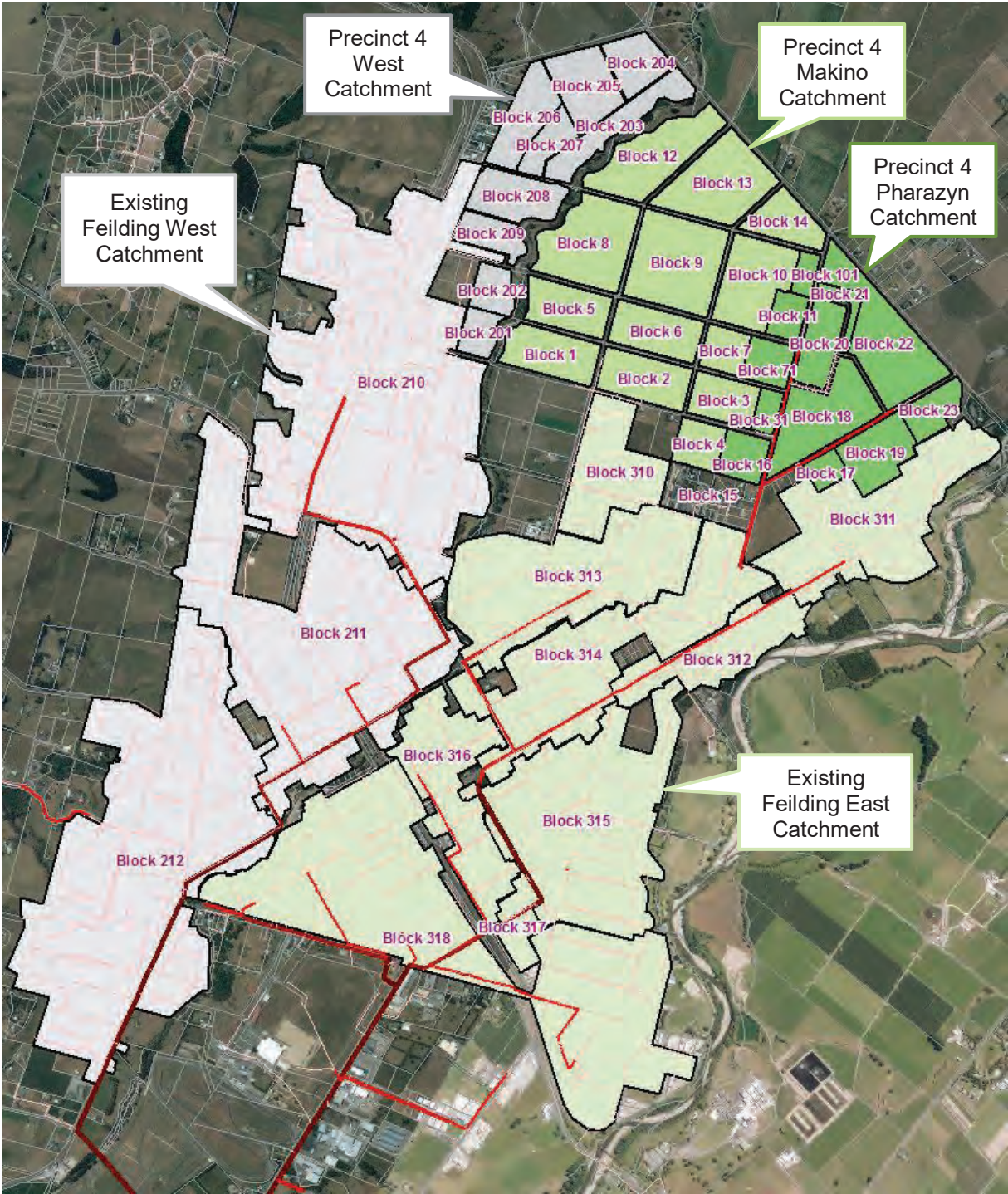


Figure 16 – Western and eastern catchments (Including Precinct 4)

Table 15 – Western catchment existing PWWF

Block No.	Area (ha)	ADWF (l/p/d)	People / Prop.	Area / Prop.	No. of Prop.	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
210	129.23	250	2.6	0.08	1615	4200	12.15	30.38	60.76
211	91.34	250	2.6	0.08	1142	2969	8.59	21.47	42.95
212	119.06	250	2.6	0.08	1488	3869	11.20	27.99	55.98
Total PWWF (l/s)									159.69

Table 16 - Eastern catchment existing PWWF

Block No.	Area (ha)	ADWF (l/p/d)	People / Prop.	Area / Prop.	No. of Prop.	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
310	17.5	250	2.6	0.08	219	569	1.65	4.11	8.23
311	37.44	250	2.6	0.08	468	1217	3.52	8.80	17.60
312	16.67	250	2.6	0.08	208	542	1.57	3.92	7.84
313	45.34	250	2.6	0.08	567	1474	4.26	10.66	21.32
314	47.05	250	2.6	0.08	588	1529	4.42	11.06	22.12
315	54.84	250	2.6	0.08	686	1782	5.16	12.89	25.79
316	25.38	250	2.6	0.08	317	825	2.39	5.97	11.93
317	7.51	250	2.6	0.08	94	244	0.71	1.77	3.53
310	17.5	250	2.6	0.08	219	569	1.65	4.11	8.23
Total PWWF (l/s)									166.86

Table 17 - Precinct 4 Pharazyn Street catchment PWWF

Block No.	Area (ha)	ADWF (l/p/d)	People / Prop.	Area / Prop.	No. of Prop.	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
101	1.72	250	2.6	0.06	29	75	0.22	0.54	1.08
11	2.95	250	2.6	0.06	49	128	0.37	0.92	1.85
21	3.87	250	2.6	0.06	65	168	0.49	1.21	2.43
22	15.41	250	2.6	0.06	257	668	1.93	4.83	9.66
20	5.68	250	2.6	0.06	95	246	0.71	1.78	3.56
18	12.24	250	2.6	0.06	204	530	1.53	3.84	7.67
23	4.33	250	2.6	0.06	72	188	0.54	1.36	2.71
19	7.47	250	2.6	0.06	125	324	0.94	2.34	4.68
17	2.18	250	2.6	0.06	36	94	0.27	0.68	1.37
71	3.87	250	2.6	0.08	48	126	0.36	0.91	1.82
31	1.92	250	2.6	0.08	24	62	0.18	0.45	0.90
16	4.07	250	2.6	0.08	51	132	0.38	0.96	1.91
Total PWWFs (l/s) – 300 Ø downstream of Pharazyn sufficient 60 l/s									39.65

Table 18 – Western catchment trunk main pipe sizing

Block No.	% Contributed	Lots	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
Pipe WT 1 – Proposed 300 Ø with a capacity of 98 l/s						
201	100%	51	132	0.38	0.96	1.91
202	100%	58	150	0.43	1.08	2.16
203	100%	87	225	0.65	1.63	3.26
204	100%	90	235	0.68	1.70	3.40
205	100%	135	350	1.01	2.53	5.06
206	100%	124	321	0.93	2.32	4.65
207	100%	62	161	0.47	1.17	2.33
208	100%	125	324	0.94	2.34	4.69
209	100%	71	185	0.54	1.34	2.68
210	23.4%	505	1312	3.80	9.49	18.98
TOTAL						50.52
Pipe WT 2 – Proposed 225 Ø with a capacity of 43 l/s						
201	100%	51	132	0.38	0.96	1.91
202	100%	58	150	0.43	1.08	2.16
203	100%	87	225	0.65	1.63	3.26
204	100%	90	235	0.68	1.70	3.40
205	100%	135	350	1.01	2.53	5.06
206	100%	124	321	0.93	2.32	4.65
207	100%	62	161	0.47	1.17	2.33
208	100%	125	324	0.94	2.34	4.69
209	100%	71	185	0.54	1.34	2.68
TOTAL						31.53
Pipe WT 3 – Proposed 225 Ø with a capacity of 39 l/s						
203	100%	87	225	0.65	1.63	3.26
204	100%	90	235	0.68	1.70	3.40
205	100%	135	350	1.01	2.53	5.06
207	100%	62	161	0.47	1.17	2.33
TOTAL						14.05
Pipe WT 4 – Proposed 150 Ø with a capacity of 12 l/s						
203	70%	87	225	0.65	1.63	3.26
204	100%	90	235	0.68	1.70	3.40
205	100%	135	350	1.01	2.53	5.06
TOTAL						11.31

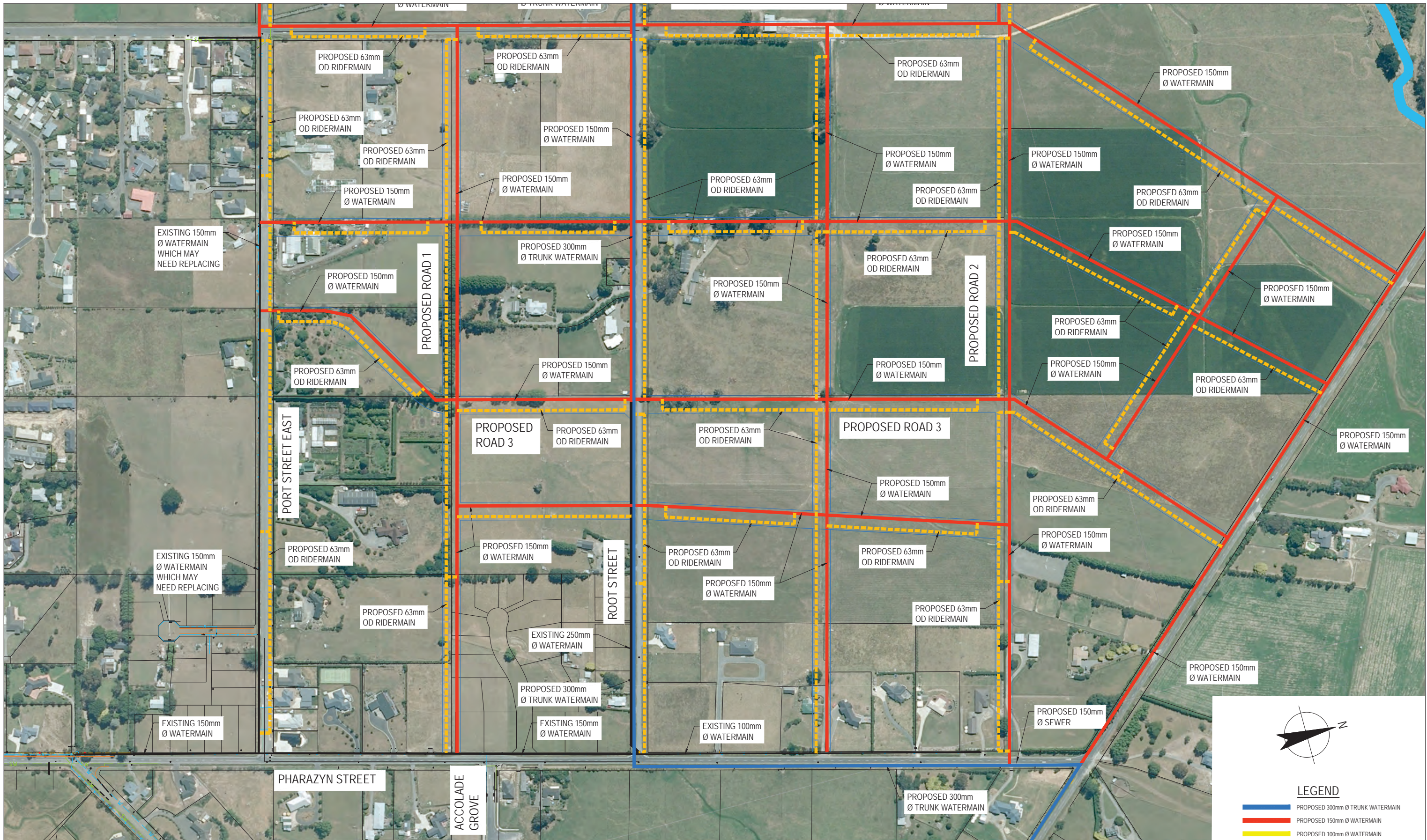
Table 19 - Churcher Street catchment revised flows and pipe sizing

Block No.	% Contributed	Lots	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
Pipe 1 – Proposed 375 Ø with a capacity of 110 l/s						
310	100%	159	413	1.20	3.0	6.0
1	100%	129	335	0.97	2.4	4.8
2	100%	127	330	0.95	2.4	4.8
3	100%	93	242	0.70	1.8	3.5
4	100%	68	177	0.51	1.3	2.6
5	100%	116	302	0.87	2.2	4.4
6	100%	126	328	0.95	2.4	4.7
7	100%	61	159	0.46	1.2	2.3
8	100%	224	582	1.68	4.2	8.4
9	100%	250	650	1.88	4.7	9.4
10	100%	179	465	1.35	3.4	6.7
12	100%	196	510	1.48	3.7	7.4
13	100%	214	556	1.61	4.0	8.0
14	100%	92	239	0.69	1.7	3.5
TOTAL		2034.0	5288.0	15.3	38.3	76.5
Pipe 2 – Proposed 375 Ø with a capacity of 110 l/s						
1	100%	129	335	0.97	2.4	4.8
2	100%	127	330	0.95	2.4	4.8
3	100%	93	242	0.70	1.8	3.5
4	100%	68	177	0.51	1.3	2.6
5	100%	116	302	0.87	2.2	4.4
6	100%	126	328	0.95	2.4	4.7
7	100%	61	159	0.46	1.2	2.3
8	100%	224	582	1.68	4.2	8.4
9	100%	250	650	1.88	4.7	9.4
10	100%	179	465	1.35	3.4	6.7
12	100%	196	510	1.48	3.7	7.4
13	100%	214	556	1.61	4.0	8.0
14	100%	92	239	0.69	1.7	3.5
TOTAL		1875	4875	14.1	35.3	70.5
Pipe 3 – Proposed 225 Ø with a capacity of 46 l/s						
1	30%	38.7	101	0.29	0.7	1.5
2	30%	38.1	99	0.29	0.7	1.4

Block No.	% Contributed	Lots	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
5	100%	116	302	0.87	2.2	4.4
6	50%	63	164	0.47	1.2	2.4
8	100%	224	582	1.68	4.2	8.4
9	50%	125	325	0.94	2.4	4.7
12	100%	196	510	1.48	3.7	7.4
13	50%	107	278	0.80	2.0	4.0
TOTAL		907.8	2361	6.8	17.1	34.2
Pipe 4 – Proposed 225 Ø with a capacity of 46 l/s						
5	30%	34.8	90	0.26	0.7	1.3
6	30%	37.8	98	0.28	0.7	1.4
8	100%	224	582	1.68	4.2	8.4
9	50%	125	325	0.94	2.4	4.7
12	100%	196	510	1.48	3.7	7.4
13	50%	107	278	0.80	2.0	4.0
TOTAL		724.6	1883	5.4	13.6	27.2
Pipe 5 – Proposed 225 Ø with a capacity of 33 l/s						
2	100%	127	330	0.95	2.4	4.8
3	100%	93	242	0.70	1.8	3.5
6	50%	63	164	0.47	1.2	2.4
7	100%	61	159	0.46	1.2	2.3
9	50%	125	325	0.94	2.4	4.7
10	100%	179	465	1.35	3.4	6.7
13	50%	107	278	0.80	2.0	4.0
14	100%	92	239	0.69	1.7	3.5
TOTAL		847	2202	6.4	15.9	31.9
Pipe 6 – Proposed 225 Ø with a capacity of 39 l/s						
2	50%	63.5	165	0.48	1.2	2.4
3	30%	27.9	73	0.21	0.5	1.1
6	50%	63	164	0.47	1.2	2.4
7	100%	61	159	0.46	1.2	2.3
9	50%	125	325	0.94	2.4	4.7
10	100%	179	465	1.35	3.4	6.7
13	50%	107	278	0.80	2.0	4.0
14	100%	92	239	0.69	1.7	3.5
TOTAL		718.4	1868	5.4	13.5	27.0

Block No.	% Contributed	Lots	Population	ADWF (l/s)	PDWF (l/s)	PWWF (l/s)
Pipe 7 – Proposed 225 Ø with a capacity of 49 l/s						
6	30%	37.8	98	0.28	0.7	1.4
7	50%	30.5	79	0.23	0.6	1.1
9	50%	125	325	0.94	2.4	4.7
10	100%	179	465	1.35	3.4	6.7
13	50%	107	278	0.80	2.0	4.0
14	100%	92	239	0.69	1.7	3.5
TOTAL		571.3	1484	4.3	10.7	21.5
Pipe 8 – Proposed 225 Ø with a capacity of 43 l/s						
8	30%	67.2	175	0.51	1.3	2.5
9	30%	75	195	0.56	1.4	2.8
12	100%	196	510	1.48	3.7	7.4
13	50%	107	278	0.80	2.0	4.0
TOTAL		445.2	1158	3.4	8.4	16.8

Appendix D – Proposed Water Supply Layout



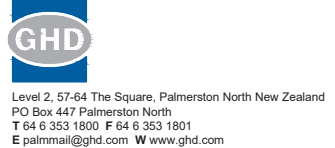
LEGEND

- PROPOSED 300mm Ø TRUNK WATERMAIN
- PROPOSED 150mm Ø WATERMAIN
- PROPOSED 100mm Ø WATERMAIN
- - - PROPOSED 63mm OD RIDERMAIN
- EXISTING WATERMAIN

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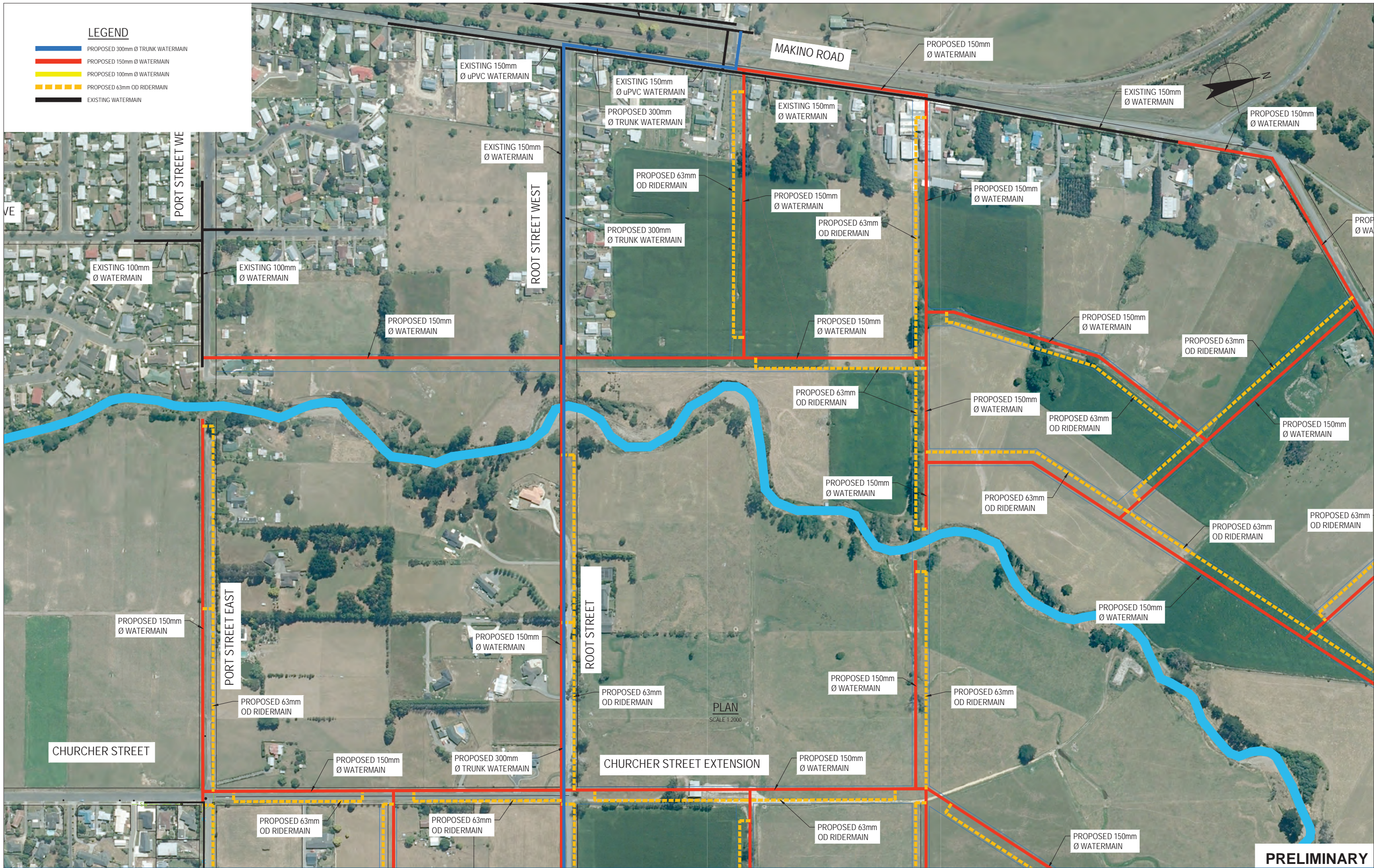
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		Rev:	A

LEGEND

- PROPOSED 300mm Ø TRUNK WATERMAIN
- PROPOSED 150mm Ø WATERMAIN
- PROPOSED 100mm Ø WATERMAIN
- - - PROPOSED 63mm OD RIDERMAIN
- EXISTING WATERMAIN



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GHD
Level 2, 57-64 The Square, Palmerston North New Zealand
PO Box 447 Palmerston North
T 64 6 353 1800 F 64 6 353 1801
E palmmail@ghd.com W www.ghd.com

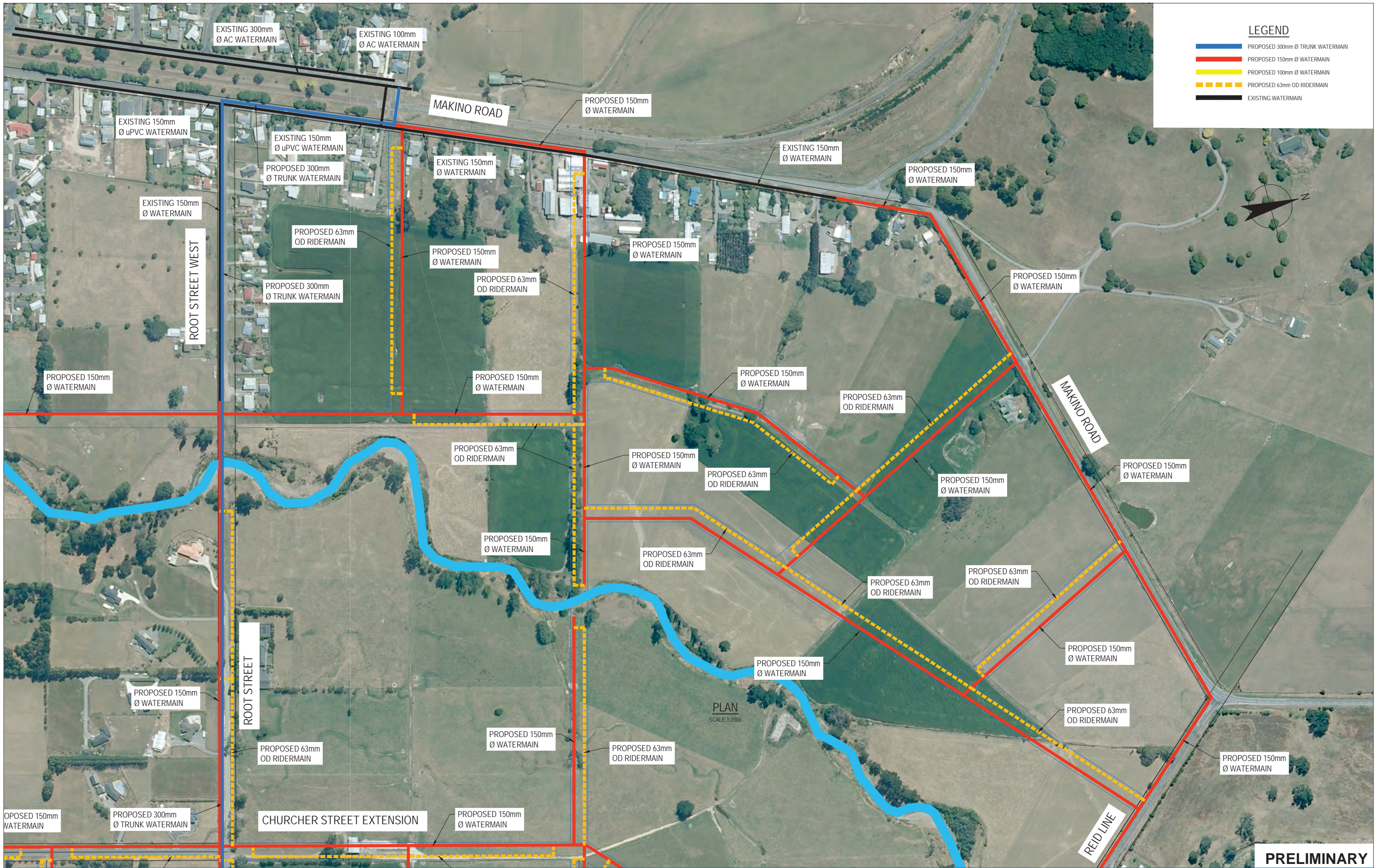
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Project	PRECINCT 4
Title	OVERALL WATER SCHEME PLAN
Original Size	A1
Drawing No:	51-33090-03-SK009B
Rev:	A

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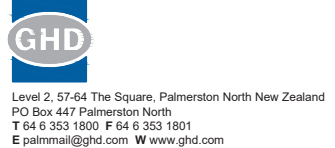
LEGEND

- PROPOSED 300mm Ø TRUNK WATERMAIN
- PROPOSED 150mm Ø WATERMAIN
- PROPOSED 100mm Ø WATERMAIN
- - - PROPOSED 63mm OD RIDERMAIN
- EXISTING WATERMAIN

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Project	PRECINCT 4
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Appendix E – Stopbank flows



Figure 17 - 1 in 30-year stopbank flows entering Precinct 4

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Level 2, 52 The Square
Palmerston North 4410



T: 64 6 353 1800 F: 64 6 353 1801 E: palmmail@ghd.com

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	W.Wagner	C. Anderson		C. Anderson		19/06/2017

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PRECINCT 4 STRUCTURE PLAN REPORT

FEILDING

6/12/18

Sue Gowan, Wendy Thompson and Cynthia Ward
Manawatu District Council

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1. Introduction and Overview

The Council has engaged in a major multi-disciplinary planning exercise in anticipation of significant, ongoing demand for residential homes in the north of Feilding. In 2012-13, Boffa Miskell undertook a high-level feasibility study of a proposed residential growth area (Precinct 4) which encompassed 277.2786 ha of rural land situated between Port Street and Reid Line West (refer Figure 1 below). The feasibility study incorporated a conceptual spatial plan to inform the future, staged development of Growth Precinct 4. (Refer Appendix 1: Conceptual Framework Plan for Growth Precinct 4). This has been used as the basis for the Draft Structure Plan.

In July 2017, this work was revised to include the land in the northwest corner of Precinct 4 (in what was a deferred, balance area, beyond the Makino (Mangakino) Stream), to account for new information on the reduced risk of liquefaction and to incorporate revised residential densities.

The following section sets out the broad planning context for Precinct 4 which formed the basis for developing the Draft Structure Plan for Precinct 4.

1.1 Location

The location of Growth Precinct 4 is spatially illustrated below. It was one of 7 Growth Precincts which were investigated in the Boffa Miskell study. The location and areal extent of the Precinct 4 study area at that time, is illustrated below:

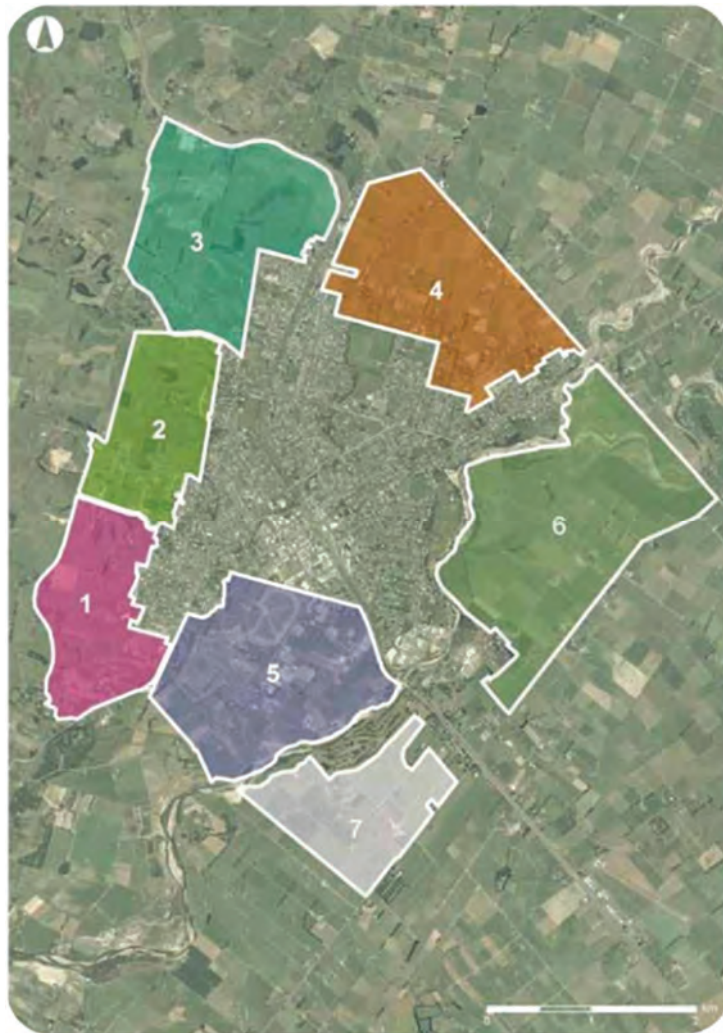


Figure 1: Growth Precincts identified by the Feilding Urban Growth Framework Plan

Structure Plans are typically non-statutory policy documents. They are not required or enforced by legislation, and the provisions in the Structure Plan do not have statutory or legal status until they are incorporated into Council's statutory documents such as the District Plan (in full or by reference), the Long Term Plan (LTP) or Asset Management Plans.

The Council's intention is to incorporate the Draft Structure Plan into the Manawātū District Plan, through Plan Change 51. Council has also proactively, referenced the infrastructure requirements within the LTP 2018-2028 (Infrastructure Strategy) and its asset management plans for Growth Precinct 4. While not a legal document, the Structure Plan Report may be considered as an 'other matter' when assessing a resource consent application and its scope allows for consideration of matters wider than those covered in the Resource Management Act 1991.

1.4 Strategic Framework for Urban Development

The strategic framework guiding future urban development in the Manawātū District comprises the Council's Vision Statements and the following documents:

- The Council's Vision Statement for the District (Long Term Plan 2018-2028):

Connected, Vibrant and thriving Manawātū District – the best lifestyle in New Zealand; and

Feilding Urban Vision Statement:

An attractive, progressing and inclusive country town that offers lifestyle choices and is the agri-business hub of the Region.

- Feilding Urban Growth Framework Plan (2013) (Boffa Miskell)

The Feilding Urban Growth Framework Plan was adopted by Council in 2013 and is Council's strategic document for urban growth planning.

The Framework Plan document includes the following information:

- Projected demand and supply for urban development at Feilding
- Urban planning principles that can be used to guide future urban development
- Density and urban form analysis of existing neighbourhoods in Feilding
- Analysis of Feilding's intensification potential and scope to achieve more efficient use of the existing urban area
- Preliminary site analysis for greenfield growth - opportunities and constraints
- Technical requirements about infrastructure and management of hazards
- Spatial guidance - Specifically, Framework Plans for 'the edge growth' areas, and the location/design requirements for density change, in the existing urban area.

The Framework Plan is a key reference document to guide Council's planning for future urban development and formulating the statutory District Plan provisions. A set of design principles are set out to guide the detailed design of the growth precinct area and the drafting of District Plan provisions. The design principles identified in the Feilding Urban Growth Framework Plan are set out below:

Context

- Plan for the future growth
- Take an integrated approach
- Recognise the overarching vision

Character & Identity

- Learn from existing developments in Feilding
- Provide a focal point
- Consider the site's features
- Retain and restore the natural environment

Connections and Networks

- Provide good street connectivity
- Enable a range of modes of transport
- Provide a range of street types

Open Space Networks and Community Amenity

- Provide a range of recreational activities
- Define the neighbourhoods
- Ensure safe public open spaces
- Provide community facilities

Neighbourhood and Building Design

- Encourage a mix of housing types
- Promote sustainable stormwater management
- Encourage buildings that are responsive to the topography
- Ensure solar access to public and private spaces
- Recognise the hydrological system
- Consider the surrounding neighbourhoods

The overall strategic direction in the Framework Plan will be implemented in the District Plan through Plan Change 51, in terms of:

- A high level Structure Plan for Growth Precinct 4
 - Urban design guidance for residential subdivision and density incorporated into planning rules and standards
 - Development contributions (these are implemented by a separate process).
 - Council's Engineering Standards for Land Development (references)
- MDC Engineering Standards for Land Development (2017)

The Council's Engineering Standards for Land Development was adopted in July 2017. The purpose of the Council's Engineering Standards for Land Development (the Standards) is to provide specific requirements, guidelines and minimum engineering standards for property subdivision and developments within the Manawatū District area.

The Standards contained in this document serve as a basis for technical compliance for consenting the subdivision and development of land, where these activities are subject to the Resource Management Act 1991 (RMA). The Standards must be read in conjunction to the provisions of the Manawatū District Plan and any applicable statutes, regulations and bylaws.

The Standards are designed to provide efficiencies for all parties involved throughout the development processes. These efficiencies include:

- Ensuring the consent application is correct when presented to Council
- Minimising both Developer and Council resource time by ensuring design standards have been met
- Ensuring that all discussions and negotiations between parties occur throughout the development process.

The Council’s Engineering Standards for Land Development, together with the Manawātū District Plan (the Plan), set out what the Council requires from developers to address the requirements of both the Resource Management Act and the ongoing management of the District’s infrastructural assets. It is framed as a ‘living document’ meaning that updates to the Standards will be made overtime. For example, where new Standards are introduced and/or amended to respond to certain land development issues.

- MDC Long Term Plan 2018-2028 and Infrastructure Strategy (2018 -2048)

The Council’s LTP 2018-2018 adopted in July 2018 is prepared in compliance with the Local Government Act 2002. It incorporates the 30 year Infrastructure Strategy. The Infrastructure Strategy is focussed on Council’s programme of critical roading and utility assets (or “essential services”), open space reserves and public amenities which are required, to enable development during the 30 year planning period, and primarily centres on the enabling infrastructure works for Growth Precinct 4.

- MDC Development Contributions Policy (2018)

The Council’s Development Contributions Policy is based on the Council’s capital expenditure programme as set out in the LTP and Infrastructure Strategy. The Development Contributions Policy sets out the development contributions to be paid by developers, how and when they are to be calculated and paid, and summarises the methodology and the rationale which is used for calculating the level of contribution required.

The purpose of the Policy is to:

- a) enable Council to provide infrastructure and facilities to cater for growth, in a timely fashion and in a manner which is affordable for ratepayers;
- b) to provide the framework for Council to charge Development Contributions for residential and non-residential development in the District so as to fund capital expenditure for network infrastructure, reserve land and community infrastructure;
- c) provide predictability and certainty to stakeholders on how infrastructure for growth is to be funded, and establish a transparent, consistent and equitable basis for recovering Development Contribution from developers; and
- d) to recover from developers a fair, equitable and proportionate portion of the total costs of the capital expenditure to service growth over the longer term.

1.5 Structure Plan Methodology

The methodology followed for developing the Structure Plan incorporated a desk top review, a critique of the 2013 Feilding Urban Design Framework Plan, the commissioning of new reports and/or updates of existing reports, Urban Design & Network Analysis and the design of a phased consultation programme to allow for input from landowners, stakeholders and the wider community, into the design of the Precinct 4 Structure Plan. Each of these are discussed below.

- Desk top review

A desk top review was undertaken of the existing planning and technical reports prepared for Growth Precinct 4. The key outcome of the review was the amendment of the Growth Precinct 4 study area to incorporate the rural land northwest of the Makino (Mangakino) Stream and to

exclude areas which were already zoned residential. The effect of this revision was to ensure that Council planned for the future growth and development of residential use in a holistic manner. Rather than adding additional areas (such as land to the west of the Makino (Mangakino) Stream) in the short to medium term. The growth pathway is now constrained by the existing network of Makino Road and Reid Line West, which forms a logical physical boundary or perimeter boundary for residential land use. The rural land beyond Growth Precinct 4 identified in this report, should be retained for rural use, and for Horizons Regional Council to manage the Flood Control network (Reid Line Floodway).

In addition, the revision of the spatial extent of Growth Precinct 4, required all the technical reports for Growth Precinct 4 to be updated so that they accurately informed the development of the area, the draft Structure Plan and the formulation of the Plan Change to rezone the land for future urban development.

- Review of the Feilding Urban Growth Framework Plan

The 2013 Feilding Framework Plan was reviewed and critiqued. Several matters were identified as needing to be updated to support the work for Plan Change 51, most notably the population assumptions, residential demand character and retail needs assessment. The original report was prepared to assess the demand for residential properties in Precinct 4 and was based on the population trends and forecasts which prevailed at the time. In the period October 2013 - 2018 conditions have changed dramatically. Feilding continues to experience strong population growth rates and increasing demand for residential property. Population projections, growth rates and retail needs assessment is discussed below.

- New technical reports

New reports were commissioned to provide critical information on the development issues and constraints for Growth Precinct 4. As noted, all the existing technical reports were reviewed and updated. The key investigation reports which underpin the design of the Structure Plan and the Draft Structure Report are listed below:

Land Development:

- Liquefaction Risk Assessment
- Land Contamination Assessment (DSI) Report
- Archaeology Assessment Report
- Cultural Impact Assessment Report

Roading and Services:

- Servicing Concept Plan
- Stormwater/Floodwater Modelling Reports
- Traffic Impact Assessment Report

Population Projections and Retail Needs Assessment

The 2016 Property Economics Report analysed population data generated by Statistics New Zealand (StatsNZ) as a basis for understanding long term residential growth demands in Feilding and residential capacity requirements (residential land supply). The report also provided expert commentary on housing demand character and retirement provision and assessed the requirement for retail land in Growth Precinct 4, upon full development. This report was instructive for Structure Planning in terms of providing direction on technical planning aspects like lot sizes and density, as well as the quantum of commercial land which needs to be provided in future, if any, to serve the retail convenience needs of the community living in Growth Precinct 4.

2018 Update Report: The population forecast information has been updated for Plan Change 51 by Council's Economic Development Advisor in view of the recent rapid growth that is taking place in Feilding and the wider District (Refer Appendix 3 attached). The latest data from StatsNZ shows that the population growth in the District has exceeded the Council's LTP projections and also the updated StatsNZ medium population projections. StatsNZ estimates that the population of Feilding has increased by approximately 600 people to 16,860. The strong rates of growth strengthen the case for the rezoning the Growth Precinct 4 area.

- Urban Design - Network Layer Analysis

The core features of the blue, green, movement and community networks were assessed to ensure connectivity in the overall design of Growth Precinct 4. Opportunities to achieve well integrated development across the growth area and maximise connectivity have been identified. This design process ensures that the salient design elements (including key infrastructure projects) are appropriately referenced in the Precinct 4 Structure Plan.

- Consultation

The Communications Plan and engagement framework for Plan Change 51 was prepared with Council's Communications Manager and targeted several groups: landowners, key stakeholders and residents in the wider community of Feilding and District beyond. A variety of media was utilised to reach the various target audiences: E-communications, Print and Friday Market Days. The most recent phase of the engagement campaign was a progressive engagement on the Structure Plan over a 12 month period and featured a Draft Structure Plan and iterations of the Plan based on feedback received. The campaign sought public input into the design process and also prompted feedback on specific structuring elements via responses to a short questionnaire. Feedback from all engagements were collated, and evaluated by the project team and reported to Council. Feedback from these engagement and previously, between 2012-2016, was extremely valuable and resulted in important refinements to the Draft Structure Plan. (Refer Consultation Record in Appendix 2).

2. Structure Plan Objectives

2.1 Purpose

Council initiated the Structure Plan development process for Precinct 4 as it recognised there was residential demand pressures in Feilding and capacity limits in Feilding's existing residential zone. Council recognised that delays in confirming an overarching plan for managing the development of the growth area could result in the ad-hoc development of rural land (including large lot residential development in the nodal overlay area) and the loss of key roading layouts (and key intersections), compromising future opportunities to provide for the efficient provision of infrastructure and the delivery of a high quality, well-integrated residential area.

2.2 Key Strategic Objectives and Design Principles

The key strategic objectives and design principles which have been applied in developing the Structure Plan for Growth Precinct 4 are explained below:

Urban design principles are a means of describing the aspirations for the form of a town, or place, to be realised over time. They equate or contribute to achieving the liveability of a place as well as its environmental quality. The design principles are instructive to guide the design of Growth Precinct 4 and to inform the drafting of statutory planning provisions in the District Plan.

The overarching design principles seek to:

- Achieve good quality urban design outcomes for all residential development.
- Achieve a residential density which ensures efficient and sustainable urban development.

- Recognise Tangata Whenua’s traditional and contemporary relationship with land and water, and in particular the Te Aranga design principles.
- Acknowledge the geotechnical characteristics of the land and ensure the location and design of buildings, structures and infrastructure is appropriate and works with the natural landscape, as far as possible.
- Ensure that development complements and does not adversely affect the amenity, recreational and ecological values of the Makino (Mangakino) Stream and adjoining esplanade corridor.
- Ensure stormwater management operates in an environmentally sustainable manner within the Growth Precinct and with neutral environmental effects to surrounding areas beyond the Growth area.
- Create safe and efficient linkages for public transport, vehicles and active modes of transport (pedestrian and cycling) which are pleasant and work with the natural landform.
- Establish good linkages within and to existing residential development and other community facilities.
- Avoid perpetuating the prevalence of cul de sacs, private rights of way, as access to back sections, which exist in the vicinity of the Growth Area.
- Ensure that the convenience needs of the growth area are provided centrally and preferably adjacent to public open space, located on a public transport route and achieves a high standard of amenity and visual character when viewed from the street.

2.3 Structure Plan Development – Design Elements and Network Layer Analysis

The Draft Structure Plan for Growth Precinct 4 reflects the key factors, natural and physical, which contribute to the design and ultimate development pattern for Growth Precinct 4. The key structuring elements, or network layers, which require investigation and assessment to develop a comprehensive design for a Structure Plan for Growth Precinct 4, as a whole are listed below:

- The blue (water, stormwater and wastewater) network
- The green (parks and open spaces) network
- The movement (transportation) network
- The community (social and cultural) network
- A land use pattern including outline zoning arrangement, spatial overlays, and any specific development controls to respond to locally specific opportunities or constraints.

An overview of the network layers and a description of the spatial planning context for each network is provided in Section 7 of this report.

3. Existing Site Overview

3.1 Overview

This section of the report addresses in more detail the site context and landscape, the landscape characteristics of site itself and summarises the key features of the Structure Plan proposal.

3.1.1 Site Context and Landscape Character

The Plan Change site is situated in a rural setting immediately north of the existing urban area of Feilding. The site covers approximately 256 ha. The estimated area of developable land – excluding the stream, parks and open spaces and roading - is 206 ha.

The Plan Change site is edged by Makino Road and Reid Line West to the North and Port Street to the South. The site is bound by Rimu Park on the west and well-established residential properties to the east. The eastern boundary adjoins a new residential housing area which is being developed between Pharazyn Street and at Arnott Street.

The site is located on a flat, low-lying river terrace. The Makino (Mangakino) Stream enters the site from the north at Reid Line West and meanders in a south westerly direction towards Port Street, where it crosses the street and edges the western rear boundary of the Feilding High School.

Between Pharazyn Street, Pharazyn Road and Arnott Street there are residential buildings and on Reid Line West there are some rural residential lifestyle properties. There is the occasional planting of single and grouped mature trees dispersed though the wider rural landscape. Generally, the aesthetic value of the existing roads and environs is typical of the rural environment on the outskirts of Feilding and the river terraces and downlands of the Manawātū Plains.

An appreciation of the wider landscape character of the environment is important to understanding how the re-zoning and proposed development will affect existing amenity values and the natural character of the adjacent rural environment and landscape.

To south, east and west of the Plan Change site the surrounding environment is urban and characterised by a mix of residential, recreation and retail land uses. Southwest of the site is the Feilding High School and Rimu Park which provides open space amenity as well as a range of recreation and sporting opportunities. Land to the north, beyond Reid Line West, is rural in character and predominantly used for grazing.

As noted, there are small pockets of rural lifestyle properties located on Reid Line West. Beyond this point there is the elevated stopbank and spillway gate, known as the Reid Line Floodway, which is maintained and operated by Horizons Regional Council for flood hazard management purposes.

There are broad views onto the site from the surrounding land, to the north of the site. Makino Road is straight as it approaches the intersection with Reid Line West and gives clear views across the rural landscape onto the grazing paddocks and onto some boundary shelterbelt plantings along the banks of the Makino (Mangakino) Stream. Travelling from the east, Reid Line West is also straight as it approaches the intersection with Pharazyn Street, and offers good views of the site. There are broad views of the Plan Change site from Roots Street. Currently there are limited views of the site from Port Street as it is screened by existing trees, some shelterbelt plantings and domestic-scale plantings growing along the street boundaries.

3.1.2 Site Description

The site is characterised as being largely open, but with a network of regular open paddocks, stream edge plantings, and some shelterbelt plantings. In addition there are a number of mature trees growing as individual trees or in small groups, particularly along Port Street and Roots Street.

The Makino (Mangakino) Stream traverses the western half of the site and is an important, and defining physical feature of the site. It serves to demarcate the east and west sections of Port and Roots Street. The existing vegetation along both banks of the Makino (Mangakino) Stream acts to visually separate the site into two distinct neighbourhoods. This visual separation results in the site being less visible from the surrounding landscape, and consequently, potentially reduces the scale of the proposal overall and is therefore less likely to have negative visual effects from vantages off site.

Port Street traverses through the bottom section of the growth precinct, in two parts: east and west. Port Street is a local road and is generally straight as it approaches the Makino (Mangakino) Stream. The views from Port Street East are fairly typical of the rural outskirts of

Feilding. There are impressive views to the Ruahine Ranges that can be taken account of and enhanced in the road layout pattern. Towards the western end of Port Street East there are some special long views to the elevated rural downlands beyond, which can also be recognised and reinforced in the block pattern and road layout.

At present there are a number of established rural homesteads on the land which is owned Mr Bailey and newer dwellings on the rural lifestyle blocks to the south of Growth Precinct 4.

3.1.3 Overview of Structure Plan Proposal - Location, Size, and Features

The Structure Plan for Growth Precinct 4 covers a land area of 256 ha. The key natural and physical features are:

- the Makino (Mangakino) Stream and 5 tributaries
- the overland stormwater channels which flow through the site in a southerly direction
- the existing, exotic and indigenous plantings along the banks of the Makino (Mangakino) Stream, and a few amenity trees with scale and landscape presence, at the intersection of Makino Road and Reid Line West..
- the existing, formed local roads: Churcher Street and Roots Street (east and west), Arnott Street and parts of Makino Road, Reid Line West, and Pharazyn Street.

A salient and determinative design feature is the location of the Growth Precinct on a river plains of the Manawatū River. As noted in section 3.1.1 above, the site lies within the Regional Council's Lower Manawatū River Control Scheme area. The Regional Council's flood hazard management objective is to protect the area from the 1 in 100 year flood event, via the Reid Line Floodway and the associated flood gates and drop structure.

3.2 Current Zoning

This section outlines the current planning context for the development site.

The site includes land which is zoned Rural, Flood Channel 2 and Recreation under the operative Manawatū District Plan (2002). Notably, some of the rural land within the Growth Precinct lies within a nodal overlay which enables rural land to be subdivided into smaller rural lots, but not less than 4,000 m² (Refer Appendix 5A, Rural Subdivision Nodes - Diagram 1 Feilding Locality and Objective 5.3.3 Landscape Appearance and Character, Policy b). The Feilding Nodal overlay illustrated in Diagram 1, extends beyond the Precinct 4 Structure Plan Area, in a number of places.

The primary intent of the Feilding nodal overlay was to enable future development on the outskirts of Feilding, being a peri-urban area, and having a peri-urban character and amenity.

In the time since the District Plan was made operative, the Council adopted the Feilding Framework Plan (as its urban growth plan) in 2013 and has progressively implemented the growth directions, through the rezoning of Growth Precincts 1-3 - and now Precinct 4 - for residential living. The existing Feilding Locality Nodal Zone (Appendix 5A Diagram 1) does not accord with Council's residential growth direction for Feilding and therefore is no longer an appropriate or relevant planning control, taking into account the future urbanisation of the area.

In terms of Growth Precinct 4, the existing local roads have been used to define the northern boundary of residential development, and provides land owners, developers and plan users with greater clarity of the future growth extent. On that basis this Plan Change seeks to remove this nodal overlay area, from the District Plan.

- Current planning proposal

Proposed Plan Change 51 (Precinct 4) seeks to delete the Rural Zone and the Feilding nodal overlay which applies to the Growth Precinct 4 area, and rezone this area as Residential Zoning in large part. The Flood Channel 2 zone in the vicinity of the Makino (Mangakino) Stream will be retained. A small area will also be zoned Recreation (refer 7.2 Structure Plan – Precinct 4 – Ultimate Development Plan). Plan Change 51 seeks to introduce a new residential zone chapter and corresponding subdivision provisions to enable urban development.

4. Council Master Planning for Growth – Feilding Framework Plan

This section of the report summarises the determinative reports and directions which shaped the Master Planning for Growth Precinct 4, and the development of the Spatial Concept Plan referenced in the 2013 Feilding Framework Plan. A summary outline of the Government’s National Policy Statement – Urban Development Capacity and the Council’s Standards for Land Development

4.1 Population projections

Property Economics were commissioned to provide expert advice to the project team working to develop the 2013 Feilding Framework Plan. The focus was on population projections, the housing market and demand trends for the 30 year planning period. The population projections used 2006 census data. In 2016 Property Economics were commissioned to update their earlier assessments. The population growth projections to 2038 (Stats NZ Medium Projections) were used as the basis for their assessment of residential demand for Feilding.

Since issuing this report, the Manawatū District has experienced high levels of population growth. From July 1 2016 to June 30 2018, the District’s population increased by 3.3 percent to 30,900 people. This is an increase of 1,000 people living within the District in June 2018, as compared with July 2016. Of this 1,000 additional residents, it is estimated that 600 have moved specifically to Feilding, resulting in strong demand for residential property in the urban area and demand for new residential dwellings. While consent numbers for new dwellings has overall increased in the last five years, there remains concern that demand will outstrip supply.

The evidence provided by historic information and current growth rates supports the need for this Plan Change to rezone more land for future residential use.

4.2 Economic demand/local business areas

The Property Economics report assessed the retail needs of Growth Precinct 4, at full development capacity. The report examined the core retail market, forecast retail expenditure and identified a sustainable retail business node for structure planning purposes.

The report identifies two markets for Precinct 4 comprising the primary and the secondary catchments. The primary catchment represents the Feilding urban area and encompasses the immediate residential market. The secondary catchment is the Manawatu-Whanganui Region. The primary and secondary markets represent the core economic market that Precinct 4 will derive market growth from.

Currently within the vicinity of Growth Precinct 4, the local retail activities include a retail strip on North Street/Andre Street comprising a Fish and Chip shop, a 4-Square superette. There is also a BP Petrol Station located on Pharazyn Street and the Makino Dairy.

The level of retail expenditure is forecast by identified markets and has been based on the LTP growth projections. Assuming that Precinct 4 reaches full capacity at 2038, the population is

estimated to be 6,800 with a household base of 2,900. (Refer Appendix 1 of the Property Economics report for a breakdown of the model and inputs).

The market currently generates annualised expenditure to sustain approximately 300m² of convenience gross floor area (GFA) which translates to 2-3 convenience stores and 1 commercial service outlet. The core market is forecast to grow to almost 1000m² GFA in 2038.

Net floor space demand has been estimated by applying sustainable retail productivity rates to forecast retail expenditure, on a sector-by-sector basis. The analysis shows that given the size of the population base, only a small convenience oriented centre (retail node) is required for Growth Precinct 4 of around 500m² retail GFA.

The report concludes that the core retail market is relatively small and localised and recommends that planning consideration is given to providing a small retail node (approximately 500m² in area). After further consideration, it was determined that the Structure Plan would not identify a location for a local business node, but leave it to the market to determine an appropriate location. The planning provisions will enable commercial activities through a discretionary activity consent framework.

4.3 National Policy Statement for Urban Development Capacity 2016 (NPS-UDC)

The NPS-UDC directs local authorities to provide sufficient development capacity in their resource management plans for housing and business growth to meet demand. The NPS contains objectives and policies which seek to ensure that urban environments have sufficient opportunities for the development of housing and business land to meet market demand.

Plan Change 51 will give effect to the NPS-UDC. The Structure Plan report serves to demonstrate the suitability of the Growth Precinct 4 for residential development proposed re-zoning of the site. Plan Change 51 and the Precinct 4 Structure Plan will promote an appropriate planning and regulatory framework land that will provide Feilding with more housing choices, into the future.

4.4 Council Engineering Standards for Land Development

The Council's Engineering Standards for Land Development (The Standards) sets out the specific requirements, guidelines and minimum engineering standards for subdivision and developments within the Manawātū District.

The Precinct 4 Structure Plan and related development planning techniques including specific engineering requirements - for example, a specific roading typology or Precinct 4 - will be referenced in The Standards. It is Council's expectation that the infrastructure in Precinct 4 will be developed in accordance with The Standards.

5. Technical Assessments

This section of the report summarises each of the technical reports and directions that have informed the development of the Precinct 4 Structure Plan. Full copies of the technical reports are included in the Section 32 Report Appendices.

5.1 Liquefaction Risk Assessment

WSP-Opus International Consultants Ltd were commissioned by Council to complete a high-level liquefaction risk assessment of the Precinct 4 growth area. This report expanded on work completed in 2013 (which covered one side of the Makino (Mangakino) Stream). The December 2017 report summarised the findings of the analysis and geotechnical testing results as:

- The ground conditions are generally uniform across the site, with clayey silt, silty clay and silty sand layers until typically 1m to 2m thick below ground level, underlain by medium dense to dense gravel layer.

- The ground conditions at the proposed expanded growth area in the Precinct 4 generally have low vulnerability to liquefaction and liquefaction-induced ground damage.
- The ground conditions at the site are more favourable than previously assumed, and the risk of liquefaction is assessed as low.

Overall the 2017 updated report recommended that:

- The less intensive land use restriction (buffer zone) adjacent to the Makino (Mangakino) Stream, to mitigate the liquefaction hazard, (identified in the initial report in 2013) can be removed.
- No residential structure should be built closer than 10m to the top of the Makino (Mangakino) Stream bank, to avoid slope stability hazards.
- The scour and erosion hazard due to Makino (Mangakino) Stream flows have not been assessed as part of this study, and should be considered further.
- Foundation requirements for the buildings should be based on the shallow soil testing such as Scala penetrometer and shear vane test detailed in NZS3604:2011 for timber frame residential structures, or similar appropriate standards during the development of the area.

These results have been incorporated in the Structure Plan through the open space extent along the Makino (Mangakino) Stream.

5.2 Land Contamination Assessment

WSP-Opus International Consultants Ltd were commissioned to undertake a site investigation and technical report (DSI) relating to 54 Roots Street, the major landholding within Growth Precinct 4. This investigation addressed NES requirements associated with the intended change in land use of the land parcel from rural production land to residential. In terms of site history, the report records and confirms that the site is used for agricultural purposes. The (DSI) report predicts that at some time in the site's history, a sheep dip or spray race has been located on this site, at test pit 2. The report records that enquiries were made to Horizons Regional Council (HRC) who advised that the land is not currently included on their HAIL database (Hazardous Activities and Industries List).

Samples were taken around the subject site and analysed for specific chemicals. The chemical analysis revealed concentrations of arsenic and cadmium above a residential (10% produce) SGV within the test pit site 2. Importantly, all other sites tested were under the levels for residential use¹. Following further testing for the area (PSI) which showed elevated levels of contamination (test pit 2), the Report found that the site is suitable for residential use and no remediation action is required.

The report and results have informed master planning for Growth Precinct 4. No technical or planning response, is required to be notated in terms of the Structure Plan nor addressed in Plan Change 51.

5.3 Archaeology Report

WSP-Opus International Consultants Limited (Opus) were commissioned by Manawatu District Council to prepare an archaeological assessment report for Precinct 4, to inform Plan Change 51. The assessment methodology included desktop research – including the NZAA *ArchSite*, and site

¹ This is consistent with the guidelines contained in:

- Appendix B: Soil contaminant standards Users' Guide National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
- Section 7: Summary of Soil Contaminant Standards and Guideline Values, Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health.

visit information. The Archaeological Assessment Report concludes that there are also no identified archaeological sites in the future development area.

5.4 Cultural Impact Assessment Report

A Cultural Impact Report was commissioned to provide technical advice on the impacts of growth precinct 4, from the perspective on Ngati Kauwhata, the local iwi. The report includes an impact assessment framework, a policy framework and a summary and recommendations.

An impact assessment framework was specifically written for the report. Called Te Putahi – the confluence, it was organised around 3 different types of wai or water, as follows:

- Wai tupuna (Ancestral waters), being the Mangakino Stream, floodwater and waste water.
- Wai Paru (Contaminated water), being stormwater, flood water and wastewater, and
- Wai Whakaaro (Conceptual waters). Two conceptual waters were identified as relevant – He Puna Oranga – a source of wellbeing and He Puna Korero, a well-being of stories.

The report records that the confluence metaphor provides a way of seeing and understanding the range of physical and non-physical effects in an holistic and interconnected way across space and time. The metaphor is used to analyse the Precinct 4 development from a Ngati Kauwhata perspective.

Key outcomes are sought in relation to the development are:

- (i) The health of the water is improved, not degraded.
- (ii) The wellbeing of the people is secured and enhanced.
- (iii) The connections of the people to the land and water are strengthened and safeguarded.
- (iv) The responsibility to future generations and to downstream iwi and communities to protect land and water is actively recognised.

The report makes recommendations regarding changing the name of the stream and associated places like the Esplanade to Mangakino. The report also makes recommendations about incorporating Maori Urban Design principles into future version of the Feilding Framework Plan and in the interim that principles based on Whakaaro Maori are used to inform Council's planning and decision making concerning Precinct 4.

The Cultural Impact Assessment report confirms the cultural importance of Makino (Mangakino) Stream and the significance of a puna (spring/drain) which feeds a tributary of the Makino (Mangakino) Stream, which enters the Growth Precinct, at Makino Road. Particular consideration will be given to the Mangakino Stream and puna in formulating the Structure Plan, and determining an appropriate planning and design response for development, in the vicinity of the Stream and Esplanade environment.

5.5 Infrastructure Services

GHD was initially engaged by the Manawātū District Council to investigate the technical requirements for 3 Waters infrastructure based on the density and form analysis conducted by Boffa Miskell, as illustrated in the conceptual spatial plan (refer Appendix 1 of this report). The 2013

report was accompanied with high level concept design layouts and cost estimates for each service indicating pipe sizing and overland flow paths.

In 2016, GHD were commissioned to carry out a review of the comprehensive concept design for the provision of essential services (3 Waters and roading), for the revised extent of Growth Precinct 4. The key design parameters specified by Council were:

- The Precinct 4 growth area shall be extended to include the undeveloped land on the west side of the Makino (Mangakino) Stream, bounded by Makino Road and Reid Line.
- The proposed stormwater system is to allow for runoff from the catchment north of the Reid Line stop bank to enter the Precinct 4 catchment via the Horizon's stopbank culverts. These culverts are closed during larger (1:30 year plus) rainfall events (Consent conditions). Allowance is to be made for climate change of 23°C.
- A new roading layout as provided by MDC.
- Precinct 4's lot sizes reduced from the 2013 spatial concept, to an average size of 600 m² per lot.

The 2016 GHD Infrastructure Report resulted in a refined concept design for servicing Growth Precinct 4, taking into account the above parameters. The report sets out the key assumptions, technical directions and recommendations for Structure Planning. The technical recommendations for the 3 Waters, are listed below:

- Water

Water reticulation for Growth Precinct 4 is based around the construction of the proposed 300 mm diameter trunk main to be installed between Kimbolton Road and Lethbridge Street. Principal mains are proposed to be 150 mm diameter mains throughout the network with the exception of no-exit roads, which will be 100 mm diameter mains. The network will have sufficient fire protection in accordance with SNZ PAS 4509, and will meet MDC's minimum pressure requirement of 250 kPa at peak demand.

The additional work that is required to upgrade existing services and connections, as growth occurs, will be investigated further and added to Council's Forward Works Programme.

- Wastewater

Growth Precinct 4 comprises 2 catchments: East and West. The concept design for each catchment and technical directions are, as follows:

Western Catchment

Precinct 4's western catchment is proposed to drain in a southern direction and tie in with the existing wastewater system at the intersection of Andrew Street and North Street, via a 300 mm diameter trunk main.

The high-level hydraulic analysis shows that approximately 260 m of the exiting trunk main along Derby Street requires upgrading to a 375 mm diameter main. The analysis conducted shows that the additional flow from Precinct 4's western catchment will bring the existing 450 mm diameter trunk main, along Awahuri Road, to its full capacity as growth occurs, and therefore it will be required to be upgraded, before the whole of Precinct 4 West is developed.

The option of directing Precinct 4's western flows to the eastern catchment was considered but was not found to be a preferred option.

Eastern Catchment

The GHD's report indicated that various pipes within the eastern catchment of Precinct 4, have to be upsized in order to meet the revised demand of the fully developed extent of Growth Precinct 4. The

existing 375 mm diameter main along Carthew Street as well as the 450 mm diameter main along Kawakawa Road, will need to be upgraded before Precinct 4 is fully developed.

The additional work that is required will be investigated further and added to Council's Forward Works Programme.

- **Roading**

As noted, a new roading layout was provided to GHD by the Council. The GHD analysis recommends that the design of the Precinct 4 stormwater mains follow the roading layout and is located within the road reserve, at the standard location of 3m from the boundary. The subdivision's roading network is proposed to form a series of overland flow paths conveying any secondary flow to the Makino (Mangakino) Stream or the existing piped network along Pharazyn Street. The management of stormwater and floodwater is further discussed in section 5.4 below.

To ensure an integrated, multi-modal transport network for Precinct 4, it is proposed that two vehicle bridges are constructed to cross over Makino (Mangakino) Stream at Port Street and Root Street. A cycle bridge is also proposed to cross over the Makino Stream, further north.

5.6 Stormwater/Floodwater Management

As noted in the previous section, the revised design parameters included reduced subdivision lot sizes of 600 m², flows from the Horizon's stopbank culverts, and climate change of 2.3 °C

Stormwater runoff associated with Precinct 4's western catchment is proposed to be discharged into the Makino (Mangakino) Stream at Proposed Road 2 West, Root Street West and Port Street West. The additional flow to be added to the Makino (Mangakino) Stream due to development for the 1 in 10-year event is estimated at 3 m³/s and 5.2 m³/s for the 1 in 100-year event. The report records that the proposed roading layout is sufficient to convey overland flow, while pipe sizes up to 1350 mm diameter are expected along Proposed Road 2 West.

Stormwater runoff associated with Precinct 4's eastern catchment, west of Pharazyn Street, is proposed to drain to the Makino (Mangakino) Stream. The main overland flow paths are along Proposed Road 2 East, Root Street East and Port Street East. In order to convey overland flow without ponding heights reaching boundary levels, the concept design includes the deduction in RL of Port Street East by at least 35 mm. Pipe sizes up to 2100 mm diameter are expected along Proposed Road 2 East, 1650 mm diameter along Root Street East and 1500 mm diameter along Port Street East.

Stormwater runoff associated with Precinct 4's eastern catchment, east of Pharazyn Street, is proposed to drain to the Oroua River. The GHD review indicates that the existing piped infrastructure along Pharazyn Street is undersized to cope with a 1 in 10-year event. The recommendation is that the excess overland flow will be conveyed overland by Pharazyn Street, however the section between Sherwill and Arnott Street needs further investigation, as the capacity of that section is not sufficient to convey the required flows. The additional work will be investigated further and added to Council's Forward Works Programme.

Additional relevant information regarding the management of stormwater relates to the Kawakawa Road Detention Area and Horizons Regional Council improvements to the Reid Line Floodway, and is summarised below:

- **Kawakawa Road Detention Area**

A stormwater detention and retention facility will be constructed at Kawakawa Road. This is considered to be a more efficient and effective option than providing a number of smaller facilities (with the attendant operational and maintenance costs involved) in Growth Precinct 4 and is also preferred to reliance on low impact techniques for stormwater management. The retrofitting of stormwater infrastructure in existing parts of the network will be undertaken by Council, in response to growth rates.

The stormwater overland flow paths are recognised and identified for specific consideration at the time of subdivision consent.

- **Horizons Regional Council - Reid Line Floodway**

Horizons Regional Council's Long Term Plan 2018-2028 (LTP) sets out a 7 year programme relating to the upgrade of the Reid Line Floodway. The Programme gives effect to the One Plan's regional flood hazard management policy direction (Protection in the 1 in 200 year flood event).

The LTP states "The Reid Line Floodway is an important component of the Lower Manawātū Scheme, keeping Feilding safe from Mākino Stream flooding. While it has generally worked well, we're concerned that it may not be as effective as it should be in a large flood. Those concerns relate to our experience of the Mākino Stream and the speed that flood flows can be generated, the rate that Feilding is growing out toward the Floodway, and the significant operating limitations that exist associated with the floodway being comprised of privately-owned land".

The LTP programme relating to the Floodway, outlines the Regional Council's intention to provide Feilding township with a 200-year return period flood protection standard and plans to divert flood flow more frequently along the Floodway, enlarge its capacity and stop bank works. This will require the Regional Council to purchase some or all of the private land in the floodway, re-contouring the Floodway to remove the stream culverts that pass through the floodway stop bank and increasing the stop bank height. The Reid Line Floodway upgrade makes allowance for climate change.

The LTP further states "This proposal complements work that the Manawatu District Council have underway, re-zoning rural land between Feilding and the floodway for residential development and allowing Feilding to continue to grow".

The programme has been costed at \$7.6 million (depending on how much of the floodway corridor is purchased) with a 7-year implementation timeframe commencing from Year 1 (2018/19). The work will be loan-funded, repaid over a 15-year period primarily (80 per cent) through an increase to the targeted flood protection rate applied to Feilding, with the balance from the Region-wide river and drainage rate.

Alternatives to an upgrade of the Reid Line Floodway were assessed by the Regional Council and found to be more complex and expensive (for example, stop banking through Feilding). In their view the risks are sufficiently large that taking no action is not considered a feasible option.

Due to the Horizon's LTP Programme and proposed future works, the Manawatu District Council is intending to implement the proposed Kawakawa detention pond works, post year 5 (2023/2024).

- **Stormwater Modelling - Overland Flow Paths – Precinct 4 minimum floor levels**

WSP-Opus International Consultants Limited (Opus) were commissioned by the Manawatu District Council to develop a stormwater model and provide technical advice on minimum floor levels for housing development within Growth Precinct 4.

Stormwater modelling was undertaken to accurately determine the minimum floor levels for buildings. The stormwater model was developed using a rain-on-grid approach. The model routes the run-off from the applied rainfall overland to the stormwater network, and overland flow as a result of flooding from the stormwater network. Overland flow paths can therefore be determined using the outputs from the stormwater model. The results of the Precinct 4 overland flow path GIS processing was Figure 3.1 (below) which shows the overland flow paths within the Precinct 4 area. The modelling analysis results and key recommendations have informed the rules framework for land use and subdivision in Plan Change 51.



Figure 3-1: Overland flowpaths within Precinct 4, Feilding

- **Feilding Flood Modelling – Precinct 4**

WSP-Opus International Consultants Limited (Opus) were commissioned by the Manawatu District Council to undertake two – dimensional flood modelling for Precinct 4. The purpose of this report was to further understand the flood hazard issues in Growth Precinct 4 and to help determine the proposed minimum floor levels.

A number of observations been made from the results of the modelling analysis, in addition to the results output information. Key observations were:

1. The model indicates that some of the runoff from Precinct 4 does not arrive at the road or stormwater infrastructure, and instead ponds on adjacent land. The model outputs show areas where additional infrastructure may be required to drain these areas and therefore reduce the flood levels.
2. The proposed stormwater pipe network is functioning as designed, with the roads acting as a flowpath. There are some locations where the results do not show conveyance along the roads, however it should be noted that the results only show depths greater than 50mm. The 2-D model has therefore provided further confidence that the designed pipe sizes are sufficient to convey large flows.
3. The results of this analysis show that proposed changes to the drainage as part of the Precinct 4 development provides benefits to Feilding (to the south of the proposed development) by reducing the flood hazard. Surface water runoff is predicted to be intercepted and diverted to the Makino Stream rather than continuing overland to the Feilding township.

4. In some areas within Precinct 4, flood levels increase as a result of the development and in some cases they decrease. The results show the areas that are predicted to experience changes as a result of the development. The modelling analysis provides further confidence in the stormwater infrastructure design for Precinct 4, and shows wider benefits to Feilding.

Consideration of freeboard

Opus has recommended consideration of the alternative flow scenarios as a means of reducing uncertainty around flood levels. For example, uncertainty associated with the staging of development, manual operation of the Makino flood diversion scheme and the hydrological conditions of the overall site.

Consideration of alternative scenarios, calibrated with past flood events, assists in providing reasonable justification for the chosen allowance for freeboard. The Opus report recommends that the freeboard be applied to the flood level and not ground level. Historically, MDC has applied a freeboard value of 350mm above current ground level.

The maps produced show the water levels predicted by the model for the 'Existing' and 'Proposed' scenarios throughout Precinct 4. These are provided in Wellington Vertical Datum 1953 and exclude freeboard.

As a result of further consideration of the policy direction in the Horizons Regional Council's One Plan, and legal advice, the proposed rule framework in Plan Change 51 will be to require a 500mm of freeboard above the 0.5% AEP modelled flood level. The freeboard requirement will be specified in a consent notice attached to any new lots created by subdivision.

Parks and Reserves Planning

Council's Parks and Property team have undertaken research and investigations to ensure that sufficient, high quality open space is provided and set aside prior to residential development. The summary investigations and strategic directions for parks and open space in growth Precinct 4, are set out below. (Refer also to Map 7.2 – Precinct 4 Ultimate Development Pattern)

- **Rimu Park**

Rimu Park is located at the eastern edge of Growth Precinct 4. Rimu Park is a 3.5 ha recreation reserve and located on the southside of Root Street West. It is classified as a Recreation Reserve. Rimu Park provides opportunities for active recreation in the small residential neighbourhood. It has two playing fields but little supporting infrastructure in the way of changing rooms, public toilets. This reserve type is generally acquired through subdivision or to meet open space needs in a suburban neighbourhood.

Rimu Park isn't well utilised by the sports community nor local residents. Some possible reasons for this are that it is too small to be a significant sports park, due to only having two fields, or it is oversized for a neighbourhood park. As noted, it is underdeveloped in terms of infrastructure required for sports parks, clubrooms, changing rooms, public toilets. The recent District-Wide Sports Facilities Review (2018), carried out by Visitor Solutions did not support future investment at Rimu Park.

As part of the planning and investigations for Precinct 4, Council's Parks and Recreation Team recommend that Rimu Park is relocated, a short distance, so it is positioned alongside the Makino (Mangakino) Stream Esplanade Corridor and can directly link into Feilding's green network. Council is proposing further future investment in the relocated Rimu Park, to serve the recreational needs of wider neighbourhood locality.

- **Proposed Makino (Mangakino) Stream Esplanade Corridor**

The Council's proposal is to extend the green network linkage from James Palmer Park northward into Growth Precinct 4, by creating a feature Esplanade Corridor along the Makino (Mangakino) Stream. The Makino (Mangakino) Stream Esplanade Corridor provides Feilding with a new, and

unique recreational asset. The Esplanade Corridor will provide a vibrant connection to water and access points, and for the community to connect with the stream catchment.

- **English-style Commons**

In response to community feedback and recent national research on open space trends, the Parks and Recreation Team are proposing to provide a 1ha English-style commons on the eastern end of Roots Street. The Commons Park will provide a smaller, more intimate open space experience. Future park investment in key assets will likely include a large open space for play and some level of playground/recreation provision, such as basketball half courts and play equipment. Generally the Commons Park will receive a standard level of development and maintenance (but not to the extent of a high quality sports fields).

- **English Oak (Tree with Heritage Value)**

The Council's Parks and Recreation Team provided specialist advice on the landscape character of the Growth Precinct 4 and the existing vegetation cover. The key findings are detailed in the Landscape and Vegetation Assessment Report, dated 9 November 2018. A combination of site visits and aerial map assessments were used to understand and characterise the landscape environment and existing amenity values of Growth Precinct 4. Information about the topography, vegetation cover and recent cultural landscapes, formed the baseline for the assessment of how the type of development would impact on the existing amenity values, the natural character of the adjacent rural environment and the surrounding outstanding natural landscapes. Significantly, the Report records that Makino (Mangakino) Stream and the views out to the western hills and downlands and to the Ruahine Ranges contribute to outstanding macro landscape values for Growth Precinct 4.

The assessment found that the landscape context, characteristics and values for Precinct 4 generally reflects the recent 100 year plus rural farming practices of the district. The vegetation cover assessment identified a prevalence of pasture and conifers, which are commonly planted for stock shade and shelter, and only a few groups of trees, or significant trees, within Growth Precinct 4.

The assessment concludes that the potential for rural character to be changed as a consequence of the proposed development is high, but not significantly detrimental, as future residential development typically results in a much broader range and extent of plantings, albeit less canopy trees. The assessment predicts that people will tend to plant fewer canopy trees on urban properties and overall there is likely to be a lower, visual tree line.

The Landscape and Vegetation Assessment Report identifies a pair of English Oaks (*Quercus robur*) located adjacent to Makino Road which exhibit good form and health and have significant scale and landscape presence. The pair of Oaks also have an association with a wider grove of Oaks on the northern side of Makino Road. The reporting officer recommends that the Oak trees have formal protection in the District Plan. The report also recommends that a stand of poplars on the boundary of Arnott Street, be further investigated.

Structure Plan Land Use Features

5.7 Residential land use

The proposed land use is intended to be residential to address the shortage of long term housing growth options in Feilding. The majority of the land within Growth Precinct 4 should be re-zoned via a plan change to Residential. The exception being the land adjacent to the Makino (Mangakino) Stream which should be rezoned Recreation, and sits alongside the existing Flood channel 2 zone. The land comprising the existing Rimu Park site is proposed to be rezoned Residential, although the current use as a park, will continue for some time into the future, until the completion of the separate process to relocate Rimu Park.

Areas for recreation are provided for within the Structure Plan and can remain as open space or landscaped to provide enhanced recreational and ecological amenity value. Given the proximity to other residential areas and the manner in which infrastructure can be provided, residential use is considered to be the most efficient and practical use of the land contained within the study area. As noted in the Property Economic report, an area of approximately 500m² will be required in future to meet local convenience retail needs. The location of this future retail node has not been identified on the Structure Plan, as this is best left to the market to determine.

5.8 Residential density / lot size

The Structure Plan assumes a minimum lot size of 600m² which aligns to market demand trends in Feilding, for larger residential lots, and will facilitate a secure, long term residential land supply to meet projected growth rates. The proposed lot size is also an appropriate size to facilitate some on-site permeability and achieve overall objectives for stormwater/floodwater management in Precinct 4. The 600m² lot size is supported by the GHD Report. To minimise the effect of stormwater flooding, design controls are introduced require development to provide an appropriate permeable surface area.

To support the integrated and comprehensive urban development of the Growth Precinct 4 it is consequentially proposed that the Feilding Nodal Overlay is removed through Plan Change 51. This strategic planning direction gives effect to the Feilding Framework Plan, which is Council's adopted Growth Strategy, and is well supported by comprehensive research and technical investigations dating from 2012 through to the reporting for Plan Change 51 and the s 32 Report. The rapid increase in market demand for housing in Feilding strongly supports the imperative to progress higher density urban development in Precinct 4 and the removal of the Feilding Nodal overlay.

5.9 Existing parcels

The proposed roading layout and future development scheme shown in the Structure Plan has sought to incorporate and integrate existing, well-established rural residential properties and dwellings, to enable future development of area in the most effective manner. The layout is sympathetic to these existing residential properties.

The Structure Plan roading configuration extends the existing, overall grid-pattern found throughout Feilding, and seeks to minimise the use of cul-de-sacs.

5.10 Consenting requirements

Developers who undertake subdivision within the Growth Precinct - in accordance with this Structure Plan - will need to consider the requirements of the Operative District Plan and Horizons One Plan (or any subsequent Regional Plan) which contains regulations with respect to earthworks and land disturbance. At the time of the drafting of this report, a Land Use consent was required for land disturbance (as well as other standards), and Erosion and Sediment Control Plans are required to be prepared for land disturbance requiring a Land Use consent.

Consideration of the earthworks rules in the Operative Manawatū District Plans will also be required.

A new regulatory framework is proposed for residential development to ensure high urban design outcomes in Growth Precinct 4 and importantly, includes controls on the height and scale of buildings, and the design of garages and fences to encourage active street frontages.

6. Development Contributions and Infrastructure Phasing

This section sets out the key assumptions for Structure Plan implementation.

6.1 Development staging (blocks)

Due to the large area of land being considered for residential development, it is acknowledged that the entire area will not be developed at one time. The stages and direction of development will depend, in part on the timing of infrastructure provision which is programmed in Council's Asset Management Plans. More specific detail around the infrastructure programme and roll out, can be found in Council's Infrastructure Strategy. These two documents work together to signal to developers and the wider community where infrastructure is already in place and where new construction is required to enable subdivision. The guiding documents will be updated over time and recognises that the Growth Precinct 4 area is intended to provide residential supply for a 20-30 years period.

It is noted that development of the northwestern portion of Growth Precinct 4 area relies on new road linkages. Either road or pedestrian bridges are required to create connections across the Makino (Mangakino) Stream.

6.2 Key infrastructure projects and development contributions

The following key infrastructure is identified as being directly attributable to growth and likely to require development contribution and/ or Council implementation ahead of development of all benefiting sections, in order to implement this Structure Plan:

- Stormwater
- Land acquisition along Makino (Mangakino) Stream
- Upgrade of 3 Waters infrastructure
- Existing road intersection upgrades
- Designation of key Collector and local road linkages
- Bridge connections
- New walkways

7. Structure Plan Development – Network Layer Analysis

A Network Layer Analysis was been undertaken to assess urban design and connectivity of the proposed Structure Plan. This process ensures optimal connectivity in the design and location of key networks such as principal transport linkages, open space and stormwater systems.

The Blue Network

The Blue Network refers to the system of water, wastewater and stormwater facilities (including pipework, detention basins, wetlands, and swales) and includes existing natural and physical resources including the Makino (Mangakino) Stream and the surface water system (overland stormwater flow paths). The Blue Network analysis will investigate and confirm how the 3 waters will be managed and how it meets quality and quantity objectives and legal requirements.

The Blue Network seeks to recognise and protect the qualities and values of the Makino (Mangakino) Stream and its tributaries, which is a defining physical feature and situated on the eastern side of Precinct 4. To enhance the characteristics and values of the Makino (Mangakino) Stream, and preserve the natural environment, landscape and recreational opportunities presenting, it is recommended that the Blue Network is developed to complement the Green Network, thereby creating a blue-green corridor as a central and defining feature of Growth Precinct 4.

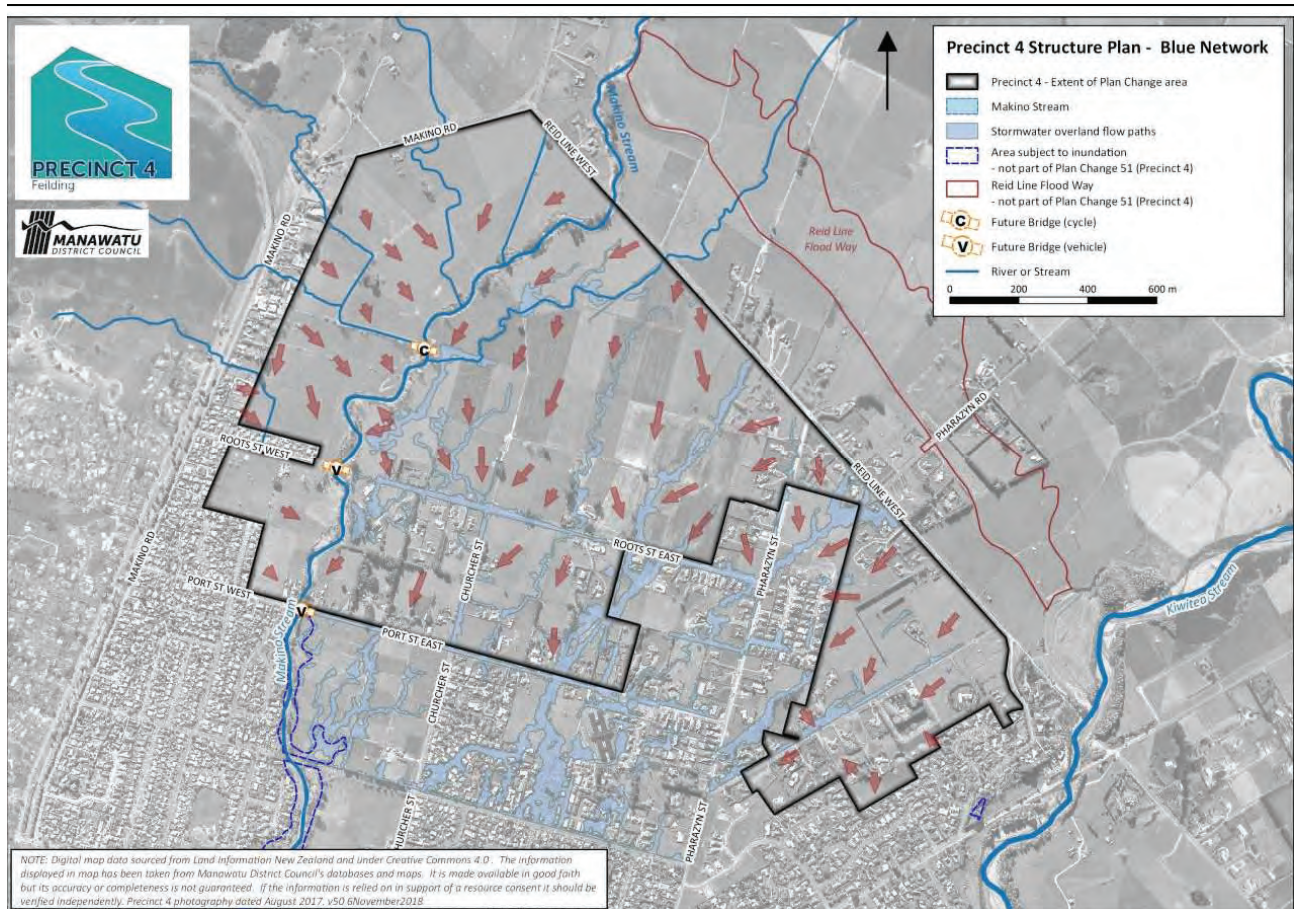
The infrastructure network needs to recognise the local or physical conditions of the environment within the Growth Precinct 4 area, its situation within the wider integrated network, and beyond that, the wider floodplain environment. Best engineering practice has been adopted to address potential hazard risks from flooding and stormwater. A predominantly engineered approach (pipework) is considered appropriate for managing flooding and stormwater associated with the wider floodplain

environment. The ultimate design of the Blue Network design utilises the collector roading network and a retention facility. A larger sized stormwater detention and retention facility will be constructed at Kawakawa Road and is considered to be a more efficient and effective option than providing for a number of smaller facilities (with the attendant operational and maintenance costs involved) and is also preferred to reliance on low impact techniques for stormwater management. The retrofitting of stormwater infrastructure in existing parts of the network will be undertaken by Council, when necessary, in response to growth rates.

The stormwater overland flow paths are recognised and have been identified for specific consideration at the time of land use and subdivision consent.

Two vehicle bridges are proposed to cross over Makino (Mangakino) Stream at Port Street and Root Street. These bridges will require consents from the Regional Council. A cycle bridge is proposed to cross over the Makino Steam, further north. These bridge connections will play a pivotal role in completing an integrated, multi-modal transport network for Growth Precinct 4.

The Flood Channel 2 zone is being retained, and is unchanged.



The Green Network

The Green Network refers to the system of public reserves and open spaces provided throughout Growth Precinct 4. The public spaces being proposed in Growth Precinct 4 offers residents a range of amenity and recreational experiences.

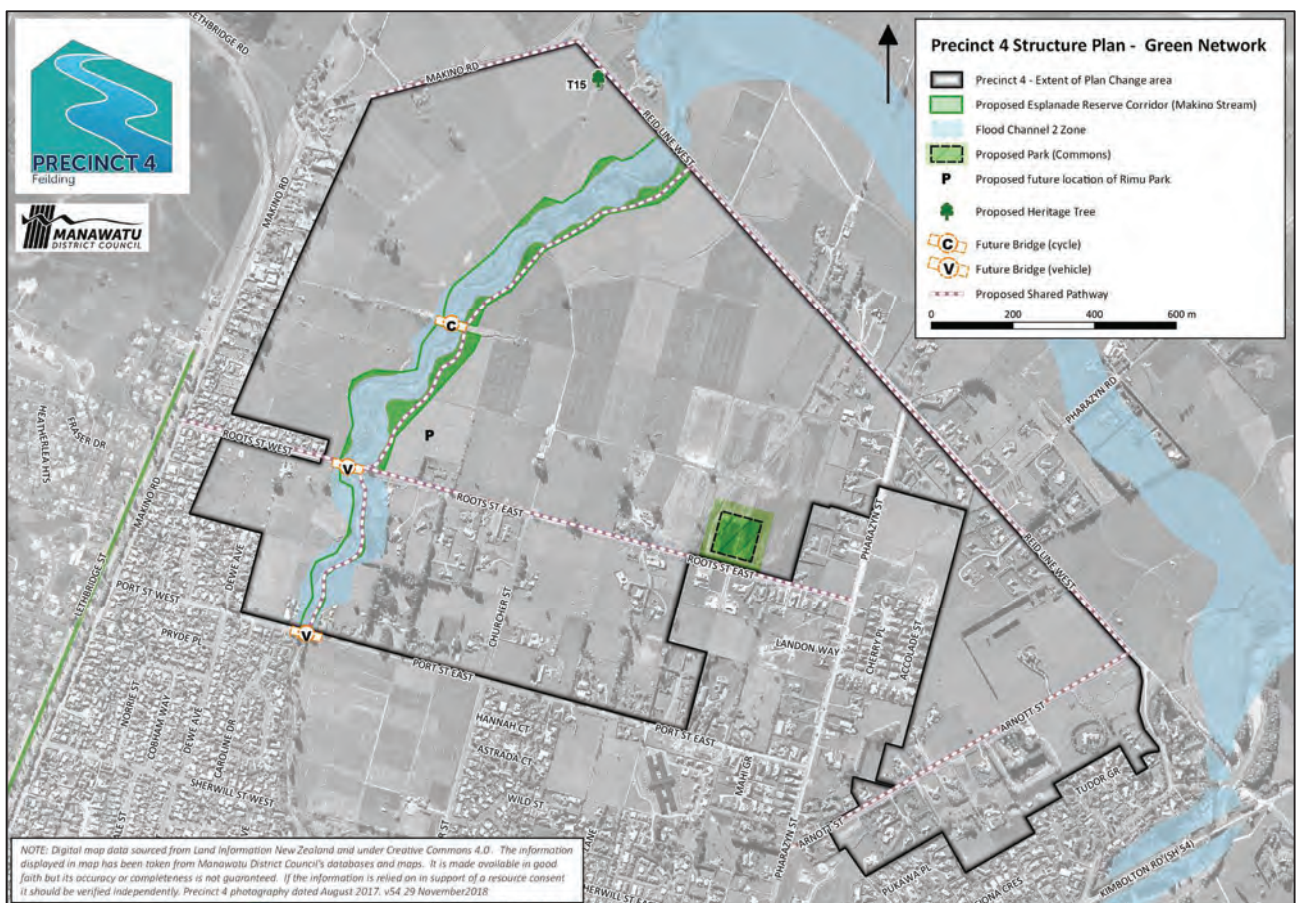
The proposed Makino (Mangakino) Stream Esplanade Corridor will act as a new greenspine and provides important linkages, in terms of access and connection, to the wider Movement Network in Feilding. The shared pathway (also referred to as the Pharazyn Street Walkway) on the eastern bank of the Makino (Mangakino) Stream will provide a pedestrian and cycling track from Port Street East up to Reid Line West and east-west connections onto the local street network at Roots Street and the new un-named road.

The location of the parks and reserves within Growth Precinct 4 means that most residents will be within easy walking access to the green spine corridor or recreation open space in accordance with Council’s Green Network objectives (as envisaged in the 2006 Open Space Framework and the 2013 Feilding Urban Growth Framework). The proposed English-style commons on Roots Street East will provide a high quality open space for residents and responds to strong public interest for a small local neighbourhood park.

The Green Network seeks to recognise and protect existing natural and cultural heritage features within the area, the most significant being the Makino (Mangakino) Stream and tributaries. It is proposed that the riparian environment be developed as a linear Esplanade Corridor. This management approach enables the existing natural environmental amenity, including the exotic and indigenous vegetation, riparian plantings and special ecological habitats, to be retained and enhanced. This planning proposal also contributes to the Blue Network’s freshwater objectives.

Some land within the Makino Esplanade Corridor, in the immediate vicinity of the Makino (Mangakino) Stream, includes land where ground treatment and specific foundation design is required for any buildings and structures. Accordingly, a no build setback (10m) from the stream edge for any buildings and structures is proposed and identified on the Structure Plan.

The Council also plans to undertake a Land Exchange and Development programme, in relation to Rimu Park, as permitted by the Reserves Act 1977. The proposal is to purchase land adjoining the Makino (Mangakino) Stream to exchange with the existing 3.5 ha at Roots Street. Proposed development includes relocating the playground from the existing park to the re-located Rimu Park, with further minor development proposed. More significant upgrades of the new Rimu Park will follow in subsequent years, including provision of a walkway, drainage, seating and plantings.



The Movement Network

The Movement Network refers to the system of public roads, cycleways, pedestrian pathways, public transportation infrastructure which collectively provide multi modal transport connectivity and linkages with surrounding areas. The roading hierarchy proposed for Growth Precinct 4 is a logical extension of

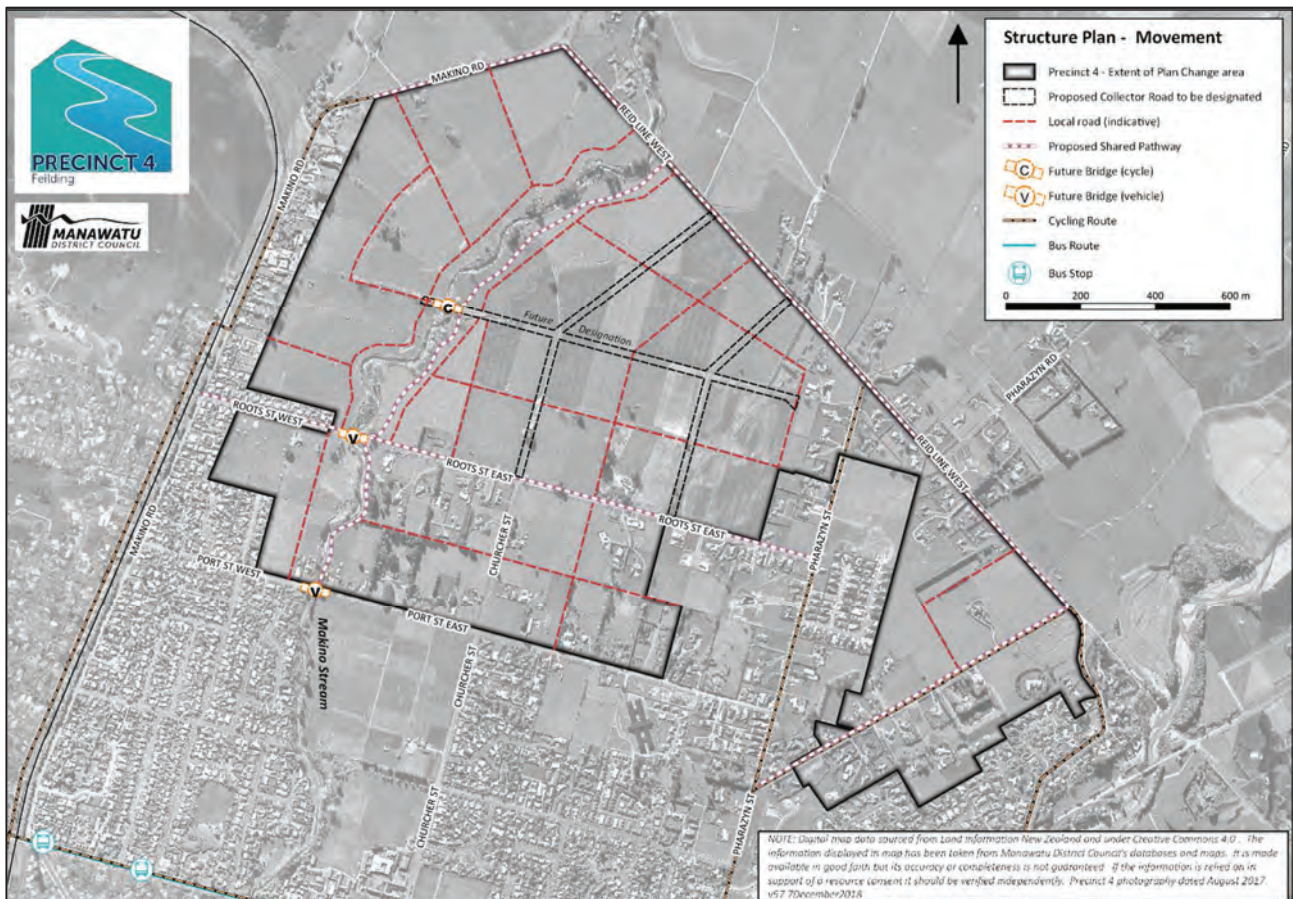
the rectilinear grid-pattern collector road network which presently exists within Feilding. The proposed network of local streets supports the higher order block structure and also responds sensitively to the existing natural and physical features, in particular the Makino (Mangakino) Stream and its tributaries. In this locality, the local street network provides a physical edge to the built development (housing area), whilst allowing for movement and travel along the shared pathway and the length of the Esplanade Corridor. Here, the proposed roading system has a strong correlation with the Green and Blue Networks, especially for pedestrian and cycleway linkages. Appendix 3B of the Operative District Plan shows the cross sections for Collector and Local Roads which will be constructed within Growth Precinct 4. A new Collector Road Typology is proposed for Growth Precinct 4 and will deliver a high standard of urban amenity to the residential neighbourhood.

Two vehicle bridges and a cycle bridge are proposed to cross the Makino (Mangakino) Stream and will significantly improve network connectivity within Precinct 4 and on completion will deliver a comprehensive and integrated road network for Feilding.

Further roading investment will be required in terms of upgrades to key road intersections, as residential development proceeds. The Traffic Impact Assessment Report commissioned for Growth Precinct 4 states that development will add extra pressure to the North Street, State Highway 54 intersection. After advocacy to the NZ Transport Agency (NZTA) the upgrade of the North Street/Kimbolton Road intersection has been included on NZTA’s low-cost, low-risk work programme. Council will continue to undertake regular monitoring of key intersections as recommended in the Traffic Impact Assessment Report.

The shared pathways and high quality linkages proposed will promote efficient and effective active movement and travel along Roots Street, Makino Road, Reid Line West and Arnott Street.

The roading hierarchy, green linkages and pathways will promote and enhance public access to the Makino (Mangakino Stream) and connection to the Stream catchment, and enable important cultural values and practices to be conducted.



Community Network

The Community Network refers to the community infrastructure, such as education and community facilities. It also extends to consider other valuable social, cultural and historical assets and infrastructure that help to foster and strengthen communities, build identity and assist integration into the wider neighbourhood.

The neighbourhood is well served with existing education and community facilities, which will be able to be accessed by new residents. The Feilding High School is located on the southern boundary of Precinct 4, at Port Street East. There are a number of primary schools in walking distance including North Street, Lytton Street, and Manchester Street schools. There are also a number of pre-school and kindergarten facilities including Northend Playcentre, Gail's Childcare Centre and the Pitter Patter Education Centre. Feedback from officials at the Ministry of Education confirms that there is sufficient capacity within the existing school network to accommodate the predicted growth and all schooling needs.

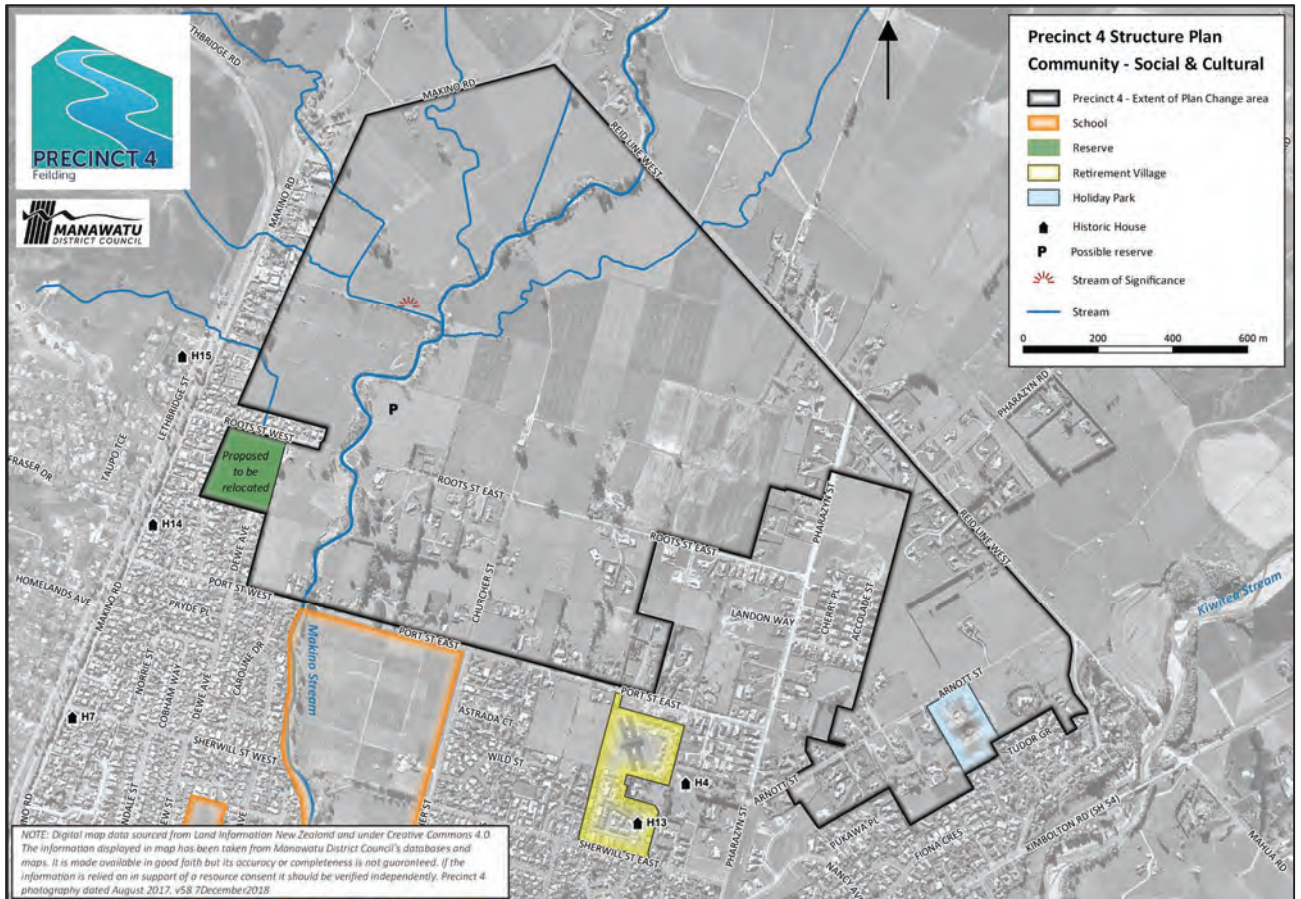
The popular Woodlands Retirement Resort and hospital is located on Port Street East on the southern edge of Precinct 4. A very short distance away is the Feilding Health Centre – an integrated health hub.

The Knox Community Church is located on Port Street East and provides a community focal point. Its offers Sunday services for church members and chaplaincy support. The site and buildings have also been regularly used by other groups. Church leadership are focussed on future plans, as a number of their buildings are earthquake prone.

In time, a local neighbourhood convenience centre will establish and provide for the day-to-day needs of the residents. This will lessen the number of vehicle trips to reach services. The Structure Plan does not identify a future indicative site for a retail node, rather this is left to the market to determine what is a viable location and the form of the retail offering. The District Plan will establish a planning framework for retail and commercial activities and require a high standard of design, amenity and visual character for commercial activities, when viewed from the street and neighbouring residences.

Close to Growth Precinct 4 are a number of buildings with historic heritage values. There are no buildings of cultural or historic value in the Growth Precinct that need to be recognised in the development of the Structure Plan. There are also no identified archaeological sites according to the Archaeological Assessment Report. A Cultural Impact Assessment report has confirmed the importance of Makino (Mangakino) Stream and the significance of a puna (spring/drain) which feeds a tributary of the Makino (Mangakino) Stream, that enters the growth area, at Makino Road. Consideration will be given to this drain in the development of the Structure Plan, and determining an appropriate planning and design response.

The roading network of collector streets and roading typologies will deliver a strongly connected and well-integrated community. The transport corridors will also offer high amenity footpaths and specimen plantings in the berms, creating a very pleasant streetscape and residential amenity character. These plantings will provide a green connection to the Esplanade Corridor and the neighbourhood parks and open spaces.



7.1 Summary Conclusion

The proposed Structure Plan aligns with the overarching design principles set out in the Feilding Framework Plan.

Context

The Draft Structure Plan promotes an overarching vision for Growth Precinct 4 and a managed approach for its future urban development which is economically sustainable. The Structure Plan achieves an integrated approach to the urban planning and design for local neighbourhood connections in regards to infrastructure, major collector roads, open space network and environmental corridors, pedestrian and cycle networks, the local street network and land use. The Structure Plan promotes an appropriate zoning strategy: residential and recreation. The Flood Channel 2 zone will be retained.

Character and Identity

The Structure Plan promotes a unique amenity character and identify for Precinct 4. It takes into consideration the natural and heritage features in the area and utilises them as part of the identity of the place.

The Structure Plan will support the restoration and enhancement of the Makino (Mangakino) Stream and the riparian corridor. The Makino (Mangakino) Stream also provides an important physical framework shaping the design of two distinct but interconnected neighbourhoods in the Growth Precinct. The recreation zoning and management will preserve the significant character of the natural environment (biodiversity, habitat) by recognising this environment, and establishing a planning framework for its future development as an Esplanade Corridor.

The urban form responds to the natural hydrology of the area. The supporting infrastructure is efficiently and sensitively designed across the growth areas to manage stormwater run-off and flooding risk by implementing a continuous chain for stormwater management. The larger lot size is a design

response to the site's environmental conditions and the requirement for occupied buildings to meet minimum floor levels avoids flood risk from stormwater.

The Structure Plan provides a number of neighbourhood focal points or where people can meet and socialise. The key focal points are the English-style Commons on Roots Street, the relocated Rimu Park and the lineal Makino (Mangakino) Stream Esplanade Corridor which runs north south through the Growth Precinct 4. The shared pathway will bring connections along its perimeter and along Roots Street.

Connections and Networks

The grid pattern and form of streets will promote the efficient flow of traffic and its distribution through the street network. The roading network will enable good connections to surrounding neighbourhoods as well as to local destinations such as Feilding High School, the Feilding Health Centre facilities and the town centre. The proposed roading hierarchy will enable people to use various transport modes be it cars, public transport (buses), walking or cycling. The local street network will promote accessibility, reduce vehicle trips for short distance movements, and promote an active and healthy lifestyle. The roading hierarchy provides for a range of street typologies, which recognise different journey patterns and destinations. For example, collector roads for north/south bound trips and local roads in the vicinity of the Makino (Mangakino) Stream residential neighbourhoods. The proposed shared pathway provides high quality linkages for active movement and travel. The pathways will enhance social interaction and community well-being.

The Structure Plan recognises the waterways, flood risks and overland flow paths across the growth area. The development of the Makino (Mangakino) Stream Esplanade creates an important blue/green corridor network for residents, local iwi and visitors to experience and enjoy.

Open Space Networks and Community Amenity

The Structure Plan provides for different types of open spaces and recreational opportunities. This diversity will enhance recreational opportunities, social interaction and community wellbeing. The development of the an Esplanade Corridor around the Makino (Mangakino) Stream will enhance neighbourhood amenity and identity, and long term ecological biodiversity. The recreational activities include active open spaces (walking and cycle track in the esplanade corridor), a local neighbourhood park and passive open spaces and various linkages and pathways. A park or open space is provided within 5 minutes walking distance to the majority of residents. The proposed public open spaces will be safe and comfortable for public use.

The Structure Plan recognises that there are existing community amenities and facilities nearby. No new community facilities and amenities are proposed. In time, it is proposed there may be a carpark and public amenities (toilet) at the re-located Rimu Park.

The Structure Plan promotes the sustainable management of stormwater. The urban form and roading layout responds to the natural hydrology of the area and the supporting infrastructure seeks to minimise urban water run-off and flooding by implementing a continuous chain for stormwater management, including: on-site permeability performance standards for residential lots, promoting conveyance along overland flow paths, installation of piping conveyance along Collector Roads, and downstream control at Kawakawa Road (passive stormwater detention system in an open space).

The Structure Plan will promote neighbourhoods, public spaces and buildings which follow the principles of passive solar design. The grid block development pattern for residential housing supports community health and well-being.

Neighbourhood and Building Design

The new residential area will integrate well into Feilding. The rectilinear grid block pattern is an extension of the existing urban form and promotes a large lot residential character, which is similar to the existing residential environment in Feilding. The lot layout and density character will promote lots averaging 600m². The block pattern is an adapted rectilinear grid and allows for northward orientation

of sites and buildings. The block pattern and local street is designed to respond to the Makino (Mangakino) Stream, allowing future development to face onto the Stream and consistent with good urban design and CPTED principles.

The pattern of development will allow for lots of different sizes, a range of dwelling sizes, and the ability to accommodate different household sizes (including greater density formats), through a consent framework. The planning rules will therefore provide opportunity for housing to meet the different lifecycle needs of residents and affordability factors.

The Structure Plan provides a number of neighbourhood focal points or where people can meet and socialise. The key focal points are the English-style Commons on Roots Street and the lineal Makino (Mangakino) Stream Esplanade Corridor which runs north-south through the Growth Precinct towards James Palmer Park. The Structure Plan will promote neighbourhoods, public spaces and buildings which follow the principles of passive solar design.

The Structure Plan seeks to retain the significant character of the natural environment (biodiversity, habitat) by recognising and protecting the Makino (Mangakino) Stream and riparian corridor. The planning provisions seek to avoid adverse impacts to the Stream-edge rural activities and to existing activities in the neighbourhood.

Conclusion

The opportunities to achieve well integrated development across the growth area have been identified in the design process and translated into the final Structure Plan. The assessment of the blue, green, movement and community networks demonstrates that there is good connectivity in the overall design of Growth Precinct 4 and that the planned growth area will be well-integrated into Feilding. The network layer analysis has ensured that the relevant, salient design elements (including key infrastructure projects) are appropriately referenced within the Precinct 4 Structure Plan and addressed appropriately in the regulatory planning framework: Plan Change 51.

The Structure Plan will contribute to achieving a high-quality liveable residential area having a high environmental quality. The Structure Plan facilitates:

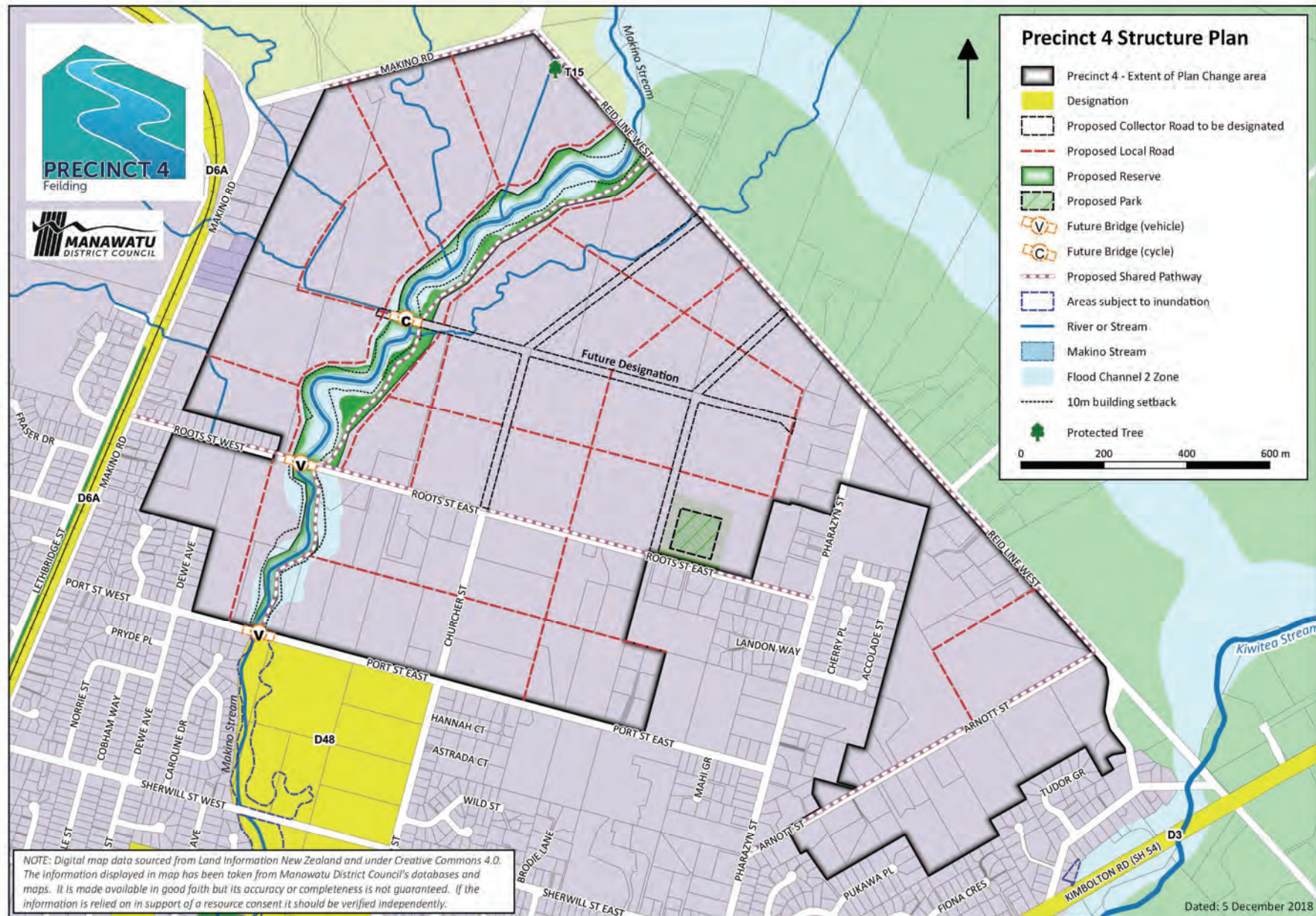
- Good quality urban design outcomes for all residential development.
- A residential density which ensures efficient and sustainable urban development.
- Good linkages within and to existing residential development and other community facilities. The block pattern and roading layout seeks to avoid the creation of cul de sacs, private rights of way, as access to back sections, as far as possible.
- Development which complements and does not adversely affect the amenity, recreational and ecological values of the Makino (Mangakino) Stream and adjoining esplanade corridor.
- Safe and efficient linkages for public transport, vehicles and active modes of transport (pedestrian and cycling) which are pleasant and work with the natural landform.

The Structure Plan recognises and provides an appropriate planning response for:

- Tangata Whenua's traditional and contemporary relationship with land and water, and in particular the Te Aranga design principles, in the future design and development of Council's public realm spaces.
- The geotechnical characteristics of the land. Controls apply in the vicinity of the Makino (Mangakino) Stream to ensure the location and design of buildings, structures and infrastructure is appropriate, and as far as possible works with the natural landscape.

- Stormwater management across Precinct 4. The proposed management system combined with directive planning rules and standards (minimum floor levels) will ensure that Precinct 4 is resilient with neutral environmental effects, to surrounding areas beyond the Growth area.
- Retail needs of residents. The planning rules ensure that the convenience needs of the growth area can be provided into the future. The planning provisions seek to ensure that commercial retail activities are provided centrally, preferably adjacent to public open space, located on a public transport route and building design will achieve a high standard of amenity and visual character when viewed from the street.

7.2 Precinct 4 - Ultimate Development Plan



8 Recommendations

8.1 Suitability for Residential Development

The Structure Plan Report has investigated the relevant, determinative factors affecting the urban development of Precinct 4. Based on the research, design assessment and conclusions reached in this report, the rezoning and development of the Growth Precinct 4 for residential development is considered appropriate. Residential development undertaken in accordance with the proposed Structure Plan should result in a high quality and desirable new residential area for Feilding. The Structure Plan gives appropriate recognition to natural hazards and climate change.

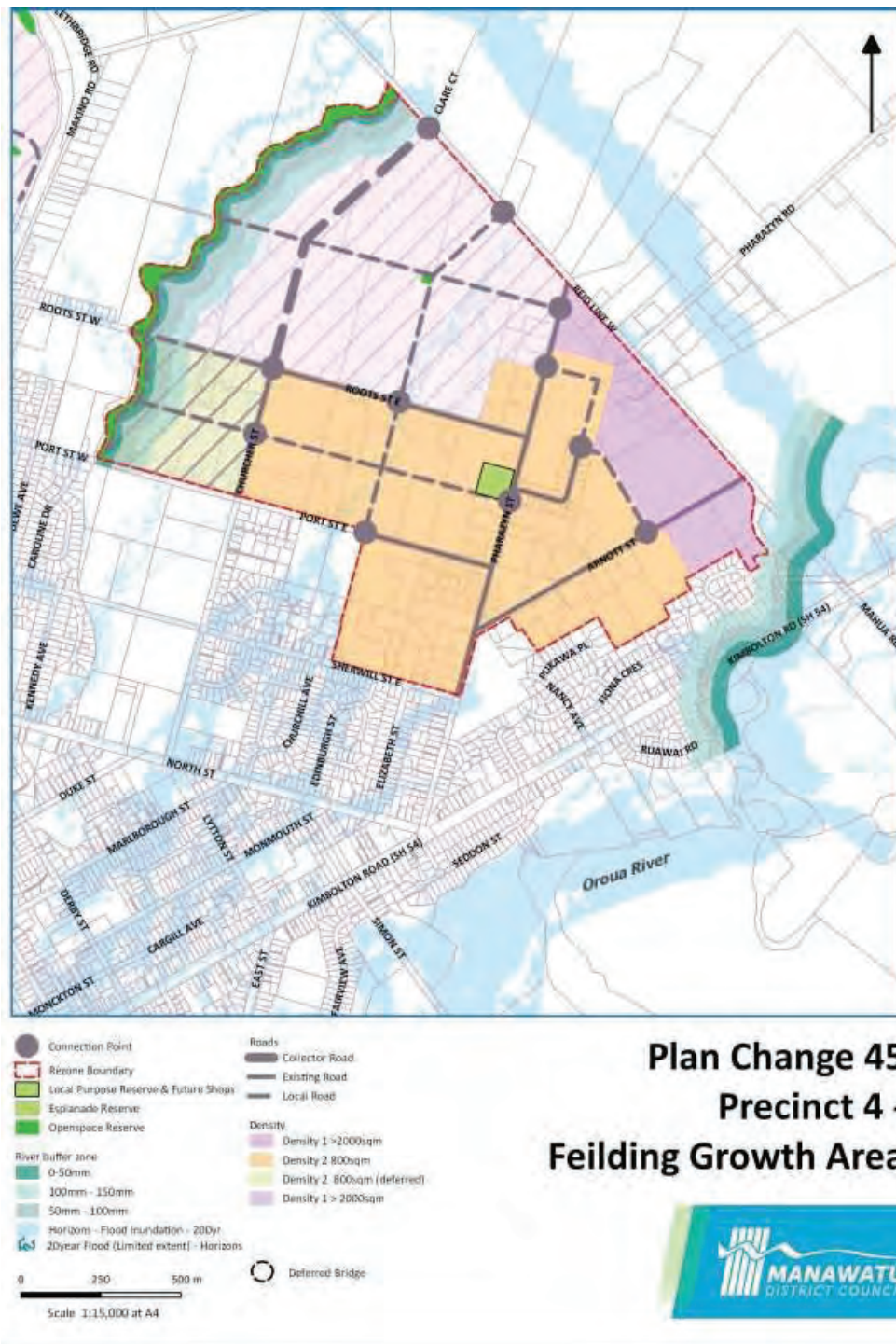
8.2 Recommendations

THAT:

1. The majority of the study area be rezoned to Residential via a change to the District Plan. The Plan Change should include appropriate objectives and policies and establish the Precinct 4 Structure Plan as a requirement to be considered when applicants apply for Subdivision and Land Use consents. The area alongside the Makino (Mangakino) Stream will be rezoned Recreation.
2. The Feilding Locality Nodal in this rural area is uplifted from the District Plan.
3. The following proposed policy (or similar) along with the Structure Plan Map 7.2 is included in the Manawatū District Plan to guide future development:
 - a. That development of the Structure Plan area be undertaken in general accordance with the Structure Plan Map 7.2.
 - b. Variations to the Structure Plan Map 7.2 are possible provided the following key criteria to ensure high quality urban design outcomes and efficient infrastructure provision are adhered to:
 - Create purposeful linkages for vehicles and for active modes of transport which are safe, pleasant and work with the natural landform. Establish linkages to existing residential development adjacent to the Structure Plan area and maintain efficient, quality road linkages in all four directions as currently proposed.
 - Manage stormwater to ensure hydrologic neutrality for each development parcel within the subdivision Structure Plan area, thus ensuring neutral environmental effects beyond the Structure Plan area.
 - Ensure quality residential areas and infrastructure which are designed to work with the natural landscape as far as possible. That the geotechnical characteristics of the land and the location and design of buildings, structures and infrastructure are appropriate.
 - Good quality urban design outcomes are achieved for all residential development. In the circumstances where residential density is greater than 600m² adverse effects on visual amenity are minimised.
 - Avoid perpetuating the prevalence of private rights of way, as access to back sections and where possible redesign to remove existing private rights of way.
 - Tangata Whenua's traditional and contemporary relationship with land and water, and in particular the Te Aranga design principles are recognised.
 - Ensure that development complements and does not adversely affect the amenity, recreational, cultural and ecological values of the Makino (Mangakino) Stream and the adjoining esplanade corridor.
 - Ensure that the future convenience needs of the growth area are located in an appropriate location preferably adjacent to public open space, on a public transport route and built development achieves a high standard of amenity and visual character when viewed from the street.

APPENDICES

Appendix 1: Conceptual Framework Plan for Growth Precinct 4. Boffa Miskell 2013



Appendix 2: Consultation Record 2017-18

Contact Details	Date	Topic/Issue	Support/Oppose	Comment
Woodlands of Feilding				
Woodlands Resident	23-Nov-17	Roading Traffic Green network Commercial Area Walkways/Footpaths Public Transport	Not Stated	Access to Rimu park is a concern – bridge plans may need to be executed sooner. Highlighted concerns for intersections: Makino/North St is pressured, and Kimbolton Rd/East St is dangerous and congested. Suggestion that a walkway is developed along Makino (Mangakino) Stream. Recommended shops be placed within easy walking distance of Woodlands as many of the 106 residents no longer have licences; a bus stop on Sherwill St would also support these residents.
Woodlands Resident	23-Nov-17	Housing Commercial Area	Not stated	A mixture of both larger/small section sizes should exist, at a minimum 500m ² . Should be a commercial area in the development – perhaps Port St/Roots St/Churcher St block, or either side of Roots St/Churcher St intersection.
Woodlands Resident	23-Nov-17	Commercial Area Public Transport	Not Stated	Suggestion of a bus stop outside Sherwill St Retirement Centre, as well as regularly scheduled buses to Feilding and Palmerston North – residents currently walk to North St to access bus. A small grocery store would be well appreciated.
Woodlands Resident	23-Nov-17	Roading Traffic	Not Stated	Investigations of roading intersections, e.g. Kimbolton Rd
Woodlands Resident	23-Nov-17	Roading Traffic Green network Public Transport	Not Stated	Concerns for increased traffic to North/Kimbolton Rd/Pharazyn St corner. Upgrade for Port St East should be continued. Suggestion that a walkway is developed along Makino (Mangakino) Stream. Bus stop should be placed outside of Woodlands as many residents have lost licences due to degenerating health issues. The bus route should include Port St East.
Woodlands Resident	23-Nov-17	Roading Traffic	Not Stated	Serious concerns re: Kimbolton Rd/North St/Pharazyn St/Seddon St intersections. Apprehensions based on large increase to traffic observed, and personal experience of several traffic incidents on this intersection. Pressure on this intersection added to by subdivision of Accolade, Cherry Lane & extensions off Pharazyn St, as well as extension of Woodlands Retirement Village. Traffic congestion further added to by servicing of country areas using Kimbolton Rd, as well as businesses and community facilities in the area. Suggestion of a roundabout to maintain good safe traffic flow.
Feilding Farmers Market - 24th November 2017				

Farmers Market Attendee	24-Nov-17	Zoning	Not Stated	Request for zoning map to be sent via email
Farmers Market Attendee	24-Nov-17	Stormwater Schools Green network Liquefaction Flooding	Not Stated	Question raised re: Makino Rd Drain Cleaning and storm water drainage to 16 houses on Makino Rd. Makino changing channel north of Precinct 4. Concern whether there is enough capacity in schools for future demand caused by increased housing. Not enough green space. Questioned risk of liquefaction & stop-bank failure.
Farmers Market Attendee	24-Nov-17	General	Not Stated	Potential for Manfield camp ground to be repurposed as a park
Farmers Market Attendee	24-Nov-17	General	Not Stated	Campsite should be walking distance to Manfield – needs to go
Farmers Market Attendee	24-Nov-17	Commercial Area	Not Stated	Café, laundromat, dairy needed
Jean & Keith, 10 Arnott Street	24-Nov-17	Stormwater	Not Stated	Concerned about drain and neighbours building a deck over it
Farmers Market Attendee	24-Nov-17	Community Facilities	Not Stated	Important to have community facilities such as halls for individuals and groups to use
Farmers Market Attendee	24-Nov-17	Green network	Not Stated	Important to encourage bird life along the Makino (Mangakino) Stream corridor
Farmers Market Attendee	24-Nov-17	Section sizes	Not Stated	Pepper-pot areas for larger homes
Farmers Market Attendee	24-Nov-17	Housing	Not Stated	Restrictions on size of timber fences
Farmers Market Attendee	24-Nov-17	General	Not Stated	Do it once, do it right – important to have good community consultation and planning in the beginning so get it right first time
Farmers Market Attendee	24-Nov-17	Green network	Not Stated	Non-residential buildings – helpful to have plantings (2 x week meeting, new church)
Farmers Market Attendee	24-Nov-17	Housing	Not Stated	Pockets of houses for first home buyers
Farmers Market Attendee	24-Nov-17	Roading	Not Stated	Information re: development of Sherwill St, Awatea Village (tarseal)
Farmers Market Attendee	24-Nov-17	Community Facilities	Not Stated	A community hall is vital

Farmers Market Attendee	24-Nov-17	Public Transport	Not Stated	Public transport services important for Woodlands and Precinct 4
Farmers Market Attendee	24-Nov-17	Community Facilities	Not Stated	Need a neighbourhood gathering area closer and more central to housing area
Farmers Market Attendee	24-Nov-17	Parks & Reserves	Not Stated	Pocket parks as well as the Esplanade
Farmers Market Attendee	24-Nov-17	Infrastructure Green network	Not Stated	Social issues with compact infrastructure – noise, cars etc. Important to deliver country town amenities and greenspace
Farmers Market Attendee	24-Nov-17	Stormwater Flooding	Not Stated	Storm water management critical, as well as Horizons flood protection
Feilding Farmers Market – 1st December 2017				
Farmers Market Attendee	1-Dec-17	Zoning Liquefaction	Not stated	Interested in liquefaction report
Resident Pukawa Place	1-Dec-17	Parks & Reserves Car parking	Not stated	Make small parks for residents and children. Small park in each subdivision. CBD requires more car parking which will provide visibility when backing
Farmers Market Attendee	1-Dec-17	Roading Traffic Flooding	Not stated	Heavy traffic and agricultural vehicles on Pharazyn street – perception of rural road – in reality there are young children around. Makino (Mangakino) Stream levels have come up high.
Farmers Market Attendee	1-Dec-17	Roading	Oppose	Don't support vehicle bridge on Port St East as it is an undersized road. Maintain rural character
Best Choice Development Trust	1-Dec-17	Roading Zoning	Support	Interested in existing zoning and proposed roading maps
Farmers Market Attendee	1-Dec-17	Roading	Not stated	When is Root St to be upgraded?
Farmers Market Attendee	1-Dec-17	Green network Roading Traffic Public Transport	Not stated	Need dog walks and pathways for residents, especially Accolade. Traffic calming required for Pharazyn – if have paths you can lift speed limits. Public transport and bus stops are important. Prefer lifestyle in Arnott St block – status quo Concerned that staging of Accolade – why not north to south?
Farmers Market Attendee	1-Dec-17	Stormwater	Not stated	Concerned about storm water from spillway and flow to Arnott. Collecting at Arnott/Pharazyn intersection. Will this be resolved?

Farmers Market Attendee	1-Dec-17	Roading Traffic Stormwater	Not stated	Problems with Pharazyn road users not following speed limits. Highlighted issue with storm water entering property – drainage is not adequate, wasn't measured at sign off. Affects neighbours as well.
Farmers Market Attendee	1-Dec-17	General	Not stated	Booklet should be produced about why things are the way they are, e.g. rate levels etc.
Farmers Market Attendee	1-Dec-17	Cycleways	Not stated	More cycleway marking on roads & designated cycleways
Farmers Market Attendee	1-Dec-17	Roading	Not stated	Upgrading Montagu St – progress on this?
Farmers Market Attendee	1-Dec-17	Commercial Area	Not stated	Concerned re: commercial at Maihi Grove – setting a precedence
Farmers Market Attendee	1-Dec-17	Green network	Not stated	More street trees – provide shade and general wellbeing

Manawatū Youth Ambassadors

Manawatū Youth Ambassadors Group	15-Dec-17	Parks & Reserves Schools Walkways/Footpaths Rooding Traffic Community Facilities Green network Commercial Area	Not stated	Questioned what schools precinct 4 children would be zoned for, and whether these schools are able to cope with an influx of students. The area may need preschool or after school care in the future. Suggestion of a separate path that links to James Palmer Park over the Makino (Mangakino) Stream – would allow a safe link to North Street allowing students to walk etc. to school, avoiding the busy streets. Request for improvements to footpaths, particularly on Roots and Port Street. Footpath up Pharazyn Street towards Reid Line should travel all along Reid Line and connect with the path on Makino Rd and Northfork Cr. Suggested playground & greenspace for the area, which are linked up with pathways. Green networks encouraged to entice native birds. Commercial node would do well in this area, perhaps could include dairy with community notice board, and electric car charging station. Bus service needs to be extended to this area, especially to accommodate Woodlands residents. Concern at narrow nature of Reid Line bridges, as well as the main bridge needing to be fixed.
Webpage Feedback				
Webpage Submitter	Dec-17	Community Facilities	Not stated	Should be more mini playgrounds with play equipment with any large developments
Webpage Submitter	Dec-17	Rooding	Oppose	Concerns over Precinct 4 proposed roads and intersection on boundary of his Oranga Lane property, and the effects this will have on future resale ability. The property was purchased because it was private and quiet, with no surrounding roads – these features will be removed with the proposed roads.
Webpage Submitter	Dec-17	Green network Community Facilities Rooding Public Transport Commercial Area Infrastructure Section sizes	Not stated	Support encouragement for developers to build in green corridor spaces between new dwelling areas to allow space for walkways etc. Don't want area to have dense housing with nothing else. A park or reserve similar to Victoria park would be well used for exercising, dog walking etc. Intersection Pharazyn St/Kimbolton road is often congested and needs to be redesigned. Trees should be planted along major roads such as Pharazyn St. A regular bus service is essential, and retail space for a dairy or supermarket would be useful. Would suggest min lot size of 700m ² , and would like to see current upmarket style houses to be continued – no relocated houses to be allowed in this area.
Webpage Submitter	11-Dec-17	Rooding Traffic	Not stated	Concern re: Kimbolton Road/North Street/Pharazyn Street junction in terms of traffic & safety. Acknowledged efforts of council in adding a stop sign on North Street but concluded that most ignore this stop sign. Expressed that would not support development around Pharazyn Street without significant redesign of the junction. Suggestion of a large oval roundabout including Seddon Street, & possibly the petrol station, as a solution.

Webpage Submitter	17-Dec-17	Community Facilities Commercial Area Cycleways		<p>Expressed how important community facilities, such as playgrounds and parks, are to community integration and bonding. Aware there may be plans for something to be developed near Nancy Ave/Arnott St, but suggested a playground or park within easy walking distance to Accolade Gr/Cherry Pl area. A park should also incorporate something for elderly members of the community to enjoy, e.g. a pond. Suggested that a dairy/local shop in the area would be highly convenient for residents.</p> <p>Important to plan for cycle safety of children on roads when developing the area.</p>
Key Stakeholder Feedback				
Powerco	15-Jan-18	Infrastructure	Neutral	<p>Wants to ensure no unreasonable constraints made on gas/electricity assets, including below ground distribution networks.</p> <p>Network Utility operators must have unrestricted access to continue with development, operation, maintenance (including trimming and clearance of vegetation) and upgrading of assets.</p> <p>New developments, buildings, structures or earthworks should not result in damage or interference with existing utilities.</p> <p>Relocation of assets needs to be authorised, supervised and undertaken by Powerco and their approved contractor.</p> <p>Any future District Plan provisions give effect to The New Zealand Energy Strategy (NZES) (2011-2021) & the National Policy Statement on Urban Development Capacity.</p> <p>Vegetation management and The Electricity (Hazards from Trees) Regulations 2003 should be taken into account during development, particularly for potential green links/vegetation corridors along Root St, Port St East and Pharyzyn St.</p> <p>Seeks to be kept informed throughout the District Plan review to provide feedback and to understand final numbers of potential new electricity and gas connections in the area.</p>
Knox Congregation and Leaders – 21st February 2018				

Breakout Group 1	21-Feb-18	Walkways/Footpaths Public Transport Parks & Reserves Commercial Area Community Facilities Housing	Neutral	<p>Suggested an extended bus route to cater for school kids and working adults. Feeder buses would be useful.</p> <p>Potential for a Feilding circle, supermarkets, health centre and 2-way circuit.</p> <p>A grid pattern would be good.</p> <p>Walkway along stream side of the Makino (Mangakino) Stream would be a good access point, as well as access points near bridges.</p> <p>Proposed park is in a good location. BMX dirt track, fenced playground and small spaces would be well used.</p> <p>Knox café could be an option, and potential to develop the hall into a multi-function community centre – this is a good area in emergency situations such as floods as it is a high point.</p> <p>Commercial area could form a small complex 4 site. Proposed road 2 could be incorporated with park/walkway facilities along the Makino.</p> <p>Council should support new building activity, especially eco/sustainable building.</p> <p>House types should be duplex housing – joint garages and walls. More small format housing.</p> <p>There should be stricter controls on developers re: whether what they are building is meeting demand.</p> <p>Concern raised that developers are not considering environmental factors.</p>
Breakout group 2	21-Feb-18	Public Transport Parks & Reserves Housing	Neutral	<p>Local Feilding bus routes would be useful.</p> <p>Suggested provision of many small green spaces.</p> <p>Mixed housing to suit all age groups should be considered (not all 4 bdrm/3 bathroom/ 3 car garaging).</p> <p>Important to provide for solos/singles, couples and young families.</p>
Breakout group 3	21-Feb-18	Cycleways Walkways/Footpaths Rooding Commercial Area Community Facilities Housing	Neutral	<p>Wider footpaths and cycle designated lanes on Main Road. East St could become a main access route.</p> <p>Commercial area of Precinct 4 needs to be bigger than 4 shops.</p> <p>Transport options could include Bus transfer to meet with PN and circuit to include Woodlands, Mt Stewart, Mt Taylor etc.</p> <p>Potential for church to link with developers to assess the possibility of building a hub. The community house is currently looking to do more, but has a funding limitation.</p> <p>The Knox church is a good place in a flood because of the height.</p> <p>A variety of building types should be considered. Older citizens need smaller homes.</p>

Member of Knox Congregation	21-Feb-18	Housing Schools Commercial Area Public Transport Rooding	Neutral	<p>Highlighted change from Feilding as rural hub for farmers, to home of commuters and retirees. Important for Feilding to cater for all of these various groups when developing housing – should include commodious houses as well as low-cost houses.</p> <p>With more young families, there will need to be more pre-schools.</p> <p>A commercial area with a supermarket/four square, postal services, and places to accommodate small businesses would be popular.</p> <p>A road linking Mt Taylor with Lethbridge Road would build connectivity. A serviceable route to support those commuting to Palmerston North was suggested, with possibly of roundabouts at Kimbolton/North/Pharazyn Streets, Kimbolton/East/Lytton Streets and East/Aorangi Streets.</p> <p>A bus route servicing Feilding only would be well used, with a depot for transfer buses to and from Palmerston North.</p>
Stakeholder Feedback				
Pharazyn Road Resident	26-Mar-18	Parks & Reserves Commercial Area Public Transport Rooding Housing	Support	<p>Providing a park area, as well as utilising the Makino (Mangakino) Stream edges (10m widths) for recreational purposes would be desirable. Would also enable access for equipment to maintain the stream.</p> <p>Important that current CBD of Feilding is retained/enhanced, and any commercial/retail development in Precinct 4 should complement rather than compete with it, e.g. corner dairy rather than shopping centre.</p> <p>Important for public transport routes to be extended to Precinct 4 to support people getting to Feilding CBD.</p> <p>Proposed rooding network appropriate as it enables development of land for housing.</p> <p>Sufficient housing sections should be created to support investment in sewerage & stormwater services. However, housing density also limits the amount of productive farm land that may be required for housing in the future.</p>

Roots St West Resident	17-Apr-18	Walkways/Footpaths Parks & Reserves Green network Cycleways	Not Stated	<p>Access to Rimu Park for residents in the East via a pedestrian/cycle bridge over Makino (Mangakino) Stream either on Roots St or Port St. Would also provide alternative access to FAHS for students who live on the NW side of town.</p> <p>A park/reserve/cycleway running along Makino (Mangakino) Stream from Reid Line to North St would be very popular with nearby residents who wish to walk/cycle away from traffic.</p> <p>An upgrade to toilets, plantings, playground & park benches in Rimu Park would attract more visitors.</p> <p>A path from Dewe Ave to Roots St would allow for it to be crossed in winter when it is water logged.</p> <p>Extending the Green Spine along the Lethbridge St side of the railway would be well appreciated by those who live near the tracks.</p>
Stakeholder	18-Apr-18	Infrastructure	Support	Disability planning should be at the forefront of development of all footpaths, bus stops , community housing and shopping areas for the Precinct 4 area
Stakeholder	19-Apr-18	Cycleways	Not Stated	Cycling is becoming popular for health benefits and environmental friendliness, so important to include cycling areas in Precinct 4. A cycling trail along Makino (Mangakino) Stream (James Palmer Reserve and beyond) could be included with road cycle lanes connecting to it. Complemented the trail along Cemetary Road in Sanson, and Green Spine in Feilding.
Churcher Street Resident	20-Apr-18	Green network Parks & Reserves Section sizes Housing Commercial Area Public Transport Tangata Whenua	Not Stated	<p>Walkway alongside Makino (Mangakino) Stream, as well as planting of native plant species for flood protection and water quality. Park sizes need to be larger than planned, and open space between houses should be included to encourage children to play outside. Section sizes should be large enough to promote planting of trees, especially natives. Disability friendly walkways should be included as footpaths amongst traffic are not always appealing.</p> <p>Houses should not all be large and expensive as they need to also accommodate people on low incomes, and the ageing population who may want to downsize without moving to a retirement village. High fences should be discouraged to promote a neighbourly feeling, and commerical areas should harness a sense of community. Buses of all sizes servicing the area would be well used.</p> <p>Tangata Whenua should be preserved in all development activities.</p>

Port Street East Resident	2-May-18	Utilities Parks & Reserves Public Transport	Not Stated	Believe that underground power should be part of the upgrade of Port St East, especially as Council's own engineering standards require that at least provision is made for underground power through the installation of suitable ducts (Engineering Standards for Land Development Section 1.11 Network Utilities). Would prefer pocket parks as opposed to another large open green field area. Would like to see a bus service extended to Pharazyn Street.
Long Term Plan 2018-28 Submissions				
Port Street East Resident	2-May-18	Utilities	Not Stated	Understands that underground power is not part of the upgrade of Port St East and thinks this is unacceptable, especially as MDC's own engineering standards require that at least provision is made for underground power through the installation of suitable ducts (Engineering Standards for Land Development Section 1.11 Network Utilities).
Feilding Community Committee	3-May-18	Green network Roothing Parks & Reserves Housing Community Facilities Walkways/Footpaths	Not Stated	Green way-sustainable urban development include Makino (Mangakino) Stream Green project. Build bridge to connect Pharazyn St development to Rimu Park and create another traffic route. 3 intersections need urgent upgrades and action, and streets need to be widened. Develop Rimu Park plan for sports, cultural, youth and dogs. Developers should provide land for new park areas and businesses Council should provide a wide range of housing options, e.g. small & large Along subdivisons there should be spacious green-ways for cycling, walking and mobility scooters. Believes that another park should be planned for the Rimu park area. The lower wet part of Rimu park should be upgraded and drained. Feilding groups should plant a green-way of natives at Rimu. Potential to connect Pharazyn development with Root St area, East West divide, another road option, and enhance river access by proposed bridge. Believes that residents should be encouraged to walk more, and provided with the walking network to do so. Highlights that Roots Street West is in a very poor state with open drains and collapsing culverts. Are keen to see the Makino (Mangakino) Stream walkway continued for Northern residents. Requests fresh water fountains in all parks around Feilding
Sherwill Street East Resident	30-Apr-18	Walkways/Footpaths Utilities Infrastructure Parks & Reserves	Not Stated	Would like more walking tracks in Feilding free of dogs and bikes. Every subdivision should have a childrens play area, wastewater systems, flood protection, and footpaths.

MidCentral District Health Board	3-May-18	Roading Walkways/Footpaths	Not Stated	Highlights the importance of good roading, cycleways and footpaths., Important to ensure that footpaths are accessible and suitable for people with low mobility, e.g. for the use of mobility scooters. Active transport should be encouraged via transport infrastructure due to it's health benefits. Older adults and residents have raised concerns about the safety of cyclists.
Stakeholder	1-May-18	Stormwater	Not Stated	Expressed that Council does not clean the roadside drain which is overgrown and causes flooding at Reids Line intersection every year
Makino Leisure and Flow Park group	26-Apr-18	Community Facilities	Not Stated	Would like to work with MDC council consider examine possible skatepark park options, investigate stakeholders, suppliers, park designs and fundraising options.
Manawatū Youth Ambassadors Group	3-May-18	Parks & Reserves Green network Walkways/Footpaths Community Facilities	Not Stated	Supports the construction of a new park and walkways in the Precinct 4 area, but disagrees with the proposal not to fund a car parking area and toilet facilities. The submission also believes that Precinct 4 needs more green space.
Facebook Feedback				
Facebook User	13-Nov-18	Housing	Not stated	Should be home owners choice how their fence looks
Facebook User	13-Nov-18	Housing	Not stated	2 metre fences in front of every property reinforces the 'paranoia'. The height also doesn't help if you get broken into as neighbours wouldn't see. 1.1 metre height in the document seems reasonable
Facebook User	13-Nov-18	Infrastructure	Not stated	Sumps are needed in Precinct 4 - Accolade area is shocking for drainage problems.
Facebook User	13-Nov-18	Infrastructure	Not stated	Should be home owners choice how their fence looks
Facebook User	13-Nov-18	Housing	Not stated	Need guidelines on fences, but the new definition goes too far
Facebook User	13-Nov-18	Housing	Not stated	Should be the home owners choice what type of fence they have - do we need to be so regulated?
Facebook User	13-Nov-18	Housing	Not stated	Would never buy or build with a 1.1m covenant in place. Should be my home - my privacy.

Stakeholder Feedback				
Powerco	19-Nov-18	Utilities	Support	<p>CHAPTER 8 SUBDIVISION COMMENTS</p> <ul style="list-style-type: none"> - 8.2 (1) - "infrastructure provisions" should read "infrastructure provision" - Issue 7 - Relief sought: The need for new developments within Growth Precinct 4 to be in accordance with any relevant structure plan, and be appropriately programmed and/or staged to ensure enable the integrated provision of infrastructure at the earliest stage of development - Objective 1 - Support the reference to electricity and gas in clause (e), and support the overall objective to be retained, and properly given effect to policies to implement it (as is) - Policies - No references to infrastructure and utility services in policies 1.1 to 1.5 that follow objective 1. Additional clause to be added to policies supporting objective 1: Relief sought: <u>1.6 Enable integrated infrastructure and utility services to be provided for Growth Precinct 4 in a staged and co-ordinated manner including the provision of reticulated wastewater, water supply, stormwater networks and power and telecommunication networks to all new lots.</u> - Objective 2 - supported as drafted - Policies - Need flexibility in Policy 2.7 regarding requirement for all power and telecommunication infrastructure to be underground, as not always practical to achieve. Remove the word 'require' as is directive. Questioned whether the wide definition of infrastructure in the RMA would require all aspects of power and telecommunication infrastructure to be underground. Policy 2.7 is more directive than Chapter 3A District Wide - Network Utilities, Policy 1.3 which uses 'encourage all new cables and line...' Seek similar wording to policy 1.3. Relief sought: <u>2.7 To require all power and telecommunication infrastructure to be underground. To encourage all new cables and lines, including electricity distribution lines (but not the National Grid) to be installed underground where practicable.</u> - Objective 4 - Intent is supported, but structure of objective awkward Relief sought: To enable the dDevelopment of Growth Precinct 4 that is in accordance with the Growth Precinct 4 Structure Plan in Appendix 8.1 and only where development delivers an integrated infrastructure network for the entire site. - Policy 4.1 & 4.4 - Supported in part. This policy would be better incorporated into a wider definition of infrastructure to ensure integration with existing Feilding network. E.g. gas reticulation is not included in definition of essential infrastructure. Highlighted section of definition for network utility: "which provide an essential service to the public." Inconsistency in definition of network utility and definition of essential infrastructure. Policy 4.1 does not include gas. Where gas is included in development, gas mains are installed in common trenches with other utilities

				<p>Relief Sought: New definition – Essential Infrastructure means the Manawatu District Council reticulated sewage and reticulated water supply systems, stormwater systems, gas, and electrical power and telecommunication (including fibre) networks.</p> <p>- Rule 8.4.1, Performance standard (g) - Infrastructure - does not appear to apply to gas pipes. Relief sought: All cables and pipes, including for power, gas and telecommunications must be placed underground. Use of the word 'essential infrastructure' should be given consideration. Noted the NZ energy strategy position of environmental friendliness of gas as a customer choice.</p> <p>CHAPTER 15 RESIDENTIAL COMMENTS</p> <p>- Objective 2 - Relief sought: To promote development within Growth Precinct 4 that creates an attractive, healthy, and safe and well serviced place to live.</p> <p>- Definitions - Relief sought to definition of 'open construction': "Means, with respect to any fence, able to be..." Gas should be included in definition of essential infrastructure, but if gas is a form of 'power' and infrastructure is to remain outside this definition, changes to drafting of new subdivision objectives, policies and rules is required.</p> <p>- Planning Maps- Change of zoning from Rural and Rec to Residential is supported</p>
Email Submitter	14-Nov-18	Housing	Not stated	<p>Disagree with front fence not being able to exceed 1.1 metres for more than third of the property. Due to wanting to ensure children don't climb over fences onto the road, stopping cars from driving into houses, stopping dogs from jumping over fences, and needing to plant behind fences to reduce noise and at night disturbances. Unlikely that owners would build cheap fences anyway as the area is not cheap to buy into/build in. A blanket rule on fencing will make houses look very much the same which is disappointing.</p>
Feilding Library Consultation – 14th November 2018				
Feilding Library Visitor Lancewood Avenue Resident	14-Nov-18	General Public Transport	Not stated	<p>New resident to Feilding and has found community is very conservative. Questioned why tenants have to mow the lawns in social housing. Noted that street patrol group (structure) is predicated on 'partners'. Makes it difficult to get involved if you don't have a partner. Interested in Precinct 4 as her neighbours are not very supportive/neighbourly.</p> <p>Should be a shuttle bus to get to the shops. Small bus routes (mini bus) within Feilding to serve local residents.</p>
Feilding Library Visitor Dewe Avenue Resident	14-Nov-18	Parks & Reserves	Not stated	<p>Property is proximal to Rimu Park. Ensure there are plenty of rubbish bins and green bins in the growth precinct. Interested in the proposal to relocate Rimu Park and rezoning to residential. Thought that the proposed relocation had some merit.</p>

Feilding Library Visitor	14-Nov-18	Stormwater Public Transport General	Not stated	Property is on Makino Rd and backs onto growth area. Support public transport in the area, as well as a Feilding circular. Would like a copy of precinct 3 plan, incl. roading development and subdivision scheme. Notes property is very damp at the back. Was interested to know about the effect of development on stormwater management.
Feilding Library Visitor	14-Nov-18	Housing	Not stated	Husband is irritated by noisy neighbours. Looking for new section, potentially in Precinct 4. Prefers north facing, east-west street, south side. Is concerned about the Feilding Herald - no delivery for some time now.

Appendix 3: Iwi Consultation Record

Contact Details	Date	Topic/Issue	Comment
Ngā Manu Tāiko Committee	18/12/15	District Plan Programme – Timeline, Plan Change scheduling – Discussion on iwi consultation preferences.	Presentation by Senior Planner; Questions and answers
Ngā Manu Tāiko Committee	19/5/16	Resource Legislation Amendment Bill 2015 – Maori Participation in Planning Processes.	Presentation by Senior Planner; Questions and an and answers
Ngā Manu Tāiko Committee	13/6/17	Resource Legislation Amendment Act – Update; Changes to Maori Participation in RMA planning processes.	Presentation by Senior Planner; Questions and answers
Ngā Manu Tāiko Committee	9/8/16	Plan Change 51 (Precinct 4).	Presentation by Senior Planner; Questions and answers
Ngati Kauwhata (Dennis Emery and Dr April Bennett – Massey University)	24/8/16	Feilding Growth Planning – Briefing on Growth Precinct 4; Initial discussion with Nga Kaitiaki- Ngati Kauwhata on engagement principles to establish a good support a working relationship.	Meeting between Principal and Senior Planners, Opus Planning Consultant and Dennis Emery and Dr Bennett (Massey).
Dr April Bennett (Researcher - Ngati Kauwhata)	5/9/16	Cultural Impact Assessment Report – scoping discussion	Meeting with Senior Planner
Dr April Bennett and Massey Planning Students (Cultural Impact Assessment - research team)	14/9/17	Planning context for Precinct 4 (Proposed Plan Change 51).	Presentation by Senior Planner; questions and answers

Grant Huwyler Chris Shenton (Ngati Apa)	4/10/17	Mana Whakahono a Rohe Discussion and District Plan Briefing, including Precinct 4	Meeting between Manawatu District Council CEO, Senior Planner, Community Development Advisor and Ngati Apa leaders. Ngati Apa confirm that planning for Precinct 4 is not a priority matter for RoM at this time.
Ngati Kauwhata (Dennis Emery)	16/11/17	Cultural Impact Assessment Report – Contract discussion and approval. Request for MoU	Meeting to discuss Work Programme and arrangements for the Cultural Impact Assessment Report.
Dr April Bennett (Researcher - Ngati Kauwhata)	11/12/17	Cultural Impact Assessment Report – Work in progress update.	Meeting between Senior Planner and Dr April Bennett.
Ngati Kauwhata (Dennis Emery)	22/12/17	Signing of MoU between MDC and Ngati Kauwhata Cultural Assessment Impact Report for Growth Precinct 4	Meeting between Manawatu District Council CEO, Strategy Manager, Senior Planner & Dennis Emery (Ngati Kauwhata).
Ngā Manu Tāiko Committee	13/2/18	Precinct 4 - Update	Presentation by Senior Planner; questions and answers
Ngā Manu Tāiko Committee	11/4/18	Statutory Acknowledgements – Rangitane & Ngati Apa	Presentation by Senior Planner; question and answers
Manawatu District Council CEO, Strategy Manager, Senior Planner & Dennis Emery (Ngati Kauwhata)	5/3/18	Precinct 4 Cultural Impact Assessment Report discussion	Meeting to discuss progress on the Cultural Impact Report and delivery timeframe.
Ngā Manu Tāiko Committee	12/6/18	Planning for Precinct 4 - Update	Presentation by Senior Planner; question and answers

Ngati Kauwhata (Dennis Emery and Dr April Bennett)	13/6/18	Cultural Impact Assessment Report for Precinct 4	Meeting to discuss the Cultural Impact Assessment Report and Report Recommendations.
Morrison Kent Lawyers (iwi client)	20/6/18 – 23/7/18	Precinct 4 – LGOIMA request	Phone discussions on information request, letter and submission of information.
Dr Bennett (Ngati Kauwhata - Dennis apology)	20/7/18	Precinct 4 – Site visit with Mr Bailey (54 Roots Street)	Mr Bailey led a farm tour for the Senior Planner, Opus Consultant, MDC Legal Counsel and Dr Bennett. Dennis Emery put in an apology (bereavement).
Rangitane o Manawatu Te Ao Turoa Environmental Centre	30/8/18	Mana Whakahono a Rohe Discussion and District Plan Briefing, including Precinct 4	Rangitane O Manawatu (RoM) confirm that planning for Precinct 4 is not a priority matter for RoM at this time.
Dr Bennett, Massey Planning Students	17/9/18	Planning context for Precinct 4	Presentation by Senior Planner; question and answers
Ngati Kauwhata (Dennis Emery and Dr April Bennett)	28/9/18	Precinct 4 – Cultural Impact Assessment Report – Feedback to Ngati Kauwhata on Council’s response to the Cultural Impact report recommendations	Council feedback to Ngati Kauwhata on Council’s response to the Cultural Impact report recommendations.
Ngā Manu Tāiko Committee	9/10/18	Precinct 4 - Update	Presentation by Senior Planner; question and answers

<p>Ngati Kauwhata (Dennis Emery and Jeff Rakatau)</p>	<p>22/11/18</p>	<p>Precinct 4 Workshop with representatives of Ngati Kauwhata to present salient information on infrastructure, housing and recreation planning for Precinct 4.</p>	<p>Meeting with Council staff (CEO, GM- Community and Strategy, Strategy Manager, Principal Planner, Principal Advisor – Maori; Utilities Manager, Community Facilities Manager, Corporate Projects Advisor) Opus Consultant and representatives of Ngati Kauwhata. Ngati Kauwhata representatives provided support in principle to the Council’s plans for Precinct 4.</p>
<p>Ngati Kauwhata (Dennis Emery)</p>		<p>Follow-up discussion from Precinct 4 Workshop, to discuss amongst other matters, the tangata whenua values for the s 32 report.</p>	<p>Meeting with Council staff (CEO, GM- Community and Strategy, Principal Planner, Principal Advisor – Māori).</p>
<p>Ngāti Raukawa (Jessica Kereama)</p>	<p>29/03/19</p>	<p>Meeting to discuss general intent of Precinct 4, and to discuss issues raised by Raukawa. Memo provided on page 557 of section 32 report.</p>	<p>Meeting with Council staff (GM - Community & Strategy, Principal Advisor – Māori , Contracted Principal Policy Planner, Senior Policy Planner.</p>



Manawatu District Council
Structure Plan Report
Feilding Residential Growth and
Demand Update Report
6th December 2018
Stacey Bell, Economic Development Adviser

1. Population growth and housing pressures – Manawatū District

The purpose of this review is to provide an update on the Feilding Residential Growth Assessment for Precinct 4 prepared by Property Economics in October 2016.

The original report was prepared for assessing the demand for residential properties in Precinct 4 based on the population trends and forecasts that prevailed at the time. Over the period October 2016 to December 2018, conditions have changed dramatically. Population growth has outstripped the former StatsNZ high projections and investment intentions across the Manawatū Region to 2030 support the continuation of strong population growth, and therefore growing demand for residential property.

Indicators such as residential house prices and sales volumes raise concerns that supply is not keeping up with demand for residential property. Rental data indicates a significant decline in the number of rental properties available to our residents, and waiting lists for emergency housing show that the number of families struggling to find accommodation has almost tripled since June 2016. Hence, the underlying conditions and expectations for the future that the original report was based on, no longer hold.

The following review considers the forecast population trends against actual population growth, emerging housing pressures and updated expectations for population growth from 2018 to 2038.

2. Underlying assumptions

The original report cited that Feilding 'is still experiencing relatively low growth compared to other growth cells in provincial NZ'. Property economics estimated that the population of Feilding would increase by 520 people between 2018 and 2038 to 16,620. Based on this population forecast and the average household occupancy rate for the District, they estimated that 610 new dwelling would be required to 2038.

3. Actual population growth

From July 1 2016 to June 30 2018, the population of the Manawatū District is estimated to have grown by 3.3 percent. This is an increase of 1,000 people living in our District.

Specific to Feilding, StatsNZ estimates that population has grown by 600 people to 16,860 residents as at June 2018. Briefly, the estimated population for Feilding in 2018 exceeds the assumed population growth as at 2038, used as the basis for forecasts of residential demand within the Property Economics report.

4. Population forecasts

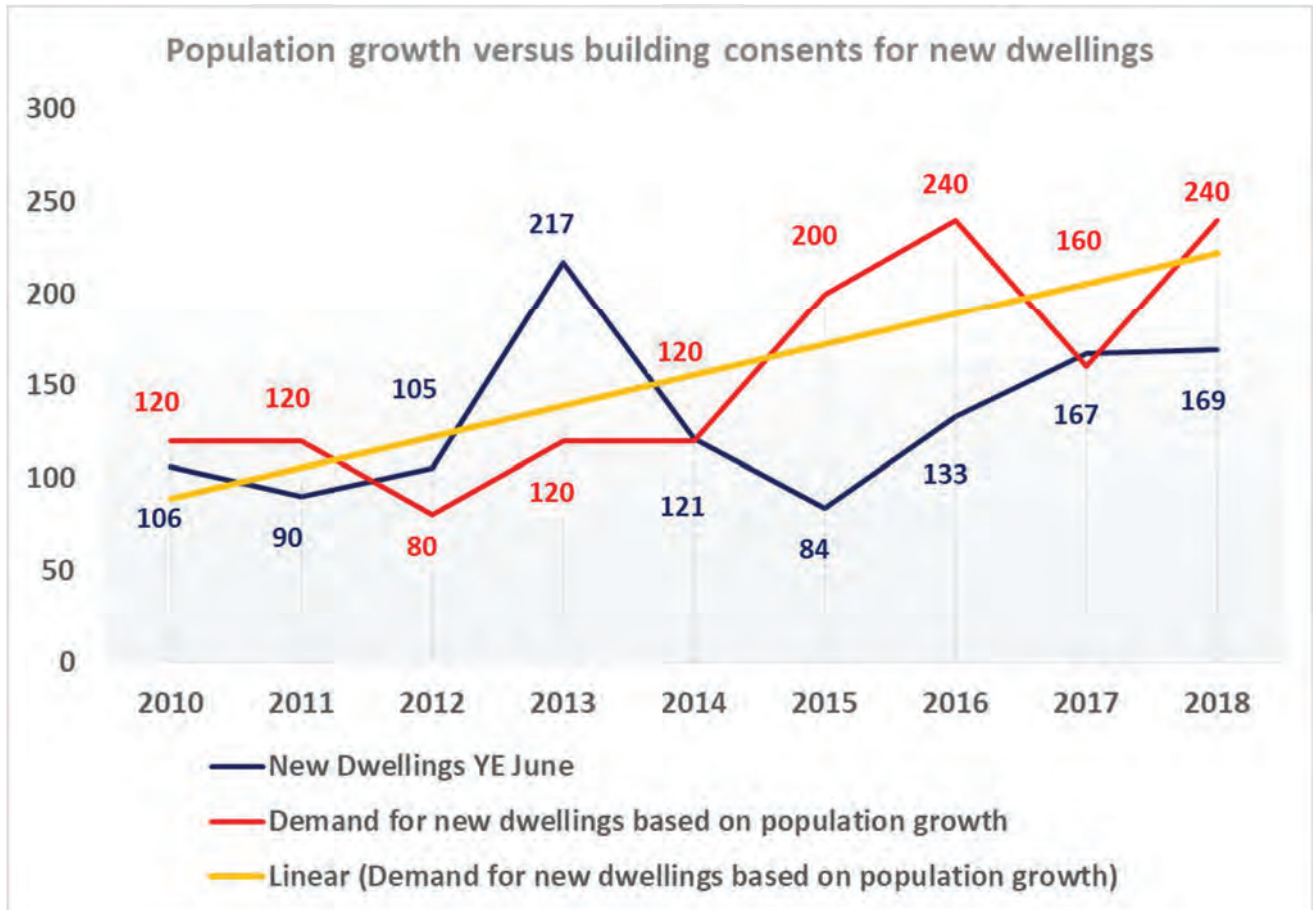
Manawatū District Council LTP population forecasts (2018-2028) estimate the population of Feilding will increase by 5,340 (31.7 percent) to 2038. Based on the average occupancy rate, we will need an additional 2,531 houses built in Feilding to keep up with demand.

It is worth noting here that our population projection of 1.7 percent per year over the period 2016 to 2018 was exceeded by actual population growth.

The latest StatsNZ 'high' population projections for the District have been scaled upwards to reflect significantly higher growth expectations, averaging 1.1% growth in population per year to 2043.

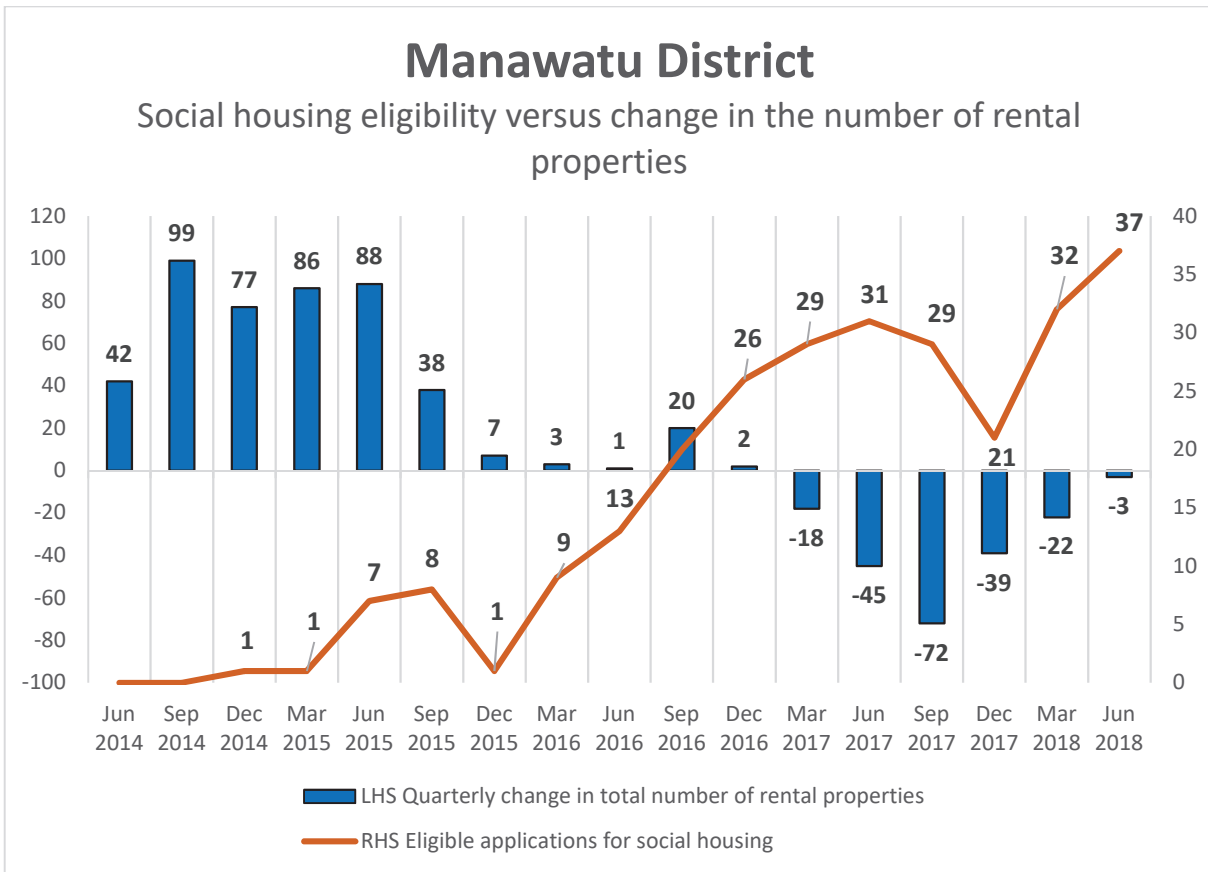
5. Emerging housing pressures

The number of new dwelling consents issued in the District² over the period 2010 to 2018 has not kept up with the rate of population growth. While there has been peaks of building activity in particular in 2013, overall the number of new dwellings fell short of that suggested by population growth by -208 dwellings. Since 2014, the net deficit has widened further to -286 dwellings.

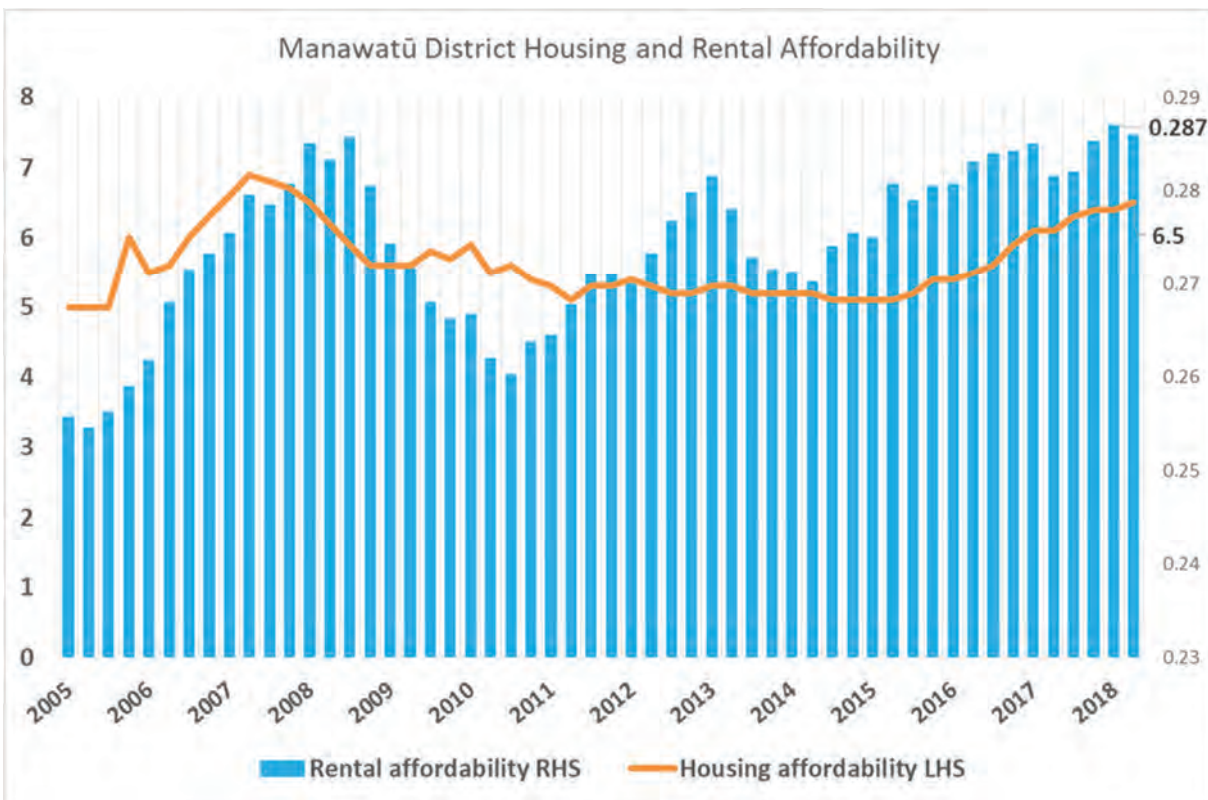


Alongside the above, anecdotal evidence from social agencies suggests that an increasing number of Manawātū residents are finding it difficult to both find and afford appropriate housing. The assumption of declining availability of affordable housing is supported by the chart below where over the period June 2014 to June 2018, a decrease in the number of available rental properties has been observed alongside an increase in the number of families eligible for social housing. Where the criteria for eligibility includes the inability to find housing alongside limited family income, the increase in eligibility suggests that the lack of rental housing is having an increasingly negative impact on our most vulnerable families.

² Based on the number of building consents for new dwellings issued and StatsNZ average household occupancy rates



Rental and housing affordability data also indicates that accommodation is becoming more expensive for Manawātū residents. Specifically, housing affordability is at its lowest since 2007 prior to the Global Financial Crisis. While rental affordability is more volatile, the time-series clearly indicates the rising cost of rental accommodation as a proportion of income.



On a relative basis, housing in the District remains more affordable than many other parts of New Zealand. However, for our most vulnerable families the increasing costs of housing will place pressure on their ability to provide for other essential needs such as healthy food.

6. Economic outlook

Year-end GDP growth figures for the Manawatū District have averaged 4.1 percent per annum over the last four quarters. This compares with GDP growth of 2.8 percent for New Zealand over the same period. With favourable trade conditions and unprecedented levels of investment (\$3.0b) planned in the Manawatū Region over the next 12 years, we expect economic growth to remain strong. With this strong economic performance will come a significant increase in demand for labour.

As at September 2018, the latest unemployment rate for the District was 2.6 percent. This low level of unemployment highlights the need to import labour from other parts of New Zealand. With current indicators showing signs of housing stress in the District, availability of land for residential development to house the anticipated growth in population is crucial to ensure supply keeps up with demand.

7. Summary

Strong population growth, declining affordability, unprecedented regional economic growth, and the need for a significant increase in labour across the region highlights the importance of ensuring adequate availability of housing.

Underlying conditions have changed dramatically from 2016, and what once were reasonable assumptions of growth and demand for residential demand in the District, no longer hold. As noted, within the space of two years, the population of Feilding has grown above that anticipated over the twenty-year period to 2038.

Ensuring availability of land to boost housing supply will support affordability of housing across the District, reduce the likelihood of hardship for Manawatū residents and ensure we can attract the labour required to deliver the benefits from the planned investment.

Stacey Bell, Economic Development Adviser – 6th December 2018



CULTURAL IMPACT ASSESSMENT of the PRECINCT 4 GROWTH AREA, FEILDING

Prepared on behalf of Ngāti Kauwhata for the Manawatū
District Council

April Bennett

16 Hōngongoi/July 2018

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Mai i tēnei ngākau iti, nei a aumihi e rere ana ki a koutou katoa

Cover image: Precinct 4 Growth Area from Reid Line West, Bennett, A, 2017

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1. INTRODUCTION

1.1. This Cultural Impact Assessment provides technical advice to the Manawatū District Council on the impacts of the Precinct 4 Growth Area from a Ngāti Kauwhata perspective. This report has also been prepared to inform Ngāti Kauwhata about the Precinct 4 Growth Area, the development that is proposed, and the implications of that development for Ngāti Kauwhata and others.

1.2. The impacts have been assessed using a framework called Te Pūtahi, The Confluence, which was written specifically for this report. The use of the confluence metaphor provides a way of seeing and understanding a range of effects, both physical and non-physical, in a holistic and interconnected way, across space and across time. Impacts were identified and organised around three different types of Wai, or Water:

- (i) **Wai tūpuna – Ancestral waters**, being the Mangakino Stream, the Oroua River and the Maewa puna or spring.
- (ii) **Wai paru – Contaminated water**: stormwater, floodwater and wastewater.
- (iii) **Wai whakaaro – Conceptual waters**. There are two conceptual waters that are relevant:
 - (a) **He Puna Oranga, a source of wellbeing**. In this report, He Puna Oranga refers to *housing*.
 - (b) **He Puna Kōrero, a wellspring of stories**. He Puna Kōrero is used here to discuss the *naming* of the Mangakino Stream, the Precinct 4 subdivision and the streets in that subdivision.

1.3. In light of these impacts, three other ideas are also important. These ideas are:

- (i) **Everything is connected**. For example, all of the tūpuna wai (ancestral waters) flow into each other, and then into the Manawatū River, and on out to sea;
- (ii) **Each waterway has its own mauri (life force), mana (integrity) and wairua (spirit)**. Discharges of contaminated water into the natural waterbodies will change the mauri, mana and wairua of each.
- (iii) **The waters connect the people**. The Precinct 4 development will not only affect Ngāti Kauwhata, but everyone downstream from them. Thus, as kaitiaki (guardians) and mana whenua¹ there is an obligation on Kauwhata to influence the development at the source, so that downstream impacts on other iwi and communities are minimised or avoided.

1.4. The approach taken in this Cultural Impact Assessment is to identify broad themes that convey the core issues for Ngāti Kauwhata in relation to Precinct 4. Some technical responses concerning physical resources are suggested in places, such as in relation to mitigation of zinc and copper contamination from dwellings (see Recommendation 1). However, in general the report leaves it up to the Council to source appropriate, technical answers to the issues raised. There is an expectation, however, that such answers will be discussed with Ngāti Kauwhata. The report signals to the Council when these conversations should occur (see, for example, Recommendation 2).

¹ Those who hold traditional authority over the land by virtue of having occupied it for several generations (Durie, 1998, p. 31).

1.5. The outcomes that Ngāti Kauwhata seek from providing this report and participating in future discussions about the development are:

- (i) The health of the water is improved, not degraded.
- (ii) The wellbeing of the people is secured and enhanced.
- (iii) The connections of the people to the land and water are strengthened and safeguarded.
- (iv) The responsibility to future generations and to downstream iwi and communities to protect the land and water is actively recognised.

1.6. These themes are threaded together using the concept of Wai. The idea is that water pervades everything. It connects the sky to the earth, the people to each other and to the land and water, the spring to the stream, and the river to the sea. In a flood, the water can pervade, contaminate and damage houses, marae and other buildings. Stormwater discharges can be toxic to fish, and wastewater discharges can disrupt aquatic ecosystems and make water unsafe for people. Climate change will alter these dynamics, in complex ways that are not fully known, but are already being experienced. And yet, water is the lifeblood of the land and the people. If the water is healthy, then the people will be too.

1.7. After this Introduction, there are five sections:

- (i) Section 2 – Ngāti Kauwhata Connections – sets Precinct 4 in the context of Ngāti Kauwhata’s relationship with the land and in particular, with the **water**. It is these relationships that make up the underlying, but often invisible layer of the Precinct 4 Growth Area and other developments.
- (ii) Section 3 briefly describes the Precinct 4 Growth Area to give a sense of the scale and nature of the development, and the effects it may have on Ngāti Kauwhata and others
- (iii) Section 4 presents Te Pūtahi, the Confluence framework used to assess the impacts of Precinct 4 from a Ngāti Kauwhata viewpoint.
- (iv) Section 5 links the cultural implications of Precinct 4 to the relevant national, regional and local policies. The term ‘policies’ is used in a broad sense to apply to laws, National Policy Statements, regional policy statements and plans, and important non-statutory documents. The policies identified as being most pertinent are:
 - Section 6(e) of the Resource Management Act 1991 (RMA);
 - the National Policy Statement for Freshwater Management 2014 (updated 2017);
 - the National Policy Statement for Urban Development Capacity 2016;
 - the Horizons Regional Council One Plan;
 - the Feilding Urban Growth Framework Plan 2013, and
 - the Oroua Declaration.
- (v) Section 6 summarises the key points from the report and presents recommendations.

2. NGĀTI KAUWHATA CONNECTIONS

2.1 Ngāti Kauwhata have had connections with the Feilding area and the Oroua River since 1825, when they migrated south from Maungatautari in south Waikato to Kapiti Island (Durie, 2014). The Kauwhata rohe (tribal area) spans key points and highways on that migration, one such highway being the Oroua River, flowing from Āpiti to its confluence with the Manawatū River at Rangiotu (ibid.). Umutoi near Āpiti marks the north-eastern point of the Kauwhata rohe, which extends in a diamond shape out to the stretch of coast that lies between the mouths of the Rangitīkei and Manawatū Rivers (see Figure 1).

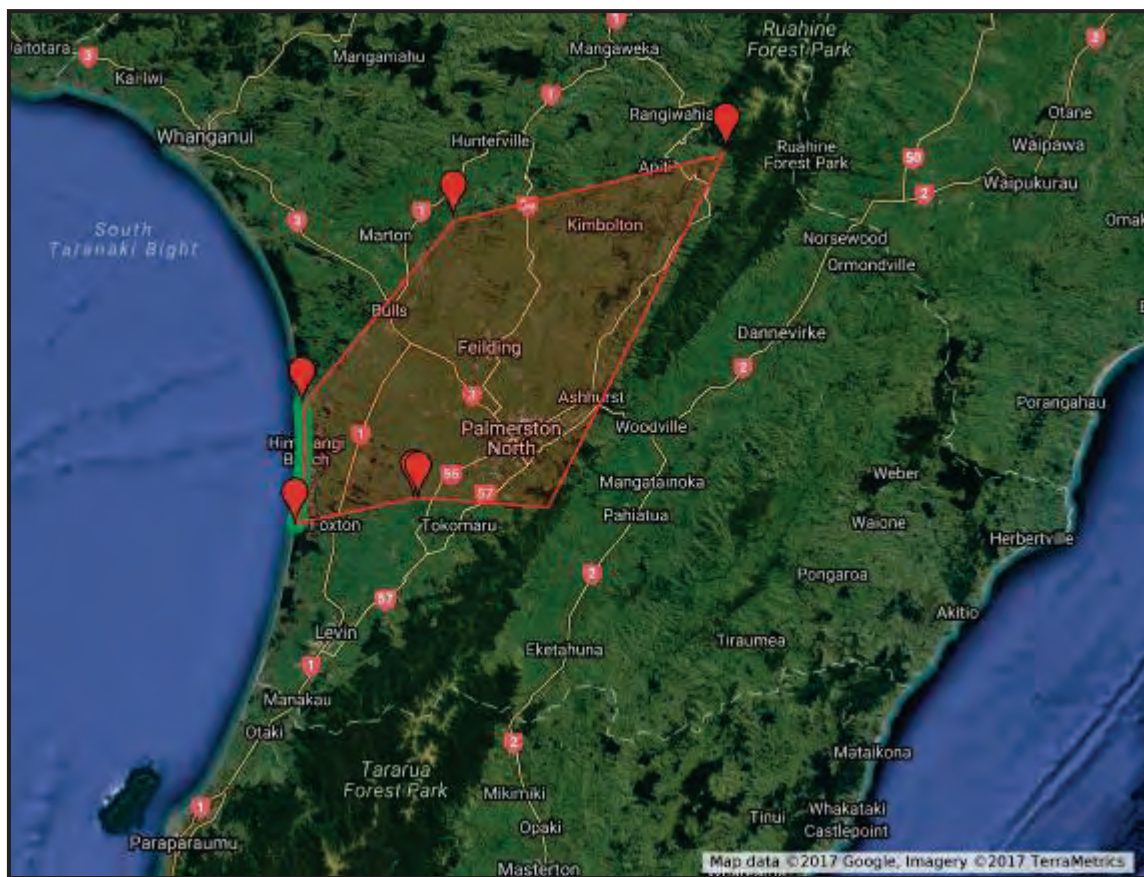


FIGURE 1: MAP OF NGĀTI KAUWHATA ROHE

(Retrieved from <https://www.justice.govt.nz/assets/Documents/Publications/Ngati-Kauwhata-Map.pdf>)

- 2.2 Returning from Kapiti around 1832, Kauwhata settled on the Oroua River at Te Awahuri, where they established marae (Durie, 2014), dwellings and cultivations². Although the marae at Te Awahuri, Te Iwa, was destroyed in 1936, two other marae, Kauwhata (Kai Iwi Pā) and Aorangi remain active and vibrant centres of the Kauwhata world. Like Te Iwa, these marae were also positioned on the river and have come to represent a ‘geneological lineage on the land’ (Durie, Joseph, Erueti, Toki, Ruru, Jones, and Hook, 2017, p. 17).
- 2.3 From the marae, Kauwhata had access to the river, to the long fingers of wetlands that ran alongside the river and across the landscape, to the tributaries that fed the river, and to the forest and shrub lands that bordered the river in all directions. This riverscape would have formed a vast mahinga kai (wild foods) catchment that would have supported the Kauwhata people, their way of life, and their economy. This catchment is shown on the following page in Figure 2: Map of early vegetation in the Manawatū district about 1860s. This map does not include the Precinct 4 Growth Area, but is provided here to illustrate the importance of the Oroua River and surrounding lands and waters to Ngāti Kauwhata. The map lends visual support to Ngāti Kauwhata’s relationship with the Oroua River, which they regard as ‘integral to their history, health, culture and economy’ and ‘a vital marker of the Ngāti Kauwhata identity’ (Durie, 2014, p. 3).

² Report of Alex McKay in his capacity as Commissioner of Native Reserves, 3 March 1884, to the Under Secretary Native Department regarding the application by James Whisker to remove the restrictions on the Kawa Kawa Native Reserve.

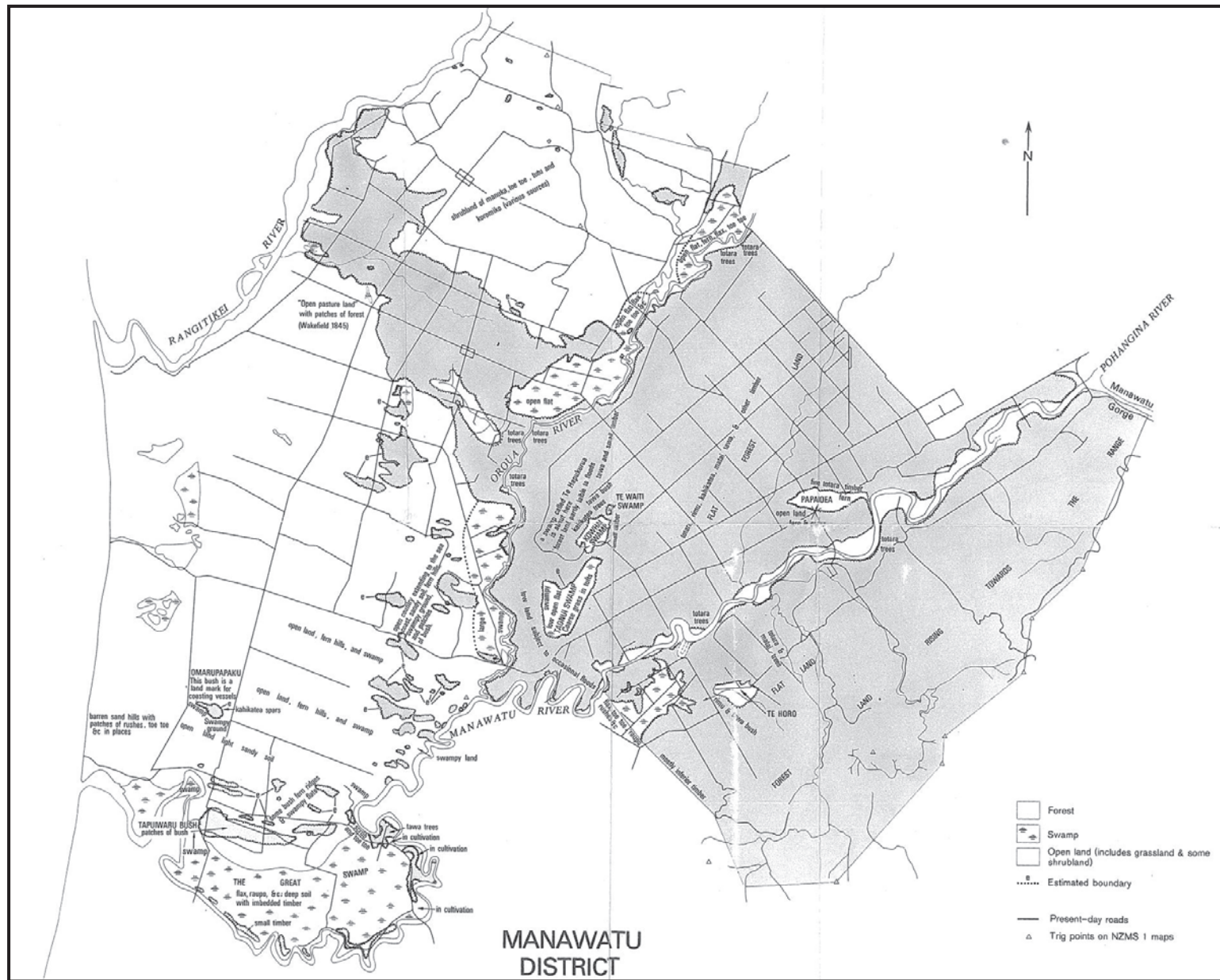


FIGURE 2: MAP OF EARLY VEGETATION IN THE MANAWATŪ DISTRICT ABOUT 1860S

(Source: Esler, A.E. (1978). Botany of the Manawatu. DSIR Information Series No. 127, New Zealand Department of Scientific and Industrial Research. Government Printer: Wellington).

3. PRECINCT 4 GROWTH AREA

- 3.1 The Precinct 4 Growth Area will be developed on lands that are part of the Ngāti Kauwhata rohe. It will have important implications for the Oroua River, and the lands, waters and people that are connected to the river. It is these implications and others that are the focus of this report.
- 3.2 Precinct 4 is one of five growth areas situated on the edge of Feilding. Manawātū District Council has identified these areas as being necessary for responding to population and industrial growth over the next 30 years (see Figure 3).

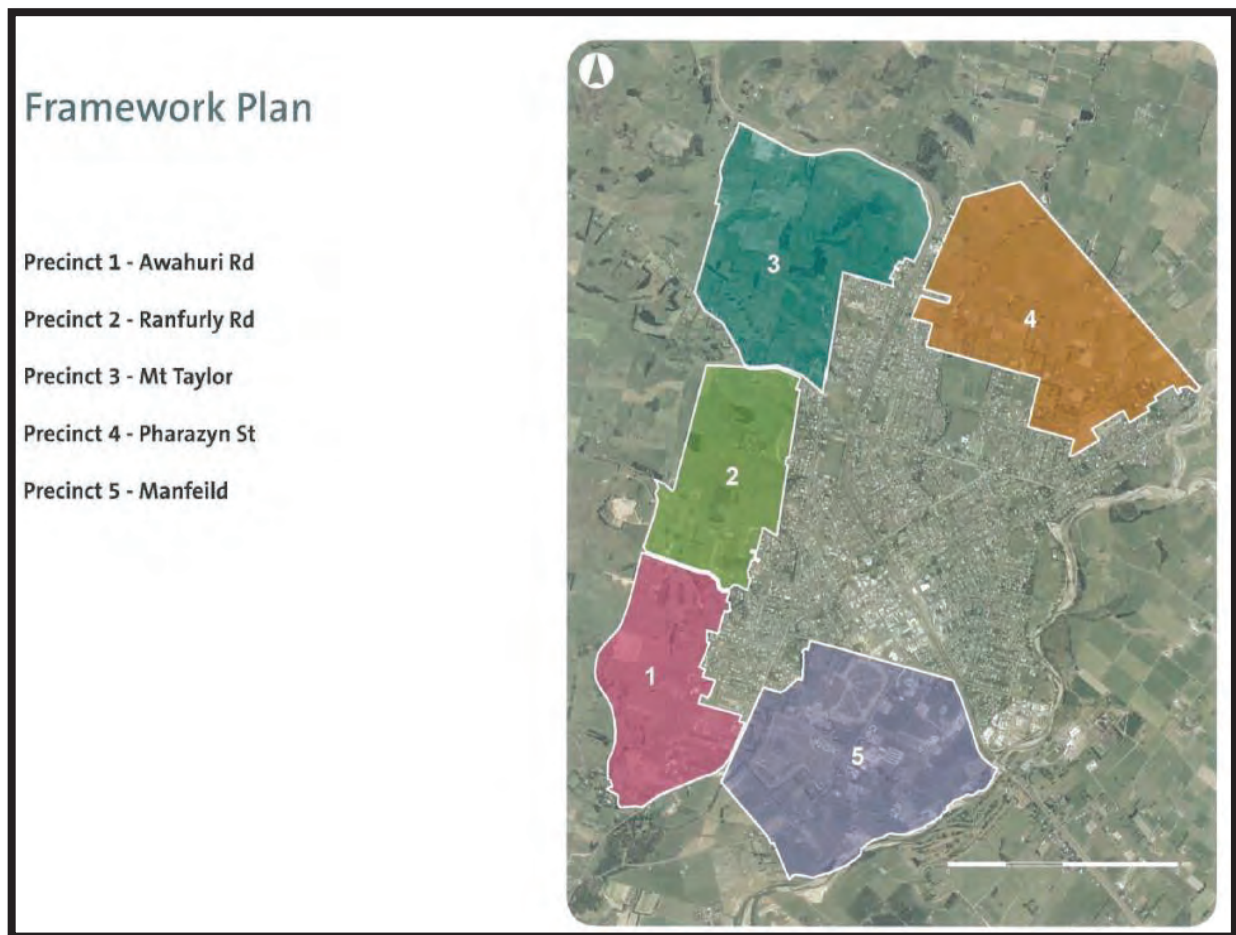


FIGURE 3: MAP SHOWING PRECINCTS 1-5 AROUND THE EDGE OF FEILDING

(Source: Manawatu District Council, 2013)

3.3 Precinct 4 is located in the north-eastern corner of Feilding in the centre of a triangle formed by the Oroua River to the east, the Makino Spillway to the north and the Mangakino Stream to the west (see Figure 4).

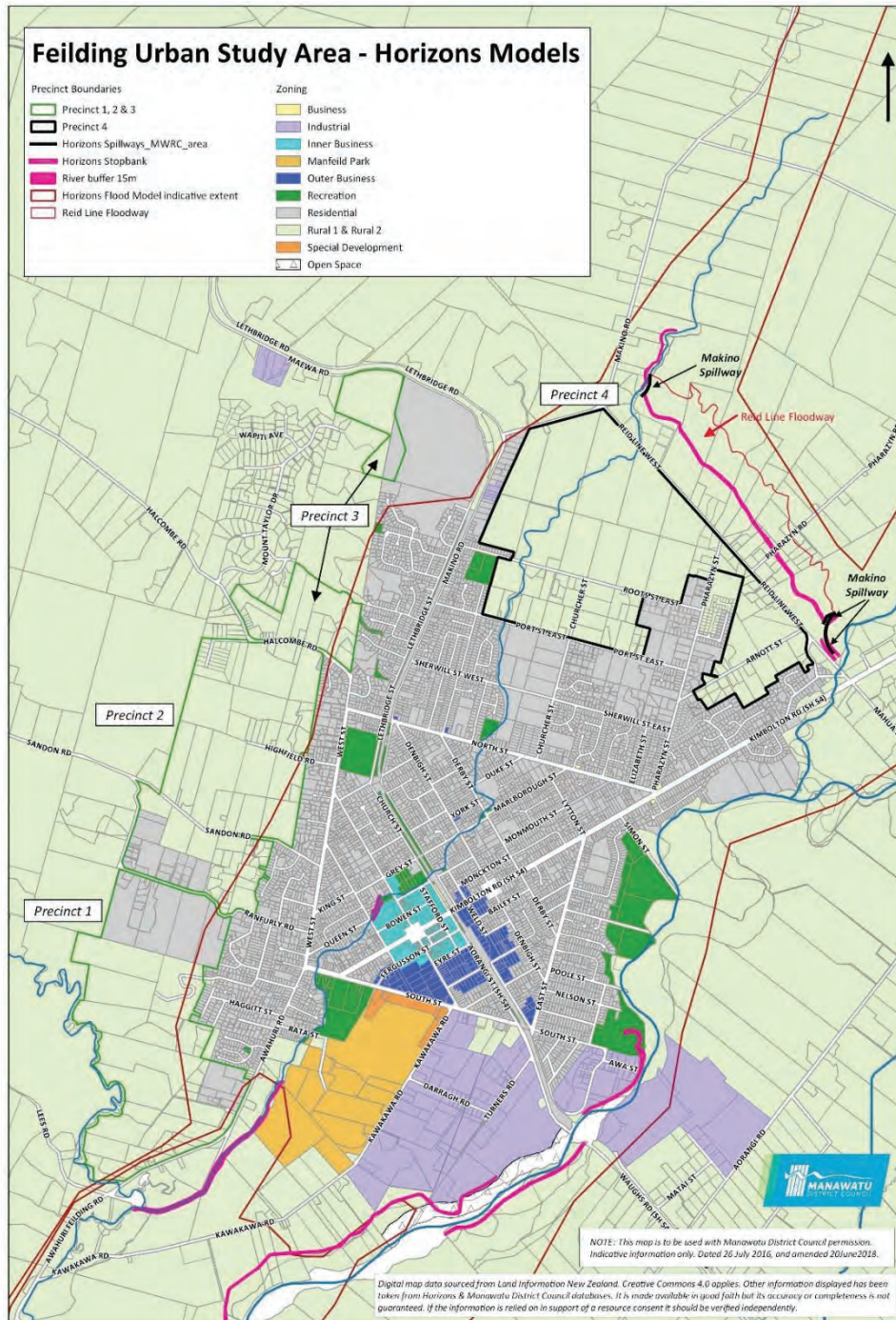


FIGURE 4: MAP SHOWING PRECINCT 4 IN RELATION TO THE OROUA RIVER, MAKINO SPILLWAY AND MANGAKINO STREAM

(Source: Manawatu District Council, 2016)

3.4 The land is mostly in pasture, but some development is already occurring around the margins (see Figure 5).



FIGURE 5: AERIAL VIEW OF PRECINCT 4 SHOWING LANDCOVER

(Source: Manawatu District Council, 2016)

3.5 The total land area is 256 hectares. Council proposes that the land will be subdivided into 1778 lots with an average density of 600m². An area of 25 hectares will be set aside as open space, and will become the Makino Stream Esplanade. Later, this report makes recommendations regarding changing the name of the Stream and associated places, such as the Esplanade, to Mangakino (see Recommendation 10). An additional 4 hectares will be allocated for a reserve. Presumably this area will be used for parks and other types of recreational space consistent with Principle 11 of the Feilding Urban Growth Framework Plan, which relates to provision of open space for recreational activities.

TABLE 1: 2017 DESIGN PARAMETERS FOR PRECINCT 4

(SOURCE: MANAWATŪ DISTRICT COUNCIL)

Development Type	2017 (256 ha)
Residential Average Density (600m ²)	1778 lots
Open Space Makino Stream Esplanade	25ha
Reserve	4ha
Total Yield (urban lots)	1778

3.6 The Feilding Urban Growth Framework Plan provides, among other things, the urban planning principles that will guide **future** urban development in Precinct 4 and the other growth areas. The Framework Plan is a non-statutory document that gives strategic direction for residential and industrial growth on the edges of Feilding over a 30-year timeframe. This strategic direction will be implemented through a plan change to the Manawatū District Plan – Proposed Plan Change 51. Among other things, Proposed Plan Change 51 will contain objectives, policies and rules for the development. Recommendations are made later in this report regarding rules to minimise the effects of stormwater on the Mangakino Stream and Oroua River (see Recommendation 1).

3.7 The Feilding Urban Growth Framework Plan and the District Plan are informed by the Council’s Vision for the district (2012). This vision is:

- Connected vibrant and thriving Manawatū District – the best rural lifestyle in New Zealand

Connected to this vision, is a set of Vision Statements and Community Outcomes. The Feilding Urban Vision Statement is:

- An attractive, progressive and inclusive country town that offers lifestyle choices, and is the agri-business hub of the region.

The Environmental Community Outcome that the Council is working towards is:

- Manawatū District protects the natural environment through stewardship of the District's natural and physical resources.

- 3.8 This Cultural Impact Assessment responds to themes in these vision and outcome statements that relate to a healthy environment and a flourishing community that takes pride in and looks after the land and waters on which it relies for cultural, social, and economic wellbeing.
- 3.9 The Feilding Urban Growth Framework Plan does not include any Māori Urban Design Principles. This report makes recommendations about incorporating Maori Urban Design Principles into future iterations of the Feilding Urban Growth Framework Plan (see Recommendation 12). In the interim, this report offers principles based on whakaaro Māori (a Māori way of thinking and planning) to inform Council's planning and decision-making regarding the Precinct 4 Growth Area. These principles are explained in the following section, which presents Te Pūtahi, the Confluence framework that has been used to analyse the Precinct 4 development through a Ngāti Kauwhata lens.

4. ASSESSMENT FRAMEWORK: TE PŪTAHI – THE CONFLUENCE³

- 4.1 The impacts of the Precinct 4 development are analysed using a conceptual framework called *Te Pūtahi*. In te reo Māori, one of the meanings of the word ‘pūtahi’ is *confluence*. Confluences are significant spatially and conceptually in the tribal landscape. For example, Te Rangimarie marae, the site of a peace-making marriage between Ngāti Raukawa and Rangitāne, is located near the confluence of the Oroua and Manawatū Rivers. As the mauri or life force of each river join at that confluence to create a new energy, so too do distinct peoples to create new families with shared ancestry.
- 4.2 *Te Pūtahi*, depicted in Table 2 and Figure 6, brings together three different waters to understand the impacts of the Precinct 4 development from a Ngāti Kauwhata perspective. The idea of a confluence enables an integrated and holistic approach to be applied to all the factors – cultural, social, environmental and economic – that need to be considered when assessing the impacts of the development. For example, all of the waters that are part of the framework are considered against a backdrop of climate change. These waters are:
- (i) **Wai tūpuna – Ancestral waters:** the Oroua River, the Mangakino Stream (commonly, but incorrectly referred to as Makino) and the Maewa puna, or spring, which enters the Mangakino Stream in the vicinity of Root Street.
 - (ii) **Wai paru – Contaminated waters:** Floodwater, stormwater and wastewater.
 - (iii) **Wai whakaaro – Conceptual waters:** *he puna korero*, a wellspring of stories about the original peoples of the land; and *he puna oranga*, a source of wellbeing for the community in the form of housing.

TABLE 2: TE PŪTAHI (THE CONFLUENCE) FRAMEWORK

Wai Tūpuna (Ancestral Waters)	Wai Paru (Contaminated Waters)	Wai Whakaaro (Conceptual Waters)
Maewa puna	Stormwater	He Puna Kōrero
Mangakino Stream	Floodwaters	<ul style="list-style-type: none"> • A wellspring of stories
Oroua River	Wastewater	He Puna Oranga
Manawatū River		<ul style="list-style-type: none"> • A source of wellbeing
Te Tai o Rehua (Tasman Sea)		

³ This framework is inspired by a presentation given by Professor Meihana Durie to the School of People, Environment and Planning at Massey University on 13 February 2018.

Wai tūpuna: ancestral waters

4.3 Precinct 4 lies in the centre of three waterbodies that are significant in the Ngāti Kauwhata tribal landscape. First, the **Oroua River** is central to the mana (authority) and wellbeing of Ngāti Kauwhata. For more than 180 years, Ngāti Kauwhata have lived on the River and regarded it as ‘a source of food, a recreational opportunity, a pathway between sites of importance, a place for spiritual revitalisation and a marker of tribal identity’ (Oroua River Declaration, para. 3). In December 2015, Ngāti Kauwhata signed the Oroua Declaration with the Manawatū District Council. The aim of the declaration is to restore the mauri of the river and to preserve the river for future generations. At the signing, Professor Sir Mason Durie emphasised the relationship between the health of the River and the health of the people, stating that, ‘if the mauri of the river is strong, then [future generations] will be more likely to be healthy and strong as well’⁴.

⁴ Durie cited in Crafar, 2015

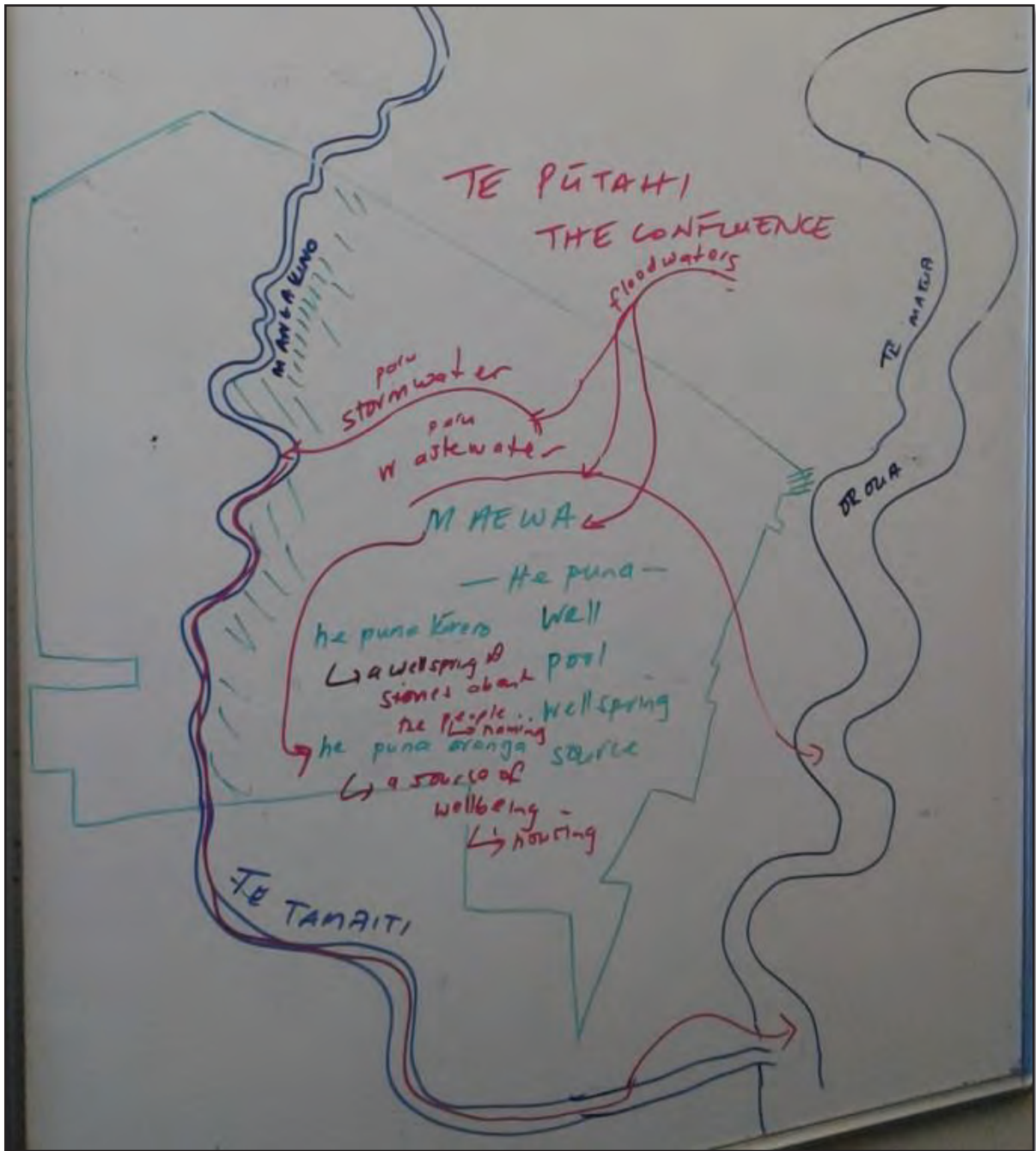


Figure 6: Diagram of Te Pūtahi (The Confluence) Framework

(Source: Bennett, A)

4.4 Second, the **Mangakino Stream** is a tributary of the Oroua River that enters the River at the Awahuri Bridge. The Mangakino Stream has its own mana and mauri (life force) that then feed into the Oroua River. Thus, the recent discharge of animal effluent from the Feilding stockyards into the Mangakino Stream via the stormwater system⁵ raised serious alarm among Kauwhata members. Both the Mangakino Stream and the Oroua

⁵ Hutton, 2018

River were declared unsafe for swimming, wading and fishing as a result of the discharge. The incident highlighted clear links between river pollution and human health, posed in this case by stormwater contamination.

- 4.5 Third, the Mangakino Stream is fed by a puna or spring, named **Maewa**. Māori regard puna as the most pure type of freshwater body (Durie et al, 2017). Because of its purity, puna wai or spring water, is preferred for use in rituals (Durie et al, 2017). For example, Higgins writes that ‘often a chief would request ... water from a particular spring, before death. These were the ‘ō matenga’ (death provisions) which would sustain the spirit in its journey after death’⁶. Thus, the preservation of water is critical for keeping customs, and the knowledge associated with those customs, alive.
- 4.6 Finally, 25 hectares of open space is to be set aside and developed into the ‘Makino Stream Esplanade’. Such green infrastructure may provide a number of benefits for the Stream, Ngāti Kauwhata and the neighbouring communities, including:
- enhanced habitat for the Stream;
 - establishing a buffer area that protects the Stream from some of the adverse impacts of the residential area *and* allows the Streambed to move naturally, without impinging on adjacent properties;
 - a beautiful and maintained recreational space that facilitates community access to the Stream;
 - a space in which tāngata whenua relationships with the Stream and the surrounding land can be acknowledged, for instance, through signage and correct use of names; and
 - potential for an ecological and recreational corridor to be built that connects the Mangakino Stream to the Oroua River.

⁶ Rawinia Higgins, ‘Tangihanga – death customs’, Te Ara – the Encyclopedia of New Zealand, <http://www.TeAra.govt.nz/en/tangihanga-death-customs/print> (accessed 8 March 2018)



FIGURE 7: MANGAKINO STREAM LOOKING DOWNSTREAM TOWARDS FEILDING

(Source: Bennett, A)

- 4.7 There is also potential for a direct connection to be established between Precinct 4 and the Oroua River in the eastern corner of Precinct 4, by having edge conditions that enable that corner to be developed in a way that enhances the River (see Recommendation 8).

Wai parū: contaminated waters

- 4.8 The development will bring about increased stormwater and wastewater volumes and has the potential to exacerbate the effects of flooding. These waters are conceptualised in Te Pūtahi as *wai parū*, or contaminated waters that are produced by human activities.

Stormwater

- 4.9 Perhaps one of the most significant effects of the development on the relationship between Ngāti Kauwhata and their ancestral waters will be the impact of stormwater. The Manawatū District Council proposes that stormwater from the western side of Precinct 4 and overland flows⁷ from the western side of Pharazyn Street will drain into the Mangakino Stream via discharge outlets. These outlets, which are still to be designed and will require consent from the Horizons Regional Council, will be at Port Street West, Root Street West and a new road. It is proposed that stormwater will also drain into the Mangakino Stream via stormwater drains in the roading network⁸. Stormwater from the eastern side of Pharazyn Street will drain via existing piped infrastructure to the Kawakawa detention pond, which is still being designed and will be located on Kawakawa Road⁹. A map showing a skeleton of the proposed roading network for Precinct 4 is given in Figure 8 (overpage).

⁷ Surface water resulting from rainfall, which can cause flooding of property and houses if not properly managed

⁸ Stormwater summary prepared by Wendy Thompson, January 2018

⁹ Stormwater summary prepared by Wendy Thompson, January 2018

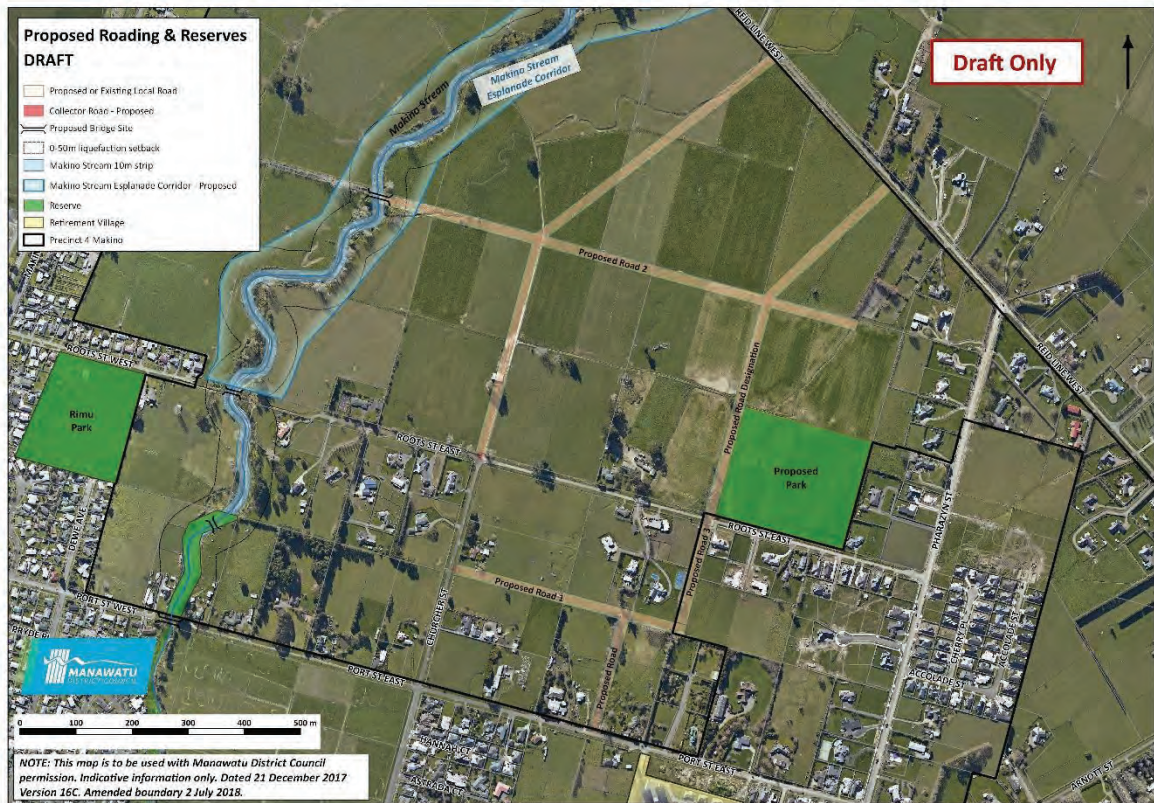


FIGURE 8: MAP SHOWING PROPOSED ROADING NETWORK FOR PRECINCT 4

(Source: Manawatū District Council)

- 4.10 The change from pasture to driveways, footpaths, roofs and roads will have effects on the environment. Batstone (2015) proposes that ‘as impervious surfaces increase, ecological health declines’. In the context of the Precinct 4 development, it is clear from considering the stormwater part of the proposal alone that freshwater environments, particularly the Mangakino Stream, possibly the Maewa puna, and certainly the Oroua River, will be adversely affected. Eventually too, coastal environs will also be impacted, because ‘everything ends up in the sink via pipes’ (ibid.). Sedimentation and heavy metal contamination, particularly from copper and zinc, are expected forms of contamination from residential development (ibid.).
- 4.11 There are three points here that are important to make from a Ngāti Kauwhata perspective. The first is that *everything is connected*. The natural waterbodies – Maewa, Mangakino and Oroua – all flow into one another, and then join the Manawatū River and Te Tai-o-Rehua, the Tasman Sea, at the coast. The second point is that each waterway has its own *mauri* (life force), *wairua* (spirit) and *mana* (power, integrity, distinct personality) (Durie et al, 2017). When stormwater enters the Mangakino Stream, it will flow into all the other waterbodies by virtue of their connectedness, and change the mauri, wairua

and mana of each. Durie et al (2017) note that ‘tikanga Māori did not permit the discharge of waste of any kind to water’ (p. 13). When there is such a discharge ‘a river or lake loses its force and may become dead ... the mauri has diminished’ (Ministry of Justice, 2001, cited in Durie et al 2017, p. 13).

- 4.12 The third point is that just as the waters are connected to each other, they also connect the people to each other, across space and time. Thus, the Precinct 4 development will have immediate impacts on Ngāti Kauwhata, as mana whenua in the Feilding area. However, it will also have implications for other iwi, including Ngāti Apa, Rangitāne, Ngāti Whakatere and Ngāti Raukawa, who have mana whenua around and downstream of Feilding. These implications place a duty of *kaitiakitanga* on Ngāti Kauwhata to influence the development at the source so that adverse impacts on other iwi and hapū are avoided. This duty spans generations. It is not only present generations that Ngāti Kauwhata must consider, but those who have passed on and those who are yet to be born.

Floodwater

- 4.13 The development has the potential to heighten the risk of properties being flooded because it is being built next to the Makino Spillway. The Horizons Regional Council River Management Group Manager has expressed concern about the location of the development, and ‘substantial’ consequences that may arise if the existing flood infrastructure is breached and the area is flooded (Strong cited in McBride, 2016). Flooding is the principal natural hazard in the region (One Plan, Chapter 9, p. 1). The Horizons Regional Council has identified ‘the increasing number of people living in hazard-prone areas’ (ibid.) as a key factor that has enhanced the vulnerability of the region to flooding. Consequently, through the One Plan the regional council seeks to ‘discourage future residential development and placement of critical infrastructure in areas prone to natural hazard events, particularly areas at high risk of flooding’ (ibid.). The effects of flooding are well known in the region. Te Rangimarie Marae near the confluence of the Oroua and Manawatū rivers, was flooded in June 2015¹⁰. The restoration took more than six months¹¹. The damage caused to Te Rangimarie Marae is an example of flood infrastructure not being able to protect property and taonga¹² in extreme circumstances. In light of this experience and others, this report raises questions for the Council regarding buffers against flooding. These questions, which are stated in paragraph 5.17 of this report, are asking whether the buffers that Council is proposing are sufficient to:

- Preserve the relationships of the people to the land;

¹⁰ Heaton, 2015

¹¹ Heaton, 2016

¹² Anything highly prized

- Provide for the wellbeing of the paper; and
- Demonstrate that current generations are being responsible guardians of the land for future generations.

Wastewater

- 4.14 Given Ngāti Kauwhata’s aspiration to lift the rāhui from the Oroua River, the effect of the Precinct 4 development on wastewater volume is a major consideration. In its decision on the Manawatū District Council’s application to renew its wastewater discharge consent, the Environment Court reported that the Feilding Wastewater Treatment Plant has capacity for the equivalent of 118,500 people¹³. However, the Court also expressed concern that there was: ‘a long history of non-compliance’ and ‘no evidence that any form of overall management plan exists for the WWTP’¹⁴. The Court emphasised that ‘a well thought out plan is a necessary requirement for resource management and consent compliance reasons alone’¹⁵. These resource management reasons include the effects of the wastewater discharge on the relationship between Ngāti Kauwhata and the Oroua River, which is a matter of national importance under section 6(e) of the Resource Management Act 1991.
- 4.15 The District Council’s Management Plan is due to be submitted to the Horizons Regional Council on 31 December 2018. The Precinct 4 development introduces some uncertainty, for example, in regards to increased wastewater volume, for which Ngāti Kauwhata seeks clear answers and assurances. These answers and assurances should be provided as part of the aforementioned Management Plan and the discussions between Ngāti Kauwhata and the council under the Oroua Declaration (see Recommendation 3). Council will be aware that Ngāti Kauwhata wish to see the Feilding Wastewater Treatment Plant discharge completely removed from the River. The Court noted that the council ‘needs to do ongoing work’ to meet this important expectation¹⁶.

He Puna Kōrero: a wellspring of stories

- 4.16 This part of the framework points to the idea that there are layers of human connections and histories on the land, and there are stories embedded in those layers. Often, these stories and layers can be invisible to the people who come to occupy the land, such as when a new residential development is proposed. One of the ways in which these layers and stories can be made visible and honoured is through **naming**. Belshaw (2005, p. 9) notes that,

¹³ [2016] NZEnvC 53 Manawatu District Council v Water Protection Society Incorporated, p. 21, para 65

¹⁴ Ibid., p. 13, para 37

¹⁵ Ibid., p. 21, para 67

¹⁶ Ibid., p. 37, para 38

new subdivisions are being widely developed, many built on land originally owned by Māori and deeply layered with rich histories. As the demand for residential and commercial properties increases, these developments give rise to unassuming place and street names, which serve to alienate Māori histories, rendering them invisible and in some cases, removing them from memory. In modern society we are experiencing a growing movement from within Māoridom that seeks to reinstate the original Māori names for places, where currently street and place-names have no association to the original area. In many ways it is an attempt to decolonise the land, revive forgotten histories and reclaim mana whenua.

- 4.17 Belshaw also highlights that local authorities have an important role to play in naming, or re-naming, the land and other resources. The Manawatū District Council may be aware that the original name for the Makino Stream is ‘Mangakino’ – ‘manga’ meaning stream, and ‘kino’ in this context meaning twisted (Emery, pers. comm, 2018). The word ‘Makino’ is the result of ‘Mangakino’ being mispronounced by early European settlers to the district. ‘Makino’ does not appear to have any meaning in te reo Māori. Restoring the original name to the stream would **restore mana** to that name.
- 4.18 Beyond the Mangakino Stream, there is the question of naming the new subdivision and its streets. Again, the use of names that signify the relationship between Ngāti Kauwhata and the area would recognise and provide for that relationship, consistent with section 6(e) of the RMA. Manawatū District Council should seek advice from Ngāti Kauwhata as to names that would be appropriate (See Recommendation 10).

He Puna Oranga: a source of wellbeing

- 4.19 The final element of the *Pūtahi* framework is *He Puna Oranga, a source of wellbeing*. In the context of Precinct 4, *He Puna Oranga* refers to **housing**. Housing is fundamental to wellbeing. Howden, Bierre and Cunningham (2013, p. 105) propose that housing has a significant, but often unrecognised impact on our health and the sense of belonging we feel in the communities in which we live. At the same time as housing is an important source of wellbeing, it is also a major source of inequality, for example, between Māori and Pākehā. Howden, Bierre and Cunningham (2013, p. 105) point out that Māori occupy a disadvantaged position in the housing market, compared to Pākehā and other New Zealanders,

as a result of historical factors (in particular, Māori have often been excluded from proactive housing policies) and ongoing structural problems (there are, for example, great divisions between those who own their house and those who rent) (ibid.).

- 4.20 For example, at 2013, Māori home ownership nationally was 28.2% compared with 56.8% for Pākehā¹⁷, while 53.3% of Māori were paying rent, compared with 32.9% of

¹⁷ Statistics New Zealand, 2014a

the New Zealand population¹⁸. These differences are reflected in Feilding. In 2013, 26% of Māori in Feilding owned or partially owned their own home, compared with 57% of Pākehā¹⁹.

- 4.21 Housing is considered to be affordable when the median house price is no more than three times the median income (14th Annual demographia international housing affordability survey, p. 6). The ratio between median house cost and median income has increased significantly. In 1980, the median house cost was twice the median income (Howden, Bierre and Cunningham, 2013). In 2017, the median house cost was 5.8 times the median income (14th Annual demographia international housing affordability survey, 2018, p. 19), causing housing in New Zealand to be declared as severely unaffordable (ibid.).
- 4.22 In 2013, the median income for all Māori over 15 years was \$22,500²⁰. In 2017, the median house price in Feilding was reported as being \$359,750²¹, 16 times the median income for Māori nationally.
- 4.23 Howden-Chapman, Bierre and Cunningham (2011) argue that ‘we cannot rely on private developers’ to provide affordable housing; central and local government must also contribute. For example, the Palmerston North City Council has invested in the rental housing market, spending \$6.5 million to complete 48 new social housing units in 2019. The council reports that the units will be modern and eco-friendly and will have disability-access²². According to Palmerston North Mayor Grant Smith, the development will ‘improve the quality of living for some of the more vulnerable members of our community’. Indeed, Howden-Chapman, Bierre, Cunningham, (2013) argue that ‘improving the quality of our housing is one of the best and simplest ways’ to lift health outcomes and bridge ‘the great divide between the haves and the have nots in New Zealand’ (p. 117). Consistent with the purpose of the RMA, there is a role for Manawatū District Council to provide for the wellbeing and health of the community that will live in Precinct 4, using the platform of affordable, quality housing as a *Puna Oranga, a source of wellbeing*.

¹⁸ Statistics New Zealand, 2014b

¹⁹ Dataset, Tenure holder and ethnic group (grouped total responses) by sex, for the census usually resident population count aged 15 years and over, 2001, 2006 and 2013 Censuses, Statistics New Zealand. Results for Feilding North, West, Central and East were used to produce the figures shown in the text.

²⁰ Statistics New Zealand, 2014c

²¹ Eade, 2017

²² Palmerston North City Council, 2017

5. POLICY FRAMEWORK

- 5.1 This section of the report identifies and discusses the policies that are relevant to the Precinct 4 Growth Area and its effects on Ngati Kauwhata. Relevant policies are set alongside the different strands of *Te Pūtahi* so that the framework can be used as a lens for thinking about the implications of these policies for Ngati Kauwhata.

Policies relating to wai tūpuna and wai paru

- 5.2 The wai tūpuna (ancestral waters) part of the Pūtahi framework emphasises three factors: the health of the natural waterways that encircle Precinct 4, their interconnectedness, and the relationships between the different waterbodies and the people. Wai paru (contaminated waters) impact affect all these factors. Thus, policies relating to wai tūpuna and wai paru are considered together.
- 5.3 There are five main policies that are relevant:
- (i) the National Policy Statement for Freshwater Management 2014;
 - (ii) the RMA, specifically section 6(e);
 - (iii) the Oroua Declaration, including the Terms of Reference for the Mana Whakahaere Group and the commitment of that Group to kaitiakitanga, captured in the paper ‘Ko Oroua te awa, ko kaitiakitanga te take’;
 - (iv) the Feilding Urban Growth Framework Plan 2013, and
 - (v) the Horizons Regional Council One Plan.

National Policy Statement for Freshwater Management 2014

- 5.4 The National Policy Statement (NPS) for Freshwater Management prioritises the **health and wellbeing** of waterways. The central principle in the NPS is **Te Mana o Te Wai**, which is defined as the ‘integrated and holistic wellbeing of a freshwater body’. When decisions are being made about waterways, the health and wellbeing of those waterbodies must be at the forefront of the discussions. Putting the health of water first in these conversations recognises that Te Mana o Te Wai is a **matter of national significance** under the NPS. Discussions about water must involve the local **people** – tāngata whenua and communities – and a process of identifying their values for water. However, in these discussions the health of water must take precedence.
- 5.5 The NPS links the holistic wellbeing of water with the **mauri** of water. To uphold Te Mana o te Wai, the mauri of the water must be acknowledged and importantly, protected. Also, in regards to uses of water, such as the use of the Mangakino Stream as a stormwater sink, three aspects of health must be provided for. Referred to by the Ministry for the Environment as the 3 Healths, these dimensions are:
- (i) Te Hauora o te Taiao – the health of the environment.
 - (ii) Te Hauora o te Wai – the health of water.

(iii) Te Hauora o te Tangata – the health of people.

The ultimate goal of the NPS is that everyone can use and enjoy freshwater, now and in the future.

- 5.6 While the Horizons Regional Council has primary responsibility for implementing the NPS, the Manawatū District Council has important obligations. For example, the District Council must have regard to the NPS in making decisions about any resource consent applications to develop the Precinct 4 Growth Area.
- 5.7 The provision regarding uses of water in the NPS is also significant for the District Council. As the supplier of drinking water, wastewater and stormwater infrastructure in the district, the Council is a major water user. The Council must give effect to the NPS in its district plan, including Proposed Plan Change 51. To ‘give effect’ has been defined as meaning to ‘actively implement’²³.

Resource Management Act 1991 – section 6(e)

- 5.8 Section 6(e) of the RMA requires planners and decision-makers operating under the Act to recognise and provide for the relationship of Māori and their culture and traditions with their ancestral **water** – their tūpuna wai – as a matter of national importance. The priority for the three tūpuna wai that encircle the Precinct 4 Growth Area is **restoration** and **protection**. Access to the Oroua River and the Mangakino Stream, by virtue of being connected to the Oroua River, is prohibited by a rāhui. Lifting the rāhui by preventing further discharges and ending current discharges is one of Kauwhata’s central objectives. Moreover, the Maewa puna is a pure water source. Protecting this purity must be the goal.
- 5.9 In practical terms, recognising and providing for these tūpuna wai means avoiding, preferably, or mitigating stormwater discharge to the Mangakino Stream. Such avoidance or mitigation may be achieved by the use of swale systems, as advocated by Awatere, Rolleston and Pauling (2010) in their work on Developing Māori Urban Design Principles. Importantly, Manawatū District Council also promote such systems as a principle of Sustainable Stormwater Management in the Feilding Urban Growth Framework Plan 2013 (see Design Principle 16).

Oroua Declaration

- 5.10 The Oroua Declaration positions the Mana Whakahaere Group between Ngāti Kauwhata and the Council as **kaitiaki**. The Declaration also applies the Treaty principles of **partnership, active protection and participation**. The Declaration is a partnership between Ngāti Kauwhata and the Council, both parties have committed to protecting the river, and both recognise that no ‘single agency, committee or task force’ can restore the river on their own (Te Mana Whakahaere, Ko Oroua te Awa, Ko Kaitiakitanga

²³ The RMA Quality Planning Resource

te Take). Everyone must participate; a ‘whole-of-community’ approach is required (ibid.). Because the Mangakino Stream is a tributary of the Oroua River, the River cannot be protected if the Stream is allowed to degrade. Thus, the Oroua Declaration strengthens the need to actively protect the tūpuna wai in the Precinct 4 Growth Area.

Feilding Urban Growth Framework Plan & Horizons Regional Council One Plan

- 5.11 This report supports proposals in the Feilding Urban Growth Framework Plan regarding the 25 hectares of open space that will be set aside for an esplanade area alongside the Mangakino Stream. For clarity, this report offers some detail in relation to these proposals, and converts this detail into recommendations. These recommendations are listed at the end of this report (see Recommendations 4-7)
- 5.12 The Council suggests in the Framework Plan that sustainable stormwater design could be used along stream corridors. Should Council wish to pursue such options for the Mangakino Stream, the detail would need to be discussed with Ngāti Kauwhata to ensure that adverse effects on Kauwhata’s values are avoided or minimised (see Recommendation 2).
- 5.13 The Mangakino Stream Esplanade will also be important for reducing the impacts of the Precinct 4 Growth Area on flooding, because the open space will provide for infiltration to occur. The open space will also provide a buffer in which the streambed can move and flood levels and flows can rise and accelerate, without putting the neighbouring community at risk.
- 5.14 The idea of building in **buffers** to the design of Precinct 4 is critical in the face of climate change. Buffers are essential for:
- preserving the relationships of the people with the land and avoiding displacement,
 - providing for the wellbeing of the people and keeping them safe, and
 - being responsible stewards of the land by making decisions now that do not compromise future generations.
- 5.15 One of the buffers against flooding being proposed by the District Council involves requiring floor levels in dwellings to be above the 0.5% Annual Exceedance Probability (1 in 200 year flood level). This proposal is consistent with Policy 9-2 in the One Plan, which states:
- (b) Outside of a floodway mapped in Schedule J the Regional Council and Territorial Authorities must not allow the establishment of any new structure or activity, or an increase in the scale of any existing structure or activity, within an area which would be inundated in a 0.5% Annual Exceedance Probability (1 in 200 year) flood event unless:*
- (i) flood hazard avoidance is achieved or the 0.5% AEP (1 in 200 year) flood hazard is mitigated ...*

(a) when making decisions under Policies 9-2(a) and (b)(i) regarding the appropriateness of proposed flood hazard mitigation methods, the Regional Council and Territorial Authorities must:

(i) ensure that occupied structures have a finished floor or ground level, which includes reasonable freeboard, above the 0.5% AEP (1 in 200 year flood level)

5.16 The Regional Council's approach is to: 'Discourage future residential development and placement of critical infrastructure in areas prone to natural hazard events, particularly areas at his risk of flooding ...' (Horizons Regional Council One Plan, p. 9-1). Similarly, Principle 19 of the Feilding Urban Growth Framework Plan encourages the District Council to 'Recognise the hydrological system' and 'avoid development in high risk areas'.

5.17 Given these statements and the District Council's proposals and approach to flood-risk mitigation, this report asks the following questions:

- (i) In addition to requirements regarding floor levels, what other buffers are being proposed by the Council for Precinct 4?
- (ii) Are these buffers sufficient to:
 - a. preserve the relationships of the people with the land,
 - b. provide for the wellbeing of the people, and
 - c. demonstrate that current generations are being responsible guardians of the land for future generations?

Policies relating to Naming

5.18 This report has emphasised that the Council needs to give attention to correct and appropriate place-naming in the development of the Precinct 4 Growth Area. Of particular concern is the correct use of the name 'Mangakino' for the Mangakino Stream, and correct and appropriate use of Māori names for the subdivision and streets. According to the New Zealand Gazetteer of Place Names, a repository that holds all official and unofficial places names, 'Makino Stream' is not an official name.

New Zealand Geographic Board (Ngā Pou Taunaha o Aotearoa) Act 2008

5.19 The policy framework for place-naming is provided by the New Zealand Geographic Board (Ngā Pou Taunaha o Aotearoa) Act 2008. Under this Act, the authority for making place names official belongs to the New Zealand Geographic Board. Among other things, the purpose of the Act is to:

- *Provide the means for appropriate recognition to be accorded to cultural and heritage values associated with geographic features (section 3(e)).*

- 5.20 As a means of recognising and respecting the Crown’s responsibility to take appropriate account of the Treaty of Waitangi, the Act confers certain functions on the New Zealand Geographic Board, including:
- collecting original Māori names of geographic features for recording on official charts and official maps; and
 - encouraging the use of those names on official charts and official maps.
- 5.21 To carry out these functions, the Board may:
- examine cases of doubtful spelling of names, and determine the spelling to be adopted on official charts or official maps,
 - collect original Māori place names for recording on official charts and official maps,
 - encourage the use of original Māori names on official charts and official maps.
- 5.22 Anyone can submit a proposal for a change to an existing name. The Board considers naming proposals on a case-by-case basis. To inform its decision-making, the Board encourages consultation between iwi, local authorities and communities. The Board can alter an official geographic name or recorded name by substituting another name, or correcting the spelling of the name.
- 5.23 The Board does not have responsibility for naming a subdivision or streets and roads. In the case of Precinct 4, it is best that these names be negotiated between the Council, the tāngata whenua and the developer. Recommendations regarding re-naming the Mangakino Stream, and naming the Precinct 4 subdivision and streets are listed under Recommendation 10 at the end of this report.

Policies relating to Housing

- 5.24 This report stresses that housing affordability is an important factor in the design of the Precinct 4 Growth Area. Housing affordability is provided for in the Feilding Urban Growth Framework Plan using density and lot size. Design Principle 15 of that Plan supports the District Council to:
- Encourage a mix of housing types within Feilding’s neighbourhoods **using a range of densities and lot sizes** to provide opportunities for housing for the range of lifecycle needs of residents and **to recognise different affordability factors**.
- 5.25 This report argues that a more proactive approach is needed to provide for housing affordability in Precinct 4. It advocates for the use of an inclusionary housing policy. Calavita and Mallach (2010, p. 1, cited in Murphy, 2015) define inclusionary housing policies as a regulatory or legal process ‘that requires or provides incentives to private developers to incorporate affordable or social housing as part of market driven developments’.

Example: Queenstown Lakes District Council Plan Change 24

5.26 As an example, the Queenstown Lakes District Council introduced affordable housing policies into its district plan in 2013 using a plan change: Plan Change 24. Plan Change 24 contains objectives, policies and methods for affordable and community housing for people who wish to rent or buy. The Council defines affordable housing as:

‘housing where a low or moderate income household spends no more than approximately 30% of gross income on rent or mortgage (principal and interest) repayments’.

5.27 The Queenstown Lakes District Council uses four methods to implement its affordable housing plan provisions:

(1) resource consent conditions on developments, which require the developer to make a contribution (for example, 5% of the land area) towards affordable and/or community housing;

(2) the Council’s HOPE (Housing Our People in our Environment) Strategy, which sets out actions the Council will take to provide affordable housing in the district;

(3) a relationship with the Queenstown Lakes Community Housing Trust, which delivers affordable and community housing, for instance, on land contributed by developers; and

(4) accessing central government support, such as funding.

5.28 At 2018, the Trust had delivered 160 affordable houses over 10 years. It aims to build 1000 affordable homes over the next 10 years²⁴.

5.29 This report also contends that an inclusionary housing policy, such as that adopted by the Queenstown Lakes District Council is consistent with the National Policy Statement (NPS) on Urban Development Capacity 2016. The NPS on Urban Development Capacity highlights the following factors:

- future generations,
- wellbeing across cultural, environmental, social and economic criteria,
- planning for the long term,
- providing housing choice for people, including choices that are affordable, and
- local government responding to the changing needs of communities, such as needs that relate to affordable housing.

5.30 Relevant objectives in the NPS include Objectives OA2 and OC1. These objectives create the following goals for urban development:

²⁴ Queenstown housing trust pledges 1000 affordable homes, Radio New Zealand, 9 January 2018

OA2. Urban environments that have sufficient opportunities for the development of housing ... and which provide **choices** that will meet the needs of **people and communities and future generations** for a range of dwelling types and locations ...

OC1. Planning decisions, practices and methods that enable urban development which provides for the **social, economic, cultural and environmental wellbeing** of people and communities and future generations in the short, medium and long term.

5.31 Relevant policies include Policy PA3, which specifies that:

PA3. When making planning decisions that affect the way and the rate at which development capacity is provided, decision-makers shall provide for the **social, economic, cultural and environmental wellbeing of people and communities and future generations**, whilst having particular regard to:

*Providing for **choices** that will meet the needs of people and communities and future generations for a range of dwelling types and locations ...*

TABLE 3: POLICIES RELATING TO THE PRECINCT 4 GROWTH AREA

Policies related to Wai Tūpuna and Wai Paru	Policies related to Naming	Policies related to Housing
<ul style="list-style-type: none"> • RMA, section 6(e) • NPS for Freshwater Management 2014 • Horizons One Plan • Feilding Urban Growth Framework Plan • Oroua Declaration 	<p>New Zealand Geographic Board (Ngā Pou Taunaha o Aotearoa) Act 2008</p>	<p>NPS on Urban Development Capacity 2016</p>

6. SUMMARY AND RECOMMENDATIONS

- 6.1 This report has assessed the impacts of the Precinct 4 Growth Area on Ngāti Kauwhata and their relationships with the lands and waters that fall within their tribal boundaries.
- 6.2 The report has highlighted a range of implications of the development for Ngāti Kauwhata and others. These implications relate to:
- (i) protecting and enhancing natural waterways
 - (ii) avoiding and minimising the effects of contaminated waters on natural waterbodies
 - (iii) naming the land and other taonga
 - (iv) being proactive about providing for affordable housing, and
 - (v) recognising whakaaro Māori, Māori ways of thinking and planning, as offering a holistic and interconnected approach to assessing and co-designing urban developments.
- 6.3 To address these impacts, this report makes 12 recommendations. These recommendations are arranged to respond to four issues:
- (i) Wai tūpuna and wai paru (ancestral waterways and contaminated water)
 - a. Recommendations 1-9
 - (ii) Naming
 - a. Recommendation 10
 - (iii) Housing
 - a. Recommendation 11
 - (iv) Lack of Māori Urban Design Principles in the Feilding Urban Growth Framework Plan
 - a. Recommendation 12

These recommendations are set out below.

Recommendations relating to Wai Tūpuna and Wai Paru

1. As a starting point, this report recommends that Council 'give effect to' the National Policy Statement for Freshwater Management in Proposed Plan Change 51 and in relation to the Precinct 4 Growth Area by including rules and conditions:
 - a. to specify the maximum impervious area for each lot to limit surface water run-off that may contaminate waterways and exacerbate flooding; and
 - b. to require sealed roofing materials to be used, such as COLORSTEEL, and prohibit others, such as uncoated zinc, to minimise zinc run-off and contamination of waterways; and
 - c. to prohibit unsealed heavy metal building materials, such as copper claddings and piping, from being used in building construction to minimise copper run-off and contamination of waterbodies.

- i. Should unsealed copper claddings or piping be used in building a house, it is recommended that Council require the property owner to install appropriate on-site mitigation to reduce copper contamination of waterways.
2. Given Ngāti Kauwhata concerns around potential stormwater contamination of the Mangakino Stream and associated tūpuna wai, it is recommended that Manawatū District Council engage Ngāti Kauwhata in discussions about the options for stormwater discharge and treatment from Precinct 4, including the use of a *full range* of water-sensitive design options for stormwater that might be possible, such as the source control methods identified in the Feilding Urban Growth Framework Plan.
3. Given Ngāti Kauwhata's aspiration to lift the rāhui from the Oroua River, and that the Precinct 4 development introduces some uncertainty in regards to increased wastewater volume, it is recommended that Ngāti Kauwhata and the District Council, through the Mana Whakahaere Group, discuss how the District Council is going to manage these volumes when the Council releases its Management Plan for the Feilding Wastewater Treatment Plant at the end of 2018.

In regards to the Mangakino Stream and surrounds, it is recommended that:

4. The Mangakino Stream be utilised and restored as an environmental corridor using eco-sourcing.
5. A network of footpaths and cycleways along this corridor be established and connect the Mangakino Stream to Oroua River, as well as provide opportunities for people to commute from Precinct 4 to other parts of Feilding using active transport.
6. The Mangakino Stream Esplanade be developed as a recreational reserve that enables people to safely access and enjoy the Stream and surrounds.
7. The connection of Ngāti Kauwhata to the land be acknowledged in the Mangakino Stream Esplanade through the use of tohu, or different types of signage, such as interpretation boards and pou whenua.
8. In regards to the eastern corner of Precinct 4 bordering the Oroua River, it is recommended that Proposed Plan Change 51 include edge conditions that enable that corner to be developed in a way that enhances the River.
9. Given the District Council's proposals and approach to flood-risk mitigation, it is recommended that the District Council engage Ngāti Kauwhata and the Horizons Regional Council in discussion to address the following questions:
 - (i) In addition to requirements regarding floor levels, what other buffers are being proposed by the Council for Precinct 4?
 - (ii) Are these buffers sufficient to:
 - a. preserve the relationships of the people with the land,

- b. provide for the wellbeing of the people, and
- c. demonstrate that current generations are being responsible guardians of the land for future generations?

Recommendations regarding Naming

10. It is recommended that a proposal be jointly submitted by Ngāti Kauwhata and the Council to the New Zealand Geographic Board to change the name of the Makino Stream to Mangakino Stream.
 - a. This proposal be submitted by the Mana Whakahaere Group formed under the Oroua Declaration, given the Mangakino Stream is a tributary of the Oroua.
 - b. Should the Council and Ngāti Kauwhata accept this recommendation, it is suggested that the Mana Whakahaere Group approach Professor Mike Roche at Massey University for advice on submitting the application. Professor Roche is a member of the New Zealand Geographic Board.
 - c. The Council and Ngati Kauwhata, perhaps through the Mana Whakahaere Group, discuss with the developer appropriate names for the Precinct 4 subdivision and streets in the subdivision.

Recommendation regarding Housing

11. It is recommended that the Manawatu District Council take a proactive approach to housing affordability in the Precinct 4 Growth Area and adopt an inclusionary housing policy, perhaps similar to that employed by Queenstown Lakes District Council.

Recommendation regarding Māori Urban Design Principles

12. It is noted there are no Māori design principles included in the Feilding Urban Growth Framework Plan. It is recommended that Council include Māori design principles in future plans regarding urban development in the Manawatū District.

7. REFERENCES

[2016] NZEnvC 53 Manawatu District Council v Water Protection Society Incorporated

A glimpse into the Māori world : Māori perspectives on justice = He hīnātore ki te ao Māori. (2001). Wellington, N.Z. : Ministry of Justice, 2001.

Awatere, S., Rolleston, S., & Pauling, C. (2010). Developing Māori urban design principles. In K. Stuart, & M. Thompson-Fawcett (Eds.), *Taone tupu ora: indigenous knowledge and sustainable urban design*. Wellington: Steel Roberts Aotearoa.

Batstone, C. (2015). *Urban development, stormwater and resilience*. New Zealand Centre for Sustainable Cities. Wellington. Retrieved from <http://sustainablecities.org.nz/2015/09/urban-development-water-resilience/>

Belshaw, K. J. (2005). Decolonising the land - naming and reclaiming places. *Planning Quarterly*(December), 7-9.

Calavita, N, Mallach, A (eds) (2010) *Inclusionary Housing in International Perspective: Affordable Housing, Social Inclusion, and Land Value Recapture*. Cambridge, MA: Lincoln Institute of Land Policy.

Carozzi, F., Cheshire, P., & Hilber, C. (2018). *14th Annual Demographia International Housing Affordability Survey: 2018*. London School of Economics. Retrieved from <http://www.demographia.com/dhi.pdf>

Crafar, V. (2015, 16 December). Historic declaration signing for Oroua River health. *Manawatū Standard*. Retrieved from <https://www.stuff.co.nz/manawatu-standard/news/75131323/historic-declaration-signing-for-oroua-river-health>

Durie, E. T., Joseph, R., Erueti, A., Toki, V., Ruru, J., Jones, C., & Hook, R. (2017). *Ngā wai o te Māori: ngā tikanga me ngā ture roia: The waters of the Māori: Māori law and State law*. A paper prepared for the New Zealand Māori Council.

Durie, M. H. (2014). *Statement of evidence in the matter of the Resource Management Act (RMA) 1991 and in the matter of a joint hearing of the applications for resource consents and a notice of requirement lodged by Manawatu District Council (MDC) - Infrastructure Group, in relation to the treatment and disposal of treated wastewater from the Feilding Wastewater Treatment Plant on Kawakawa Road*.

Durie, M. (1998). *Te mana te kāwanatanga: the politics of Māori self-determination*. Auckland: Oxford University Press.

Eade, S. (2017, 13 December). Manawatū-Whanganui median house prices hit new records. *Manawatū Standard*. Retrieved from <https://www.stuff.co.nz/manawatu-standard/news/99807225/manawatwhanganui-median-house-prices-hit-new-records>

- Esler, A.E. (1978). *Botany of the Manawatu*. DSIR Information Series No. 127, New Zealand Department of Scientific and Industrial Research. Government Printer: Wellington.
- Heaton, T. (2016, 27 January). 'Te Rangimarie Marae nears recovery, homestead a way off', *Manawātū Standard*. Retrieved from URL: <https://www.stuff.co.nz/manawatu-standard/news/76112146/te-rangimarie-marae-nears-recovery-homestead-a-way-off>
- Heaton, T. (2015, 26 June). 'Flooded Te Rangimarie Marae stripped and cleaned', *Manawātū Standard*. Retrieved from <https://www.stuff.co.nz/manawatu-standard/news/69707046/flooded-te-rangimarie-marae-stripped-and-cleaned>
- Higgins, R. 'Tangihanga – death customs'. *Te Ara – the Encyclopedia of New Zealand*, <http://www.TeAra.govt.nz/en/tangihanga-death-customs/print> (accessed 8 March 2018).
- Horizons Regional Council. (2014). *One Plan: the consolidated Regional Policy Statement, Regional Plan and Regional Coastal Plan for the Manawatu-Wanganui Region*. Palmerston North: Horizons Regional Council.
- Howden-Chapman, P., Bierre, S., & Cunningham, C. (2013). Building inequality. In M. Rashbrooke (Ed.), *Inequality: a New Zealand crisis*. Wellington: Bridget Williams Books.
- Hutton, C. (2018, February 18), 'Animal effluent warning for popular swimming river', *Radio New Zealand*. Retrieved from <https://www.radionz.co.nz/news/top/350631/animal-effluent-warning-for-popular-swimming-river>
- McBride, N. (2016, 26 June). Housing developments in Feilding floodplain cause concern for council, *Manawātū Standard*. Retrieved from <https://www.stuff.co.nz/manawatu-standard/news/81309816/housing-developments-in-feilding-floodplain-cause-concern-for-council>
- Murphy, L. (2016). The politics of land supply and affordable housing: Auckland's Housing Accord and Special Housing Areas. *Urban Studies*, 53(12), 2530-2547. doi: 10.1177/0042098015594574
- Palmerston North City Council. (2017, 28 June). Palmerston North City Council to invest \$65 million in Papioea Place. Retrieved from <https://www.pncc.govt.nz/news-events-and-culture/news/palmerston-north-city-council-to-invest-65-million-in-papaioea-place/>
- Queenstown housing trust pledges 1000 affordable homes, *Radio New Zealand*, 9 January 2018. Retrieved from <https://www.radionz.co.nz/news/national/347772/queentown-housing-trust-pledges-1000-affordable-home>
- Report of Alex McKay in his capacity as Commissioner of Native Reserves, 3 March 1884, to the Under Secretary Native Department regarding the application by James Whisker to remove the restrictions on the Kawa Kawa Native Reserve.
- Statistics New Zealand. (2014a). 2013 Census quick stats about housing: Home ownership by individuals. Retrieved from <http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-about-housing/home-ownership-individuals.aspx>

Statistics New Zealand. (2014b). 2013 Census ethnic group profiles Māori: Housing. Retrieved from http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/ethnic-profiles.aspx?request_value=24705&tabname=Housing

Statistics New Zealand (2014c). 2013 Census quick stats about income: Personal income by ethnic group. Retrieved from <http://archive.stats.govt.nz/Census/2013-census/profile-and-summary-reports/quickstats-income/personal-income-ethnic.aspx>

The RMA Quality Planning Resource, 'Give Effect To', Retrieved from <http://www.qualityplanning.org.nz>

29/03/2019

Memo

To: Brent Limmer **CC** Larry Parr

From Jessica Kereama, Pou Taiao

Date: 29/03/2019

Purpose

The purpose of this memo is at the request of MDC Section 32 Report for Precinct 4 housing development and provides the basis of feedback from Ngāti Raukawa at this point in time.

Information provided to date

This is the beginning of Te Rūnanga o Raukawa being engaged in this project, and we are looking forward to an opportunity to engage further in this urban development.

At this point we have been supplied the Precinct 4 CIA, and our analysis and support is limited to a critique of the document.

Analysis of CIA of Precinct 4 development

- The conceptual model of Te Pūtahi is beautiful and aligns with universal Maori values, whether the values be the Mauri model, Tapa Wha or Kaupapa Tuku Iho.
- Raukawa agree that the analysis of waters connecting to people as discussed in 1.3 (iii) is inclusive of our inter-iwi relationships on waterways.
- There is a need to update the maps references for the project as current Kauwhata interests have been identified on Fig (1) as overlaying many hapū whom refer to themselves as Te Reureu.
- The connectivity between those hapū of Raukawa and Kauwhata is an important celebration of the key marae and hapū who would call Feilding their home. It would be good to profile a breakdown of the Māori community, and ensure these connections are celebrated in this project, and understood in terms of a demographic profile.
- We note MDC are seeking to address RMA matters section 6 e, and the NPS for Fresh water, and the NPS for Urban Development. Raukawa have committed to continue to work with MDC regarding this housing project and outstanding questions relating to more detailed aspects of project design, implementation and social investment will be progressed with MDC.
- MDC has formally committed to ongoing work and investment with Ngāti Raukawa in this space, and this would continue to satisfy us in terms of meeting section 6e matters.
- We have commissioned a piece of work that identifies the cultural landscape broadly across the Outstanding Natural Landscapes, which will also feed into a further analysis of Precinct 4.
- The need for Raukawa statistics was identified for clause 3.2, however we support in full the recommendations of 3.6.

- Raukawa would like to have input into Maori Urban design as identified in 3.9.
- Sedimentation and heavy metal contamination, from copper and zinc from residential development, and it's impact on coastal environments is a concern to us, clause 4.1.
- In the report the iwi landscape is referred to in 4.12, Kauwhata and Whakatere, which sit inside Te Rūnanga o Raukawa, as do Tukorehe and Wehiwehi. We support both hapū and iwi sovereignty, both also provide resources as a collective Rūnanga to help facilitate and celebrate our communities.
- Concerning naming the landscape, we absolutely agree to see our iwi celebrated in this space and would like this to be inclusive of our maori communities, as referred to in clause 4.18.
- Affordable housing, water quality, wāhi tapu; relationship with the Makino Stream and access) are the overall themes that we believe are important at this point in time.

Summary

We are committed to sustainable development, and our focus is on ensuring that infrastructure development does not negatively impact on our waterways and land.

Te Rūnanga o Raukawa believe that housing development needs to reflect an investment in its tāngata whenua communities, and we have a focus on social procurement, investment and development in the wellbeing of our people. To advance the conversation MDC and Raukawa have committed to continue to work together over the planning, design and implementation phases.

The amount of information provided for analysis is limited to the Precinct 4 CIA report, and further work is required to advance our understanding of this project. Having stated that, there is a tangible commitment to working together, and we believe at this point in time this meets RMA requirements in regards to 6e, 7 and 8.

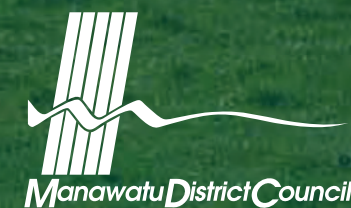
Nga mihi

Jessica Kereama

Pou Taiao

Feilding Urban Growth Framework Plan

adopted May 2013



Boffa Miskell



Feilding Urban Growth Framework Plan

Prepared for: Manawatu District Council
 Prepared by: Boffa Miskell Ltd
 Project Number: W09117D
 Version: E - FINAL DRAFT
 Date: 6.05.2013

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BOFFA MISKELL LIMITED
 Level 9, 190 Willis Street,
 PO Box 11340, Wellington 6142
 New Zealand
 Tel: 64 4 385 9315 Fax: 64 4 384 3089
 www.boffamiskell.co.nz

01 Introduction

Purpose of the Framework Plan

Planning for urban growth and development presents an opportunity to consider the type of urban environment that will best meet the community's future needs.

The purpose of this Framework Plan is to present the results of a strategic analysis of the needs and challenges for Feilding's urban growth and development. It also examines the opportunities for an 'urban form' that addresses the urban growth and development needs and challenges through the application of urban planning principles.

The challenges to the future for Feilding are common to many being experienced by other urban places throughout New Zealand. These include the need to:

- provide for a changing population demographic and its different needs like smaller households, less structured and informal recreation facilities, accessibility to services
- provide for more flexibility in the way the urban area can adapt over time to recognise the pace with which our needs change over time
- provide for sustainable forms and placement of development that both reduce the large investment in infrastructure and energy to service, as well as reduce the risk from damage from natural or induced hazards
- provide for increasing costs of transport and the need for cheaper as well as more accessible forms of moving around (like walking and cycling)
- provide for local businesses and economies to be maintained and new ones established and to prosper to ensure that the viability of the town as a place to live and work
- provide for a cyclical growth environment with its attendant fluctuations in demand for new houses or business
- provide for a range of socio-economic influences on the community's ability to access services and housing
- provide for a distinctive and positive character to instill local pride and a clear differentiator that will attract people to live, visit and conduct business there.



01

Introduction

District Plan Relationship

The Manawatu District Council's (MDC) process to develop an approach for Feilding's growth has been to consider it at two levels. These levels are outlined below and described graphically in the diagram alongside. The over-arching strategic direction is provided by the MDC Manawatu District Vision (2012).

Framework Plan (this document) The Framework Plan document provides and has included:

- Projected demand and supply for urban development at Feilding
- Urban planning principles that can guide future urban development
- Density and urban form analysis of existing neighbourhoods in Feilding
- Intensification potential for more efficient use of existing urban area
- Preliminary site analysis for greenfield growth - opportunities and constraints
- Technical inputs (infrastructure and hazards) as appropriate
- High level spatial guidance - Framework Plans for 'edge growth' areas, and location/design requirements for density change in the existing urban area

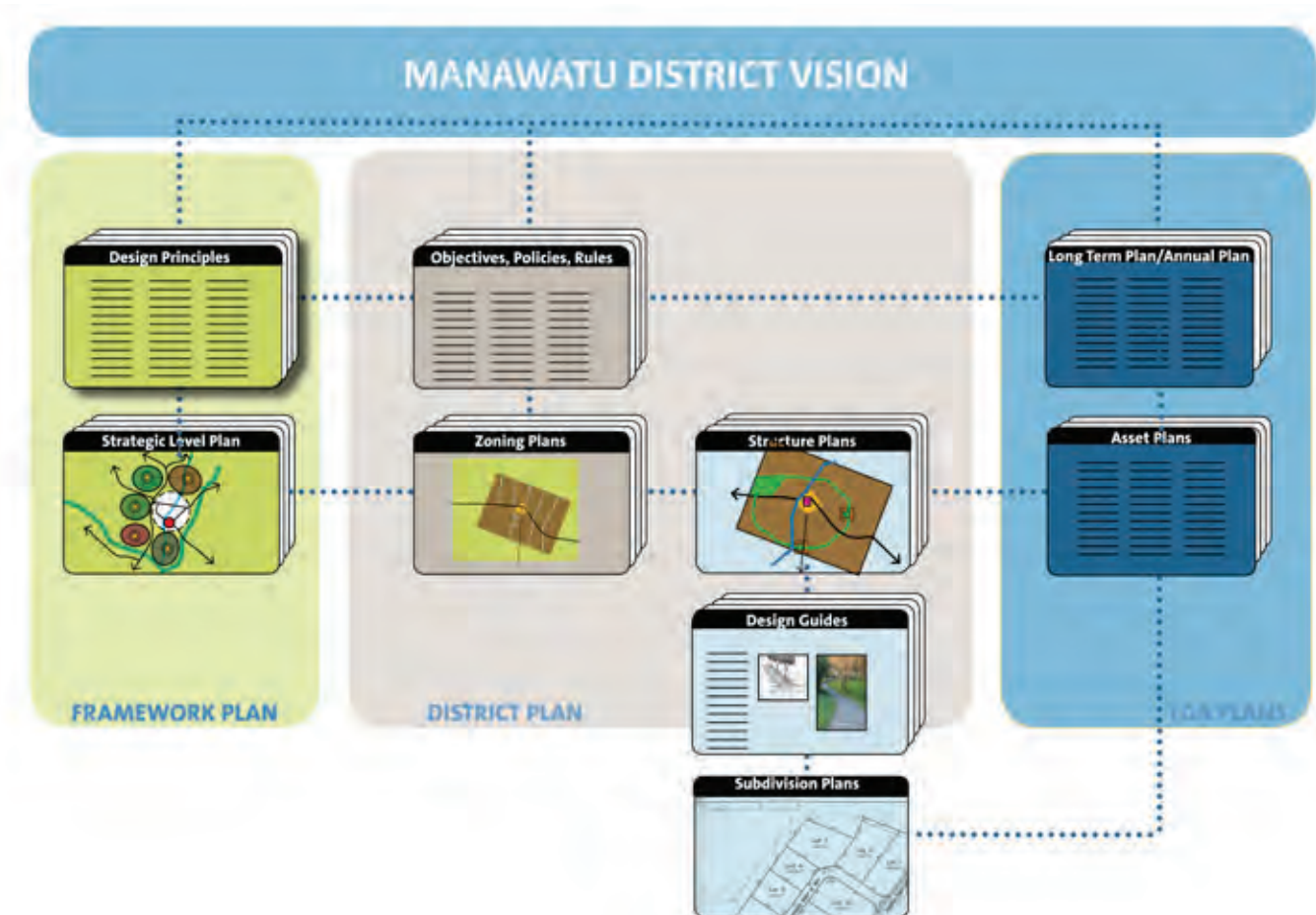
District Plan Change(s) The District Plan changes are expected to provide the following:

- Structure plans for edge growth areas
- Design guidance for edge growth area subdivision and urban density change
- Key stakeholder (major landowner) consultation
- Definition of priority growth areas
- Basis for development contributions (implemented by separate process)

Referencing to the Framework Plan

Strategic direction from the Framework Plan will be implemented (refer also to Section 10 of this Framework Plan for more detail) by MDC through the Manawatu District Plan and other documents prepared under the Local Government Act (eg Long Term Plan and Asset Plans).

The Framework Plan is a reference for the District Plan provisions. For each growth precinct it describes conceptual spatial plans that apply principles for good urban planning. Council will reference these growth precinct plans in its application of District Plan design guidelines. The growth precinct plans can assist developers and others to see how urban planning principles can be applied to generate good quality urban environments.



Growth Planning Relationship Diagram

The Framework Plan is not a 'statutory' document - the District Plan is the basis on which MDC will make decisions regarding resource consent applications (such as for subdivision for example).

02

Demand and Supply

Demographics and Growth

Part of understanding the needs for the future of Feilding is to know what types of growth and change are likely to occur over the next 20 years and well beyond. It is important to know the quantum of population change as well as its demographic profile - how many people and what ages will they be?

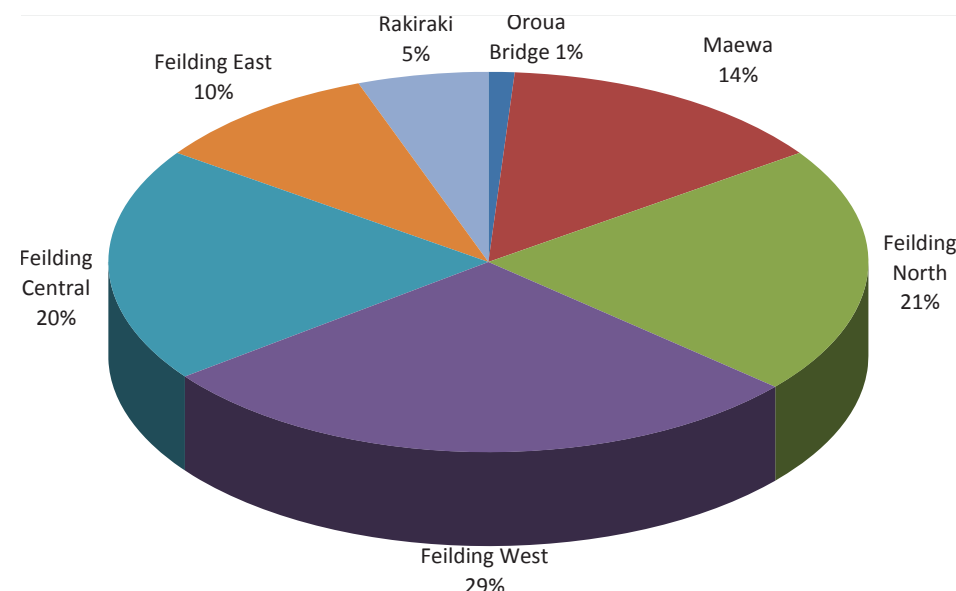
The projection of population and demographic profile will not provide an exact basis for planning as many variables will influence the future. However, as trends the projections are useful and this is the manner in which they have been used. The statistics presented in this document have been based on 2006 census.

The census was retaken in 2013, but at the time of this report the information had not been available. The changes in the census period are not expected to significantly change the way in which the Framework Plan provides for urban growth given the long range nature of the Framework and strategy approach described in Section 5. As part of monitoring progress of urban growth (action noted in Section 10) the trends evident from successive census can be provided for by the strategy.

Summary (projections unless otherwise stated). Details are provided in the tables and graphs on the following pages.

- Feilding population growth - 780 people by 2031 (22% of the region's growth)
- Feilding household growth - 910 households by 2031 (36% of the region's growth)
- Feilding household growth share - 29% Feilding West; 21% Feilding North; and 20% Feilding Central
- Manawatu District population growth - 3,550 people by 2031
- Manawatu District population growth - people aged over 65 will more than double by 2031
- Manawatu District household growth - 2,530 households by 2031
- Manawatu District's economy will grow at the same rate as the national economy: 3.5% (GDP) per year to 2016, and then 3.1% per year to 2026
- Manawatu - Wanganui region one-person household = currently 26.1% (Census 2006)
- Manawatu - Wanganui region one-family household = currently 67.4% (Census 2006)
- Manawatu - Wanganui region household size = currently 2.5 people
- Manawatu - Wanganui region car ownership = currently 35.7% 1 car; and 34.8% 2 cars

Projected Share of Household Growth within Feilding by 2031
source: Manawatu District Council



Projected Feilding Population Growth - Medium Series - 2006 (base) - 2031

	2006	2011	2016	2021	2026	2031	% Change	Actual Change
Oroua Bridge	170	180	180	190	190	190	12%	20
Maewa	520	580	630	680	740	800	54%	280
North Feilding	3,820	3,900	3,950	3,970	3,970	3,940	3%	120
West Feilding	3,690	3,790	3,850	3,880	3,900	3,890	5%	200
Central Feilding	2,850	2,890	2,930	2,960	2,980	2,990	5%	140
East Feilding	2,930	2,950	2,950	2,940	2,910	2,860	-2%	-70
Rakiraki	280	300	320	340	350	370	32%	90
Total	14,260	14,590	14,810	14,960	15,040	15,040	5%	780

Projected Feilding Household Growth - Medium Series - 2006 (base) - 2031

Household projections produced by Statistics New Zealand according to assumptions agreed to by MDC
Prepared for: MDC (Philip Bronn) - Ref No: ROM27206

	Households						% Change	Actual Change	Share of Change
	2006	2011	2016	2021	2026	2031			
Oroua Bridge	60	60	60	60	70	70	17%	10	1%
Maewa	190	210	240	260	290	320	68%	130	14%
Feilding North	1,370	1,430	1,490	1,530	1,550	1,560	14%	190	21%
Feilding West	1,590	1,670	1,740	1,790	1,820	1,850	16%	260	29%
Feilding Central	1,150	1,190	1,230	1,270	1,300	1,330	16%	180	20%
Feilding East	1,150	1,180	1,210	1,230	1,230	1,240	8%	90	10%
Rakiraki	100	110	120	130	140	150	50%	50	5%
Total Households	5,610	5,850	6,090	6,270	6,400	6,520	16%	910	100%

02

Demand and Supply

Existing Zoned Land Supply

The information shown on the plan beside is a compilation of the MDC data [January 2011] which describes the potential for new lots within the existing Feilding urban area. These zones can be considered as the land bank (supply of all available land available for urban development). It also shows the total area currently zoned and used for business and industrial purposes.

It is important in considering the need for future land to be zoned to understand the existing 'land bank'. It is also important to recognise that this land bank is theoretical to some extent as there are many influences on the potential utilisation of this land bank including existing owner's intentions to develop, value, serviceability, constraints (eg. lot shape or access).

The methodology followed for the land bank estimate was as follows:

Residential Yield Calculation Estimate

Vacant land within residential zone (with no existing dwellings)

- Yield was estimated for each vacant parcel and was based on a gross density of 8 dwellings per hectare (average density of recent developments in Feilding)
- A gross density of 8 dwl/ha would provide lot sizes ranging from 800m² to 1000m², with 30% of the land dedicated for roads and green open spaces

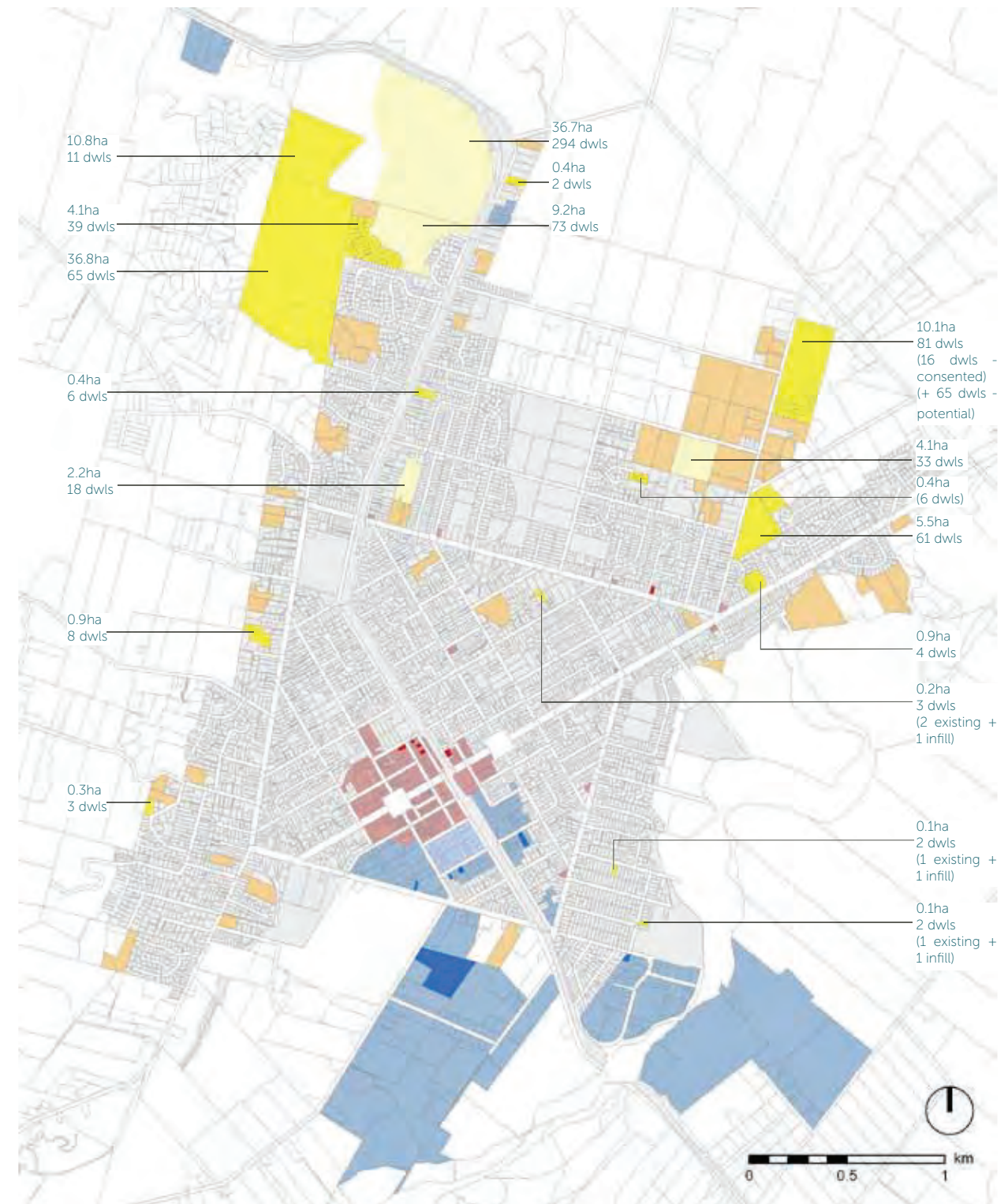
Land with resource consent for subdivision (consented - post 2006)

- Areas and lot numbers as per information provided by MDC

Lots greater than 5,000m², with one existing dwelling, within the residential zone (not yet subdivided and with no resource consent)

- Yield was estimated for each parcel based on a gross density of 8 dwellings per hectare (average density of recent developments in Feilding)
- A gross density of 8 dwl/ha would provide lot sizes ranging from 800m² to 1000m², with 30% of the land dedicated for roads and green open spaces

- Residential - vacant land within residential zone *
- Residential - land with resource consent for subdivision (consented) *
- Residential - lots > 5,000m² within residential zone (not yet subdivided and with not resource consent) *
- Business 1 - with commercial activities *
- Business 2 - with residential activities *
- Industrial 1 - vacant or with industrial activities *
- Industrial 2 - with residential or rural activities *
- Industrial 3 - LFR is a permitted activity (Plan Change 33) *
- Feilding urban area *



02

Demand and Supply

Industrial and Business Area Estimate

Business 1 (as identified by MDC)

- Lots within the Business zone that are currently used for business/commercial purpose

Business 2 (as identified by MDC)

- Lots within the Business zone that are currently used for residential purpose. While these lots are currently used for residential purposes, they have been considered as part of the land bank for business activities

Industrial 1 (as identified by MDC)

- Lots within the Industrial zone that are currently used for industrial purpose or are vacant or have resource consent - exclusively industrial uses.

Industrial 2 (as identified by MDC)

- Lots within the Industrial zone that are currently used for residential purposes (1 dwelling per parcel) or large rural residential (1 dwelling per parcel). While these lots are currently used for residential purposes, they have been considered as part of the land bank for industrial activities

Industrial 3 (as identified by MDC)

- Lots within the Industrial zone where large format retail (LFR) is a permitted activity. Refers to the LFR Private Plan Change (Plan Change 33 - Operative)

Summary of Estimated Land Bank

Residential

The land bank of vacant residential land is 52.2ha, which would yield 418 lots/dwellings. This calculation assumes an average gross density of 8 dwellings per hectare across the vacant land parcels.

Land parcels with proposed subdivision development that have been granted resource consent (post 2006) would deliver an additional 289 lots/dwellings. Based on information provided by MDC, the consented subdivisions have lots ranging in size from

600m² to 4,000m².

For lots larger than 5,000m², and assuming an average gross density of 8 dwellings per hectare, the total area of these vacant lots is 68.9ha, which would yield an additional 549 lots/dwellings.

Summing the estimates above, the land bank within the existing urban area (residential land) would yield 1,256 lots/dwellings, with the majority of lots ranging in size from 800m² to 1,000m².

It is also noted that there is a theoretical potential source of new lots /dwellings to be derived from infill. Lots larger than 800m² can be subdivided by resource consent - the larger the lot the more dwellings it could accommodate. An analysis identifies that there is a theoretical additional 6,000 dwellings that could be generated by infill. However, this analysis takes no account of the suitability of the land for more intensive development (like slope, access, existing uses), or the interest of the owner in development. It is also noted that many infill developments result in poor living environments. Many lot shapes are not suitable for infill and pursuing a strategy of infill without better control over the form of this development is not recommended (refer to sections 7 and 8).

Business

Based on the Manawatu District Plan 2007, there are currently 19.9 ha of land zoned business, of which 0.4 ha are currently used for residential purposes and 19.5 ha are used for business purposes.

MDC has completed an assessment (Property Economics [2012] Feilding Growth Assessment) of the future demand for business (retail, commercial and industrial) land. In summary that report concludes:

...the existing zoned provision in the Feilding Town Centre provide large enough land quantum to accommodate projected retail demand and land requirements over the forecast period (to 2041) without the need to extent the town centre.

projected industrial land requirements of 15.6 ha over the assessed period to 2041 can easily be absorbed by the zoned provision suggesting no additional industrial land zoning is required.

The demand for residential lots is estimated at 910 dwellings by 2031 - the supply of residential lots that can be provided by the existing land bank is 1256 (not including infill).

This land bank is theoretical. Because the land is zoned residential and currently under-utilised does not mean it is available for development.

In respect of industrial land supply it is noted that some additional demand is expected (15.6ha). Although at face value there is land zoned and vacant for industrial use this tends to be held in larger parcels and in limited ownerships. It is also distributed in a range of locations and of variable conditions/suitability for industrial activities. It is of significance to Feilding's economic sustainability that there are a range of new business and business expansion.

Use	Area (ha)	Nº of additional dwellings (potential or proposed) *
Residential		
Vacant land	52.2	418
Consented land	71	289
Lots > 5,000m ²	68.9	549
Total	192.1	1,256
Business		
With commercial activities	19.5	-
With residential activities	0.4	-
Total	19.9	-
Industrial		
With industrial activities	161.2	-
With industrial activities (LFR is a permitted activity)	4.1	-
With residential activities	4.8	-
Total	170.1	-

* assumes 1 dwelling per lot

03

Design Principles

Context

Feilding is not an isolated entity – it sits within an existing district and regional context and the town itself is a context for which the growth planning will need to provide.

1.0 Plan for the Future Growth

Recognise the growth demand and needs of Feilding over time and plan for this in a staged way that provides a managed approach for development into the future which is economically sustainable, including an appropriate management of zoned land supply.

2.0 Take an Integrated Approach

Take an integrated approach to the urban planning and design for district and local connections in regards to infrastructure, major roads and environmental corridors, open space network, pedestrian and cycle network, street network and land use.

3.0 Recognise the Overarching Vision

MDC has developed Vision Statements for the District, its villages, rural community and the Feilding urban township. For Feilding urban area the vision is: A thriving community enjoying the most vibrant country town in New Zealand, servicing the regional rural sector. Key concepts are:

- The best country town in New Zealand
- Regional rural servicing centre hub supported by dynamic infrastructure able to support growth
- Value-add food businesses generating wealth and creating employment
- Attractive entrances leading to a pleasant and attractive town centre
- Wide range of residential choices
- Unique attributes and special character retained
- Public transport options to Palmerston North enhanced, including commuter train to Wellington starting in Feilding
- Excellent public spaces and recreational facilities suitable for young and old

Character and Identity

- Compliments Palmerston North City, not competes
- Growth into rural areas is carefully directed

The character of an area will determine its identity - how people perceive it and the amenity they gain from living or working there.

4.0 Learn from Existing Developments in Feilding

Reference existing types of urban form in Feilding and repeat the positive attributes of development in new neighbourhoods.

5.0 Provide a Focal Point

Ensure each neighbourhood has a focal point or a "heart" where people can meet and socialise. The focal point should be within a 5 to 10 minutes walking distance to the majority of residents. The focal point should not compete with the town centre and may be for example a green space, a corner shop, a community hall and/or a childcare facility.

6.0 Consider the Site's Features

Ensure new developments take into consideration the area or site's natural features, orientation and heritage values to minimise negative impacts on these features and utilise them as part of the identity of the place.

7.0 Retain and Restore the Natural Environment

Plan to recognise the character and identity of the town that can be derived by the natural environment

Each neighbourhood to have a focal point



Consider the site's natural features



Connections and Networks

(biodiversity, urban ecology) such as from streams, gullies, riparian corridors and greenways.

The pattern and form of streets will influence the efficiency of traffic flow distribution as well as the enablement of people moving around the town using different modes of transport, be that by car, bus, walking or cycling.

8.0 Provide Good Street Connectivity

Ensure the new street pattern enables connections within neighbourhoods and to existing surrounding neighbourhoods as well as from growth areas to destinations such as community facilities and the town centre.

9.0 Enable a Range of Modes of Transport

Provide the street network that enables a range of modes of transport (walking, cycling, future public transport and vehicle) to increase the accessibility of all people, reduce vehicle trips for short distance movements, and promote an active and healthy lifestyle.

10.0 Provide a Range of Street Types

Provide a range of street types that reflect an appropriate road hierarchy and recognise the scale and frequency of movement as well as the type of environment sought (ie arterial as different from a 'slow street' where there is pedestrian priority, but shared with vehicle use);

Public open space can provide for a combination of uses that enhance recreational opportunities, community

Range of street types and hierarchy



Range of modes of transport



03

Design Principles

amenity and identity, social interaction, ecological biodiversity, as well as infrastructure such as stormwater management.

11.0 Provide a Range of Recreational Activities

Promote a diversity of recreational activities by the provision of active open spaces (regional parks, playing fields, greenways, neighbourhood parks and/or communal open spaces) and passive open spaces (pocket parks, plazas and/or private open spaces).

12.0 Define the Neighbourhoods

Define the spatial extent and identity of each neighbourhood by the provision of a park within 5 minutes walking distance to the majority of residents and green buffers, greenways and linkages at the edge of each neighbourhood.

13.0 Ensure Safe Public Open Spaces

Ensure that public open spaces are safe and comfortable for public use - use the principles of Crime Prevention Through Environmental Design (CPTED).

14.0 Provide Community Facilities

Consider the need for new community amenities and facilities, but with reference to existing community facilities and amenities in the town or area to avoid oversupply.

The neighbourhood design and the building design in the growth areas will shape the type of houses and buildings that can be developed – the diversity of community needs over time and environmental performance of new buildings are important aspects of sustainability.

15.0 Encourage a Mix of Housing Types

Encourage a mix of housing types within Feilding's neighbourhoods using a range of densities and lots sizes to provide opportunities for housing for the range of lifecycle needs of residents and to recognise different affordability factors;

16.0 Promote Sustainable Stormwater Management

Provide for an urban form that responds to the natural hydrology of the area and that minimises urban water run-off by a continuous chain for stormwater provision, which includes source control (on-site rainwater tanks and recycling), conveyance control (along streets, reticulation or greenways) and downstream control (passive stormwater systems in open space areas such as in detention);

17.0 Encourage Buildings that are Responsive to the Topography

Promote built form solutions ranging from slab on ground, split level homes and suspended floor construction in response to the natural topography of the site to reduce requirements for earthworks;

18.0 Ensure Solar Access to Public and Private Spaces

Plan neighbourhoods, public spaces and buildings in accordance with the principles of passive solar design. Designing for solar access means providing for the sun to penetrate a building, a lot or an open space to gain solar heat in winter and control solar radiation in summer.

19.0 Recognise the Hydrological System

Recognise the waterways, flood risks and overland flow paths across the plain and avoid development in high risk areas.

20.0 Consider the Surrounding Neighbourhoods

Consider any adverse impact to existing neighbourhoods and rural edge activities and consider appropriate mitigation strategies.

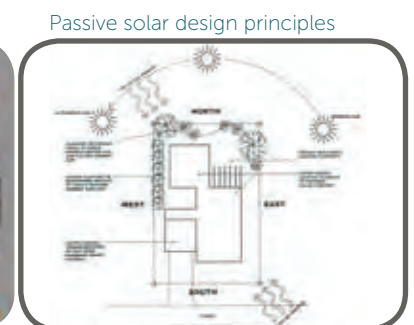
Diversity of open space types, and sizes



Preserve and restore the natural environment



Range of housing types and sizes with buildings that are responsive to the natural topography and features of the site



Sustainable stormwater management "greenways"



Active and highly visible frontages (crime prevention through environmental design)



04

Density and Urban Form Analysis

Purpose

The Density and Urban Form Analysis examines the different patterns of development that have occurred in the Feilding urban area over time.

The benefit of undertaking this analysis is that it provides a more empirical (measurable) basis for determining what form of development works best relative to the Principles (in 3.0 above).

This analysis provides indicators as to the form of new growth and development that is appropriate to the optimise the liveability and environmental quality for the town.

It is also useful to reflect on the local examples from Feilding to recognise that whatever type of development occurs in the future, it should be planned to suit Feilding - not some other place. Local people will also be familiar with the study areas and if they wish can visit them all to get their own sense of the contrasts between that the analysis shows.

The analysis uses five different study areas from within Feilding of similar sizes (approximately 19 hectares). The five study areas were selected to provide a range of existing densities and urban forms that typify different types of neighbourhoods within Feilding. These forms typically reflect different eras in the Feilding's development.

It is important to note that the analysis is not intended to be read as being negative of the places studied - although there is a measure of their performance relative to the principles as criteria, the aim is to look for the positive attributes so they can be reapplied. It is recognised also that what has been a popular type of urban development in the past may not now suit the different needs of the future.

Geographic information systems (GIS) and field work were used to gather information about each study area.

The urban design criteria used to analyse each study area are as follows:

- » Population and residential density
Analyses the range of lot sizes, range of dwelling sizes, number of people per household and number of dwellings per hectare.
- » Urban form
Considers the street connectivity, streetscape quality, the interface between public and private spaces and the provision of nearby community facilities.
- » Walkability
Examines the distance travelled by a pedestrian from each of the study areas to community facilities such as schools, shops, parks and bus stops.
- » Built form
Analyses built form typologies such as site coverage, building height, housing types and setbacks.

The Density and Urban Analysis is presented below in three parts





- » Methodology
An explanation of the assessment criteria, data gathering tools and assumptions when statistics are not available. It describes two distinct methodologies used for the "Case Studies Investigations" and the "Assessment"
- » Case studies Investigation
A detailed analysis of each study area against the design criteria mentioned above
- » Assessment
An evaluation of each study area and a comparison between the study areas in regards to the following:
 1. Population and residential density
A comparison of the different densities and range of lot types in each Study Area to guide the densities for the new Growth Areas.
 2. Walkability
The ease with which people of all abilities can walk to and from the places they need access to - from home to school, to the shops or parks.
 3. Urban form
The combination of street connectivity, streetscape, community facility location and type, and built form
 4. Liveability
A combination of the walkability and urban form criteria as key factors in achieving sustainable and liveable communitiesThe evaluation also provides recommendations on existing patterns of development to be promoted or avoided in the new growth areas.

04

Density and Urban Form Analysis

Methodology - Definitions








Population and Residential Density

- n° of dwellings**

Total number of dwellings
 Includes detached, semi-detached and attached dwellings. Does not include vacant lots.
Density
 Calculated as gross density (includes roads, open spaces, commercial and community facilities)
- lot sizes**

Total number of lots
 Includes vacant lots.
Range of lot sizes
 Shows the percentage and the total number of lots for each range. Range defined as <300m²; 301m² to 450m²; 451m² to 800m²; 801m² to 2,000m²; 2,000m² to 5,000m²; >5,000m²
- dwelling sizes**

Range of dwelling size
 Dwelling size estimates the number of bedrooms. It shows the percentage and the total number of dwellings for each range. Range defined as 1 to 2 bedrooms; 3 bedrooms; 4 bedrooms or more.
- n° of people**

Population Density
 The total number of people per dwelling is estimated within each of the study areas. This analysis assumes an average number of people per household of 2.5 people per gross hectare (Statistics NZ 2006)

Assumptions





- The analysis uses the building footprint and the total number of storeys per dwelling to calculate the gross floor area. Ancillary buildings such as sheds and garages or carports are not included in the gross floor area calculations. The number of bedrooms per dwelling are calculated based on the gross floor area and it assumes the following: 1 to 2 bedrooms (gross floor area less than 120m²); 3 bedrooms (gross floor area between 120m² to 160m²); 4 bedrooms or more (gross floor area greater than 160m²).
- The population density for each study area assumes an average number of people per household of 2.5 people per gross hectare (Statistics NZ 2006).

Urban Form

- street connectivity**

Block length
 The length of a block separated by roads. This analysis does not consider cul-de-sacs as separations between blocks because they don't provide through block connectivity
- 
Block depth
 The width of a block separated by roads
- 
Intersections
 The total number of intersections in each study area. Intersections to cul-de-sacs are not included in the calculations because they don't provide through block connectivity
- 
Connections to adjoining neighbourhoods
 The total number of streets that provide connections to adjoining neighbourhoods
- focal point**

Community focal point
 A pocket park/neighbourhood park or neighbourhood shops that are not categorised as take away/grocery shops.
- public space interface**

High visibility and active frontages (residential)
 The total number of houses that have a good public space interface. For the purpose of this analysis, "high visibility and active frontages" is achieved when fences are not fortifications, windows front onto the public spaces, and there is an ability to maintain a visual relationship between people in buildings and the street
- 
Low visibility and inactive frontages (residential)
 The total number of houses that have a poor public space interface. This analysis considers "low visibility and inactive frontages" when high and solid front fencing, lack of windows and high and dense shrubs front onto the public space

The principles outlined in the previous section of this report have corresponding component attributes that are defined below. For example, the principle that seeks a mix of housing types (Principle 15) will require a pattern of development that allows for lots of different sizes, a range of dwelling sizes, and the ability to accommodate different household sizes (see population and density below). Accordingly below the analysis begins by defining the attributes of urban development that will be studied so there is a direct link to the principles. From the analysis the best forms of existing development in Feilding can be applied to the new growth areas.

Urban Form

- public space interface**

High visibility and active frontages (commercial)
 The total number of retail buildings that have good public space interface. "High visibility and active frontages" is achieved when buildings are placed close to the street boundary and have transparent windows and verandahs fronting onto the public spaces
- 
Low visibility and inactive frontages (commercial)
 The total number of retail buildings that have poor public space interface. This analysis considers "low visibility and inactive frontages" when large surfaces of car parking, blank walls and/or opaque windows front onto the public space
- streetscape**

Walkable streets
 The percentage of streets within each study area that are considered "walkable streets"
- 
Car-dominant streets
 The percentage of streets within each study area that are considered "car-dominant streets"

The following are 'definitions' of terms used above.







- Community focal point is a public amenity where the community can get together. The amenity is generally located within a 400m walking distance to the residents.
- Public space interface means the relationship of the houses (private ownership) with the streets and/or parks (public ownership). Low visibility and inactive frontages means any visual barrier between the private and the public spaces.
- The streetscape analysis only considers local streets. Connector streets are not included in the analysis because some of the study areas do not have them. The inclusion of collector streets would not create an equal comparison between study areas.
- "Walkable streets" are streets that are designed to provide good connectivity for vehicles but also to offer a pleasant and safe experience for pedestrians and cyclists. A walkable street has footpaths, street trees and narrow carriageway (depending on its hierarchy). From an urban design point of view, there are other factors that are important in creating good streetscapes which have not been included in this analysis - such as sustainable stormwater management systems, good width of footpaths and cycleways, landscape treatment, street furniture and on-street parking configurations).
- "Car-dominant" streets are streets designed for cars only. They have no footpaths, no street trees and wide surfaces of asphalt.

04

Density and Urban Form Analysis

Methodology - Case Studies Investigations









Walkability
community facilities and activities

-  **Primary school**
The distance to the nearest primary school
-  **Neighbourhood park**
The distance to the nearest neighbourhood park/playground
-  **Neighbourhood shop**
The distance to the nearest neighbourhood shop
-  **Childcare**
The distance to the nearest childcare
-  **Bus stop**
The distance to the nearest bus stop
-  **Walkaway**
The distance to the nearest recreational walkway. This analysis does not consider on-street footpaths as recreational walkways. Recreational walkways are generally along streams or bushwalks trails





The definition of 'walkability' for this study was the distance measured from a centre point within each study area (point A) to the closest community facility (point B). The analysis takes two factors into consideration as follows:

- Direct route - is the distance from A to B
- Along the path - is the distance travelled by a pedestrian from A to B along the footpath

Built Form

- site cover**
 **Residential site coverage**
The total area of a lot occupied by buildings. It includes the primary building and any ancillary structures within the lot. Site coverage is shown in percentage, ranging from less than 10% to 65% (maximum site coverage within the study areas)
- building height**
 **One storey building**
The percentage and the total number of dwellings within each study area that are 1 storey buildings
-  **Two storey building**
The percentage and the total number of dwellings within each study area that are 2 storey buildings
- housing type**
 **Detached dwelling**
The total number of detached dwellings within each study area. A detached dwelling is a stand-alone building that has a setback (separation) between adjoining dwellings. It does not share a common wall with the adjoining dwellings.
-  **Semi-detached dwelling**
The total number of semi-detached dwellings within each study area. A semi-detached dwelling is a building that is attached on one side to an adjoining dwelling. It shares one common wall with the adjoining dwelling.
-  **Attached dwelling**
The total number of attached dwellings within each study area. A attached dwelling is a building that is attached on both sides to the adjoining dwellings. It shares two common walls with the adjoining dwellings.
- construction type**
 **Responsive to the local topography**
The total number of dwellings that are site responsive. Buildings that are site responsive are classified as follows:
 - Flat sites (up to 10% slopes) - slab on ground
 - Steep sites (greater than 10% slopes) - split level (retaining elements within the built form and/or on driveways) or suspended floors (pole homes). Minimum retaining elements on lot boundaries
-  **Not responsive to the local topography**
The total number of dwellings that are not site responsive. Buildings that are not site responsive are classified as follows:
 - High retaining elements on lot boundaries and/or extensive earthworks (cut and fill)

Built Form

- front setback**
 **2 to 5m**
The total number of dwellings that have a front setback of up to 5 metres
-  **Greater than 5m**
The total number of dwellings that have a front setback greater than 5 metres
- car parking typology**
 **Not car-dominant built form**
The total number of dwellings where the garage doors do not dominate the built form. A not car-dominant built form occurs when:
 - Lock-up garage doors are at the same alignment or set back from the main building line
 - The design of the garages are integrated with the design of the building form for a dwelling
 - Garages do not compromise the visual connection to the public space
-  **Car dominant built form**
The total number of dwellings where the garage doors dominate the built form. A car dominant built form occurs when:
 - Lock-up garage doors fronting the streets project in front of the main building line
 - The design of the garages are not integrated with the design of the building form for a dwelling
 - Garages compromise the visual connection to the public space

04

Density and Urban Form Analysis

The methodology to assess walkability and urban form uses accepted standards based on best practice planning and design solutions.

The assessment classifies each of the assessment criteria as "good", "adequate" and "poor". If a site scores "good" for every assessment criteria it will have the maximum total score of 1. If a site scores "adequate" for every assessment criteria it will have a total score of 0.5. If a site scores "poor" for every assessment criteria it will have a total score of 0.

Methodology - Assessment

Walkability

community facilities and activities

The methodology to assess walkability uses the same parameters for the different community facilities and activities (such as primary school, neighbourhood park, neighbourhood shops, childcare, bus stop and walkway). Neighbourhoods that provide nearby facilities create opportunities for people to walk and cycle and reduce car dependency. People will generally walk up to 1km (10 to 15 minutes walk) to go to neighbourhood facilities. A maximum of 500m walking distance is considered the ideal. People will generally not walk to neighbourhood facilities that are greater than 1km.

Walkability is measured from a centre point within each study area (point A) to the closest community facility (point B). The analysis takes three factors into consideration as follows:

- Direct route - is the distance from A to B
- Along the path - is the distance travelled by a pedestrian from A to B along the footpath
- Percentage change - is the difference in distance from A to B travelled directly and along the footpath. The percentage change is used to analyse how well connected each of the study areas are. The percentage change between "along" and "direct" is also influenced by the pattern of connectivity in the surrounding neighbourhoods. This analysis reinforces the importance of a high level of connectivity within each neighbourhood as a contributor to a highly connected street network within Feilding.

Distance along the footpath

Good	less than 500m
Adequate	between 500m and 1km
Poor	greater than 1km

Percentage change between "along" and "direct"

Good	less than 130%
Adequate	between 130% and 160%
Poor	greater 160%

Urban Form

street connectivity

focal point



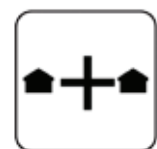
Good less than 200m
Adequate between 201m to 250m
Poor greater than 250m
 Block lengths of up to 200m promotes a good distribution of traffic flow by improving the numbers of possible routes taken by a pedestrian, cyclist or vehicle. Block lengths greater than 250m is considered inadequate as it generally increases the distance travelled from "A" to "B".



Good less than 100m
Adequate between 101m to 120m
Poor greater than 120m
 Block depth of up to 100m is considered the ideal outcome as it enables every lot to have a street frontage. Designing all lots with street frontage increases the possibility of changes overtime. for example, a 25m x 40m lot (1,000m²) with street frontage can be subdivided into 3 townhouses (8m x 40m) in the future. In contrary, block depth greater than 120m generally creates battle-axe lots which reduces the opportunities for re-development overtime.



Good more than 10
Adequate between 7 and 9
Poor less than 7
 The greater the number of intersections within a neighbourhood the greater the opportunities to distribute vehicle traffic flow and to promote a more walkable neighbourhood. Intersections to cul-de-sacs are not included in the calculations because they don't provide through block connectivity. Less than seven intersections within a neighbourhood is considered inadequate.



Good more than 10
Adequate between 7 and 9
Poor less than 7
 The greater the number of connections between neighbourhoods the greater the opportunities to distribute vehicle traffic flow and to promote a more walkable neighbourhood. The analysis considers inadequate less than seven connections.



Good less than 400m walking distance
Adequate between 401m and 600m
Poor greater than 600m walking distance
 A community focal point is a place where residents can get together. To work effectively, this places should be provided within a 5 to 10 minutes walking distance to the majority of the houses. Therefore, a focal point located more than 600m from the majority of the residents is considered a poor solution.

Urban Form

public space interface

streetscape - local streets



Good between 85% to 100% of the total number of dwellings with high visibility and active frontages



Adequate between 75% to 84% of the total number of dwellings with high visibility and active frontages



Poor less than 75% of the total number of dwellings with high visibility and active frontages

Public space interface means the relationship of the houses (private ownership) with the streets and/or parks (public ownership). An active street frontage (low fences, low shrubs and windows fronting the public space) is important in creating safe environments and is part of the principles for Crime Preventions Through Environmental Design. The greater the number of houses with active frontages the better.



Good carriageway less than 7.5m (including car parking); street trees planted in 10m spacing; and footpath on one or both sides

Adequate carriageway less than 7.5m (including car parking); street trees planted in 15m spacing; and footpath on one side

Poor any street without street trees or planted with spacing greater than 20m

The streetscape assessment only considers the local streets. Street trees, narrow paving and footpaths are important in creating streets that are pleasant and safe for cars, pedestrians and cyclists. Bare streets, wide paved surfaces or lack of a footpath in urban areas is also considered to be poor.

04

Density and Urban Form Analysis

Case Study Investigations - Study Area 1



Land use	Areas (ha)
residential	15.38 (78%)
senior living	0
open space	0
community facility	0
commercial	0
roads	4.45 (22%)
total	19.83

Walkability

community facilities and activities

	direct along	1.2km / 1.6km
	direct along	600m / 1km
	direct along	400m / 500m
	direct along	900m / 1.3km
	direct along	450m / 700m
	direct along	900m / 1.3km

Population and Residential Density

n° of dwellings	lot sizes	dwellling sizes	n° of people
129 dwellings			
6.5dwellings/ha			
126 lots			
<300m²	00 (0%)	801 to 2,000m²	65 (52%)
300 to 450m²	09 (7%)	2,001 to 5,000m²	10 (8%)
451 to 800m²	40 (32%)	>5,000m²	02 (2%)
2 bed or less	15 (12%)		
3 bed	32 (25%)		
4 bed or more	82 (64%)		
322 people			
16people/ha			

Urban Form

	300m to 360m
	80m to 200m
	5
	6
	No 1km distance to the closest park
	85% active frontages
	15% inactive frontages
	30% walkable streets
	70% car-dominant streets

Built Form

	<10%	05 (4%)	40 to 50%	05 (4%)
	10 to 20%	51 (40%)	50 to 60%	00 (0%)
	20 to 30%	43 (34%)	>60% (65% max)	00 (0%)
	30 to 40%	22 (17%)		
		118 dwellings (92%)		
		11 dwellings (8%)		
		123 dwellings (95%)		
		6 dwellings (5%)		
		0 dwellings (0%)		
		127 dwellings (98%)		
		2 dwellings (2%)		
		32 dwellings (25%)		
		97 dwellings (75%)		
		121 dwellings (94%)		
		8 dwellings (6%)		

04

Density and Urban Form Analysis

Case Study Investigations - Study Area 2



Land use	Areas (ha)
residential	10.80 (56%)
senior living	0
open space	0.81 (4%)
community facility	0.14 (1%)
commercial	1.58 (8%)
roads	6.03 (31%)
total	19.36

Walkability

community facilities and activities

	direct 400m	along 500m
	direct 0m	along 0m
	direct 100m	along 100m
	direct 50m	along 50m
	direct 100m	along 100m
	direct 1km	along 1km

Population and Residential Density

n° of dwellings	lot sizes	dwellling sizes	n° of people
157 dwellings			
8 dwellings/ha			
126 lots			
<300m ²	02 (2%)	801 to 2,000m ²	72 (57%)
300 to 450m ²	19 (15%)	2,001 to 5,000m ²	02 (2%)
451 to 800m ²	31 (25%)	>5,000m ²	00 (0%)
2 bed or less	30 (20%)		
3 bed	54 (35%)		
4 bed or more	69 (45%)		
382 people			
20people/ha			

Urban Form

street connectivity	120m to 200m
	100m
	11
	12
focal point	Yes less than 400m distance to the closest park
public space interface	84% active frontages
	16% inactive frontages
streetscape	10% walkable streets
	90% car-dominant streets

Built Form

site cover	<10%	00 (0%)	40 to 50%	17 (13%)
	10 to 20%	14 (11%)	50 to 60%	01 (1%)
	20 to 30%	54 (43%)	>60% (65% max)	01 (1%)
	30 to 40%	39 (31%)		
building height				
			155 dwellings (98%)	
			2 dwellings (2%)	
housing type				
			116 dwellings (74%)	
			14 dwellings (9%)	
			27 dwellings (17%)	
construction type				
			153 dwellings (100%) - flat site	
			0 dwellings (0%)	
front setback				
			43 dwellings (28%)	
			110 dwellings (72%)	
car parking typology				
			146 dwellings (95%)	
			7 dwellings (5%)	

04

Density and Urban Form Analysis

Case Study Investigations - Study Area 3



Land use	Areas (ha)
residential	11.50 (61%)
senior living	0
open space	0
community facility	2.75 (14%)
commercial	0.07 (1%)
roads	4.79 (24%)
total	19.11

Walkability

community facilities and activities

	direct along	400m / 800m
	direct along	1.4km / 1.8km
	direct along	200m / 230m
	direct along	200m / 300m
	direct along	385m / 500m
	direct along	900m / 1.4km

Population and Residential Density

n° of dwellings	lot sizes	dwellling sizes	n° of people
156 dwellings			
8 dwellings/ha			
145 lots			
<300m²	00 (0%)	801 to 2,000m²	50 (34%)
300 to 450m²	06 (4%)	2,001 to 5,000m²	01 (1%)
451 to 800m²	88 (61%)	>5,000m²	00 (0%)
2 bed or less	31 (20%)		
3 bed	75 (48%)		
4 bed or more	50 (32%)		
390 people			
20people/ha			

Urban Form

street connectivity	400m
	80m to 240m
	06
	08
focal point	No
	1.4km distance to the closest park
public space interface	84% active frontages
	16% inactive frontages
streetscape	00% walkable streets
	100% car-dominant streets

Built Form

site cover	<10%	00 (0%)	40 to 50%	08 (6%)
	10 to 20%	22 (15%)	50 to 60%	03 (2%)
	20 to 30%	79 (54%)	>60% (65% max)	00 (0%)
	30 to 40%	33 (23%)		
building height				
			153 dwellings (98%)	
			3 dwellings (2%)	
housing type				
			136 dwellings (87%)	
			8 dwellings (5%)	
			12 dwellings (8%)	
construction type				
			156 dwellings (100%) - flat site	
			0 dwellings (0%)	
front setback				
			15 dwellings (10%)	
			141 dwellings (90%)	
car parking typology				
			152 dwellings (97%)	
			4 dwellings (3%)	

04

Density and Urban Form Analysis

Case Study Investigations - Study Area 4



Land use	Areas (ha)
residential	12.69 (68%)
senior living	2.83 (15%)
open space	0
community facility	0
commercial	0
roads	3.15 (17%)
total	18.67

Walkability

community facilities and activities

	direct along	900m / 1.1km
	direct along	1.1km / 1.2km
	direct along	700m / 1km
	direct along	900m / 1.3km
	direct along	700m / 1km
	direct along	1.1km / 1.2km

Population and Residential Density

	71 dwellings														
	3.88 dwellings/ha														
	145 lots														
	<table border="1"> <thead> <tr> <th>lot sizes</th> <th>n° of dwellings</th> </tr> </thead> <tbody> <tr> <td><300m²</td> <td>00 (0%)</td> </tr> <tr> <td>300 to 450m²</td> <td>00 (0%)</td> </tr> <tr> <td>451 to 800m²</td> <td>00 (0%)</td> </tr> <tr> <td>801 to 2,000m²</td> <td>01 (14%)</td> </tr> <tr> <td>2,001 to 5,000m²</td> <td>02 (29%)</td> </tr> <tr> <td>>5,000m²</td> <td>04 (57%)</td> </tr> </tbody> </table>	lot sizes	n° of dwellings	<300m ²	00 (0%)	300 to 450m ²	00 (0%)	451 to 800m ²	00 (0%)	801 to 2,000m ²	01 (14%)	2,001 to 5,000m ²	02 (29%)	>5,000m ²	04 (57%)
lot sizes	n° of dwellings														
<300m ²	00 (0%)														
300 to 450m ²	00 (0%)														
451 to 800m ²	00 (0%)														
801 to 2,000m ²	01 (14%)														
2,001 to 5,000m ²	02 (29%)														
>5,000m ²	04 (57%)														
	2 bed or less 62 (87%)														
	3 bed 02 (3%)														
	4 bed or more 7 (10%)														
	177 people														
	9people/ha														

Urban Form

	400m
	400m
	04
	05
	No 1.2km distance to the closest park
	85% active frontages
	14% inactive frontages
	00% walkable streets
	100% car-dominant streets

Built Form

	<table border="1"> <thead> <tr> <th>site cover</th> <th>n° of dwellings</th> <th>percentage</th> <th>max</th> <th>n° of dwellings</th> <th>percentage</th> </tr> </thead> <tbody> <tr> <td><10%</td> <td>06</td> <td>(67%)</td> <td>40 to 50%</td> <td>00</td> <td>(0%)</td> </tr> <tr> <td>10 to 20%</td> <td>01</td> <td>(11%)</td> <td>50 to 60%</td> <td>00</td> <td>(0%)</td> </tr> <tr> <td>20 to 30%</td> <td>02</td> <td>(22%)</td> <td>>60% (65% max)</td> <td>00</td> <td>(0%)</td> </tr> <tr> <td>30 to 40%</td> <td>00</td> <td>(0%)</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	site cover	n° of dwellings	percentage	max	n° of dwellings	percentage	<10%	06	(67%)	40 to 50%	00	(0%)	10 to 20%	01	(11%)	50 to 60%	00	(0%)	20 to 30%	02	(22%)	>60% (65% max)	00	(0%)	30 to 40%	00	(0%)			
site cover	n° of dwellings	percentage	max	n° of dwellings	percentage																										
<10%	06	(67%)	40 to 50%	00	(0%)																										
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30 to 40%	00	(0%)																													
	71 dwellings (100%)																														
	0 dwellings (0%)																														
	21 dwellings (30%)																														
	50 dwellings (70%)																														
	0 dwellings (0%)																														
	71 dwellings (100%) - flat site																														
	0 dwellings (0%)																														
	61 dwellings (86%)																														
	10 dwellings (14%)																														
	71 dwellings (100%)																														
	0 dwellings (0%)																														

04

Density and Urban Form Analysis

Case Study Investigations - Study Area 5



Land use	Areas (ha)
residential	14.26 (71%)
senior living	0.42 (1%)
open space	0.12 (1%)
community facility	0
commercial	0
roads	5.43 (27%)
total	20.23

Walkability

community facilities and activities

	direct 1.2km along 1.4km
	direct 350m along 350m
	direct 250m along 250m
	direct 700m along 900m
	direct 700m along 1.2km
	direct 350m along 350m

Population and Residential Density

n° of dwellings	lot sizes	n° of dwellings	n° of people
132 dwellings			
6.5 dwellings/ha			
132 lots			
<300m ²	00 (0%)	801 to 2,000m ²	108 (82%)
300 to 450m ²	03 (2%)	2,001 to 5,000m ²	02 (2%)
451 to 800m ²	19 (14%)	>5,000m ²	00 (0%)
2 bed or less	07 (5%)		
3 bed	42 (32%)		
4 bed or more	83 (63%)		
330 people			
16people/ha			

Urban Form

street connectivity	370m
	120m
	08
	08
focal point	Yes 350m distance to the closest park
public space interface	77% active frontages
	23% inactive frontages
streetscape	20% walkable streets
	80% car-dominant streets

Built Form

site cover	<10% 00 (0%) 10 to 20% 59 (44%) 20 to 30% 53 (40%) 30 to 40% 16 (12%)	40 to 50% 04 (3%) 50 to 60% 01 (1%) >60% (65% max) 00 (0%)
building height	131 dwellings (99%)	
	1 dwellings (1%)	
housing type	126 dwellings (95%)	
	06 dwellings (5%)	
	0 dwellings (0%)	
construction type	132 dwellings (100%) - flat site	
	0 dwellings (0%)	
front setback	08 dwellings (6%)	
	124 dwellings (94%)	
car parking typology	126 dwellings (95%)	
	06 dwellings (5%)	

04

Density and Urban Form Analysis

Assessment

Population and Residential Density

In terms of population and residential density, there are similarities between Study Areas 1 and 5 and Study Areas 2 and 3.

Study Areas 2 and 3 have the highest density of all the study areas with both having a gross density of 8 dwellings/ha and 20 people/ha. Study Area 2 provides a much greater diversity of lot sizes and housing types compared with Study Area 3, which has a greater proportion of 3 bedroom houses in lots ranging from 450m² to 800m².

Study Areas 1 and 5 present a gross density of 6.5 dwellings/ha and 16 people/ha. There is a greater diversity of housing types in Study Area 1. More than 60% of dwellings in both Study Areas are 4 bedrooms or more.

The majority of site coverage within Study Areas 2 and 3 range from 20 to 40%, whilst within Study Areas 1 and 2 the range is between 10 to 30%.

Study Area 4 contains a small portion of senior living residential and the remaining is rural lots. It presents the lowest gross density of 3.8 dwellings/ha and 9 people/ha. However, the senior living (2 bedrooms houses) has a net density of 22 dwelling/ha, which is high in comparison with the other Study Areas. The site coverage is quite low, ranging from 10 to 30%.

Walkability

A good walkability score is achieved by the combination of a mix of land uses and good street connectivity. All the Study Areas have achieved a good score, which is generally adequate, good or very good. Study Area 4 is the exception because many of its lots are rural lifestyle lots with areas greater than 5,000m². In this case, a mix of land uses and street connectivity are not relevant. Therefore, the walkability analysis is not so relevant to Study Area 4.

Study Area 2 achieved the best score - very good - due to a highly connected street pattern, a good mix of uses and community facilities located nearby. Study Area 5 is also a walkable neighbourhood with a "good" score. It could have achieved a "very good" score if its block lengths were shorter than 370m.

Study Area 3 has a very good mix of uses and presents a variety of nearby community facilities. However, its various cul-de-sacs compromised the results. A "very good" score would have been achieved by providing better street connectivity.

Study Areas	Dwelling/ha	Lot Size						Dwelling Size			People/ha	Site Coverage						
		<300	300 - 450	451-800	801-2,000	2,001-5,000	>5,000	<2bed	3bed	>4bed		<10%	10-20%	20-30%	30-40%	40-50%	50-60%	60-65%
1	6.5	0%	7%	32%	52%	8%	2%	12%	25%	64%	16	4%	40%	34%	17%	4%	0%	0%
2	8	2%	15%	25%	57%	2%	0%	20%	35%	45%	20	0%	11%	43%	31%	13%	1%	1%
3	8	0%	4%	61%	34%	1%	0%	20%	48%	32%	20	0%	15%	54%	23%	6%	2%	0%
4	3.8	0%	0%	0%	14%	29%	57%	87%	3%	10%	9	67%	11%	22%	0%	0%	0%	0%
5	6.5	0%	2%	14%	82%	2%	0%	5%	32%	63%	16	0%	44%	40%	12%	3%	1%	0%

Population and Residential Density

Study Areas 1 and 5 and 2 and 3 present the same densities despite the fact of having different urban form solutions. There is a good range of housing types and lots sizes in Study Areas 1 and 2, which promotes a greater mix of household types within each neighbourhood. Although Study Area 1 is located on steeper slopes, it still provides for some 2 bedrooms houses. This model (range of lot types) should be applied to each of the growth areas when applicable.

The site coverage analysis shows that once the density increases, the site coverage increases as well. However, it also shows that site coverage within Feilding is reasonably low - generally less than 40%.

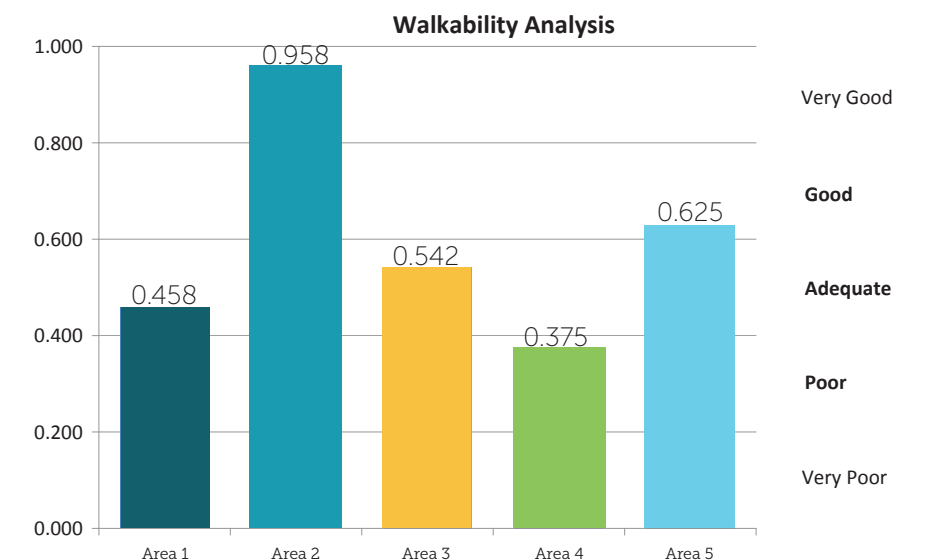
The lot size and dwelling type analysis shows that there are few lots of less than 450m² and 2 bedrooms houses - the 62 two-bedrooms senior living houses in Precinct 4 is an exception to the pattern of development that generally occurs in Feilding. If we take into consideration that most of the growth within Feilding will be in the over 65 age group (refer to "Demographics and Growth") it means that there will be a need for smaller housing within the Growth Areas. Site coverage for the smaller lots will have to increase as well.

Study Area 1 did not achieve a "good" or "very good" score generally because of the lack of community facilities close by and the poor mix of uses. Although it is located on a steeper site, its street connectivity was less favourable as well.

Walkability

The analysis shows that the study areas are generally walkable neighbourhoods due to their good mix of uses and community facilities in close proximity to the dwellings. Street connectivity in some areas are poor due to a large number of cul-de-sacs.

To achieve walkable neighbourhoods within the Growth Areas new developments should provide connected streets in accordance with the "good" and "adequate" parameters described in the "street connectivity" under "Methodology - Evaluation". A good mix of uses and neighbourhood amenities should also be encouraged.



04

Density and Urban Form Analysis

Assessment Summary

Urban Form

A good neighbourhood design is achieved when its urban form provides for a flexible (enable changes overtime), compact (mixed densities and land use) and walkable and safe environment.

Study Area 2 scored the best as "very good". It is highly connected and the majority of lots have street frontage. It is compact - has a diversity of housing types and mix of uses, has a community focal point (squares) and nearby community facilities (childcare, school, bus stop). The other Study Areas did not score as well. They generally lack a community focal point and have the street pattern of predominantly various battle-axe lots and cul-de-sacs which limit walkability and the ability to adapt overtime.

Streetscape is poor in many of the Study Areas. There is a lack of street trees and landscape treatment and the surface of asphalt is too wide for the purpose of a local street. This is not only a waste of space, but requires more maintenance and generates large hard surface areas that load the stormwater system.

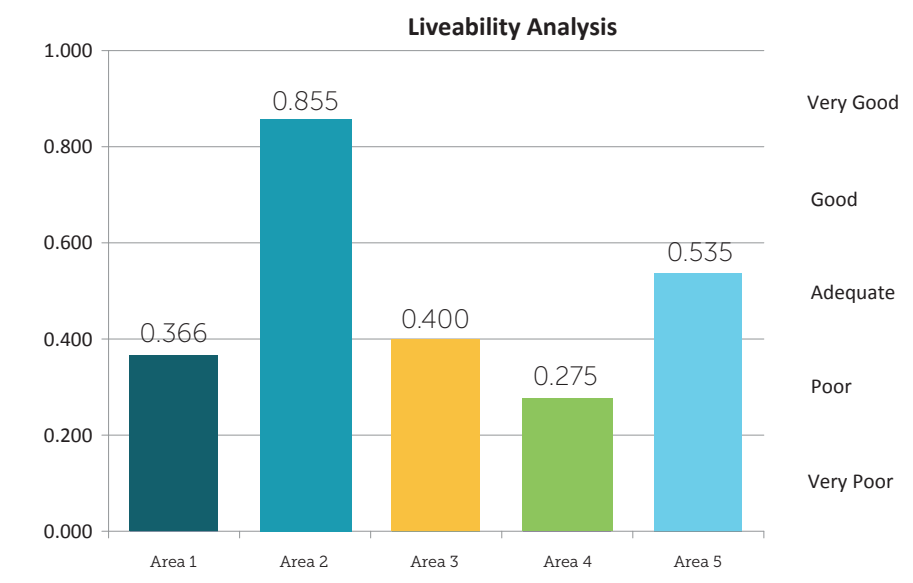
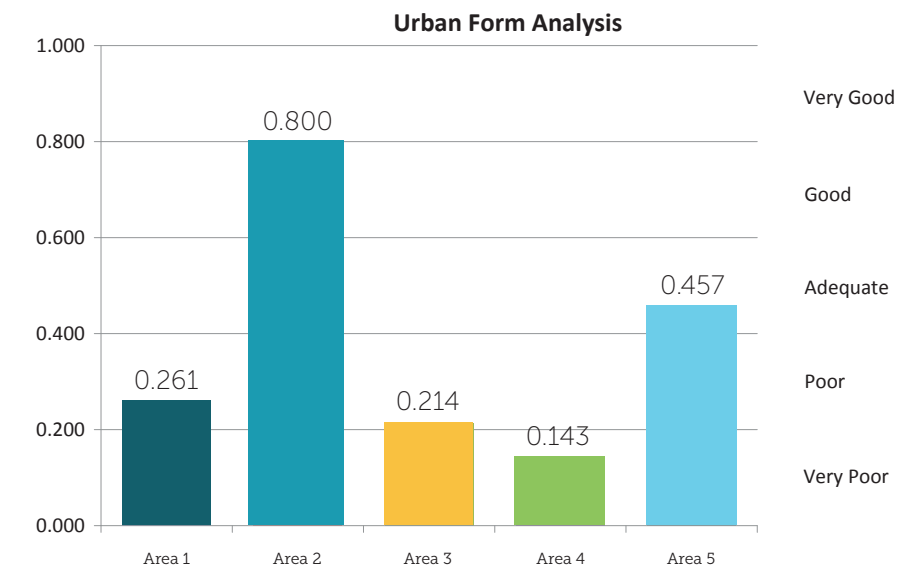
The interface with the public space is generally "good" to "adequate". The majority of the houses have low front fencing, garages at the rear of the lots and windows fronting the streets. All these factors improve the opportunities for passive surveillance and create safer public spaces. However, newer houses have double lock-up garages fronting the streets and tall fences, which compromise the interface between public and private spaces. The analysis does not apply to Study Area 4 for the same reasons previously mentioned.

Liveability

For the purpose of this analysis, liveability is determined by the combination of the assessment criteria under walkability and urban form. It analyses how the neighbourhood design influences the way people live and interact in each Study Area. It does not consider the different desires of the community in terms of a more urban lifestyle versus a rural lifestyle.

Study Area 2 scored the best on liveability being "very good". For many of the same reasons that the urban form score and walkability scores are noticeably higher in Study Area 2 (as described above) it is the ready access to facilities and amenities such as those provided in the town centre close by, the well connected street network that makes movement distances relatively direct, and the built form that has all houses addressing the street (rather than in back lots for example) that makes the difference.

The contrast is Area 4 which is a more recent area of urban development and relatively large lots - many of which are not densely or at all developed. It is located away from the town centre and has not the same amenities and facilities that are provided in other areas. Its street network is less well connected and this makes walking and cycling distances longer and less manageable to any facilities that do exist in the vicinity.



05

Urban Growth Strategy

Background Summary

The previous background sections of this Framework report have established:

- Projected demand and supply for urban development at Feilding
- Urban planning principles that can guide future urban development
- Density and urban form analysis of existing neighbourhoods in Feilding

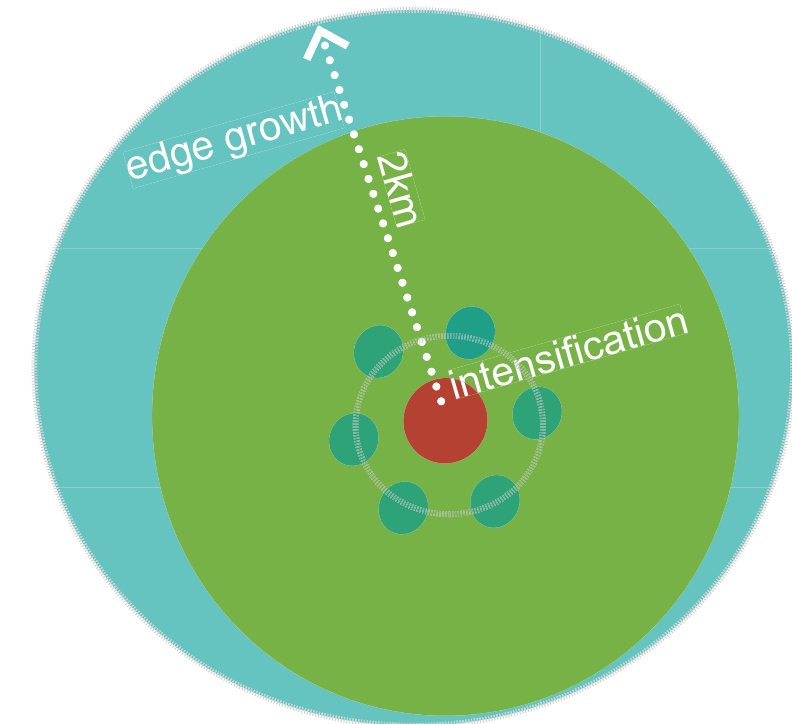
From these sections and in summary it has been determined that the:

- Feilding population growth is projected to be 780 people by 2031 (22% of the region's growth);
- Feilding household growth is projected to be 910 households by 2031 (36% of the region's growth);
- existing Feilding urban area has land that is zoned (or already consented for subdivision) for urban development that could, theoretically, provide for the projected growth of household numbers and commercial development;
- principles for urban growth that should guide the form of Feilding's future urban development to satisfy the Vision for Feilding established with the community should include those which address Character and Identity, Connections and Networks, Open Space and Amenity, and Neighbourhood and Building Design;
- existing Feilding urban area has a range of different patterns (or streets, lots, open spaces and facilities) and that those which provide the greatest levels of connectivity, open space amenity and access to facilities have the highest levels of liveability.

Urban Growth Summary

The Feilding urban growth strategy recognises that:

- although there is existing urban zoned land within the existing urban area that there are a range of factors - such as ownership, development feasibility (eg topography or existing development), and market desirability that will constrain the availability for urban development;
- that projections for housing development demand will vary over time and that establishing a Framework Plan that makes it clear well into the future what the long term direction and pattern of development of the town will be, but also leaves flexibility for land release, is good urban planning practice;
- that MDC wishes to attract business, employment and people to live in Feilding (and the District generally) and by signalling the opportunities for growth and quality of urban development that this may generate interest from those currently outside the District;
- that in order to provide for the range of living environments that may be sought by the range of needs within the existing and future population, that a range of housing choice options is appropriate;
- that Feilding is a relatively small town and that there are a range of options for "edge" growth locations that will continue to provide reasonable accessibility to the town centre (ie less than 2km) whilst also enabling an option for 'country' style living environment;
- that constraints and opportunities analysis suggests the appropriate direction for urban edge growth is west and north and not east or south given the barriers to connectivity presented by the Oroua River; and
- that Feilding has an existing urban form (large and appropriately shaped lots) that will enable urban intensification that will provide people in smaller household sizes with a living option with smaller properties, easier access to shops, social facilities and less demanding maintenance requirements.



As a diagram the urban development strategy consists of edge growth close to the town centre and intensification where there is easy access to existing facilities and social amenities - these could be close to the centre or distributed within the existing urban area

06

Site Analysis: Edge Growth

The following section of the Framework Plan document presents site analysis for the potential edge growth areas. These growth areas form as 7 precincts which generally 'ring' the existing urban area. The precincts are as described below.

Site Analysis - Land Form



Precinct 1

It is bounded by Awahuri Road and Mangaone West Stream to the south, Ranfurly Road to the north, residential neighbourhoods to the east and farmland to the west. The south, south-east and south-west parts of the area are generally flat and susceptible to flood inundation. The high points are located at the northern portion of the area and present a series of terraces and gullies that drain to Mangaone West Stream.



Precinct 2

It is bordered by Ranfurly Road to the south, residential neighbourhoods to the east, Halcombe Road to the north and Ranfurly Road and farmland to the west. The area to the north of Sandon Road has an undulating landform with a large flat terraced area in the centre. A series of gullies run throughout. The area to the south of Sandon Road is characterised by steep slopes that drain towards Sandon Road and a large flat terrace to the north of Ranfurly Road.



Precinct 3

It is bounded by Halcombe Road to the south, farmland to the west, Lethbridge Road to the north and residential neighbourhoods to the east. The western and central parts have already been built for residential purposes or have developments under construction or already consented. The areas available for future developments are located to the north (adjacent to Lethbridge Road) and the south (adjacent to Halcombe Road). The two areas present an undulating land form with steep slopes and various gullies running west-east.



Precinct 4

Located to the north of North Street. It is bordered by Makino Road to the north, Reids Line West to the east, Arnott and Port Streets to the south and residential neighbourhoods to the west. Makino Stream cuts through the site in a north-south direction. The site is flat, with slopes less than 1:20m, and is susceptible to flood inundation.



Precinct 5

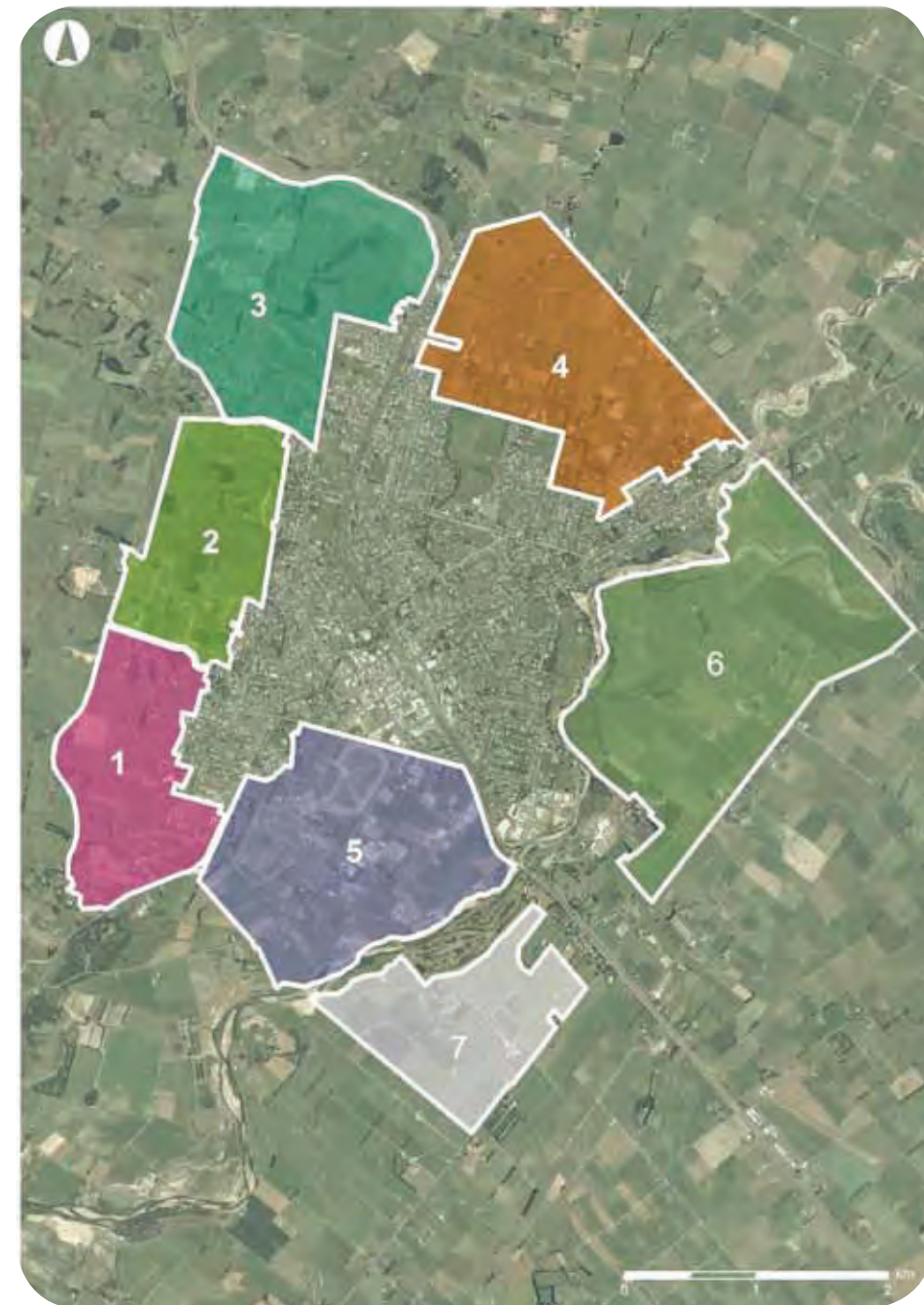
Precinct 5 is to the south of Feilding Town Centre, where Manfeild and the industrial zone are located. Makino Stream and Oroua River bound the site to the north-west and south-east respectively. The site is flat and a large extent of it is susceptible to flooding.

Precinct 6

On the east side of the Oroua River Precinct 6 is a large relatively flat rural area border by the river and Aorangi Road. The south end of this area is near to the freezing works. Areas near the river are susceptible to flooding.

Precinct 7

Like Precinct 6, this area is on the east side of the Oroua River. It is a large relatively flat rural area border by the river and SH54 Camerons Line. The north end of the area is adjacent to the golf club and there are several areas of mature native vegetation within the area generally.



06

Site Analysis: Edge Growth

Site Analysis - Land Form

The maps below illustrate the land form and elevation of five precincts (the boundaries are described by the white line). It is noted that Precincts 6 and 7 are not shown as these areas were discounted as unsuitable for further consideration when constraints and opportunities were addressed (refer to pages 29 and 30).

It is clear from these maps where the flatter areas are (discrete areas on the tops of the terraces to the west in Precincts 1-3) and most of the area of Precincts 4 - 5. The incised gullies in Precincts 1-3 create potential barriers to connectivity, whilst also presenting opportunities to define neighborhoods and use them as natural corridors for stormwater management and amenity recreation connections.



Precinct 1



Precinct 2



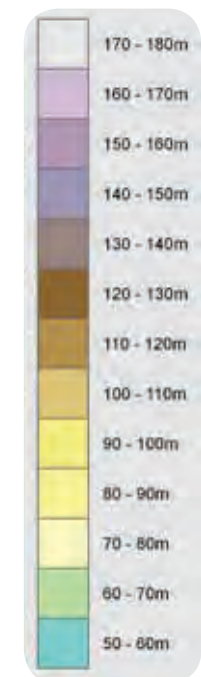
Precinct 3



Precinct 4



Precinct 5



06

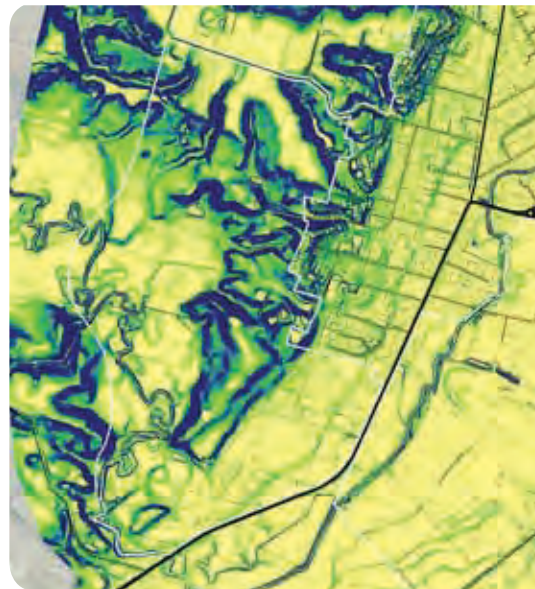
Site Analysis: Edge Growth

Site Analysis - Slope Analysis

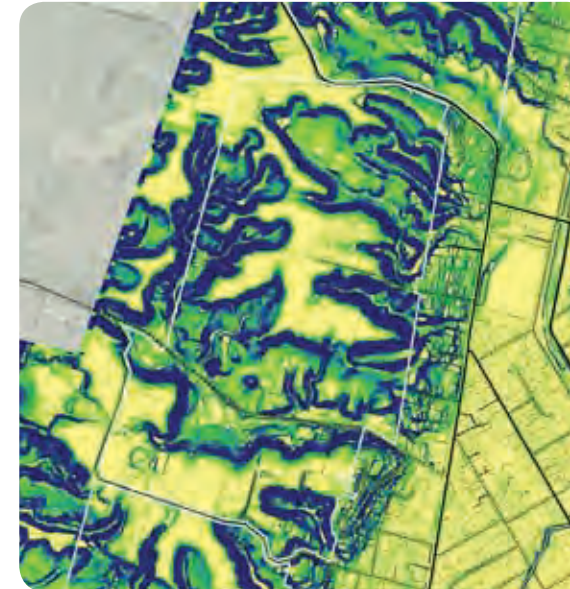
Precincts 1, 2 and 3 are located to the west of Awahuri and West Streets. Much of the western area is characterised by steep slopes ranging from 10% (1:10m) to greater than 25% (1:4m). The flat areas (less than 5%) are generally located in the floodplain, near Mangaone West Stream, or at the top of the terraces.

Precincts 4 and 5 are located to the north and south of Feilding respectively. These areas are characterised by minimal slopes - generally less than 5% (1:20m). A large portion of these two precincts are flood prone zones due to inundations from Makino Stream and Oroua River.

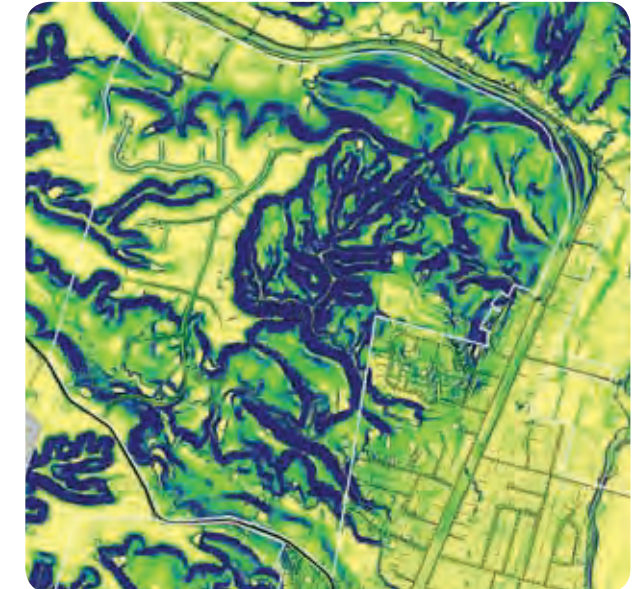
It is noted that Precincts 6 and 7 are not included as these were discounted as unsuitable for further consideration when constraints and opportunities were addressed (refer to pages 29 and 30).



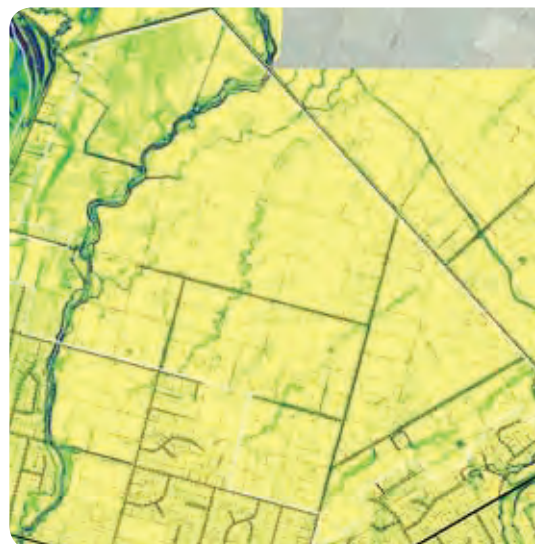
Precinct 1



Precinct 2



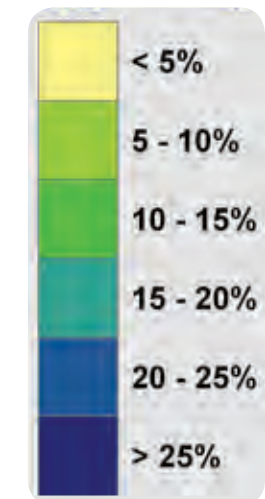
Precinct 3



Precinct 4



Precinct 5



06

Site Analysis: Edge Growth

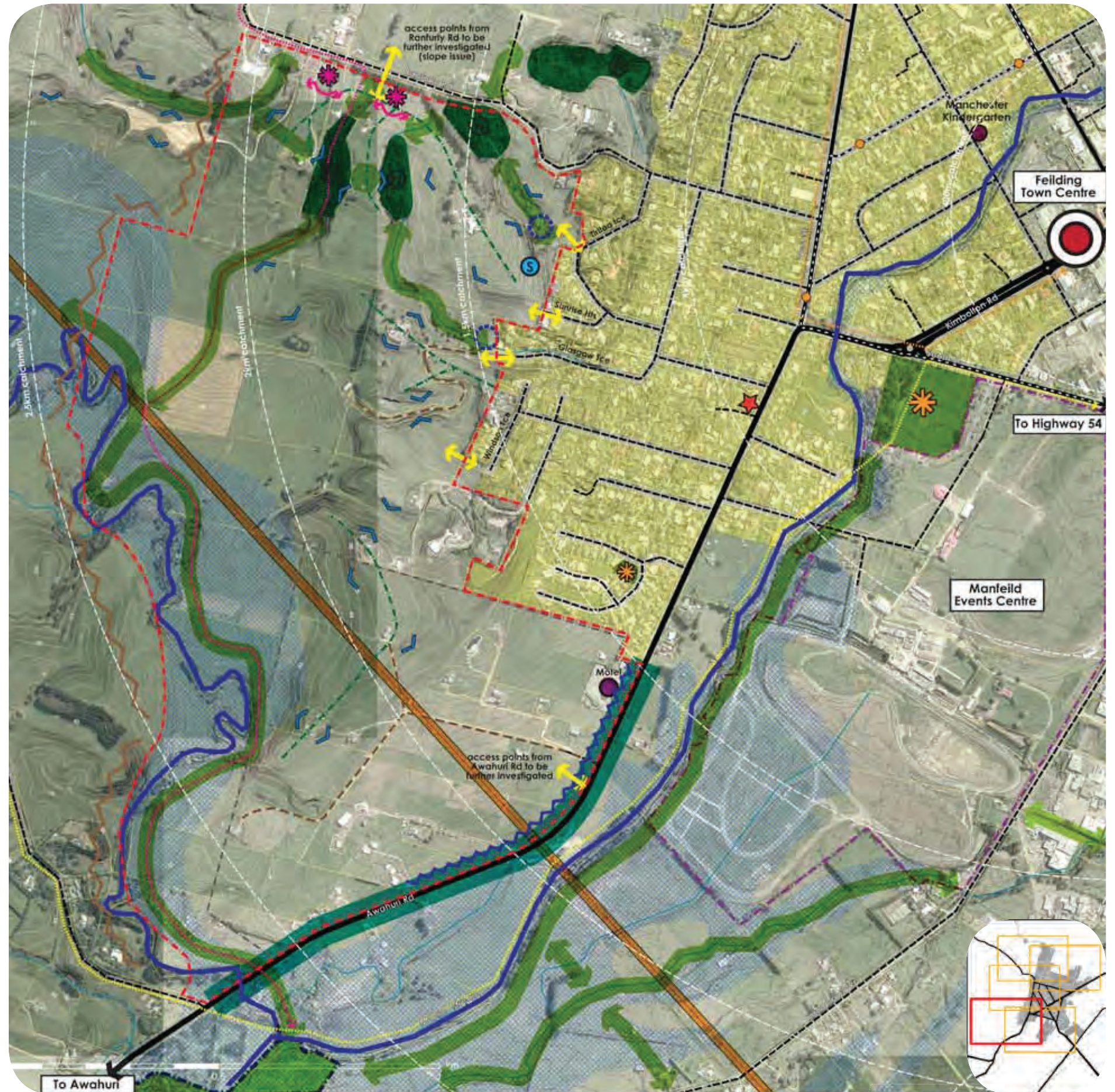
Opportunities and Constraints - Precinct 1



Legend

- Principal streets
- Connector streets
- Local streets
- Vegetation to be protected (native-subject to further investigation)
- River/stream
- Drainage lines
- Overland flow
- Possible access points (to be further investigated)
- Adjoining urban areas (residential zones)
- Potential green links (vegetation corridor/riparian corridor/pedestrian links and/or stormwater management)
- Flood Channel 1:100 years (potential green belt/recreational zones)
- High Points
- Important views from the site
- Existing Park
- Existing shops
- Visual Amenity Corridor
- Manfeild Events Centre
- Rural Tracks/roads
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Te Araroa walkway
- Transmission line
- Transmission line corridor (20m on either side from the centreline)
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Queen Elizabeth II Covenant (QEII)
- Awahuri/Kitchener Reserve
- Top of Terrace
- Potential Noise Impact from Manfeild
- Rural/urban interface
- Stormwater issues
- Potential stormwater detention location
- Future urban growth path
- Precinct 1 Boundary (potential - approximately 175ha)

note 1 - information on secondary flow paths and flood extents is limited and requires further investigation.



Opportunities and Constraints - Precinct 1

06

Site Analysis: Edge Growth

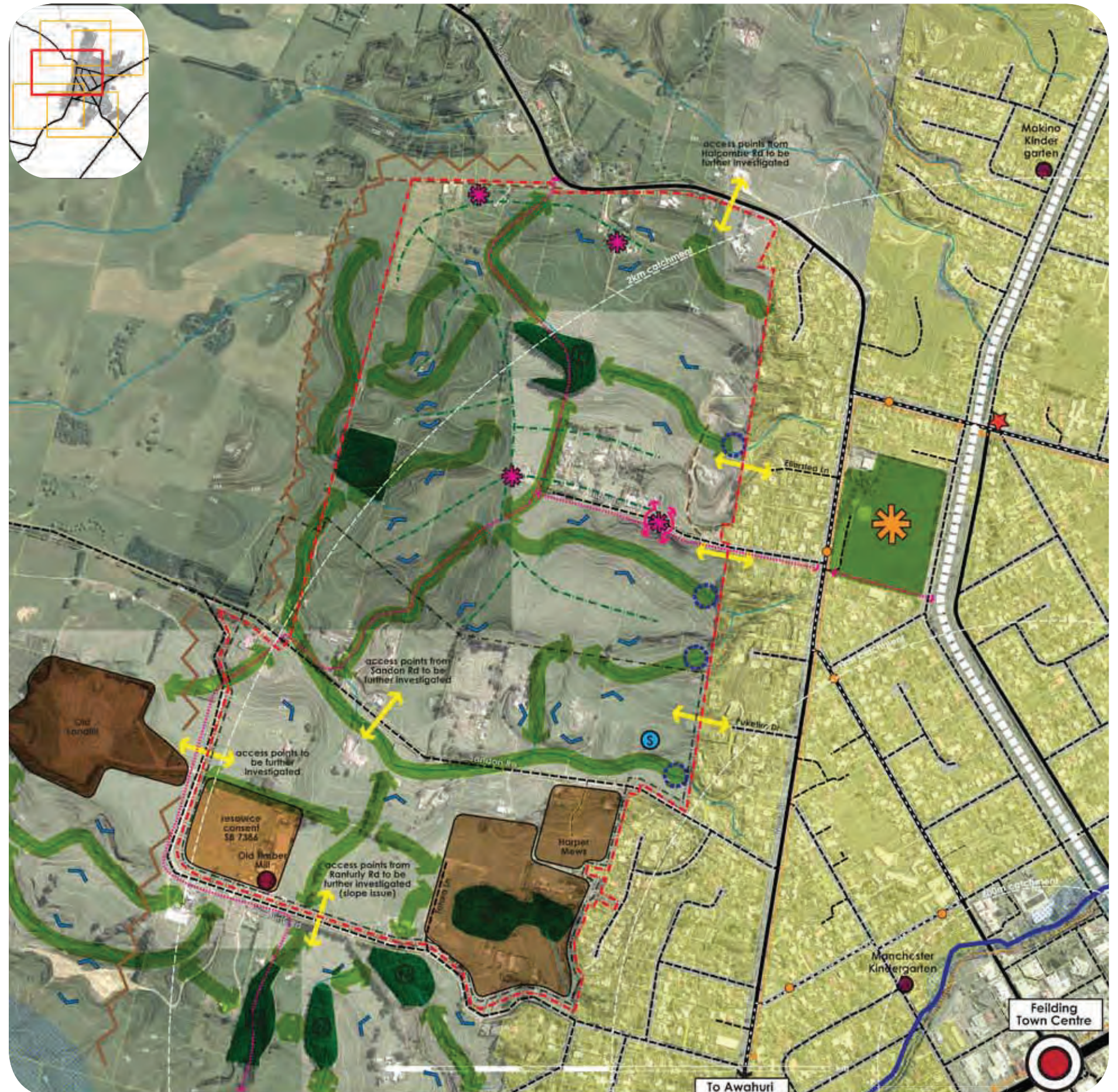
Opportunities and Constraints - Precinct 2



Legend

- Principal streets
- Connector streets
- Local streets
- Railway line (potential cycleway and walkway link)
- Vegetation to be protected (native - subject to further investigation)
- Production wood lot (or mixed - subject to further investigation)
- River/stream
- Drainage lines
- Overland flow
- Possible access points (to be further investigated)
- Adjoining urban areas (residential zones)
- Adjoining new residential developments (built or under construction)
- Adjoining new residential developments (proposed)
- Potential green links (vegetation corridor/riparian corridor/pedestrian links and/or stormwater management)
- Flood Channel 1:100 years (potential green belt /recreational zones)
- High Points
- Important views from the site
- Existing Park
- Existing Shops
- Rural Tracks/roads
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Top of Terrace
- Old Landfill (potential to be rehabilitated /mountain bike track /recycling centre)
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Rural/urban interface
- Potential stormwater detention location
- Future urban growth path
- Precinct 2 Boundary (potential - approximately 163ha)

note 1: Information on secondary flow paths and flood extents is limited and requires further investigation.



Opportunities and Constraints - Precinct 2

06

Site Analysis: Edge Growth

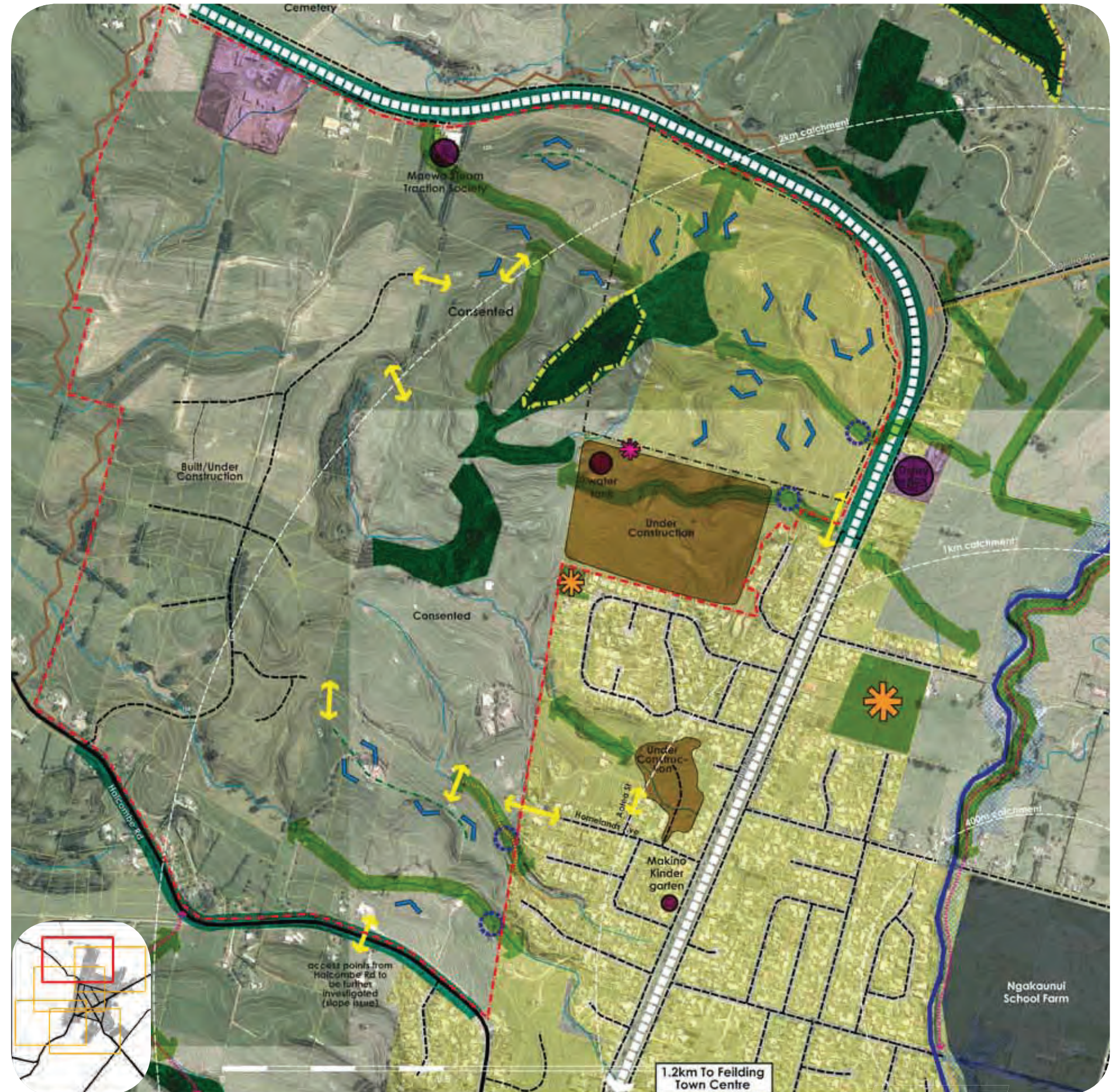
Opportunities and Constraints - Precinct 3



Legend

- Principal streets
- Connector streets
- Local streets
- Railway line (potential cycleway and walkway link)
- Vegetation to be protected (native-subject to further investigation)
- River/stream
- Drainage lines
- Overland flow
- Possible access points (to be further investigated)
- Adjoining urban areas (residential zones)
- Adjoining new residential developments (built or under construction)
- Industrial zone
- Potential green links (vegetation corridor/riparian corridor/pedestrian links and/or stormwater management)
- Flood Channel 1:100 years (potential green belt/recreational zones)
- High Points
- Important views from the site
- Existing Park
- Visual Amenity Corridor
- Queen Elizabeth II Covenant (QEII)
- Top of Terrace
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Rural/urban interface
- Potential stormwater detention location
- Future urban growth path
- Precinct 3 Boundary (potential - approximately 270ha)

note: 1) information on secondary flow paths and flood extents is limited and requires further investigation



Opportunities and Constraints - Precinct 3

06

Site Analysis: Edge Growth

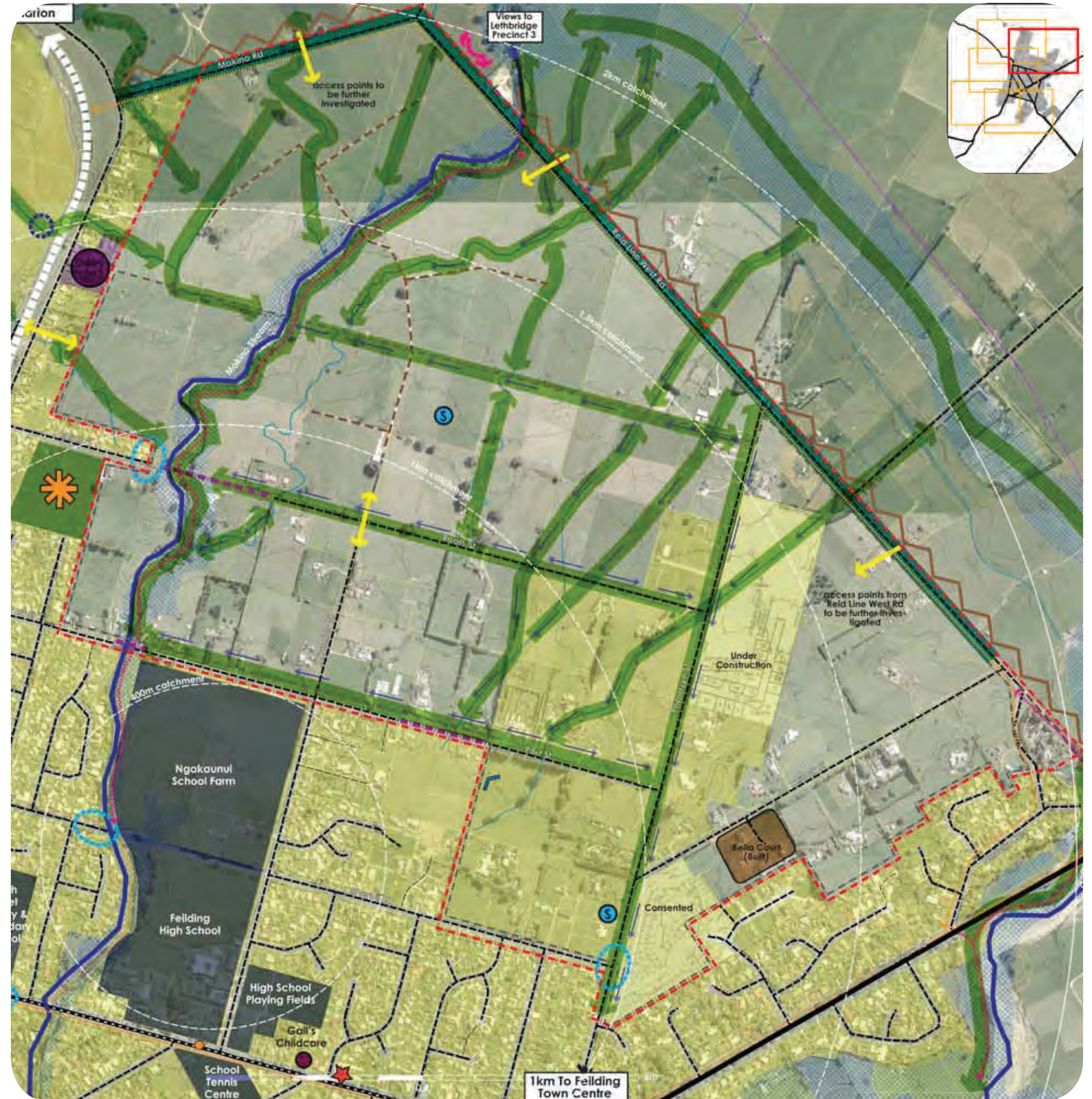
Opportunities and Constraints - Precinct 4



Legend

- Principal streets
- Connector streets
- Local streets
- Railway line (potential cycleway and walkway link)
- Vegetation to be protected (native - subject to further investigation)
- River/stream
- Drainage lines
- Stormwater flow paths
- Possible access points (to be further investigated)
- Adjoining urban areas (residential zones)
- Adjoining new residential developments (built or under construction)
- Industrial zone
- Potential green links (vegetation corridor/riparian corridor/ pedestrian links and/or stormwater management)
- Flood Channel (1:100 years (potential green belt / recreational zones)
- Important views from the site
- Existing Park
- Rural Tracks/roads
- Transmission line
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Queen Elizabeth II Covenant (QEII)
- Potential bridge/street connections
- Existing shops
- Rural/urban interface
- Visual Amenity Corridor
- Stormwater issues
- Potential stormwater detention location
- Areas of surface flooding and system surcharge
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Future urban growth path
- Precinct 4 Boundary (potential approximately 277ha)

note 1: information on secondary flow paths and flood extents is limited and requires further investigation



Opportunities and Constraints - Precinct 4

06

Site Analysis: Edge Growth

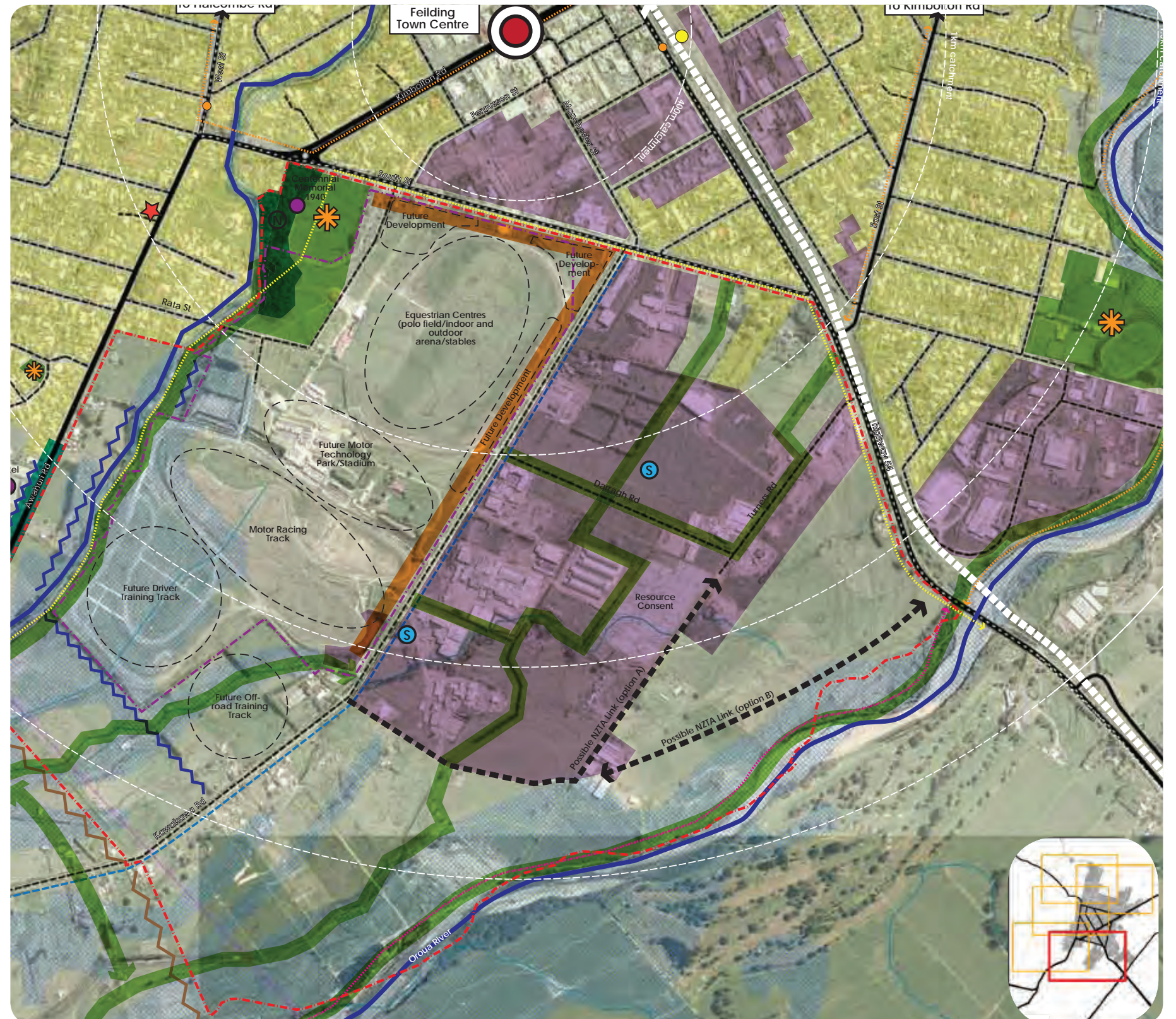
Opportunities and Constraints - Precinct 5



Legend

- Principal streets
- Connector streets
- Local streets
- Railway line (potential cycleway and walkway link)
- River/stream
- Vegetation to be preserved (native-subject to further investigation)
- Awahuri/Kitchener Reserve
- Drainage lines
- Overland flow
- Adjoining urban areas (residential zones)
- Industrial Zone
- Interface sensitivity
- Visual Amenity Corridor
- Potential green links (vegetation corridor/riparian corridor/ pedestrian links and/or stormwater management)
- Flood Channel 1:100 years (potential green belt/recreational zones)
- Existing Park
- Rural Tracks/roads
- Transmission line
- Transmission line corridor (20m on either side from the centreline)
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Te Araroa walkway
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Train station
- Existing shops
- Mantfield Events Centre
- Hydraulic constraints (subject to further investigation)
- Potential Noise Impact from Mantfield
- Rural/Industrial Interface
- Precinct 5 Boundary (potential - approximately 295ha)

note 1: information on secondary flow paths and flood extent is limited and requires further investigation.



Opportunities and Constraints - Precinct 5

06

Site Analysis: Edge Growth

Opportunities and Constraints - Precinct 6

Legend

- Principal streets
- Connector streets
- Local streets
- Railway line
- Vegetation to be protected (native - subject to further investigation)
- River/stream
- Drainage lines
- Stormwater flow paths
- Possible access points (to be further investigated)
- Adjoining urban areas (residential zones)
- Adjoining new residential developments (built or under construction)
- Industrial zone
- Potential green links (vegetation corridor/riparian corridor/ pedestrian links and/or stormwater management)
- Flood Channel 1:100 years (potential green belt / recreational zones)
- Industrial Buffer
- Possible Contaminated Land
- Important views from the site
- Existing Park
- Rural Tracks/roads
- Transmission line
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Queen Elizabeth II Covenant (QEII)
- Potential bridge/street connections
- Existing shops
- Rural/urban interface
- Visual Amenity Corridor
- Stormwater issues
- Potential stormwater detention location
- Areas of surface flooding and system surcharge
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Future urban growth path
- High Tension Power Lines
- Intersection upgrade



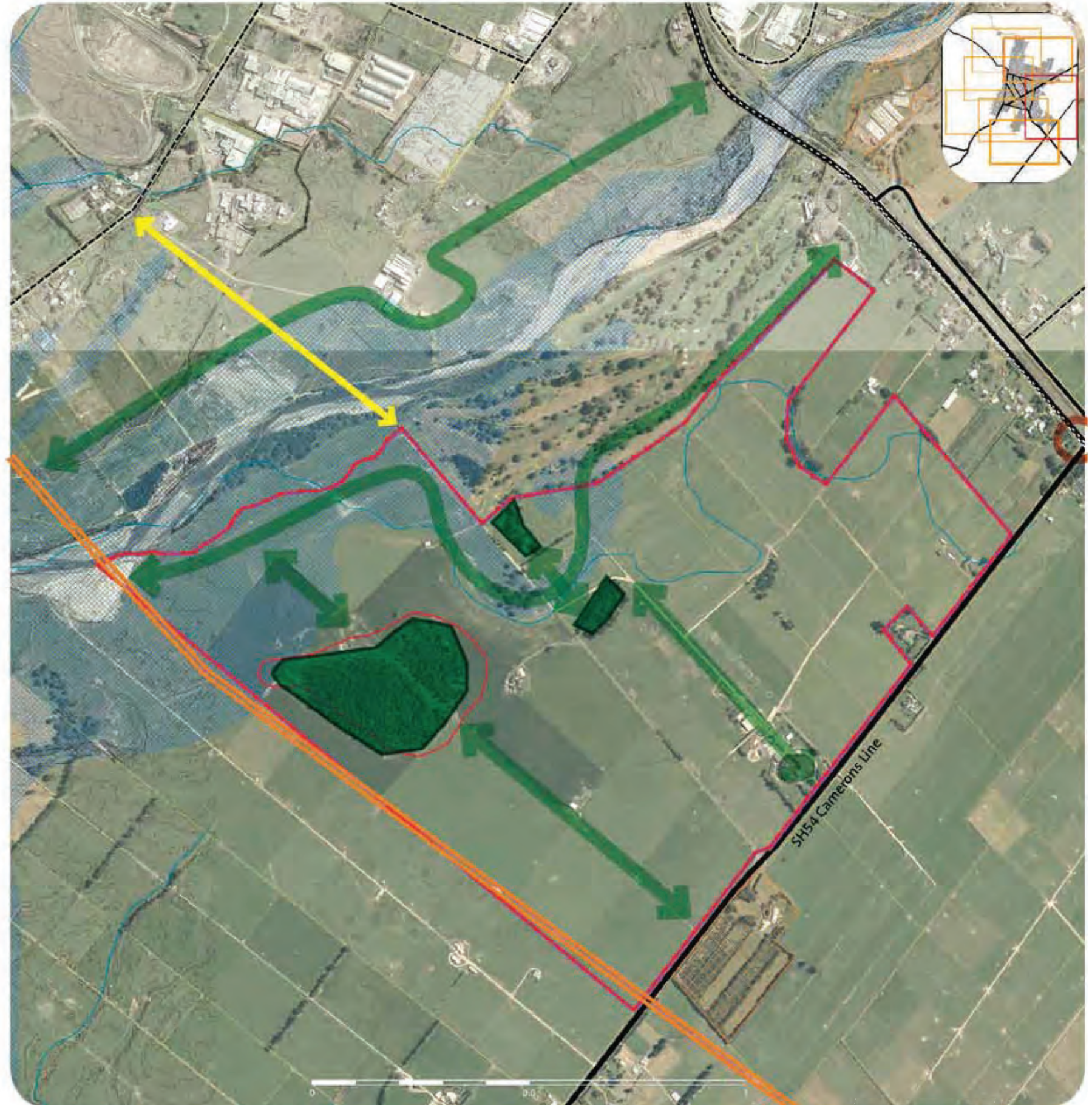
06

Site Analysis: Edge Growth

Opportunities and Constraints - Precinct 7

Legend

- Principal streets
- Connector streets
- Local streets
- Railway line
- Vegetation to be protected (native - subject to further investigation)
- River/stream
- Drainage lines
- Stormwater flow paths
- Possible access points (to be further investigated)
- Adjoining urban areas (residential zones)
- Adjoining new residential developments (built or under construction)
- Industrial zone
- Potential green links (vegetation corridor/riparian corridor/ pedestrian links and/or stormwater management)
- Flood Channel 1:100 years (potential green belt / recreational zones)
- Industrial Buffer
- Possible Contaminated Land
- Important views from the site
- Existing Park
- Rural Tracks/roads
- Transmission line
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Queen Elizabeth II Covenant (QEII)
- Potential bridge/street connections
- Existing shops
- Rural/urban interface
- Visual Amenity Corridor
- Stormwater issues
- Potential stormwater detention location
- Areas of surface flooding and system surcharge
- Existing walkway (potential cycleway)
- Potential walkway/cycleway links (subject to further investigation)
- Future urban growth path
- High Tension Power Lines
- Intersection upgrade



07

Concepts: Edge Growth

Population and Residential Density

The following plans provide for a variety of housing types and densities across the Feilding Growth Areas and some additional areas for mixed use and industrial uses to the south. It is noted that concepts for growth within the existing urban footprint are described in sections 8 and 9 of this Framework Plan.

The western hills (Precincts 1, 2 and 3) are shown with a form that responds to the undulating and steep topography. It is proposed that some flat areas at the top of the terrace in Precincts 1 and 2 could be planned in a form that allows intensification in the future (ie they start now with lower density with higher density residential in the future). These areas are located near the proposed neighbourhood centre (Precincts 1 and 2) and a local park (Precinct 2) and they could potentially achieve a gross density of 10 dwellings per hectare.

Much of Precinct 3 has been developed or consented already. The areas available for growth (northern and southern boundary) are proposed as low density, rural lifestyle lots. In the Feilding context, these areas are considered to be reasonably far from the Town Centre (approximately 2.5km) and have a series of gullies, steep topography and native vegetation. Higher density residential is not considered appropriate in this location.

The Framework Plan provides for a more regularised form in Precinct 4. The topography is generally flat (less than 5% slope) and is within close proximity to community facilities such as primary, secondary and high schools. It is envisaged that a neighbourhood centre and a local park centrally located will provide amenities to the new residents and the existing surrounding neighbourhoods.

There is a projected demand in the next 20 years for smaller housing types within Feilding. It is proposed that in the next 20 years the smaller lots with 2 bedroom types (eg cottages or townhouses) would occur near the Town Centre and in Precinct 4. It is important that this type of housing is placed near existing or new community facilities (shops, childcare, parks, schools) to reduce car dependency and promote a more walkable, sustainable and liveable environment for these residents. Typically the smaller households are for people with a lower and fixed income and who benefit from a less car dependant urban form.

The following section of the Framework Plan presents 'concepts for five edge growth precincts - two of the seven precincts examined in the previous section have been discounted as not suitable for urban growth (Precincts 6 and 7). The purpose of the concepts is to demonstrate the potential for these growth areas in terms of yields and also service provision feasibility including stormwater. They also demonstrate the application of the urban planning principles outlined earlier.

Street Network

The plan proposes a well connected system of streets. The new streets should connect adjoining Growth Areas to each other. Each neighbourhood within the Growth Areas should also provide a highly connected system of internal local streets.

Open Space Network

The Framework Plan proposes an integrated approach to the green infrastructure of Feilding. Streams and high value gullies should be utilised and restored as environmental corridors. A network of footpaths and cycleways combined with a sustainable approach to stormwater management (swales, bioretention and treatment ponds) could be provided along these corridors. The plan proposes a network of parks and open spaces ranging from neighbourhood and pocket parks, reserves and environmental and recreational corridors.

Pedestrian and Cycleway Network

A system of footpaths and cycleways running along the streets, major parks, the railway corridor, Manfield Centre and the proposed recreational corridors is proposed to improve the opportunities to use alternative modes of transport within Feilding and also to provide greater opportunities for recreational activities.

Industrial Areas

New mixed use and industrial zones are proposed within Precinct 5. The plan proposes a mixed use zone along South Street to provide for some streetfront retail activities (large format retail format is not recommended), medium density residential, office spaces and short-term accommodation. Light industry is envisaged to occur along Kawakawa Road. A possible business park is proposed near Oroua River.

Existing Urban Area

As noted previously the Framework Plan identifies potential for growth to be provided for within the existing urban area. This should be considered as a growth strategy in parallel with greenfield growth.

In terms of residential development a logical location for smaller houses with 1-2 bedrooms is close in to the town centre. The town house type would be appropriate here.

Infill (leaving an existing house and adding more houses to the site) or redevelopment (removing existing house and adding more houses to the site) are two primary ways residential growth is likely to occur in Feilding.

07 Concepts: Edge Growth

Framework Plan - Precinct 1

All of the Precinct Plans illustrate a conceptual application of the urban planning principles. The District Plan itself will set the rules, design guidelines and the structure plans. The structure plans make some reference to key connecting links and open space and slope areas.

Legend

Proposed

- Connector streets (new or to be upgraded) including swales in most cases
- Local streets including swales in most cases
- Environmental protection corridor
- Recreational corridor / stormwater management
- ① Density type 1 - rural lifestyle lots (1 dwelling/ha - lots > 5,000m²)
- ② Density type 2 - rural lifestyle lots (2 dwelling/ha - lots 2,000m² to 5,000m²)
- ③ Density type 3 - urban lots (4.5 dwelling/ha - lots 800m² to 2,000m²)
- Neighbourhood centre
- Neighbourhood park
- Pocket park or neighbourhood focal point
- Dedicated pedestrian and cycleway
- Potential stormwater detention location
- Density node

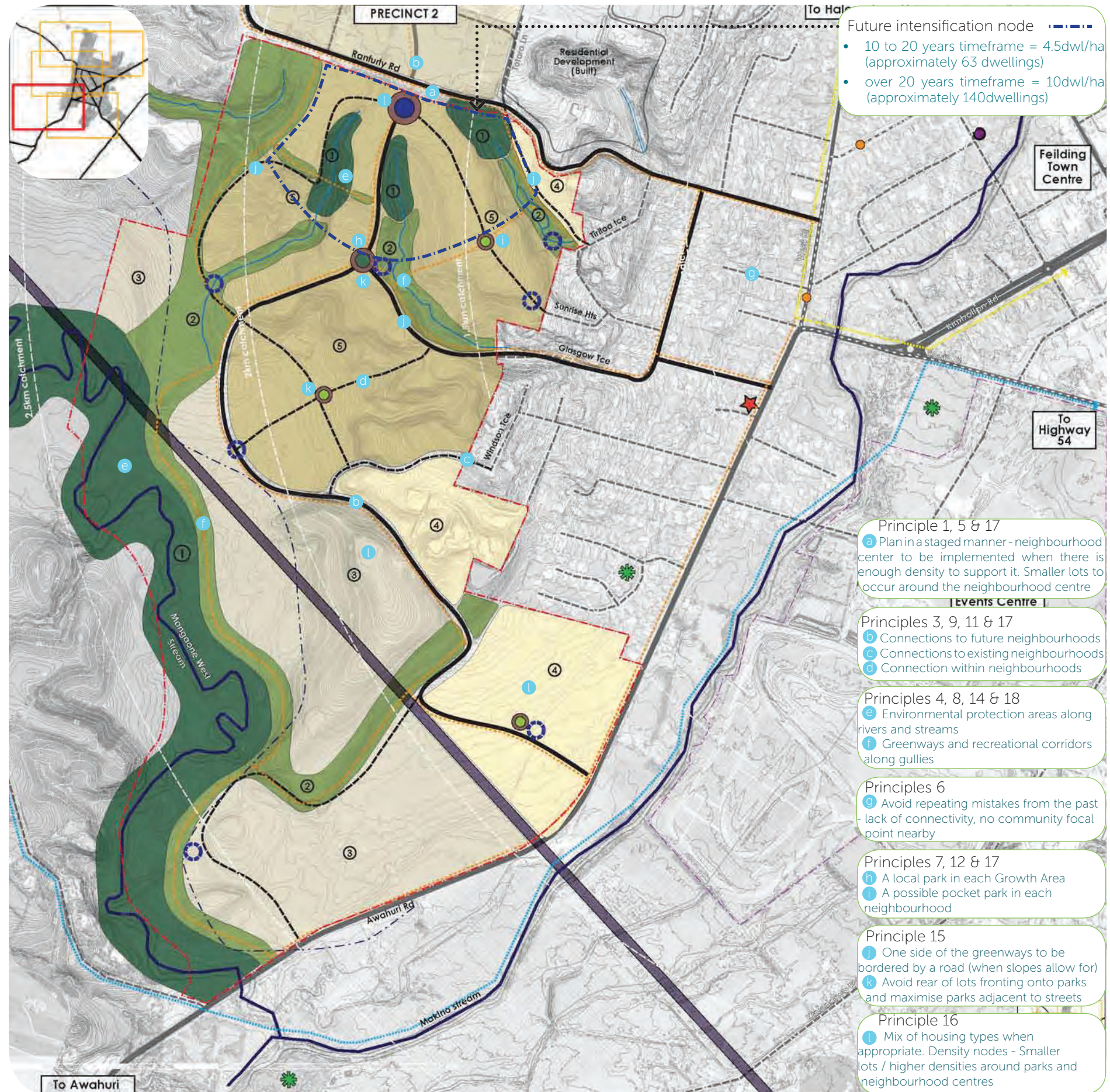
Existing

- River/stream
- Drainage lines
- 1:100ys flood line
- Transmission line corridor (20m on either side from the centreline)
- Roads
- Parks or reserves
- Shops
- Childcare or kindergarten
- Walkways
- Te Araroa walkway
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Precinct 1 Boundary (approximately 175ha)

Note 1: Information on secondary flow paths and flood extents is limited and requires further investigation.

Preliminary Yield

Category	Count	Percentage
Rural lifestyle lots		
Type 1 (>5,000m ²)	55	(18%)
Type 2 (2,000m ² to 5,000m ²)	44	(15%)
Total rural lifestyle lots	99	(33%)
Urban lots		
Type 3 (800m ² to 2,000m ²)	198	(67%)
Total urban lots	198	(67%)
Total Yield	297	lots



Framework Plan - Precinct 1 (1:10,000 at A3)

07

Concepts: Edge Growth

Framework Plan - Precinct 2

All of the Precinct Plans illustrate a conceptual application of the urban planning principles. The District Plan itself will set the rules, design guidelines and the structure plans. The structure plans make some reference to key connecting links and open space and slope areas.

Legend

Proposed

- Connector streets (new or to be upgraded) including swales in most cases
- Local streets including swales in most cases
- ① Recreational corridor / stormwater management
- ② Density type 1 - rural lifestyle lots (1 dwelling/ha - lots > 5,000m²)
- ③ Density type 2 - rural lifestyle lots (2 dwelling/ha - lots 2,000m² to 5,000m²)
- ④ Density type 3 - urban lots (4.5 dwelling/ha - lots 800m² to 2,000m²)
- Neighbourhood centre
- Neighbourhood park
- Dedicated pedestrian and cycleway
- Potential stormwater detention location
- Density node

Existing

- River/stream
- Railway line (potential pedestrian and cycleway)
- Drainage lines
- Roads
- Parks or reserves
- Shops
- Childcare or kindergarten
- Old brick works (heritage value to be assessed)
- Walkways
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Precinct 2 Boundary (approximately 163ha)

Note 1: Information on secondary flow paths and flood extents is limited and requires further investigation.

Preliminary Yield

Rural lifestyle lots	
Type 1 (>5,000m ²)	27 (11%)
Type 2 (2,000m ² to 5,000m ²)	48 (20%)
Total rural lifestyle lots	75 (31%)
Urban lots	
Type 3 (800m ² to 2,000m ²)	162 (69%)
Total urban lots	162 (69%)
Total Yield	237 lots

Principle 1, 5 & 17
 a Plan in a staged manner - neighbourhood center to be implemented when there is enough density to support it. Smaller lots to occur around the neighbourhood centre

Principles 3, 9, 11 & 17
 b Connections to future neighbourhoods
 c Connections to existing neighbourhoods
 d Connection within neighbourhoods

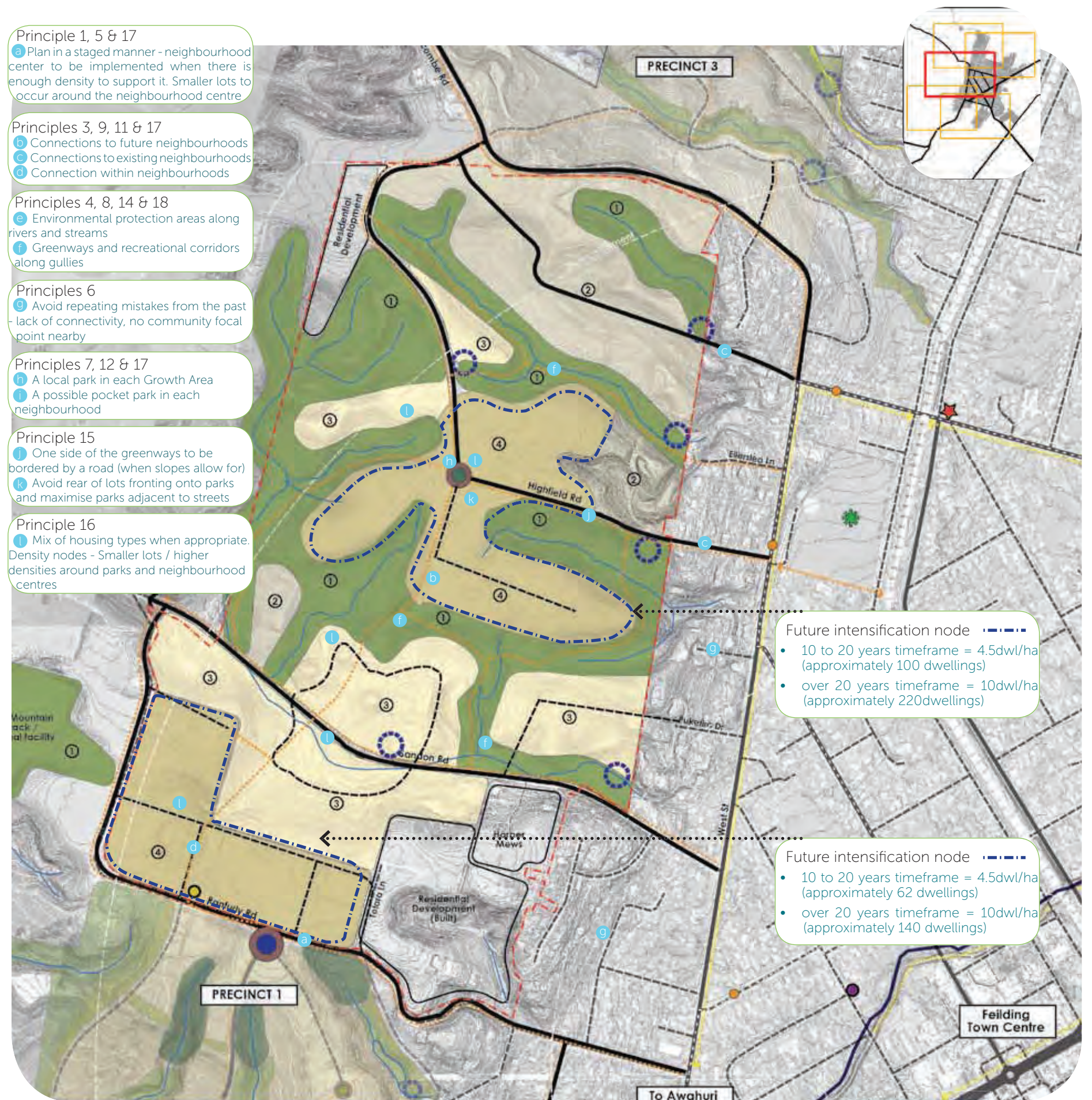
Principles 4, 8, 14 & 18
 e Environmental protection areas along rivers and streams
 f Greenways and recreational corridors along gullies

Principles 6
 g Avoid repeating mistakes from the past - lack of connectivity, no community focal point nearby

Principles 7, 12 & 17
 h A local park in each Growth Area
 i A possible pocket park in each neighbourhood

Principle 15
 j One side of the greenways to be bordered by a road (when slopes allow for)
 k Avoid rear of lots fronting onto parks and maximise parks adjacent to streets

Principle 16
 l Mix of housing types when appropriate. Density nodes - Smaller lots / higher densities around parks and neighbourhood centres



Future intensification node — — — — —

- 10 to 20 years timeframe = 4.5dw/ha (approximately 100 dwellings)
- over 20 years timeframe = 10dw/ha (approximately 220dwellings)

Future intensification node — — — — —

- 10 to 20 years timeframe = 4.5dw/ha (approximately 62 dwellings)
- over 20 years timeframe = 10dw/ha (approximately 140 dwellings)

Framework Plan - Precinct 2 (1:10,000 at A3)

07

Concepts: Edge Growth

Framework Plan - Precinct 3

All of the Precinct Plans illustrate a conceptual application of the urban planning principles. The District Plan itself will set the rules, design guidelines and the structure plans. The structure plans make some reference to key connecting links and open space and slope areas.

Legend

Proposed

- Connector streets (new or to be upgraded) including swales in most cases
- Local streets including swales in most cases
- Environmental protection corridor
- Recreational corridor / stormwater management
- Density type 1 - rural lifestyle lots (1 dwelling/ha - lots > 5,000m²)
- Dedicated pedestrian and cycleway
- Potential stormwater detention location

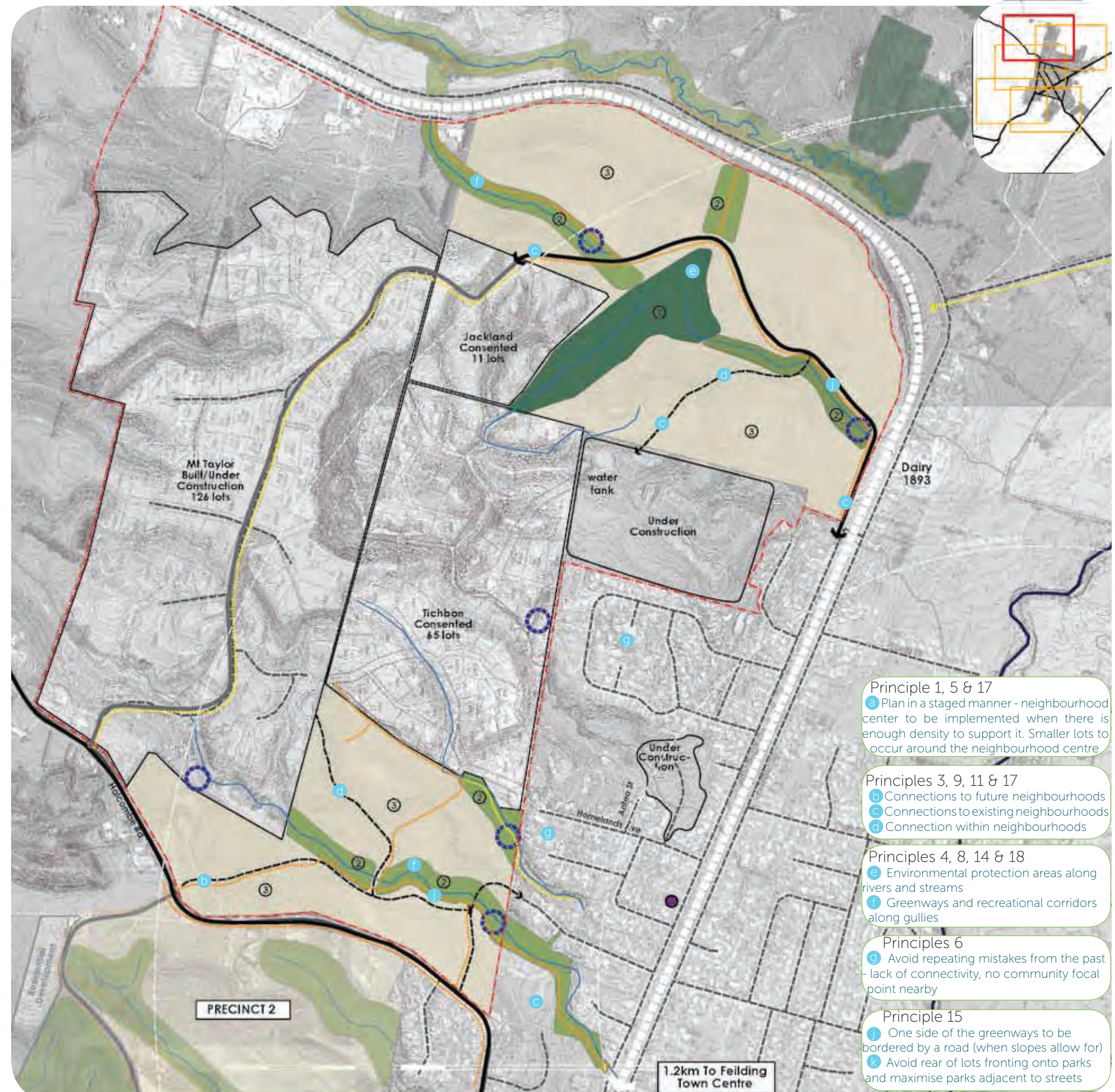
Existing

- River/stream
- Railway line (potential pedestrian and cycleway)
- Drainage lines
- Roads
- Parks or reserves
- Childcare or kindergarten
- Walkways
- Precinct 3 Boundary (approximately 270ha)

note 1: information on secondary flow paths and flood extents is limited and requires further investigation.

Preliminary Yield

New developments	
Built	126 (46%)
Consented	74 (28%)
Total new developments	202 (74%)
Proposed rural lifestyle lots	
Type 1 (> 5,000m ²)	71 (26%)
Total rural lifestyle lots	71 (26%)
Total Yield	273 lots



Principle 1, 5 & 17
 a Plan in a staged manner - neighbourhood center to be implemented when there is enough density to support it. Smaller lots to occur around the neighbourhood centre

Principles 3, 9, 11 & 17
 b Connections to future neighbourhoods
 c Connections to existing neighbourhoods
 d Connection within neighbourhoods

Principles 4, 8, 14 & 18
 e Environmental protection areas along rivers and streams
 f Greenways and recreational corridors along gullies

Principles 6
 g Avoid repeating mistakes from the past - lack of connectivity, no community focal point nearby

Principle 15
 h One side of the greenways to be bordered by a road (when slopes allow for)
 i Avoid rear of lots fronting onto parks and maximise parks adjacent to streets

Framework Plan - Precinct 3 (1:10,000 at A3)

07

Concepts: Edge Growth

Framework Plan - Precinct 4

All of the Precinct Plans illustrate a conceptual application of the urban planning principles. The District Plan itself will set the rules, design guidelines and the structure plans. The structure plans make some reference to key connecting links and open space and slope areas.

Legend

Proposed

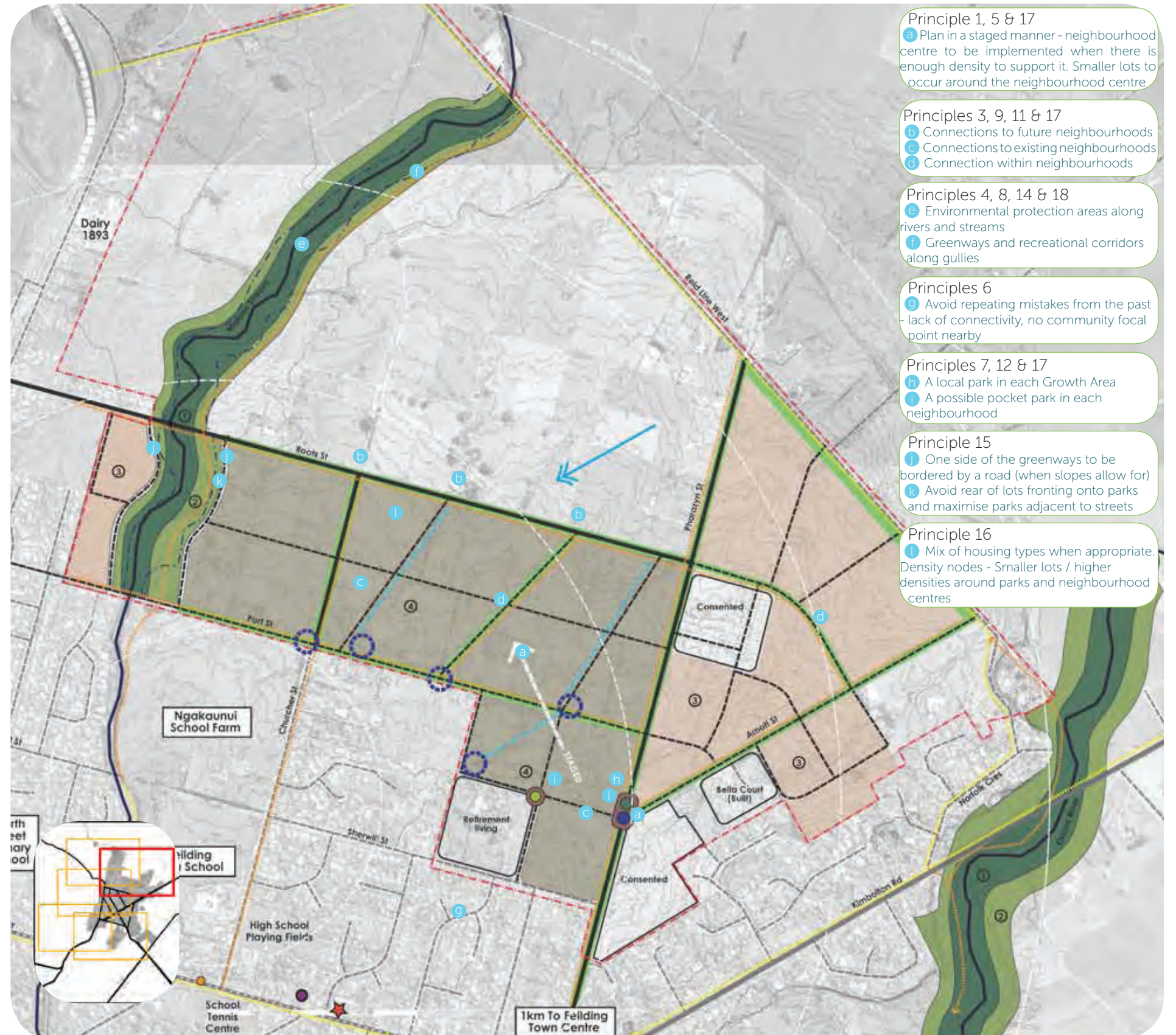
- Connector streets (new or to be upgraded) including swales in most cases
- Local streets including swales in most cases
- Environmental protection corridor
- Recreational corridor / stormwater management
- ④ Density type 4 - urban lots (8 dwellings/ha - lots 450m² to 2,000m²)
- ⑤ Density type 5 - urban lots (10 dwellings/ha - lots 200m² to 2,000m²)
- Neighbourhood centre
- Neighbourhood park
- Pocket park or neighbourhood local point
- Dedicated pedestrian and cycleway
- "Green road" (combined use of stormwater management, road and pedestrian and cycleways)
- Density node
- Potential stormwater detention location
- Potential stormwater detention in swale/ditch

Existing

- River/stream
- Drainage lines
- 1:100ys flood line
- Railway line (potential pedestrian and cycle ways)
- Roads
- Parks or reserves
- Shops
- Childcare or kindergarten
- Walkways
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Stormwater flow path
- Precinct 4 Boundary (approximately 277ha)

Preliminary Yield

Urban lots	
Type 4 (450m ² to 2,000m ²)	176 (23%)
Type 5 (200m ² to 2,000m ²)	590 (77%)
Total Yield	766 lots



- Principle 1, 5 & 17
 - a Plan in a staged manner - neighbourhood centre to be implemented when there is enough density to support it. Smaller lots to occur around the neighbourhood centre
- Principles 3, 9, 11 & 17
 - b Connections to future neighbourhoods
 - c Connections to existing neighbourhoods
 - d Connection within neighbourhoods
- Principles 4, 8, 14 & 18
 - e Environmental protection areas along rivers and streams
 - f Greenways and recreational corridors along gullies
- Principles 6
 - g Avoid repeating mistakes from the past - lack of connectivity, no community focal point nearby
- Principles 7, 12 & 17
 - h A local park in each Growth Area
 - i A possible pocket park in each neighbourhood
- Principle 15
 - j One side of the greenways to be bordered by a road (when slopes allow for)
 - k Avoid rear of lots fronting onto parks and maximise parks adjacent to streets
- Principle 16
 - l Mix of housing types when appropriate. Density nodes - Smaller lots / higher densities around parks and neighbourhood centres

07

Concepts: Edge Growth

Framework Plan - Precinct 5

All of the Precinct Plans illustrate a conceptual application of the urban planning principles. The District Plan itself will set the rules, design guidelines and the structure plans. The structure plans make some reference to key connecting links and open space areas.

Legend

Proposed

- Connector streets (new or to be upgraded) including swales in most cases
- Local streets including swales in most cases
- Environmental protection corridor
- Recreational corridor / stormwater management
- New industrial zone / business park
- Mixed use type 1 (office spaces / short-term accommodation)
- Light industry
- Dedicated pedestrian and cycleway
- "Green roads" (combined use of stormwater management, roads and pedestrian and cycleways)
- ← Viewlines / green spaces

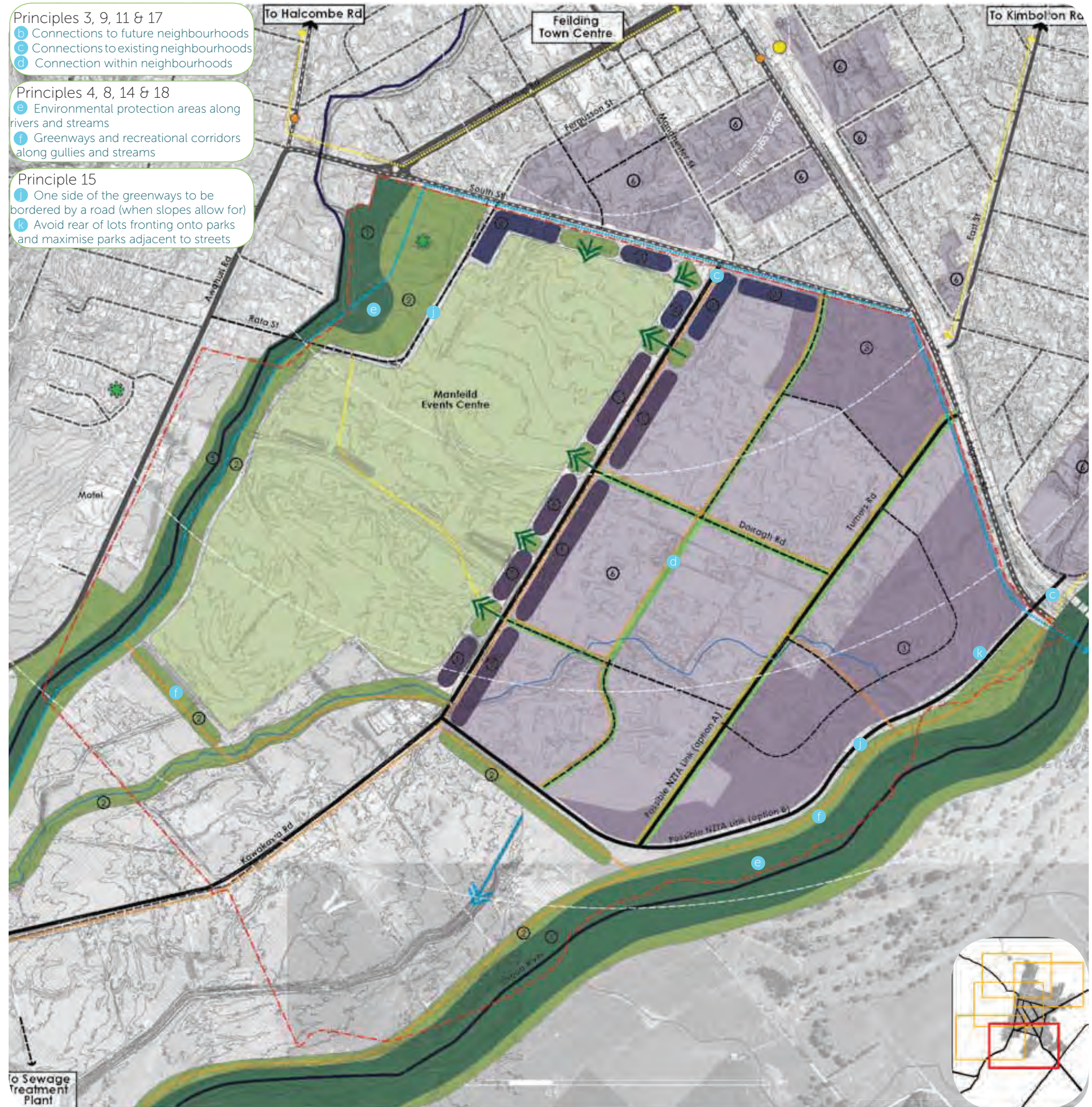
Existing

- River/stream
- Drainage lines
- 1:100yr flood line
- Railway line (potential walkway and cycleway)
- Railway station
- Industrial zone
- Roads
- Parks or reserves
- Shops
- Childcare or kindergarten
- Walkways
- Te Araroa walkway
- Feilding to Palmerston North bus route
- Bus stop (approximate location)
- Stormwater flow path
- Precinct 5 boundary (approximately 175ha)

Note 1: Information on secondary flow paths and flood extent is limited and requires further investigation.

Preliminary Area Calculation (approximate)

Category	Area (ha)
Mixed Use	
Mixed use type 1	3ha
Total mixed use	3ha
Industry	
Existing industrial zone (within precinct boundary)	74ha
Existing industrial zone (outside precinct boundary)	96ha
New industrial zone/business park	34ha
Light industry	6ha
Total Industry	210ha
Total	213ha



- Principles 3, 9, 11 & 17
 - (b) Connections to future neighbourhoods
 - (c) Connections to existing neighbourhoods
 - (d) Connection within neighbourhoods
- Principles 4, 8, 14 & 18
 - (e) Environmental protection areas along rivers and streams
 - (f) Greenways and recreational corridors along gullies and streams
- Principle 15
 - (1) One side of the greenways to be bordered by a road (when slopes allow for)
 - (k) Avoid rear of lots fronting onto parks and maximise parks adjacent to streets

Framework Plan - Precinct 5 (1:10,000 at A3)

08

Analysis: Intensification

Current Provision for Intensification

Residential Intensification is often described alternatively as infill, medium or high-density development.

In Feilding it is anticipated that intensification of residential activities will occur by a combination of infill (additional houses are added to an existing site and the existing house retained), or comprehensive redevelopment (existing house is removed and site completely redeveloped with additional houses, or sites amalgamated to make a larger redevelopment site).

Within Feilding currently there are multiple lots which have the theoretical ability to be intensified (by resource consent) given the minimum lot size of 500m². The Figure below describes the range of infill potential lots based on lot size. However, the distribution of these lots and their suitability (lot shapes, access slope etc) requires a more considered strategy to guide intensification to appropriate sites. Sections 7 and 8 examine the appropriate condition of lots for intensification and suggests a basis for District Plan changes to guide this type of development in the future.



Feilding's urban growth will be accommodated and promoted by the encouragement of both edge growth and the intensification of development of the existing urban footprint. Sections 6 and 7 describe edge development analysis and concepts. The following sections 8 and 9 address intensification.

Historical Patterns of Development

Residential intensification in Feilding has occurred as larger lots have been subdivided over time. Where blocks are relatively deep they have tended to result in multiple rear lots (Type A). Blocks of lesser depth (Types B and C at 100-120m) have allowed subdivision to a form where all sites have a street frontage and rear lots are rare.

The other block form which has tended to be generated from more recent greenfield subdivision (Type D) is less distinct given the combination of dead end disconnected streets.

The shape and form of lots is very influential to the suitability for intensification. Lots suitable for intensification have a direct street frontage, have good width and shape, are flatish, and have good access to public open space.



Lot Size (and number of possible additional lots)	
800m ² - 1149m ²	(1 additional lots)
1150m ² - 1549m ²	(2 additional lots)
1550m ² - 1899m ²	(3 additional lots)
1900m ² - 2299m ²	(4 additional lots)
2300m ² - 2599m ²	(5 additional lots)
2600m ² - 2999m ²	(6 additional lots)
3000m ² - 3999m ²	(7 additional lots)
4000m ² - 4999m ²	(8 additional lots)
= or >5000m ²	(9 or more additional lots)
Feilding urban area	

08

Analysis: Intensification

Methodology

The following pages (37 and 38) of this section identify and assess nine different configurations of existing urban development in Feilding to understand their quality. This assessment allows the most appropriate lot shape for identification to be determined.

A | Six Detached Dwellings

street frontage: yes
 dwellings at rear: yes (4)
 dwellings fronting street or green space: yes (2)
 lot frontage width: 40m
 lot depth: 58m
 lot area: 2,320m²
 Net Density: 26dwl/ha
 Average lot size/dwl: 385m²

B | Five Attached Dwellings

street frontage: no
 dwellings at rear: yes (all)
 dwellings fronting street or green space: no
 lot frontage width: 25m
 lot depth: 51m
 lot area: 1,275m²
 Net Density: 38dwl/ha
 Average lot size/dwl: 255m²

C | Two Detached Dwellings

street frontage: yes
 dwellings at rear: yes (1)
 dwellings fronting street or green space: yes (1)
 lot frontage width: 20m
 lot depth: 50m
 lot area: 1,000m²
 Net Density: 20dwl/ha
 Average lot size/dwl: 500m²

D | Five Attached Dwellings

street frontage: yes
 dwellings at rear: no
 dwellings fronting street or green space: yes (all)
 lot frontage width: 50m
 lot depth: 20m
 lot area: 1,000m²
 Net Density: 50dwl/ha
 Average lot size/dwl: 200m²

E | Two Detached Dwellings

street frontage: yes
 dwellings at rear: yes (1)
 dwellings fronting street or green space: yes (1)
 lot frontage width: 40m
 lot depth: 50m
 lot area: 2,000m²
 Net Density: 10dwl/ha
 Average lot size/dwl: 1,000m²

F | Ten Detached Dwellings

street frontage: yes
 dwellings at rear: yes (9)
 dwellings fronting street or green space: yes (1)
 lot frontage width: 40m
 lot depth: 160m
 lot area: 6,400m²
 Net Density: 16dwl/ha
 Average lot size/dwl: 640m²

G | Six Detached Dwellings

street frontage: no
 dwellings at rear: yes (all)
 dwellings fronting street or green space: yes (all)
 lot frontage width: variable
 lot depth: variable
 lot area: 2,214m²
 Net Density: 27dwl/ha
 Average lot size/dwl: 370m²

H | Four Detached Dwellings

street frontage: yes
 dwellings at rear: yes (3)
 dwellings fronting street or green space: yes (1)
 lot frontage width: 21m
 lot depth: 66m
 lot area: 1,386m²
 Net Density: 28dwl/ha
 Average lot size/dwl: 350m²

I | Five Detached Dwellings

street frontage: yes
 dwellings at rear: yes (4)
 dwellings fronting street or green space: yes (all)
 lot frontage width: variable
 lot depth: variable
 lot area: 5,400m²
 Net Density: 9dwl/ha
 Average lot size/dwl: 1,080m²



08

Analysis: Intensification

Residential Intensification: Quality

The different examples analysed have different levels of quality associated with them. These are discussed below.

Examples B & D (attached dwellings) have similar densities but with very different design outcomes. Example D is considered good because all dwellings front onto the street giving each small households an outlook, and individual address. Example B has located housing at the rear of the block, with poor connectivity and visual aspect. This is not a recommended alternative and should be avoided.

Example C is a common type of infill and has only minor issues (quality of building design) that can be addressed with design guidelines. Example E could be a useful positive example for more comprehensive development as it relies on a relatively large site.

Example F lot is long (160m) and the dwellings are at the rear with poor visual amenity and connectivity - this is not a recommended solution and should be avoided.

Examples A, G & H (detached dwellings) have achieved similar densities but with very different design outcomes. The wider street frontage of Example A has positively enabled 2 dwellings to front the street. Potential issues arising from this type of development (such as poor building quality, access, orientation and spaces between buildings) can be effectively addressed with site planning and building design guidelines.

Example G (detached dwellings) can be an appropriate alternative for larger irregular shaped lots. Small dwellings placed around a communal park can create good living environments. The disadvantage of Example G is that as a rear lot it creates various no-exit accessways that exacerbate problems with connectivity in this block.

Example H (detached dwellings) is not positive with issues including inadequate space between buildings, poor orientation and solar access; poor aspect of the buildings fronting the accessway; and low quality landscape treatment of accessways.

Example I has the advantage of providing dwellings facing the creek, but would benefit from better connectivity.



08

Analysis: Intensification

Areas Less Suitable for Residential Intensification

This is a broad scale assessment of areas that may be less well suited to residential intensification. The assessment includes the following aspects:

A. Poor Connectivity

For the purpose of this analysis, areas with poor connectivity are identified as residential zoned land (may include schools) with high percentage of no-exit roads and with block depths greater than 120m.

High percentage of no-exit roads can create a negative impact on pedestrian, vehicle and cycle circulation. Block depth greater than 120m can create lots deeper than 55m-60m long, which will require long no-exit accessways.

B. Distant to the Town Centre and/or Community Amenities

These are areas zoned residential that are located more than 2km from the Feilding Town Centre and/or with poor nearby community amenities, such as parks, shops and schools.

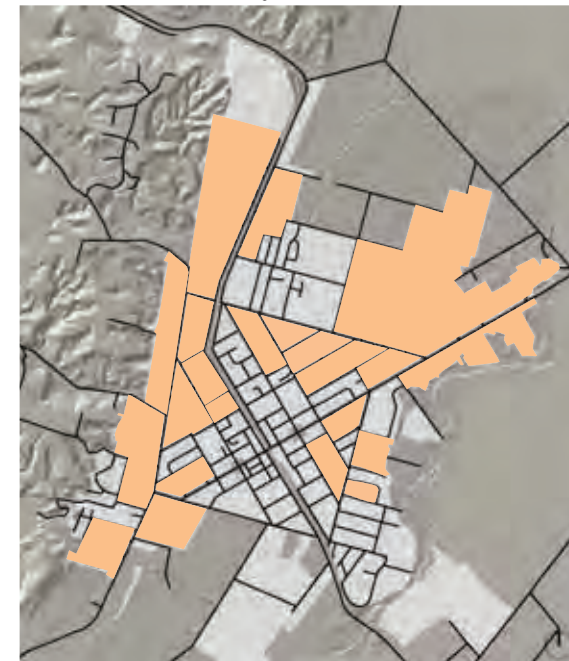
C. Steep Slopes

Areas where slopes are greater than 15% (1:6m). If not properly designed, residential intensification could significantly alter the natural landform of these areas.

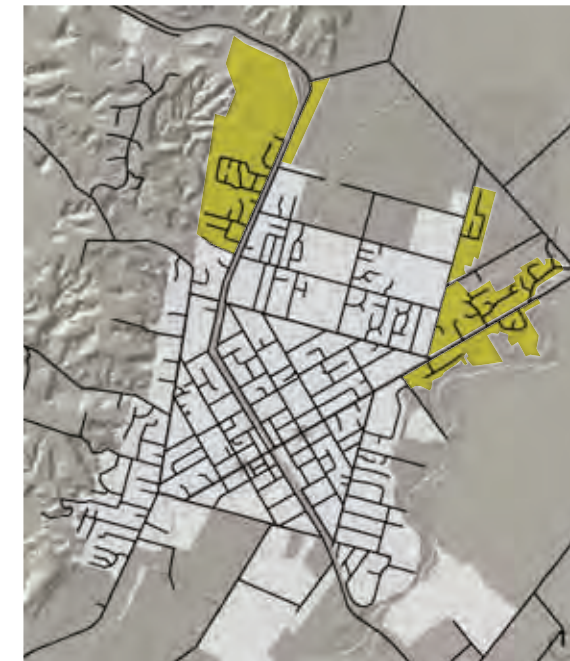
D. Proximity to Industrial Land

There are some residential zoned land that have poor amenity values due to its close proximity to industrial areas.

A. Poor Connectivity



B. Distant to the Town Centre



C. Steep Slopes



D. Proximity to Industrial land



08

Analysis: Intensification

Lot Shapes for Residential Intensification

As described above (page 40) the location of some areas of Feilding makes them less suitable for intensification. The following pages (41 and 42) assess the shape factor of lots that makes them good, challenging or to be avoided for intensification.

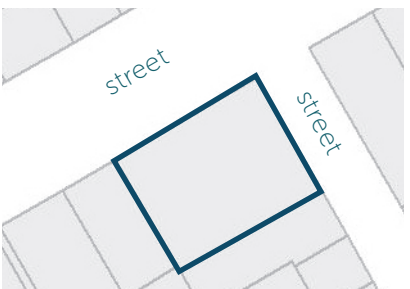
Regular Shaped Lots - Good



Type A - standard lot
street frontage: yes
lot frontage width: >18m
lot depth: 25m-55m



Type B - shallow lot *
street frontage: yes
lot frontage width: >16m
lot depth: 20m-25m



Type C - corner lot
street frontage: yes
lot frontage width: >13m (primary street)
lot depth: 20m-100m

Lot types A, B and C offer the best opportunities to achieve good design outcomes for residential intensification.

The benefits are:

Direct street frontage

Type A - wide street frontages that enable at least two attached dwellings to face the street (assuming 6m wide building frontage per dwelling), a 4m wide (minimum) accessway with space for landscaping, and a side setback to adjoining property

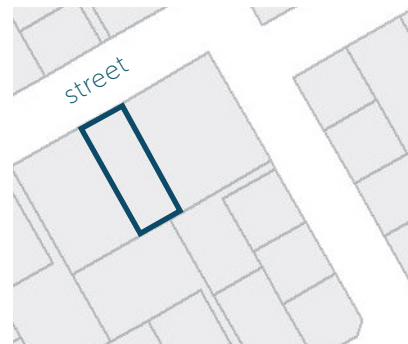
Type A - lot depth no greater than 55m, which avoids the need for long driveways

Type B - wide street frontage that enable at least two attached dwellings to face the street (assuming 6m wide building frontage per dwelling), and side setback to adjoining property.

Type B - lots are shallow and do not require accessways. All dwellings can be designed to front the street.

Type C - corner lots enable various alternatives to vehicle access and provide wide street frontages

Regular Shaped Lots - Challenging



Type D - standard lot narrow
street frontage: yes
lot frontage width: 13-17m
lot depth: 25m-55m



Type E - standard lot long
street frontage: yes
lot frontage width: >18m
lot depth: 55m-100m

Lot types D and E can offer good opportunities to achieve good design outcomes for residential intensification. But, narrower frontages (Type D) and long lots (Type E) will require site specific assessment criteria.

The benefits are:

Direct street frontage

Type D - 13m to 17m wide street frontages enable one dwelling to face the street, a 4m wide (minimum) accessway with space for landscaping, and a side setback to adjoining property.

Type D - lot depth no greater than 55m, which avoids the need for long driveways

Type E - wide street frontage that enables at least two attached dwellings to face the street, a 4m wide (minimum) accessway with space for landscaping and side setback to adjoining property.

The Challenges are:

Type D - new houses that do not address the street

Type E - lot depth greater than 55m will create a series of long no-exit accessways.

Type E - sites are flat. Potential poor visual aspect and amenity values of the houses at the rear

Regular Shaped Lots - Avoid



Type F - narrow lot
street frontage: yes
lot frontage width: <13m
lot depth: <55m



Type G - narrow and long lot
street frontage: yes
lot frontage width: <13m
lot depth: >55m

Lot Types F and G can create poor quality residential intensification. Residential intensification should only occur if lots are amalgamated.

The benefits are:

Direct street frontage

The challenges are:

Lot frontage width is too narrow to enable appropriate side setbacks, accessways, and at least one dwelling to front the street

Lot frontage width can potentially compromise the correct orientation of living spaces and private open spaces to ensure solar access

Type G - lot depth greater than 55m will create a series of long no-exit accessways. Potential negative impact on connectivity

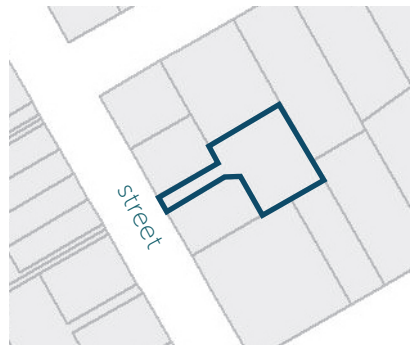
Type G - sites are flat. Potential poor visual aspect and amenity values of the houses at the rear

08

Analysis: Intensification

Lot Shapes for Residential Intensification

Regular Shaped Lots - Avoid



Type H - rear lot
street frontage: no
lot frontage width: variable
lot depth: variable



Type I - multiple rear lots - small
street frontage: no
lot frontage width: variable
lot depth: variable



Type J - multiple rear lots - large
street frontage: no
lot frontage width: variable
lot depth: variable

Lot Types H, I and J can create poor quality residential intensification. Residential intensification should only occur if lots are amalgamated.

Existing no-exit accessways should be linked or new streets and/or pedestrian ways should be provided when possible.

The benefits are:

Lots are regular in shape

The challenges are:

Lots with no frontage to the street

Sites are flat - potential poor visual aspect and amenity values of the houses at the rear

Types I and J - multiple rear lots will create a series of long no-exit accessways. Potential negative impact on connectivity

Irregular Shaped Lots - Challenging



Type K - L shaped lot
street frontage: yes
lot frontage width: >15m
lot depth: >55m

Lot Types K can create poor quality residential intensification. Site specific assessment criteria will be required.

The benefits are:

Direct street frontage

Street frontages greater than 18m wide enable at least two attached dwellings to face the street (assuming 6m wide building frontage per dwelling), a 4m wide (minimum) accessway with space for landscaping, and a side setback to adjoining property

Street frontages between 15m and 17m wide enable at least one dwelling to face the street, a 4m wide (minimum) accessway with space for landscaping, and a side setback to adjoining property

The challenges are:

Lot depth greater than 55m will create a series of long no-exit accessways. Potential negative impact on connectivity

Sites are flat - potential poor visual aspect and amenity values of the houses at the rear

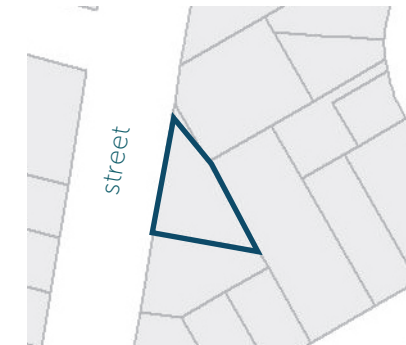
Irregular Shaped Lots - Avoid



Type L - corner lot
street frontage: yes
lot frontage width: variable
lot depth: variable



Type M - rear lot
street frontage: no
lot frontage width: variable
lot depth: variable



Type N - triangular lot
street frontage: yes
lot frontage width: variable
lot depth: variable

Lot Types L, M and N can create poor quality residential intensification. Residential intensification should only occur if lots are amalgamated.

The benefits are:

Types L and N have direct street frontage

The challenges are:

Correct placement and orientation of buildings can be difficult due to the irregular shape of the lots

Site specific assessment criteria can be difficult due to the variance in shapes and dimensions

Type M - rear lot will create a series of long no-exit accessways. Potential negative impact on connectivity

Type M - sites are flat. Potential poor visual aspect and amenity values of the houses at the rear

09

Concepts: Intensification

Residential Intensification Quality

Feilding's urban quality and attractiveness as a place to live relies on providing a choice of housing with different market offerings to respond to the wide range of needs in the community - for today and into the future.

It is important that the quality of development is good as this influences quality of life including personal safety and health, accessibility to facilities and services, and costs of maintenance for example.

When considering intensification, careful planning and design to generate good quality is even more important than for standard forms of residential development. This is because people will live closer together and with higher density, more people stand to be affected by the quality than lower density development.

New Zealand now has various examples of good quality intensification and it is the living environment of choice for an increasing number of people. Feilding will need to develop its own forms of intensification that suit its character and the market there.

MDC will use the analysis and concepts in this strategic Framework Plan document to guide the development of District Plan provisions. The aim of the provisions will be to encourage intensification, but ensure the quality is good and that the resultant development makes a positive contribution to the town's development future.

The previous Section 8 identifies the locations and lot shapes that less well suited for urban intensification.

Section 9 describes concepts for intensification that would generate good quality living environments. These concepts are indicative only. As the urban growth strategy (Section 5) describes, the principles are for intensification to occur close to existing facilities and amenities including open space. As the previous Section 8 has described, there are some locations and lot shapes in Feilding that are less well suited to intensification and the implementation of the urban growth strategy will need to address these matters.

Attached Dwellings



Row houses | 6 units

Corner lot or shallow lot

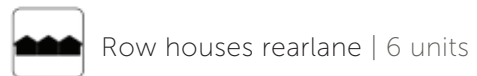
Lot frontage width:	54m
Lot depth:	20m
Lot area:	1,080m ²
Street frontage:	yes (all)
Dwellings at rear:	none
Net density:	60dwl/ha
Average lot size/unit:	160m ²
Average unit size:	100m ² (& 1 garage)
Height:	2 storeys
Vehicle access via:	street
Floor area ratio:	0.66
Site coverage:	39.5%
Average Private Open Space Area:	48m ²



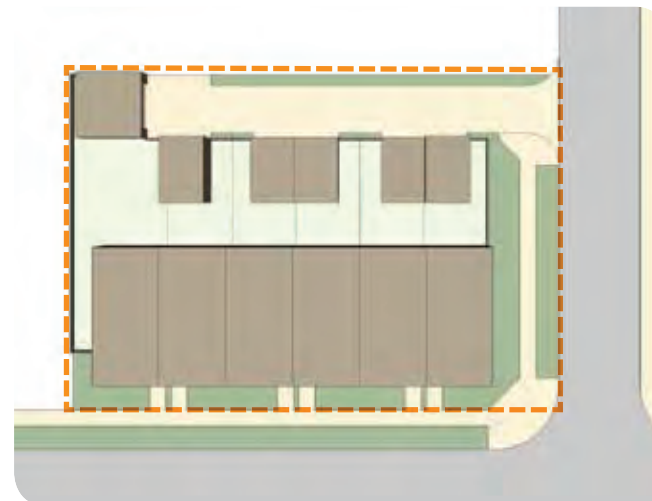
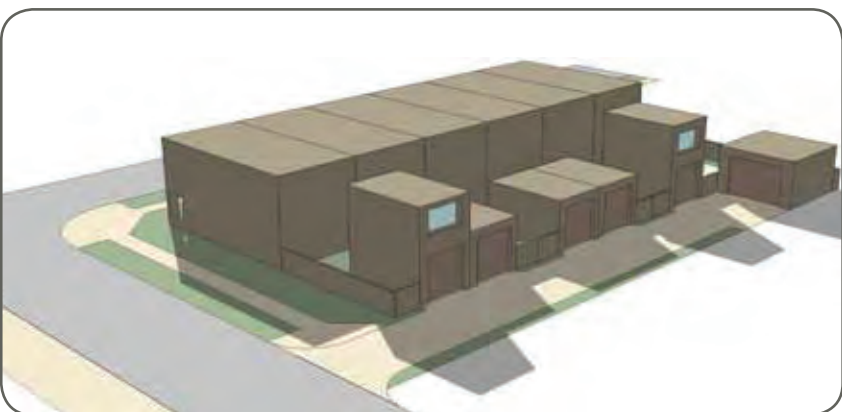
09

Concepts: Intensification

Attached Dwellings



Corner lot
Lot frontage width: 50m
Lot depth: 35m
Lot area: 1,750m²
Street frontage: yes (all)
Dwellings at rear: none
Net density: 34dwl/ha
Average lot size/unit: 155m²
Average unit size: 150m² (& 1 garage)
Height: 2 storeys
Vehicle access via: rear lane
Floor area ratio: 0.60
Site coverage: 35%
Average Private Open Space Area: 35m²



09

Concepts: Intensification

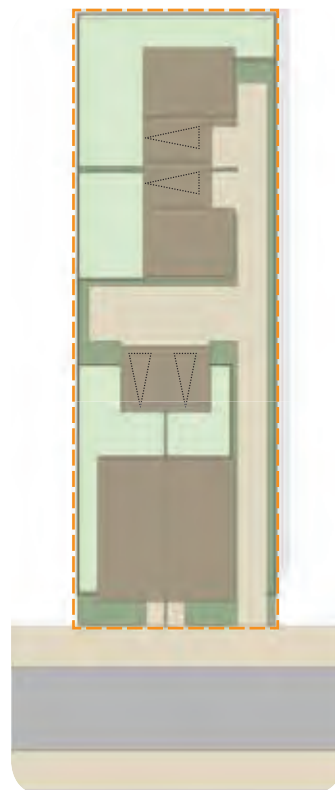
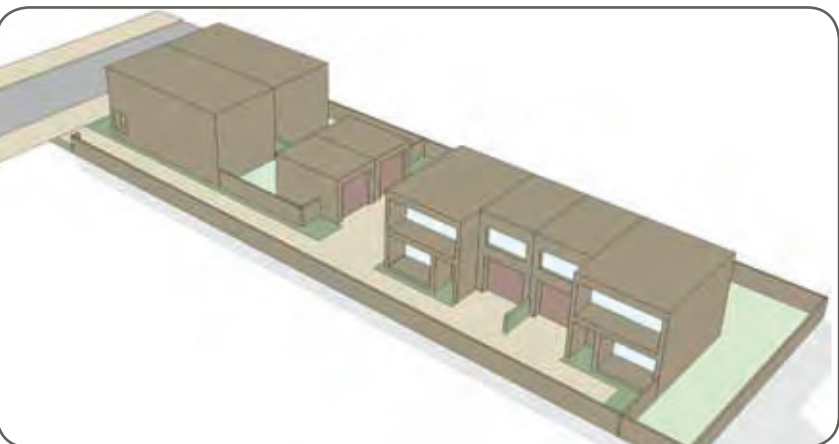
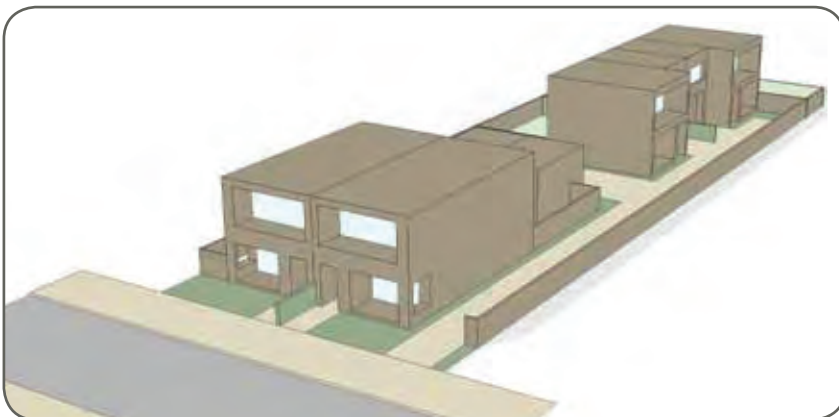
Semi-detached Dwellings



Duplex side-by-side | 4 units

Standard lot


Lot frontage width:	18m
Lot depth:	55m
Lot area:	990m ²
Street frontage:	yes (2)
Dwellings at rear:	yes (2)
Net density:	40dwl/ha
Average lot size/unit:	150m ²
Average unit size:	120m ² (& 1 garage)
Height:	2 storeys
Vehicle access via:	accessway
Floor area ratio:	0.58
Site coverage:	35%
Average Private Open Space Area:	40m ²



09

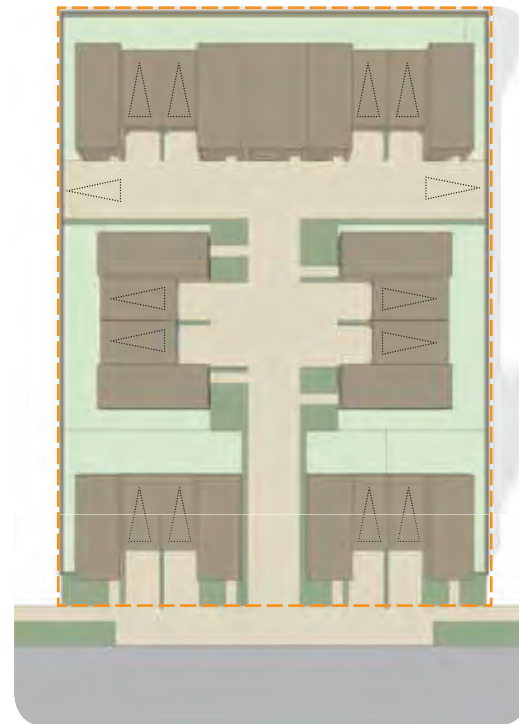
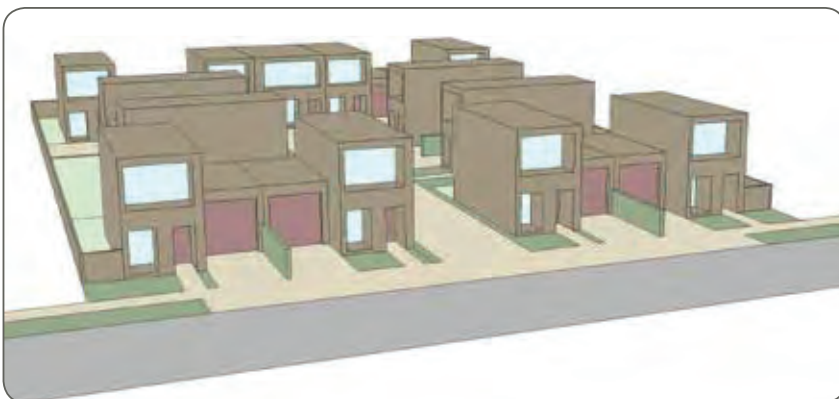
Concepts: Intensification

Semi-detached Dwellings

 Duplex side-by-side | 8 units
Row houses | 5 units

Standard lot


Lot frontage width: 40m
Lot depth: 55m
Lot area: 2,200m²
Street frontage: yes (4)
Dwellings at rear: yes (9)
Net density: 60dw/ha
Average lot size/unit: 170m²
Average unit size: 105m² (& 1 garage)
Height: 2 storeys
Vehicle access via: street & accessway
Floor area ratio: 0.62
Site coverage: 40%
Average Private Open Space Area: 55m²



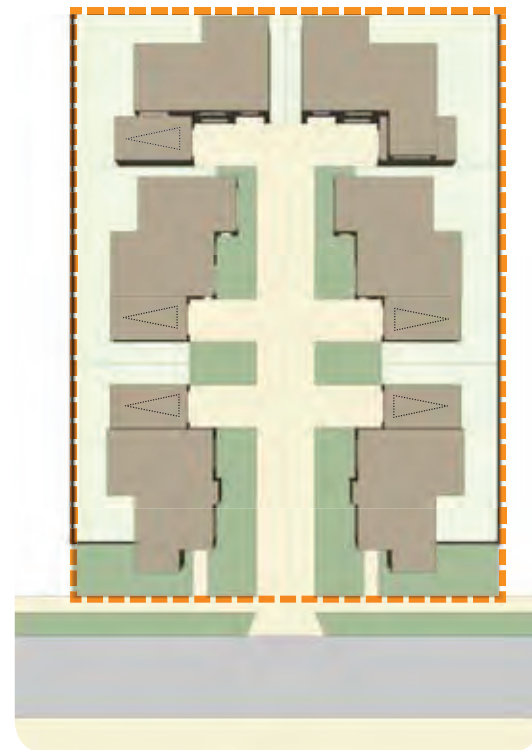
09

Concepts: Intensification

Detached Dwellings

 Narrow house | 6 units

Standard lot
Lot frontage width: 40m
Lot depth: 55m
Lot area: 2,200m²
Street frontage: yes (2)
Dwellings at rear: yes (4)
Net density: 27dwl/ha
Average lot size/unit: 350m²
Average unit size: 100 to 200m² (& 1 garage)
Height: 1 to 2 storeys
Vehicle access via: accessway
Floor area ratio: 0.52
Site coverage: 34%
Average Private Open Space Area: 90m²



10

Implementation

Actions

The Framework Plan Introduction (Section 1) describes the relationship between various planning documents produced by MDC. As noted in Section 1, the Framework Plan is not a statutory document - it provides a strategy only. As a strategy it requires a range of other actions to implement it. Those actions are set out below:

Action	Timing	Who
1. Formally adopt the Feilding Urban Growth Framework Plan (May 2013) with it attendant spatial planning principles as its strategy for directing urban growth into the future	May 2013	MDC
2. Draft Manawatu District Plan Changes that provide for the Framework Plan spatial planning and design principles through a series of Structure Plans, Design Guidelines and District Plan objectives, policies and rules.	2012/ 2013	MDC and advisers
3. Consult with landowners in principal growth areas to determine constraints and opportunities	2012	MDC and landowners
4. Include in Action 2 provision for the staged release for the edge growth areas to recognise the project current demand, the need for flexibility in release and the MDC service provision programme	2012/ 2013	MDC and advisers
5. Engage expert engineering advice to confirm by assessment suitability of the structure plan areas and any matters that may affect urban growth in these locations	2013	MDC and advisers
6. Review and adjust as required Financial Contributions requirements and/or Asset Plans to reflect the infrastructure supply (including open spaces) requirements generated by the growth areas	2013	MDC and advisers
7. Confirm District Plan Changes documentation and publicly notify for submissions as required under RMA statute	2013	MDC
8. Review submissions, undertake hearings and makes decisions under RMA statute		MDC, advisers and community
9. Manage process of land development making approve or decline decisions on subdivision applications using the Framework Plan as background and the new provisions of the District Plan to guide the quality of design		MDC, advisers and community
10. Monitor the quality of development and the growth rates to gauge the need for release of further land or changes to design provisions or their application to development proposals		MDC



Manawatu District Council
**Precinct 4 Landscape and
Vegetation Assessment**

Prepared by Peter Shore
Property and Parks Support Officer
9 November 2018

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1. Introduction

Three main aspects are evaluated within this report. They are:

- a. The existing landscape character of the site and its place in the local and regional context.
- b. The potential landscape and visual effects of the type of development expected from typical viewer locations.
- c. An overview of the effects of the type of development expected on landscape and natural/rural/urban character.

The assessed overall site is located between Makino Road, Reid Line West, Pharazyn Street and Port Street, Feilding. (Refer Map 1 on page 8 of the report).

2. Assessment Methodology

A generic assessment approach has been used to identify the existing landscape character of the overall proposed development site. The assessment evaluation will consider the potential effect of reducing the vegetative cover and provide commentary and directions around the case for imposing other restrictions on the landscape and visual amenity.

In broad terms, the generic assessment consists of the following elements:

- a. Identification of the key vegetative sites or within the proposed development; and
- b. Identification of the landscape values, character, key attributes of the future development site.

A combination of site visits and aerial map assessment has been undertaken to identify and understand potential landscape value of the area.

3. Precinct 4 – Landscape Environment and Vegetation Cover

A. Existing landscape and visual character

In this report, the term Landscape Character is used as a way of explaining how the landscape's relates to us. This includes things that contribute to its appearance and the cultural and historical changes which have taken place on it.

The landscape character of Precinct 4 is a result of a series of factors including topography, vegetation cover, cultural changes to it over time (changes in farming, housing, etc).

B. Landscape Context

The relationship between the main geographical features contained within this landscape and the human modifications that have occurred upon them, are also important factors to consider when assessing how the type of development expected, will influence existing amenity values and the natural character of the adjacent rural environment and the wider natural landscapes.

The site is located approximately 5km NW of the Feilding town centre. The wider surrounding area is characterised by a backdrop to the west of gently rolling hills, and to the north and east the Ruahine Ranges. The immediate site is generally flat with meandering watercourses, including the Makino Stream and its tributaries.

The key topographical features that influence perceptions of overall landscape character at the macro level include the low rolling hills to the west and the Ruahine Ranges to the east and north.

The key landscape features that influence perceptions of overall character of the landscape surrounding the development site include:

- a. The Ruahine Ranges;
- b. The low lying topographical characteristics of the Manawatu Plains; and
- c. The various streams and watercourses that meander through this general area.

Landscape Elements	Types / Characteristics	Visual Effect Function
Vegetation	<p>Trees</p> <ul style="list-style-type: none"> • Predominantly farm shelter and amenity planting. • The main species of any significant height appear to be a range of conifers mainly Pines with Eucalyptus, Poplars and Willows featuring widely and along the stream. • Individual trees are a reflection of farm practices having shelter and shade trees planted primarily for the benefit of stock. 	<ul style="list-style-type: none"> • Continuity • Climate Control • Historical Value • Sense of Place • Functional value • Identity and Image – this type of planting relates to traditional farm setups. • Ecological and aesthetic – particularly along the stream. However, it is noted, there is arguably low ecological value in the exotic trees along the Makino Stream.
Stream	<ul style="list-style-type: none"> • Meandering lowland water course 	<ul style="list-style-type: none"> • Provides a lineal break in the landscape.

4. Consideration and Evaluation

Section A below summarises the landscape character of the development site the potential landscape and visual effects expected to be generated by the proposed development of the site, for residential purposes.

A. Aspects

- a. The existing landscape character of the site and its place in the local and regional context:

The landscape reflects the recent 100 year plus farming practices of the district. Conifers planted for shade and shelter of stock and pasture.

- b. The potential landscape and visual effects of the type of development expected from typical viewer locations:

The potential for the farming character to be changed as a consequence of development is high, but (arguably) not in a negative way.

- c. An overview of the effects of the type of development expected on landscape and natural/rural/urban character:

Typically redevelopment of a site like this for residential development will result in a much broader range of plants and generally lower planting. People tend to plant fewer canopy trees on their properties. The result of which is a lower visual tree line.

B. Assessments

Section B below summarises the vegetation values of the site and landscape and key attributes.

- a. Identification of the key vegetative or other sites within the development:

On balance - there are few significant trees or groups of trees within Precinct 4.

- b. Identification of the landscape values, character, key attributes:

The meandering Makino Stream and the views from the site out to the downlands and Ruahine Ranges contribute to outstanding macro landscape values.

5. Summary and Recommendations

Overall, it would be hard to argue that there is much value in the existing tree vegetation on the development site. The majority of the older taller trees are exotic and of low amenity value. Furthermore as a consequence of being farm trees, the majority appear to have had little or no pruning or treatment and therefore may, in many cases, pose a potential risk to any dwellings built under or near them.

The standout tree(s) appear to be as consequence of alternative development requirements e.g. the Poplars adjacent to and around the Feilding Holiday Park. These Poplars warrant further assessment.

The other standout specimens are the two large English Oaks (*Quercus robur*) which are located adjacent to Makino Road, and which forms part of a wider Oak Grove on the other side of the road. These trees exhibit relatively good form and look healthy.

A technical assessment of the *Quercus robur* by is provided on page 6. over.

Report Recommendations

1. That the two English Oaks (*Quercus robur*) at Makino Road, be formally protected in the Manawatu District Council - District Plan.
2. That the Stand of Poplars (*Populus* species) at Arnott Street be further investigated.

Peter Shore
Property and Parks Support Officer

9th November 2018

6. Tree Assessment for Precinct 4: *Quercus robur*

Trees Species:	<i>Quercus robur</i> . Common name English Oak
Location:	30m off road boundary at the intersection of Makino Road and Reid Line West, within Precinct 4 development site.
Number:	2
Date of Assessment	9 th November 2018
Form	Healthy appearance no breakages, even branch distribution
Health	Appear to be in very healthy condition
Height	Estimate 20 m
Width	Estimate 28m
Age	Estimate 60 – 80 years
Landscape Presence	Significant presence, dominant specimens provide appropriate scale in relation to immediate landscape



Map 1 - Precinct 4 Structure Plan

