APPENDIX A

Response to Prelim s42A

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MEMORANDUM: PTDP – Hearing G – Response to RFI

To:	Timaru District Council
Submitter:	Aitken/ RSM Trust Submission **237.2**
From:	Davis Ogilvie (Aoraki)
Date:	20 February 2025
Subject:	Response to preliminary s42A report for Hearing G - Growth

1 INTRODUCTION

The purpose of this memorandum is to reply to Council's preliminary s.42A report in relation to Hearing G - Growth. The short s.42a report requested further information be supplied to Council to address the planning framework, servicing considerations, environmental values and site-specific matters.

2 BACKGROUND

2.1 Submission

Our client's submission requests that FDA6 (Temuka) be either rezoned now to General Residential Zone (GRZ) or that the schedule be amended from a "beyond 10 year" timeframe to a "5 year" timeframe. The location of FDA6 is shown below in **Figure 1.**

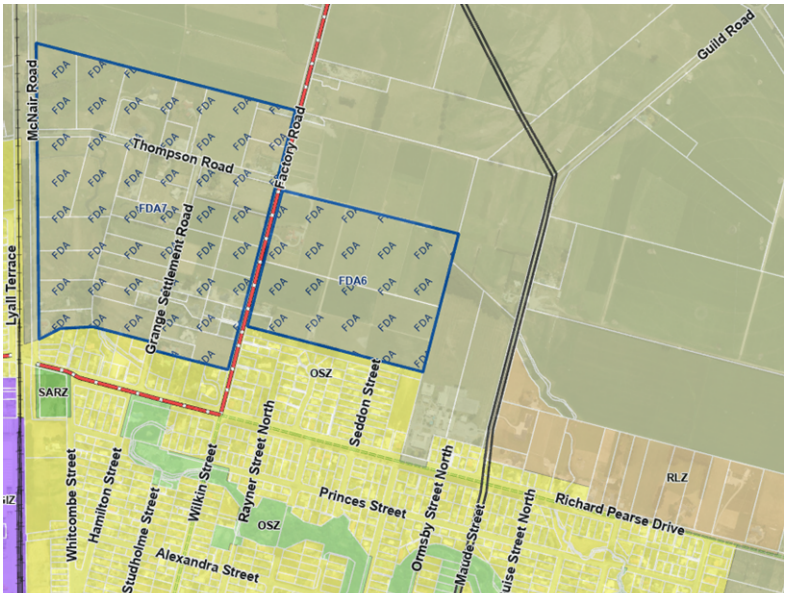


Figure 1: Location of FDA6

3 PLANNING FRAMEWORK

3.1 National Policy Statement: Urban Development

Timaru District Council, as a Tier 3 Council, must still plan for urban growth in a way that avoids unnecessary barriers to development under the requirements of the NPS-UD.

Upon development, the greenfield FDA6 site could yield somewhere between 140 - 240 lots/household units. This potential yield is based on the following assumptions:

- The FDA6 site area is 17.93 ha
- Less 40% reduction in developable area to accommodate roading, reserves, stormwater management and unmapped constraints (17.93 ha - 7.17 ha = 10.75 ha)
- Then a sensitivity assessment based on a section size range of 0.0450ha to 0.0800ha (450m² being the minimum lot size under the PDP and 800m² being more realistic for Temuka while still meeting 12 HH/ha), thus resulting in a potential yield range of approximately 140 – 240 residential sections. We would note that for any infrastructure planning purposes one should use the higher potential yield/minimum lot size (i.e. 240 sections), however for potential capacity and market uptake/demand we would suggest that the more realistic/lower density of say 140 sections be considered so as to not overstate potential supply thus ensuring 'at least' supply over the life of the plan is achieved.

The subject site is in close proximity to Fonterra's Clandeboye factory and the Temuka township. This is a significant development which will help meet demand of new and affordable housing in this district. The Property Economic analysis shows that Temuka is heavily relying on infill development to meet expected demand, under both medium and a high growth projection. History shows infill demand is subject to several constraints, one of which is land owner's willingness to develop which is outside of Council's control. Furthermore, the Growth Management Strategy 2022 recommends this site *"as a potential growth area and zoned FUZ. This land is well located to amenities, infills the area between the Rural Lifestyle zones, is already partly occupied by the high school and is still relatively unfragmented."*

The GMS 2022 also considered that in comparison the RLZ areas are somewhat fragmented and therefore the preference is to rezone additional greenfield land in Temuka identifying the subject site as being suitable for this purpose.

These matters among others should be considered in the context of the NPS-UD which at a high level are mentioned within the brief planning advice memo prepared by Novo Group, attached as **Appendix 2**. Particularly in regards to capacity, we consider Council should be certain on the assumptions that the PE modelling has used. While not entirely clear, the PE analysis seemingly

bases the capacity/supply assessment on a 450m^2 lot size within the general residential zone, when in reality for our district the average residential typology size is much larger. This is supported by the market evidence within the Colliers, 2022 Timaru Residential Property Market Study commissioned by Council, which notes on page 13: *"Of note the average land area of a vacant section is 1,033sqm compared to 784sqm for the average house"*, both being well above the 450m^2 that seems has been used. Even using an average of 12 HH/ha (833m^2) compared to 450m^2 represents that forecast capacity modelling could fall short by some 46% of projections if on average 450m^2 has been used across the district – putting into question whether 'at least' sufficient supply is being allowed for.

3.2 National Policy Statement: Highly Productive Land

As the subject site has a proposed rural zoning and includes areas of LUC 2 classified soils, regard must be had towards the NPS-HPL only if the site is to be rezoned through the District plan review.

NPS-HPL allows for exemptions, one being when land is identified for future urban development in a strategic planning document such as the GMS Review 2022. Despite FDA6 being suitably identified and defined within this document, the GMS Review 2022 notes the site should be considered as a "FUZ" or future urban zone. As no timeframe was proposed for the proposed zoning within the GMS Review 2022, the site is still subject to assessment against the NPS-HPL if Council was to consider rezoning to General Residential zone.

The secondary relief sought is to retain the FDA, but amend the timeframe from "beyond 10 years" to "5 years". As the retention of the FDA, or change in timeframe, does not rezone the underlying land, limited consideration towards NPS-HPL shall be had, as the land within FDA6 is still subject to a private plan change process to amend the underlying zoning from General Rural Zone to General Residential zone.

This assessment has been confirmed by Matt Bonis, being the author of the *"Without prejudice – Applicability of NPS-HPL to proposed re-zonings – Growth Topic"* Memorandum, dated 21 January 2025.

We note there is a section of FDA6 not subject to NPS-HPL, as shown on the **Figure 2** below:

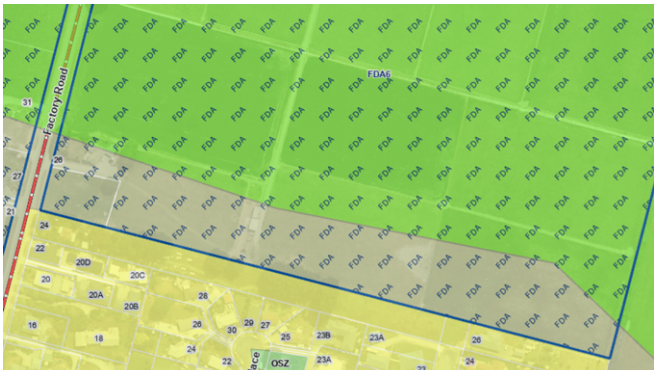


Figure 2: FDA area outside of NPS-HPL

The client requests this section of land is immediately zoned General Residential as part of the District Plan Review in the absence of consensus regarding FDA6 and NPS-HPL.

Additionally, our client wishes to retain the right to respond to NPS-HPL considerations until review of the full s42A Report, to better understand Council's appetite to rezone the subject land under the District Plan review process.

3.3 Canterbury Regional Policy Statement

Growth Rezonings/Amendments to SCHED-15: FDA6 is located over three Records of Title, all of which are owned by the submitter. The subject site is therefore unfragmented which allows for a coordinated, efficient pattern of development.

Energy Efficiency: FDA6 has road frontage onto both Factory Road and Seddon Street. The development of FDA6 will therefore provide efficient roading links to existing roads. Factory Road is designated as a collector road within the District Plan. The Temuka High School is located to the south-east of FDA6 and any residential development which allows for children to walk to school will also have positive health, environmental and social benefits. As touched on earlier, FDA6 is in close proximity (<10km by road) to Fonterra, one of the Districts largest employers, so provides an option for more efficient commuting for employees.

Natural Hazards: The subject site is within a Flood Assessment Area under the Proposed Timaru District Plan, as is all of the Temuka township and surrounding land. A **flood hazard assessment** (FHA) has been provided which summarises the site is suitable for residential development. The FHA attached as **Attachment 1**.

Yield: The proposed development will be in accordance with the Regional Council's submission, which seeks 12 hu per ha. As noted above in section 3.1, the number of sections/lots the site could yield could vary between 140-240 lots with many local factors that may influence this. However given the existing pattern of development south of the site (i.e. Around Harris Place), along with

the flat nature of the site and potential desire to supply affordable housing, it would be reasonable to anticipate a yield around 180 lots could be expected (i.e. at approx. avg. size 600m^2).

3.4 Proposed Timaru District Plan

PDP: FDA6 has road frontage onto both Factory Road and Seddon Street. The development of FDA6 will therefore provide connectivity and efficient roading links to existing roads. Factory Road is designated as a collector road within the District Plan.

Amendments to SCHED-15: The secondary relief seeks a change in timeframe for FDA6 to "5 years". FDA7 is located immediately west of FDA6 with the development area being identified for rural lifestyle development – 2 years. FDA7 is subject to several constraints against growth, including LUC 2 soils and being heavily fragmented with a large number of land owners. Therefore it is anticipated a much greater density of sections will be realised from FDA6 than FDA7 which is considered a more efficient use of land and resources.

Furthermore, the development of FDA6 can be efficiently serviced due to the proximity of the three water networks, as well as Energy and Telecommunication services. See Section 4 below.

4 SERVICING CONSIDERATIONS: SELWYN CHANG, PRINCIPAL CIVIL ENGINEER

4.1 Service Provision

Portable Water Supply

There is nearby public water network close by to service the proposed site. There is an existing DN100 PVC watermain at Factory Road and DN100 AC watermain in Seddon Street respectively.

The extension of the network should have sufficient capacity to deliver the required urban level of service to the proposed development.

Wastewater

There is nearby public wastewater network close by to service the proposed site. There is an existing DN150 CC-RF wastewatermain at Factory Road and Seddon Street.

The existing wastewater network pipe depth at the point of connection is considerable shallow and unlikely to be extended as fully gravity system due to insufficient pipe cover to meet Council standards and Building Code. Therefore, a low-pressure network system or a communal wastewater pump station can mitigate this issue.

Stormwater

There is no public stormwater network in vicinity to the proposed site. It is anticipated the site will have its own stormwater management system that manage post-development stormwater runoff.

Subject to detailed assessment of the ground conditions, it is considered likely that the proposed site could be suitable to discharge stormwater to ground. A spring fed water course (ECan drain) also runs through the north east corner of the site, this provides another option for discharge of stormwater (i.e. discharge to surface water). Therefore, the proposed site will require discharge consents to be obtained from ECan.

Electricity

Alpine Energy has confirmed the site is able to be serviced for power.

Telecommunication

It is anticipated there is no issue to service the proposed site.

4.2 Hazards

Liquefaction Assessment

From TDC Infrastructure Design Standard; Part 4, the liquefaction potential in Timaru District identified the proposed site to be of very low potential liquefaction. This aligns with Canterbury Map liquefaction desktop assessment (MBIE Level A assessment) confirming liquefaction damage is unlikely.

Flood Hazard Assessment

A FHA have been carried out by ECAN for 26 and 52 Factory Road, Temuka, see **Attachment 1: Flood Hazard Assessment**

The FHA described as low risk and therefore development should be permitted under the District Plan rules, provided that the flow of floodwaters through the area and flood depths are addressed.

Determining habitable floor heights, appropriate stormwater management system for the development, management of overland flowpath can contribute to mitigate the floodwater issues and not creating any adverse impact downstream.

5 ENVIRONMENTAL VALUES

5.1 Existing Environment and Characteristics

The area contained within FDA6 has an area of approximately 17 ha and is held with an additional 10 ha to the north, contained within three records of title. The sites include residential dwellings, and farm sheds, with the balance being cultivated, grazed farmland.

The site is heavily overlooked by residential activity to the west and the south, and adjoins the Temuka High School to the east. Taumatakahu Stream traverses the north-east corner of FDA6.

The land to the north is owned by “Public Trustee” and appears to be incorporated as part of a farming operation to the north.

The site is unable to comply with the anticipated density standards under the Proposed District Plan.

5.2 Environmental Values

The site is identified as having "wāhi tupuna" values, as does the larger Temuka region. To provide context, wāhi tupuna is considered to mean:

"Broader geographical areas/ cultural landscapes that hold significant value to Kāi Tahu due to the concentration of wāhi tapu or taoka values, or the importance of the area to cultural traditions, history or identity."

6 SPECIFIC MATTERS

6.1 Further Comments:

The site has been suitably identified in a Strategic Planning Document (GMS Review 2022) and therefore meets this exemption under the NPS-HPL. However, as the GMS Review 2022 did not identify this as commencing over the next 10 years it has been excluded within this plan change process. We note the second FDA identified in Temuka (FDA7) is identified as "Rural Lifestyle". Clause 3.7(1) states Council's must **avoid** rezoning of highly productive land as rural lifestyle, except as provided in clause 3.10. We therefore consider FDA7 will face significant challenges such as the fragmentation of the land and proposed "rural lifestyle" zoning. FDA6 provides for a more efficient use of land and resources, and it is sited in closer proximity to Council infrastructure. The land is in single ownership and presents a better option for coordinated, affordable and consolidated development.

7 CONCLUSION

The site is generally flat in nature and adjoins residential zoned land to the south. It is a large land holding, held in one ownership, which secures efficient development. FDA6 has the potential to yield up to approximately 240 household units (noting our comments within this memo on realistic yield considerations being much lower than this), which is sited in close proximity to the existing Temuka urban township, places of work and education facilities. The site is able to be serviced in an effective manner due to the greenfield nature of development and easy connection to the existing networks of roading and three waters services. The development will bring new development to Temuka which will bring new, affordable housing and support employment opportunities.

Council has already accepted the site is suitable for residential development under the Growth Management Strategy 2022. Furthermore, consideration must be given to the NPS-UD which allows for Council to identify "at least" sufficient capacity. Should rezoning not be feasible through the District Plan review, the submission seeks to retain FDA6 and adjust the timeframe to "5 year".

Disclaimer: The above is intended to provide the preliminary s.42A author with some further information in regards to the suitability of the site for residential development. The submitter retains their right to provide further information in response to the s42A report and is not bound by the information provided to date.

8 ATTACHMENTS

- Appendix 1 – Flood Hazard Assessment
- Appendix 2 – Novo Group – Planning Advice on NPS-UD

APPENDIX B

Evidence of Selwyn Chang – Civil Engineering and Site Constraints

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of a submission made under clause 6 of the First Schedule to the Resource Management Act 1991, in relation to the Proposed Timaru District Plan – Hearing G (Growth Chapter)

STATEMENT OF EVIDENCE OF SELWYN CHANG

ON BEHALF OF CLIENT AITKEN / RSM TRUST (SUBMITTER NO. 237)

25 JUNE 2025

1. INTRODUCTION

1.1 My full name is Selwyn Chang. I am a Charted Professional Engineer (Water Services) and the Principal Civil Engineer (Timaru Lead) at Davis Ogilvie (Aoraki) Limited based in Timaru.

1.2 I hold over 20 years of civil engineering experience, specialising in land development, infrastructure planning, and public servicing solutions. Prior to working with Davis Ogilvie (Aoraki) Limited I spent 15 years working in local government with the Timaru District Council as a Drainage and Water Engineer.

1.3 Through my work at Davis Ogilvie I lead engineering assessments for growth planning, infrastructure feasibility, and rezoning across South Canterbury.

1.4 I am familiar with Factory Road and have provided infrastructure design advice and analysis for Future Development Area 6 (FDA6), on behalf of Submitter 237.

Qualifications and experience

1.5 In terms of academic qualifications I hold a:

(a) Bachelors (Honours) degree in Civil Engineering (2004);

from the University of Canterbury NZ

1.6 I am a Chartered Professional Engineer with a practice field of Three Waters competent in drinking water supply systems, wastewater systems, stormwater management, asset management and renewals planning and water safety planning.

1.7 I am an active member of the Engineering NZ Canterbury branch and am committed to continually advancing my professional and advancing skills and capabilities.

2. CODE OF CONDUCT

2.1 I have read the **Environment Court's Code of Conduct for Expert Witnesses** set out in the Environment Court Practice Note 2023. I agree to comply with it while giving this evidence. I confirm that I have not omitted any material facts known to me that might alter or detract from the opinions expressed in this evidence. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I understand my duty to the Hearing Panel is to assist impartially and that this duty overrides any obligation to the party engaging me.

3. SCOPE OF EVIDENCE

3.1 This evidence supports the reclassification of FDA6 from "Beyond 10 Years" to a Future Urban Zone (FUZ) in the Proposed Timaru District Plan (PDP), subject to infrastructure servicing triggers.

3.2 It addresses technical feasibility, servicing integration, stormwater solutions, and Council concerns raised in the Section 42A Report and associated expert evidence.

4. SITE CONTEXT AND DEVELOPMENT INTENT

4.1 FDA6 comprises approximately 17.93 hectares at 26 and 52 Factory Road, Temuka, identified as a growth area under the Proposed District Plan with indicative yield is 180 to 280 residential lots.

4.2 No potential land contamination registered in the Listed Land Use Register (LLUR) on both sites within the FDA6.

4.3 The submission supports the Future Development Area overlay but opposes the deferred 10+ year horizon.

4.4 Relief sought includes:

(a) Rezoning the site (or southern non-HPL portion) to General Residential Zone (GRZ), or

(b) Applying a Future Urban Zone (FUZ) with clear infrastructure-related triggers.

5. INFRASTRCUTRE FEASIBILITY – WATER

5.1 The site is in close proximity (~200m) to existing water mains along Factory Road, which are linked to the McNair Reservoir.

5.2 Network extension and connection to existing water reticulation is straightforward and can be delivered through standard developer-funded works.

5.3 The **WSP Water Growth Capacity Assessment (Dec 2023) Section 6** confirms that Temuka residential areas including FDA6 can be serviced upon commissioning of the new McNair reservoir and pump station.

5.4 McNair reservoir and pump station have been commissioned since 2022.

5.5 FDA6 can proceed once that occurs, or earlier if staged. No LTP funding is required to initiate early works.

6. INFRASTRUCTURE FEASIBILITY – WASTEWATER

6.1 FDA6 can be serviced via a partial gravity and pressurised wastewater system that would connect to the existing Temuka network. However, development is contingent on downstream infrastructure capacity.

6.2 The WSP Wastewater Growth Capacity Assessment (Nov 2023) Appendix E identifies a series of pipe and pump station upgrades required to support FDA6, including downstream of Factory Road and at Princes Street Pump Station.

6.3 According to the report, no development should proceed within FDA6 until the required reticulation upgrades and pump station capacity increases.

6.4 These dependencies are not insurmountable but require sequencing to ensure Council renewals and upgrades to the existing reticulation take growth areas into consideration.

6.5 Potentially entering infrastructure agreements or similar will provide greater certainty to developer and Council infrastructure investment and planning to enable reasonable timing and staging for the development and avoid ad-hoc upgrades.

6.6 Infrastructure upgrades can be funded through target financial or development contributions that could accommodate wider public benefits from the upgrades.

6.7 A **Future Urban Zone** designation with infrastructure-related triggers provides the ideal framework to manage this responsibly and efficiently.

6.8 The submitter is committed to:

(a) Developer funding the reticulation within FDA6;

(b) Paying fair and equitable contributions for any network extension to the site;

(c) Coordinating staging with Council's network renewals and upgrades planning;

(d) Entering infrastructure agreements or contributions as trigger mechanism that could increase certainty to both Council, community and developers.

7. INFRASTRUCTURE FEASIBILITY – STORMWATER

7.1 A dedicated stormwater management area is included in the Indicative Outline Development Plan (PL01), integrated with the natural topography and existing creek system.

7.2 The **Preliminary Geotechnical Desktop Study** (Davis Ogilvie, June 2025) confirms that the site is underlain by permeable gravel, sand and silt deposits typical of outwash plains. These materials are potentially suitable for stormwater discharge to ground, subject to infiltration testing and investigation.

7.3 The shallow groundwater table (0.5–2.5 m BGL) will require careful design to ensure soakage systems maintain hydraulic separation and comply with ECan standards.

7.4 A hybrid solution is proposed, involving:

(a) Onsite attenuation (basins);

(b) Stormwater treatment (raingardens/swales/first flush basin/proprietary devices);

(c) Discharge to ground where feasible, supplemented or alternatively by controlled discharge to the creek.

7.5 The approach ensures stormwater is managed on-site and reduces reliance on public networks. Consent will be sought from ECan once site testing confirms design parameters.

7.6 Engineering design best practice will be adopted which will include Council consultations to ensure stormwater management option for the site is acceptable to both regional and local Council.

7.7 The stormwater management and infrastructure within the site will be developer-led funded.

8. PLANNING ALIGNEMENT AND NETWORK INTEGRATION

8.1 The site is compact, unfragmented, and adjoins existing residential areas.

8.2 The **Indicative Outline Development Plan (OPD) (PL01)** shows:

(a) Logical road extensions (e.g. Seddon Street);

(b) Multi-modal pathways;

(c) Naturalised stormwater and open space;

(d) Public water and wastewater reticulation in vicinity.

8.3 This layout reflects the principles of a Development Area Plan and enables integration into Council's network and spatial strategy.

9. RECOMMENDATION

9.1 FDA6 is serviceable, strategically located, one land owner and consistent with the WSP growth capacity assessment reports.

9.2 I recommend it be rezoned as **Future Urban Zone**, with infrastructure triggers tied to:

(a) Commissioning of Temuka reservoir and pump station since 2022;

(b) Infrastructure agreements and contributions with developer to ensure wastewater reticulation renewals and upgrades to the existing network are planned, funded and coordinated efficiently.

(c) Adoption of a detailed DAP or equivalent at subdivision stage.

10. **SUPPORTING DOCUMENTS**

(a) WSP (2023) Timaru & Temuka Water Growth Capacity Assessment

(b) WSP (2023) Timaru & Temuka Wastewater Growth Capacity Assessment

(c) DOP (2025) Preliminary Geotechnical Desktop Study for 26 and 52 Factory Road

(d) ECAN (2025) 26 and 52 Factory Road LLUR Enquiry

Selwyn Chang
Principal Civil Engineer

BEng (Civil), CPENG, CMEngNZ

Davis Ogilvie (Aoraki) Ltd

25 June 2025

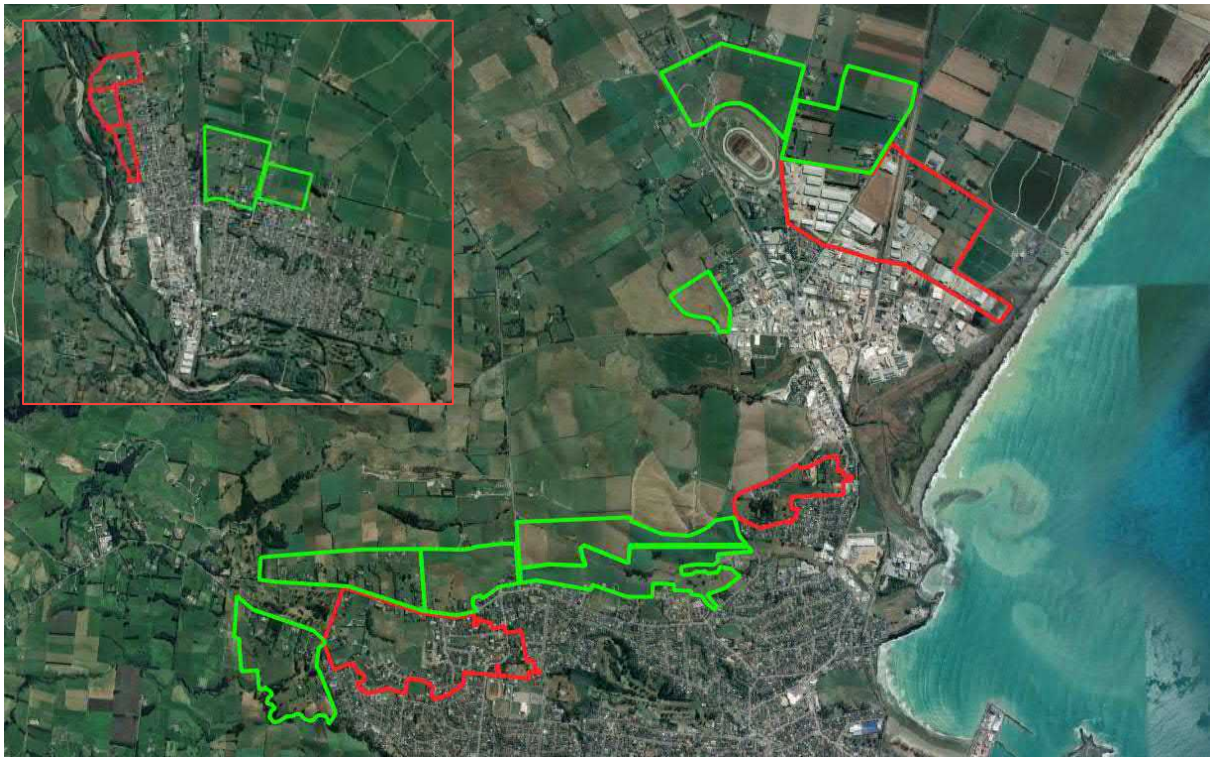
Timaru District Council

TIMARU AND TEMUKA GROWTH CAPACITY ASSESSMENT

WATER

18 DECEMBER 2023

CONFIDENTIAL



TIMARU AND TEMUKA GROWTH CAPACITY ASSESSMENT

WATER

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REV	DATE	DETAILS
00	18 December 2023	Final Report

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ABBREVIATIONS

AC	Asbestos cement
CI	Cast iron
CCZ	City Centre Zone
FDA	Future Development Area
GRZ	General Residential Zone
LoS	Level of Service
MRZ	Medium Density Residential Zone
MUZ	Mixed Use Zone
NZFF CoP	New Zealand Fire Service Firefighting Water Supplies Code of Practice
PDD	Peak Day Demand
PS	Pump Station
WTP	Water Treatment Plant

EXECUTIVE SUMMARY

Timaru District Council (TDC) wishes to quantify the impacts of their proposed future growth areas within Timaru and Temuka on the existing water networks. Additionally, TDC wants to identify locations on the water network that have insufficient capacity for the proposed future demand and will require upgrading.

Growth scenarios for the Timaru and Temuka models were created with the residential and commercial demand for the development areas identified by TDC. To assess what upgrades would be required to service the future development areas the following performance criteria were applied:

- Maintaining a pressure level of service (LoS) of 200 kPa (20 m) for existing and future customers. For Timaru a higher pressure LoS was considered for three key customers in Washdyke (McCain, Alpine Salmon, and Smithfield)
- Maximum headloss ≤ 5 m/km for pipes > DN 200
- Maximum velocity ≤ 1.5 m/s for normal conditions, < 3.0 m/s for fire flow conditions
- Maintaining 100 kPa during FW2 (25 L/s) and FW3 (50 L/s) fire flow.

The hydraulic assessment predicted that:

- No pressure LoS or FW2 fire flow capacity issues are predicted for the residential development areas in Temuka. The residential development areas can be connected to the reticulation once the Temuka reservoir and pump station have been commissioned (there are no commercial development areas planned for Temuka).
- The additional demand from the residential and commercial development areas in Timaru results in a significant increase in the number of properties with pressure LoS below 20 m (increases from nine to 171 properties). To resolve these issues the following is recommended:
    - Upgrade the existing DN 300 cast iron main in Morgans Road to DN 500 PE 100 PN 12.5. Some development (approximately 200 lots) for Elloughton South (FDA1) and Elloughton North (FDA 4) can progress in advance of the Morgans Road pipe upgrade. However, this will need to be located in the lower ground elevation areas close to Old North Road / Jellicoe Street.
    - Upgrade the Gleniti pump station. Further investigation is required to determine the optimal location and size of the pump station upgrade, including considering the benefits of rezoning Claremont customers onto the Gleniti zone. Additional storage at Gleniti Reservoir and a dedicated inlet main to the reservoir may also be required. We recommend that all the development areas in the Gleniti zone be put on hold until this has been investigated further.
- Previous growth assessment and the 2015 Timaru Water Supply Strategy were based on an ultimate demand of 35 ML/day and the availability of the existing Timaru sources (Opihi and Pareora). With the latest growth, this has increased to 40 ML/d. It is recommended that a review of the future strategy for Timaru is undertaken to consider, for example:
    - The demand management that could be achieved from universal metering which TDC currently have programmed to be implemented over 2025-2029.

- Whether demand in Washdyke can be reduced through water-saving initiatives such as greywater recycling or more efficient water use measures by commercial and industrial consumers.

This assessment provides an initial indication of capacity for growth and potential pipe upgrades. We recommend further master planning and optioneering be undertaken to optimise the long-term plan for water infrastructure in Timaru – in particular for the Gleniti zone.

1 INTRODUCTION

WSP was approached by the Timaru District Council (Council) to provide hydraulic modelling services to quantify the impact of proposed future growth areas in Timaru and Temuka. The proposed growth is comprised of committed developments, consented developments, Future Development Areas (FDA), and infill development.

1.1 BACKGROUND

The hydraulic assessment was undertaken to determine the impact on the existing network and to determine the available capacity to supply the proposed growth. The current Timaru and Temuka peak day water supply models were utilised.

The Timaru and Temuka water supply hydraulic models were calibrated in 2015 with peak day models produced for system performance assessment based on historical demand telemetry data. The models were utilised as the base models for each township to apply the growth demand and further investigate the infrastructure upgrades to supply the new development areas.

1.2 PROJECT OBJECTIVES

The objectives of this assessment were to:

1. Assess the impact of future growth on the existing network and current level of service (LoS)
2. Identify pipe upgrades to resolve the LoS deficiencies caused by future growth
3. Confirm which developments can proceed without pipe upgrades

1.3 REPORT STRUCTURE

The structure of this report is summarised below:

- Growth – growth areas and projected demand
- Assumptions – key assumptions specific to this project and applied to the modelling
- Modelling Assessment – model results and proposed upgrades
- Proposed Development Phasing – staging of developments
- Conclusions and Recommendations

2 GROWTH

TDC provided growth plans to identify the location, development type, and estimated number of units projected for the Timaru and Temuka townships.

A breakdown of the growth for each township is presented in this section of the report and has been applied to the hydraulic models as part of the modelling assessment.

Growth has been broken down into the following development types:

1. Residential/Urban Development
2. Rural Residential Development
3. Commercial Development
4. Committed Development
5. Intensification

2.1 DEMAND ASSUMPTIONS

Table 2-1 shows the peak day demand (PDD) values applied to the residential growth areas. These are based on the 2015 Timaru and Temuka calibrated models.

A peak factor of 2.3 was used for the residential PDD, based on the residential diurnal profiles from the 2015 Timaru and Temuka hydraulic models. A leakage rate of 150 L/connection/day has been applied to all new residential connections.

Table 2-1: Residential Connection Peak Day Demand

DEMAND AREA	PEAK DAY DEMAND (PDD) (L/PROP/DAY)	PEAK FACTOR
Timaru	970	2.3
Timaru – Gleniti	1,171	2.3
Temuka	1,293	2.3

Modelled commercial (industrial) peak day demand has been based on Table 5.1 of NZS4404:2010 (see Table 2-2). Similar to residential growth areas, a peak factor of 2.3 has been applied based on the standard 10-hour commercial profile in the calibration models for industrial growth areas. An estimated building footprint of 60%[1] of the total development area has been used, as there is no specific guidance within the Council's District Plan (refer to report, Growth Capacity Report v1.0_final - Section 2.3).

[1] Source: xlstructural.co.nz

Table 2-2: Commercial and Industrial Flows

INDUSTRY TYPE	DESIGN FLOW (L/S PER HA)
Light	0.4
Medium	0.7
Heavy	1.3

2.2 RESIDENTIAL / URBAN DEVELOPMENT

Eight areas (six in Timaru, and two in Temuka) of proposed residential growth were added to the growth scenarios. These are summarised in Table 2-3 and Table 2-4, and shown in Figure 2-1.

Table 2-3: Timaru - Residential Growth Areas and Estimated Peak Day Demand

REF	NAME	TYPE	NO. LOTS	AVG PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID AND ELEVATION (M)
FDA1	Elloughton Road South	Future	598	6.7	16.5	FDA1_1 = 56 m FDA1_2 = 49 m FDA1_3 = 25 m
FDA2	Kellands Heights East	Future	440	4.9	12.1	FDA2_1 = 65 m FDA2_2 = 60 m FDA2_3 = 52 m
FDA4	Elloughton Road North	Future	542	6.1	14.9	FDA4_1 = 50 m FDA4_2 = 50 m FDA4_3 = 31 m
FDA14	Kennels Road	Future	646	7.2	17.8	FDA14_1 = 13 m FDA14_2 = 16 m
DEV1	Broughs Gully	Confirmed	200[2]	2.2	5.5	DEV1_1 = 21 m DEV1_2 = 30 m
DEV2	Gleniti Residential	Consented	700[1]	9.5	23.0	DEV2_1 = 81 m DEV2_2 = 79 m DEV2_3 = 63 m

[2] Lot numbers provided by Council (growth meeting 3rd August 2023)

Table 2-4: Temuka - Residential Growth Areas and Estimated Peak Day Demand

REF	NAME	TYPE	NO. LOTS	AVG PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID AND ELEVATION (M)
FDA6	Factory Road	Future	215	3.2	7.8	FDA6_1 = 18 m FDA6_2 = 17 m
DEV3	Temuka Northwest	Confirmed	210[1]	3.1	7.6	DEV3_1 = 26 m DEV3_2 = 26 m DEV3_3 = 25 m

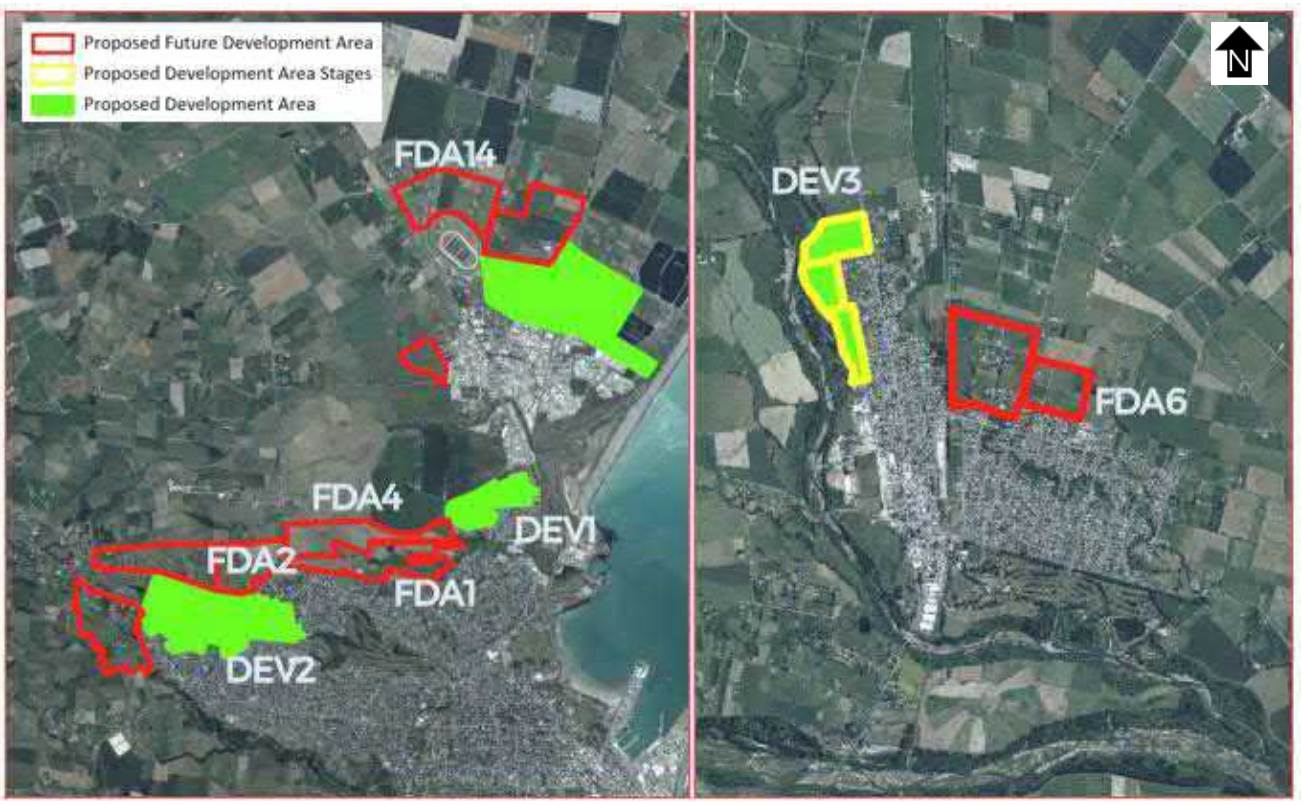


Figure 2-1: Residential growth areas

2.3 RURAL RESIDENTIAL DEVELOPMENT

Three areas (two in Timaru and one in Temuka) of proposed rural residential growth were added to the growth scenarios. These are summarised in Table 2-5 and Table 2-6, and shown in Figure 2-2.

Table 2-5: Timaru - Rural Residential Growth Areas and Estimated Peak Day Demand

REF	NAME	TYPE	NO. OF LOTS	AV. PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID AND ELEVATION (M)

REF	NAME	TYPE	NO. OF LOTS	AV. PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID AND ELEVATION (M)
FDA9	Gleniti North	Future	102	1.4	3.4	FDA9_1 = 90 m FDA9_2 = 58 m
FDA10	Kellands Heights West	Future	88	1.2	2.9	FDA10_1 = 90 m FDA10_2 = 70 m

Table 2-6: Temuka - Rural Residential Growth Areas and Estimated Peak Day Demand

REF	NAME	TYPE	NO. OF LOTS	AV. PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID AND ELEVATION (M)
FDA7	Thompson	Future	86	1.28	3.10	FDA7 = 20 m

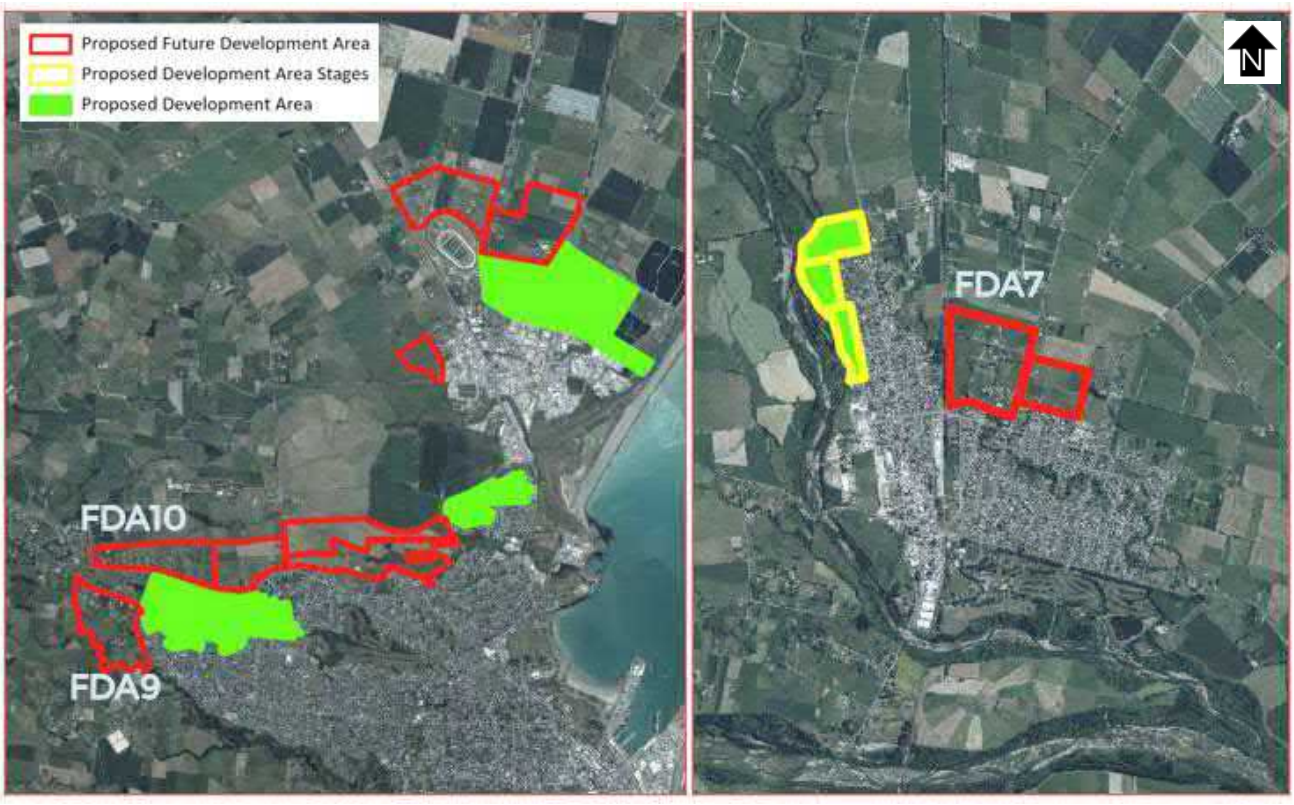


Figure 2-2: Timaru and Temuka rural residential growth areas

2.4 COMMERCIAL DEVELOPMENT

Three areas (all in Timaru) of proposed commercial growth were added to the growth scenario.

The commercial areas are summarised in Table 2-7, and shown in Figure 2-3.

Table 2-7: Commercial Development and Estimated Peak Day Demand

REF	NAME	TYPE	AREA (HA)	USE	AV. PDD (L/S)	PEAK DEMAND (L/S)	GROWTH NODE ID AND ELEVATION (M)
FDA12	Sir Basil Arthur Park	Future	13.3	Light, with potential for wet industries (Medium flow values used)	5.6	12.8	FDA12_1 = 10 m FDA12_2 = 8 m
FDA13	Seadown Road	Future	61.0	Light, with potential for wet industries (Medium flow values used)	25.6	58.9	FDA13_1 = 11 m FDA13_2 = 9 m
DEV3	Washdyke Expansion	Confirmed	56.1	East – heavy industry	43.8	100.6	WSD EXP East_1 = 11 m WSD EXP East_2 = 10 m WSD EXP East_3 = 9 m WSD EXP East_4 = 8 m
			36.7	West–light industry only	8.8	20.3	WSH EXP WEST_1 = 6 m

Figure 2-3: Timaru - commercial development areas

2.5 COMMITTED DEVELOPMENT

Several sites in Timaru have either already been granted consent or are under construction but are not yet included in the model. These were added to the growth scenario similar to the calculated residential and commercial demand.

The demand and pipework for the Showgrounds were previously added to the Timaru model as part of the Evans Street fire flow assessment undertaken in 2023 (based on the demand supplied by the developer).

Committed developments are summarised in Table 2-8, and shown and labelled in Figure 2-4.

No committed developments were identified in Temuka.

Table 2-8: Timaru - Committed Development, Residential and Estimated Peak Day Demand

REF	NAME	TYPE	NO. OF LOTS	AV. PDD (L/S)	PEAK DEMAND (L/S)	GROWTH NODE ID AND ELEVATION (M)
iii	Ascot Street	Rural Residential	160[3]	1.8	2.1	ASC ST = 12 m
iv	St. Vianneys	Residential	92	1.0	1.2	St.Viny_1 = 23 m St.Viny_2 = 36 m
v	Grey Road	Residential	48	0.5	0.6	CHPL-FH34790 = 19 m
vi	O'Neill Place	Residential	84	0.9	1.1	O'Neil = 8 m
vii	O'Neill Place Extension	Residential	48	0.5	0.6	O'Neil Ext = 25 m
viii	College Road	Medium Density Residential	45	0.5	0.6	COLG-FH34931 = 12 m

Table 2-9: Timaru - Committed Development, Industrial and Estimated Peak Day Demand

REF	NAME	AREA (HA)	USE	AV. PDD (L/S)	PEAK DEMAND (L/S)	GROWTH NODE ID AND ELEVATION (M)
i	Washdyke Flat Road	12.5	Light Industrial	3.0	6.9	WSH FLT RD_1 = 5 m WSH FLT RD_2 = 2 m
ii	Showgrounds	12.1	Light Industrial	9.4[4]	21.6	SHW GRDS = 10 m

[3] Assuming 1,200m^2 sections (growth meeting 3 August 2023)
[4] As per Showgrounds Water Supply Demand.pdf

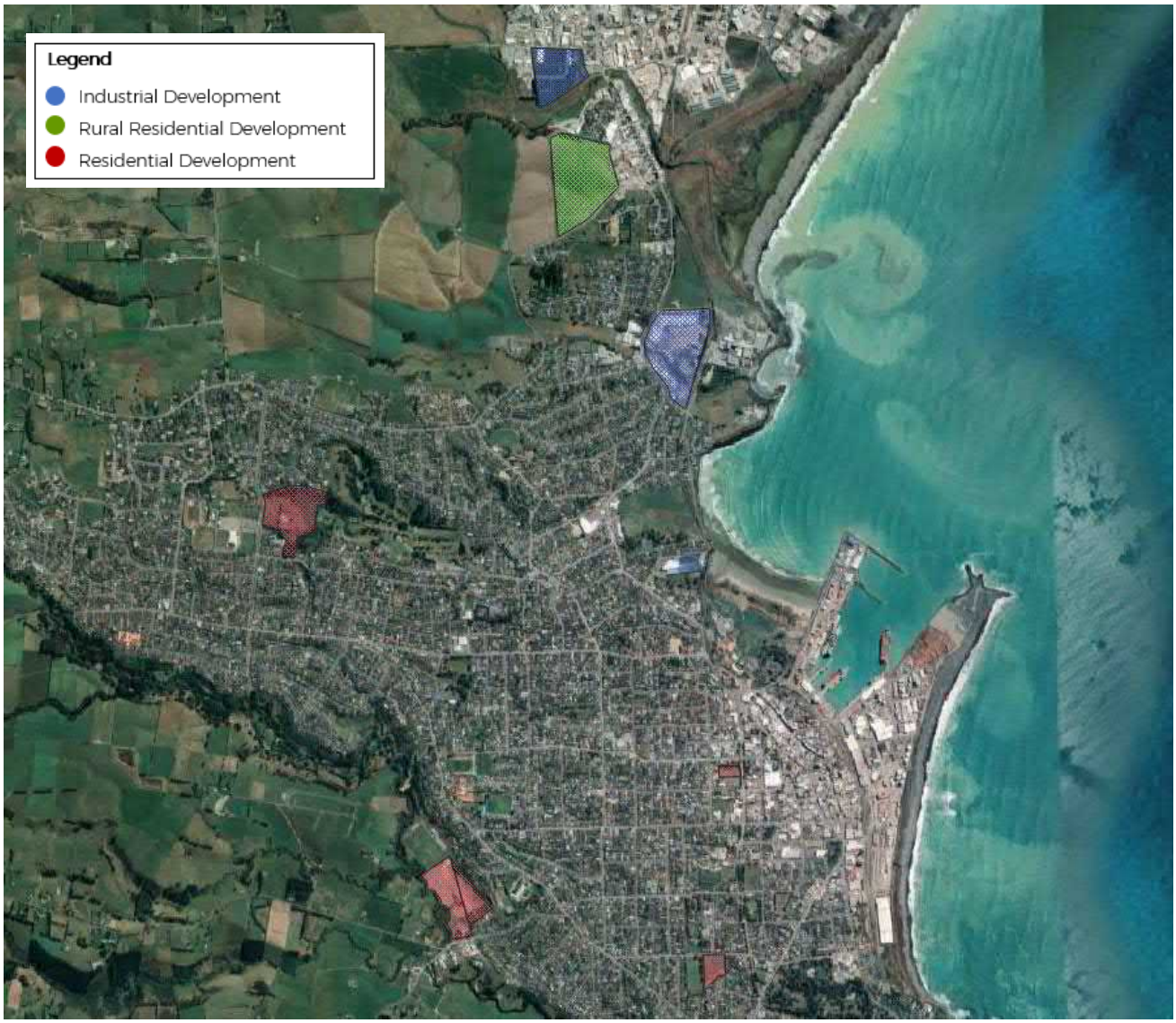


Figure 2-4: Timaru - committed development

2.6 INTENSIFICATION

Intensification has been included within areas zoned as Medium Density Residential (MRZ), City Centre (CCZ), and Mixed Use (MUZ) (see Figure 2-5). The council provided an estimate of 160 households to be accounted for within the Timaru CBD in areas zoned as CCZ or MUZ. The equivalent total PDD demand for these households has been evenly distributed across the 224 existing nodes in these zones – as an additional 693 L/connection/day {(160/224) x 970 L/connection/day}.

As there are no areas zoned MRZ, CCZ, or MUZ in Temuka, intensification has not been accounted for in the Temuka growth model.

Figure 2-5: Timaru - District Plan 2022 residential zones

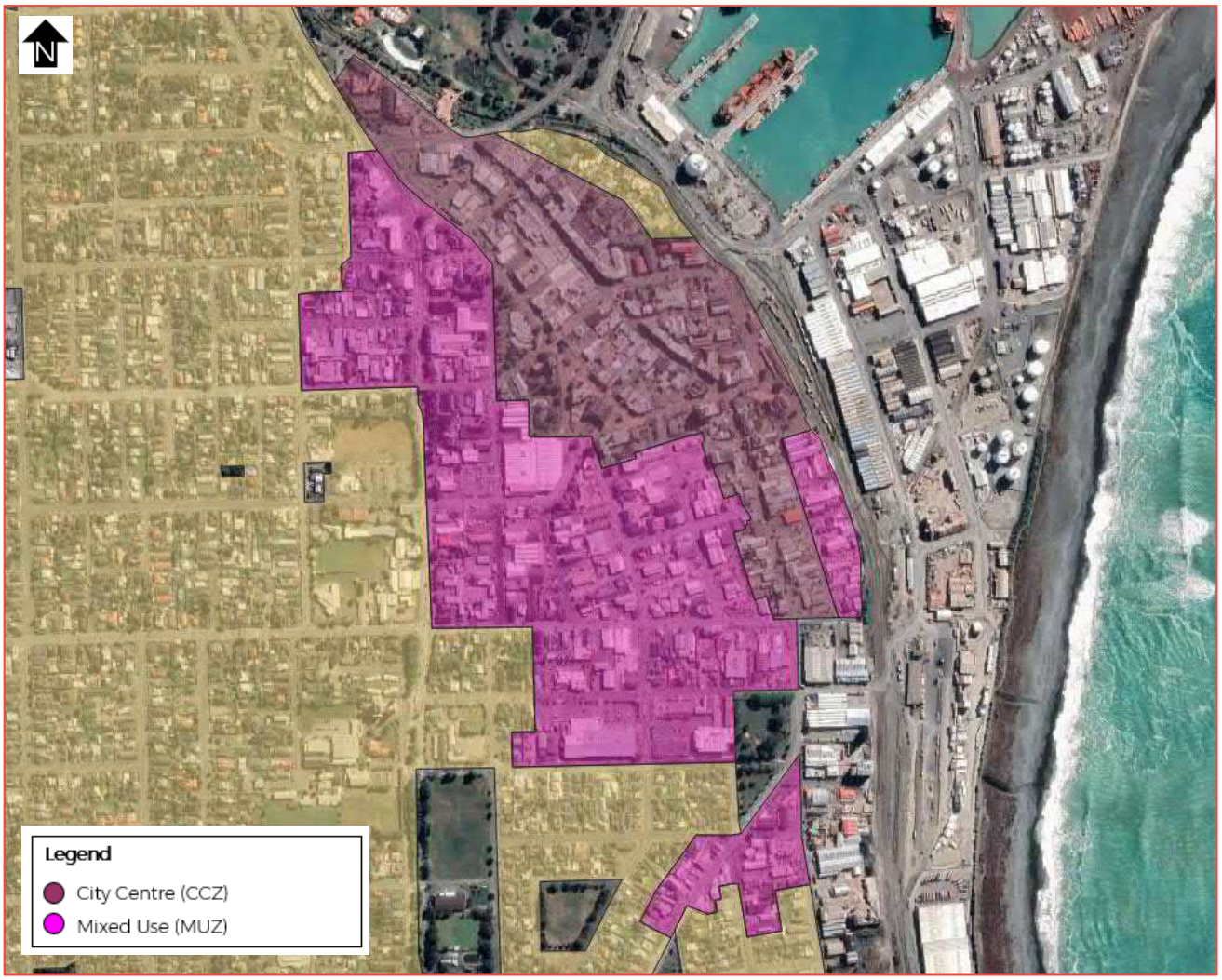


Figure 2-6: Timaru - District Plan 2022 CBD zones

3 ASSUMPTIONS

3.1 GENERAL

Assumptions that have been adopted for this project and applied to the modelling are summarised below:

1. Timaru Model Update Final Report (WSP, July 2017) and Temuka Model Update Final Report (WSP, August 2016) contain assumptions and limitations that apply to this project. The key assumptions and limitations from these are listed below (note that these are not all the assumptions, just key limitations relevant to this assessment):
    - The Timaru calibration model showed a larger response to hydrant flow tests in the Marine Parade and High St / Queen St areas compared to logged pressures.
    - The Timaru calibration model for the Pacific Street hydrant test indicated a significant anomaly between the model response (192 m pressure drop) versus the 31 m logged pressure drop.
2. The calibration and system performance of the 2015 models are also described in the Timaru Model Update Final Report (WSP, July 2017) and Temuka Model Update Final Report (WSP, August 2016).
3. The based demands in the 2015 models have not been updated to reflect the current peak day demand. This includes no changes to the existing customer connections, updates to diurnal patterns, customer demand or leakage rates.
4. Diurnal demand profiles have been applied as follows:
    - Residential: existing Temuka and Timaru peak day model residential demand profiles
    - Commercial: 10-hour standard profile
    - Leakage: leakage allowance of 150 L/connection/day for all residential growth (assumes 'new' pipe network).
5. All new pipes have been modelled with an equivalent pipe internal diameter for PE 100 PN 12.5. The exception is the Showgrounds development area which has been modelled with the PE 100 PN 16 pipe based on supplied developer as-built drawings.
6. Rural residential growth has been connected to the water network and is assumed to be on-demand.

3.2 MODELLING

A summary of the key assumptions and updates to the hydraulic models are presented below:

1. The Timaru and Temuka peak day water model was updated to InfoWorks Pro 2024.3.0 and used as the base models for this assessment.
2. A model update was carried out to include the new pipe assets installed since September 2017 (based on TDC GIS data) such as the Kellands Hill (Washdyke) and Temuka trunk main, as shown in Figure 3-1.

3 The following boundary conditions have been applied to the models for this assessment:

- Temuka: A pressure sustaining valve/pressure reducing valve (PSV/PRV) was installed on the Temuka trunk main in 2015 (adjacent to the new Temuka reservoir and pump station (PS)). The PSV / PRV maintains positive pressures in the DN 300 PVC-U section of the Temuka trunk main (north of Winchester) for flows up to 85 L/s. For flows above 75 L/s the new Temuka reservoir and PS (once commissioned) will operate to supply a delivery pressure of 31 m in the trunk main. For this growth capacity assessment, this arrangement has represented using a fixed head of 31 m in the trunk main at McNair Rd.
- Timaru: The 2015 Timaru model has Claremont reservoir level operating between 88.7 and 88.9 m. The reservoir level can drop lower - for example, the Washdyke Water Supply Strategy adopted a worse-case reservoir level of 83.6 m. The pressures reported in this assessment could be up to 5 m lower for the scenario whereby the Claremont reservoir level is not being maintained.

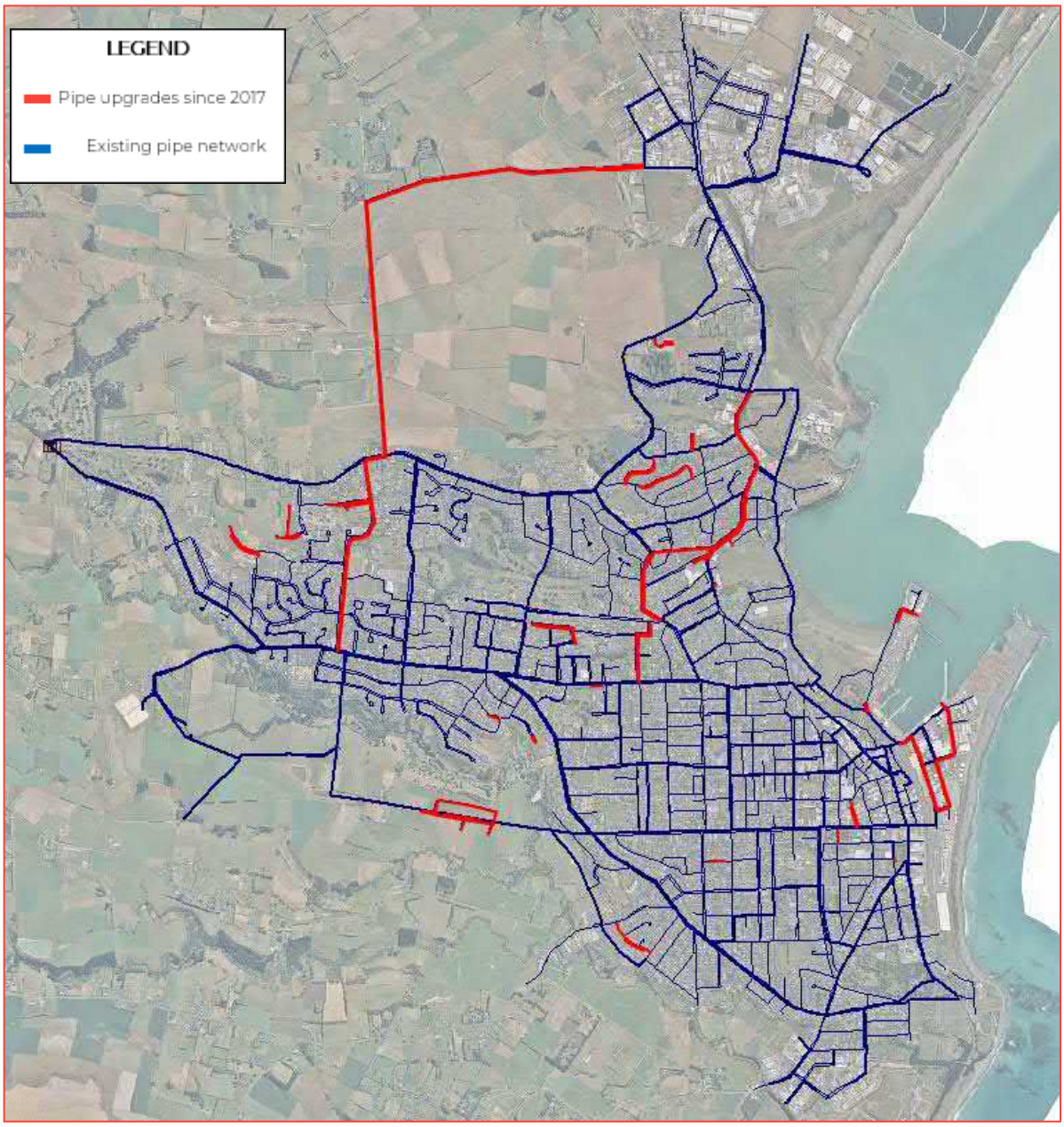


Figure 3-1: Base model update - pipe upgrades since 2017

4 MODELLING ASSESSMENT

4.1 APPROACH

For this assessment we have undertaken the following approach:

1. Assigned the growth to the base Timaru and Temuka models using demand nodes to represent the individual developments and connected them to the existing network with new pipes (ring mains) located within the growth areas (refer to Figure 4-1 and Figure 4-2). For the Timaru assessment the growth areas of Gleniti North (FDA9), Kellands Heights West (FDA10), Kellands Height (East) FDA2 and Gleniti Residential (DEV2) were connected to the Gleniti zone. All other growth areas were connected to the Claremont zone.
2. Applied demand and leakage based on the current 2015 models, as discussed in Section 3 to create the 'ultimate' future peak day demand (PDD).
3. Ran the base and ultimate demand models to assess the impact on the pipe capacity and levels of service (LoS) on the existing network.
4. Identified upgrades to resolve customer LoS deficiencies.
5. Determined which developments require upgrades to proceed.

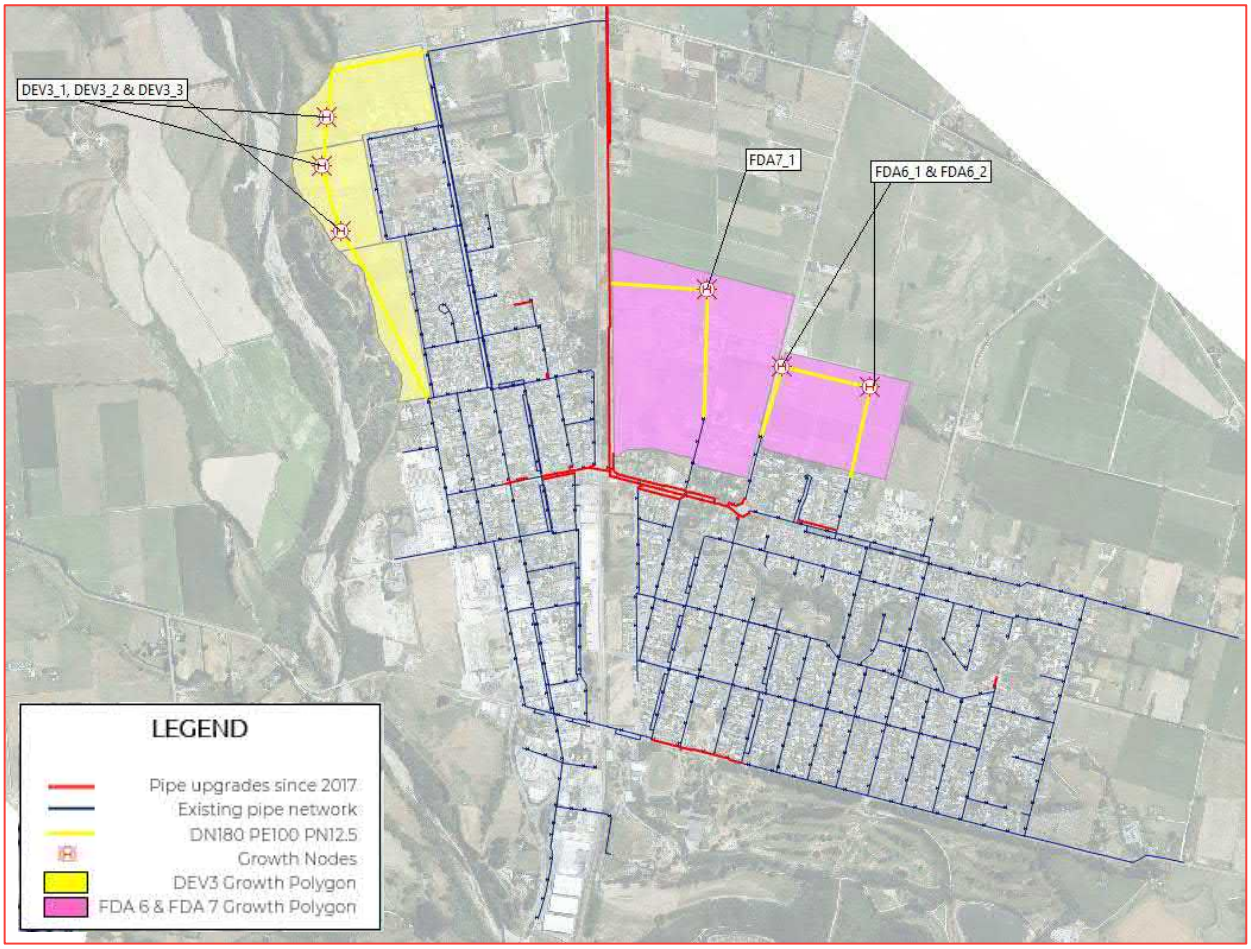


Figure 4-1: Temuka - growth nodes, pipe upgrades, and future development polygons

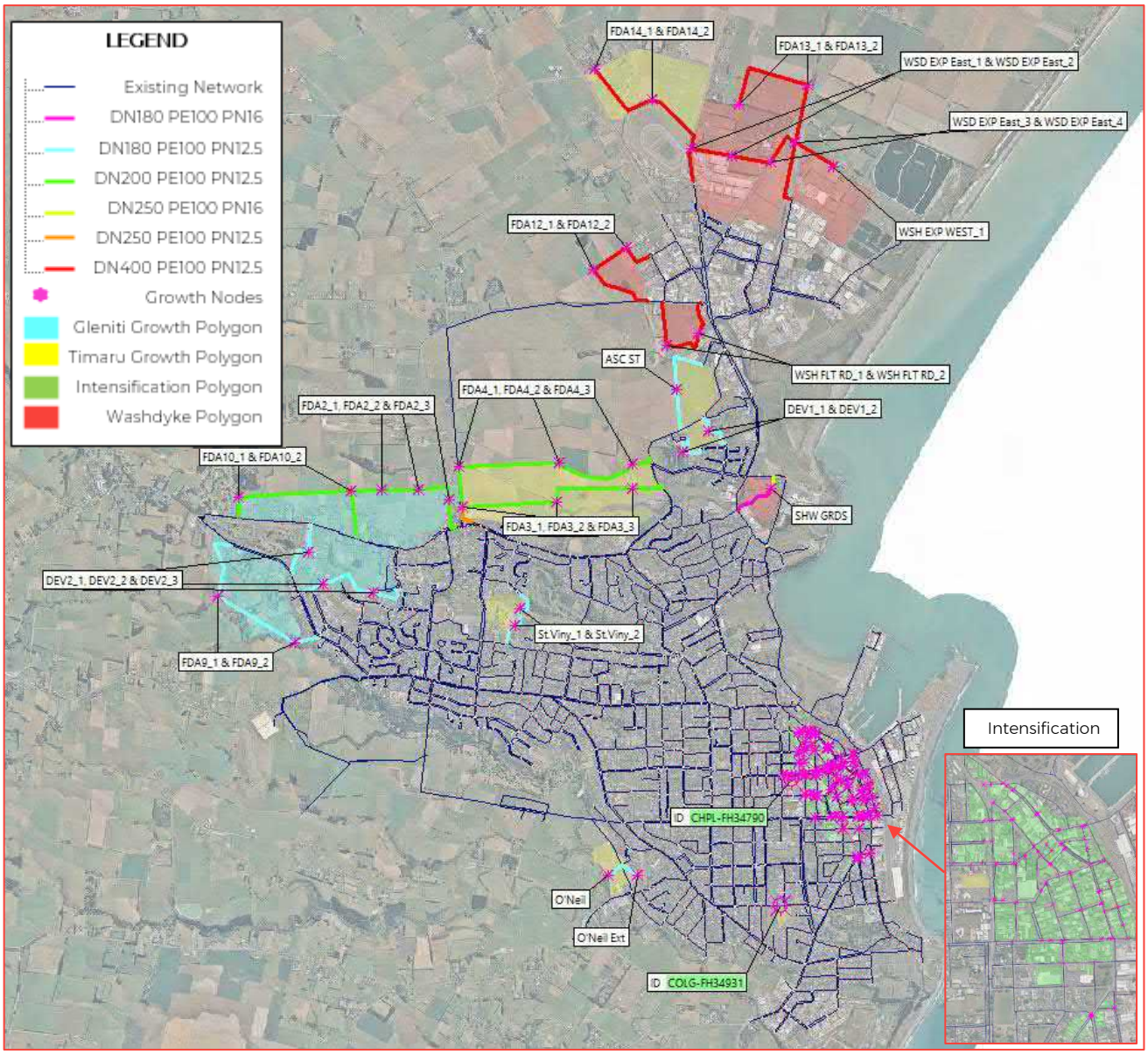


Figure 4-2: Timaru – growth nodes, pipe upgrades, and future development polygons

4.2 PERFORMANCE CRITERIA

For the system performance assessment, a set of criteria has been used to identify pipe capacity constraints and customer LoS issues, as presented below. The criteria have been used to size new pipe upgrades to meet the LoS requirements as stated.

4.2.1 HYDRAULIC

The parameters used to identify pipes that are at capacity or to size upgrades are based on the following criteria:

1 Maximum headloss ≤ 5 m / km for pipes > DN 200

2 Maximum velocity ≤ 1.5 m/s for normal conditions, < 3.0 m/s for fire flow conditions

3 Network pressure of 200 kPa is achieved in the development areas

4 A pass is achieved at hydrants for fire flow in the development areas (refer to Section 4.2.2)

5 For Timaru, the Washdyke Water Supply Strategy identified some specific pressure levels of service requirements for key customers in Washdyke – these have been considered when reviewing the impact of the additional growth in the Washdyke network.

- McCain (MEAD-WV36981Y) = 413 kPa
- Alpine Salmon WESC-WV37104Y = 300 kPa
- Smithfield (SHEF-FH39081 = 500 kPa

4.2.2 FIRE FLOW COMPLIANCE

4.2.2.1 FW2 FIRE FLOW

FW fire flow has been assessed as per the New Zealand Fire Service Firefighting Water Supplies Code of Practice (NZFF CoP). Each hydrant was assessed individually at 60% of the peak day maximum demand while maintaining 100 kPa of residual pressure based on:

- greater than 25 L/s from a single hydrant = compliant (pass)
- between 18 and 25 L/s from two adjacent hydrants = likely to be compliant (marginal)
- less than 18 L/s = unlikely to be compliant (fail)

4.2.2.2 FW3 FIRE FLOW

FW3 fire flow has been assessed for the Timaru industrial growth areas in Washdyke by simulating an exceptional demand of 50 L/s at 60% of the peak day maximum demand. These nodes are located at FDA12, FDA13, Showgrounds, Washdyke Flat Road, Washdyke Expansion East, and Washdyke Expansion West.

We have further investigated the impact of fire flow within the Ports industrial area, and proximity to Timaru CBD by applying an exceptional demand of 50 L/s at 60% of peak day maximum demand at Dawson Street (hydrant HYMN-FH34573).

4.3 SYSTEM PERFORMANCE

4.3.1 ULTIMATE DEMAND

With the addition of the growth areas and their associated demand to the Timaru and Temuka peak day models, the current (base) peak day and estimated future (ultimate) peak day demand are shown in Table 4-1.

Table 4-1: Peak Day Demand – Current (Base) and Ultimate

TOWN	CURRENT PDD (ML/d)	FUTURE PDD (ML/d)	% INCREASE
Timaru	28.5	40.4	42 %
Temuka	4.0	4.7	18 %

4.3.2 TIMARU

4.3.2.1 SYSTEM PERFORMANCE

The base model predicts a total of nine customers are receiving 20 m or below pressure LoS.

For the ultimate demand, this is predicted to increase to 171 customers with pressures below 20 m. Of these 171 customers, 145 are supplied from the Claremont reservoir while the remaining 26 customers are supplied from the Gleniti reservoir. Appendix A shows a comparison of the pressure LoS results between the base and ultimate demand models.

Pressure LoS issues are also predicted at the new development areas FDA9, FDA10, and DEV2 (supplied by Gleniti reservoir) and FDA1 and FDA4 (supplied by Claremont reservoir).

In terms of the Claremont zone:

- The residential development located in the north of Timaru causes excessive headlosses (>11 m/km) in the DN 300 cast iron (CI) main on Morgans Road. This is partially due to the newly commissioned Washdyke trunk main supplying the western end of Timaru, with flows of 200 L/s to supply the increased Washdyke demand. Furthermore, the FDA1 and FDA4 growth areas contribute to the peak instantaneous flows of up to 31 L/s in the CI main.
- In total 13 km of pipes with a diameter greater than 200 mm are experiencing headloss greater than 5 m/km, with 1.5 km of the Morgans Road CI main contributing to the pressure LoS issues in its associated area and the new growth areas of FDA1 and FDA4 (see Figure 4-3).
- Velocities greater than 2 m/s are predicted in the DN 300 AC main coming off the Washdyke trunk main in Washdyke Flat Road through to SH1 and Meadows Road. These mains are carrying high flows greater than 150 L/s supplying the industrial growth areas and two of the three key customers. One of the key customers, Smithfield (SHEF-FH39081) is receiving pressure LoS marginally below the required 500 kPa (see Figure 4-4).

In terms of the Gleniti zone:

- The inlet and outlet pipework of the Gleniti Pump Station (PS) and the PS are undersized to meet ultimate growth. The localised pipework at Gleneti PS is experiencing a headloss of 95 m/km, with the new developments and the increased growth within the Gleniti zone. As a result, a 135 m section of pipe downstream of the Glenti PS, results in a headloss of 12.45 m and causes 28 customers to receive pressure <20 m. The development area FDA9 is located at a high elevation, and results in LoS pressure issues (see Figure 4-3).
- Similarly, the development area FDA10 is located at a high elevation and has an available static head of less than 11 m, suggesting pumping will be required to supply the demand and pressure LoS.
- An indicative estimate of the future duty flow that will be required from an upgraded Gleniti PS based on current Gleniti zone demand is 97 L/s. This assumes that the Gleniti zone peak day average demand of 48.5 L/s is supplied by the Gleniti PS over 12 hours.

Table 4-2: Timaru – Capacity Assessment Results, Peak Day Demand Pressure LoS

PERFORMANCE PARAMETER	BASE SCENARIO – NO. OF PROPERTIES	ULTIMATE GROWTH SCENARIO – NO. OF PROPERTIES
< 20 m pressure LoS	9	• 171 existing properties • FDA9, FDA10 & DEV2 • FDA1 & FDA4

Table 4-3: Timaru – Capacity Assessment Results, Peak Day Demand Pipe Headloss and Velocity

PERFORMANCE PARAMETER	BASE SCENARIO – PIPE (M) > 200 MM DIA.	ULTIMATE GROWTH – PIPE (M) > 200 MM DIA.
Max HL ≥ 5 m / km	3,121	12,965
Max. V ≥ 1.5 m/s	361	1,887

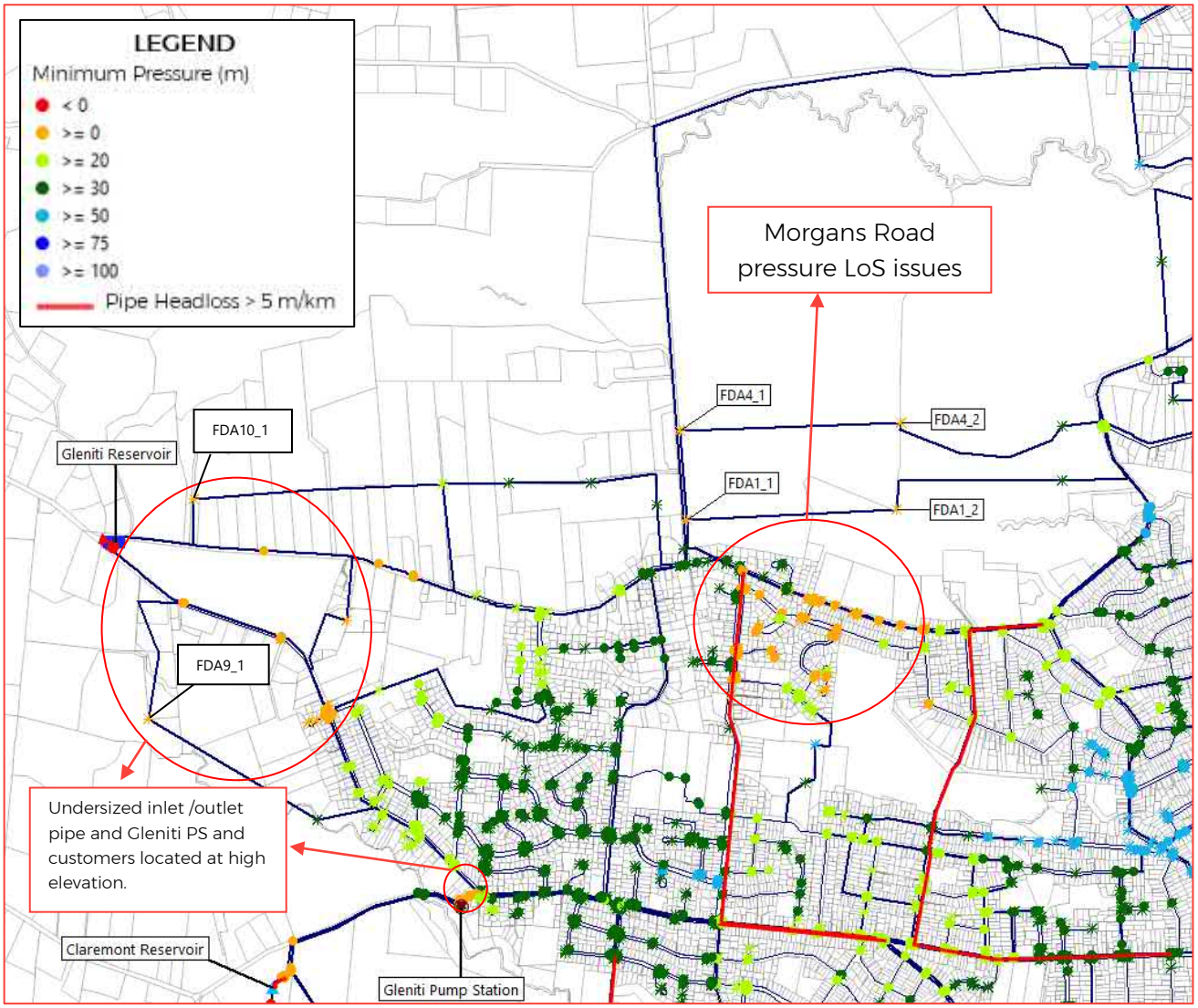


Figure 4-3: Timaru – Ultimate scenario pressure LoS issues

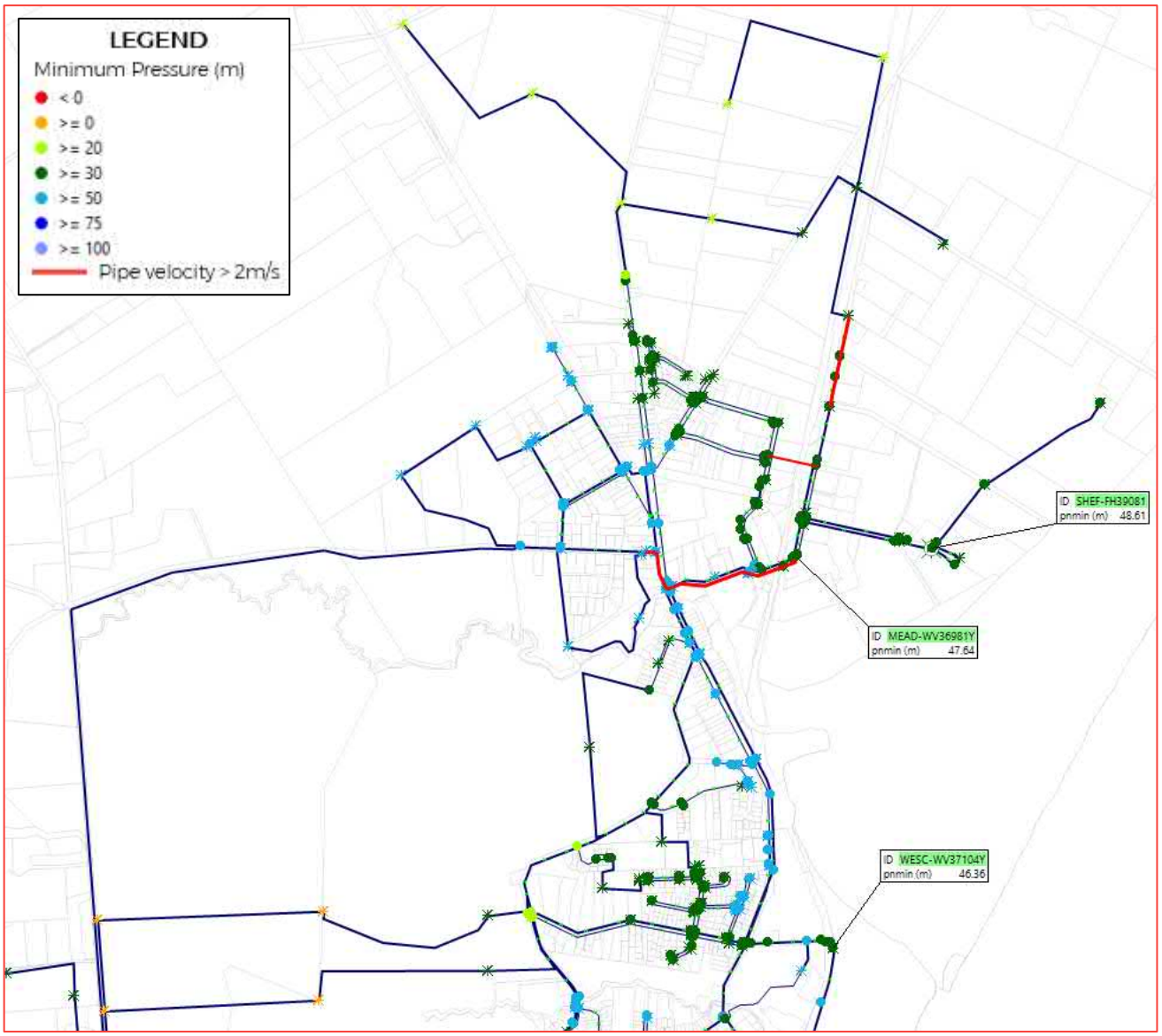


Figure 4-4: Timaru - growth model pipe network in Washdyke with velocity > 2 m/s

4.3.2.2 FIRE FLOW COMPLIANCE

Similar flows were observed during the events of FW3 requirement in the Washdyke industrial area during peak hour demand. The new trunk main is working at full capacity with flows reaching close to 200 L/s.

The model is predicting an additional 62 hydrants are failing to meet the FW2 requirement, and 71 hydrants are failing to meet the FW3 requirements, that previously passed under the current (base) scenario. However, all the hydrants located in the growth development area are passed (see Figure 4-5).

No marginally passed hydrants were observed as most failed hydrants were able to provide the minimum fire flow requirement of 25 L/s but did not meet the 10 m residual pressure requirement.

Overall, approximately 29% of the total hydrants do not meet the FW2 and FW3 requirements. Appendix A presents the results for the fire flow compliance assessment for Timaru.

Table 4-4: Timaru Capacity Assessment Results – FW2 & FW3

PERFORMANCE PARAMETER	BASE SCENARIO	ULTIMATE GROWTH SCENARIO – FW2	ULTIMATE GROWTH SCENARIO FW3 (Washdyke)	ULTIMATE GROWTH SCENARIO FW3 (Timaru CBD)
No. hydrants 'Pass'	1,680	1,656	1,647	1,647
No. hydrants 'Marginal'	0	0	0	0
No. hydrants 'Fail'	410	471	480	480

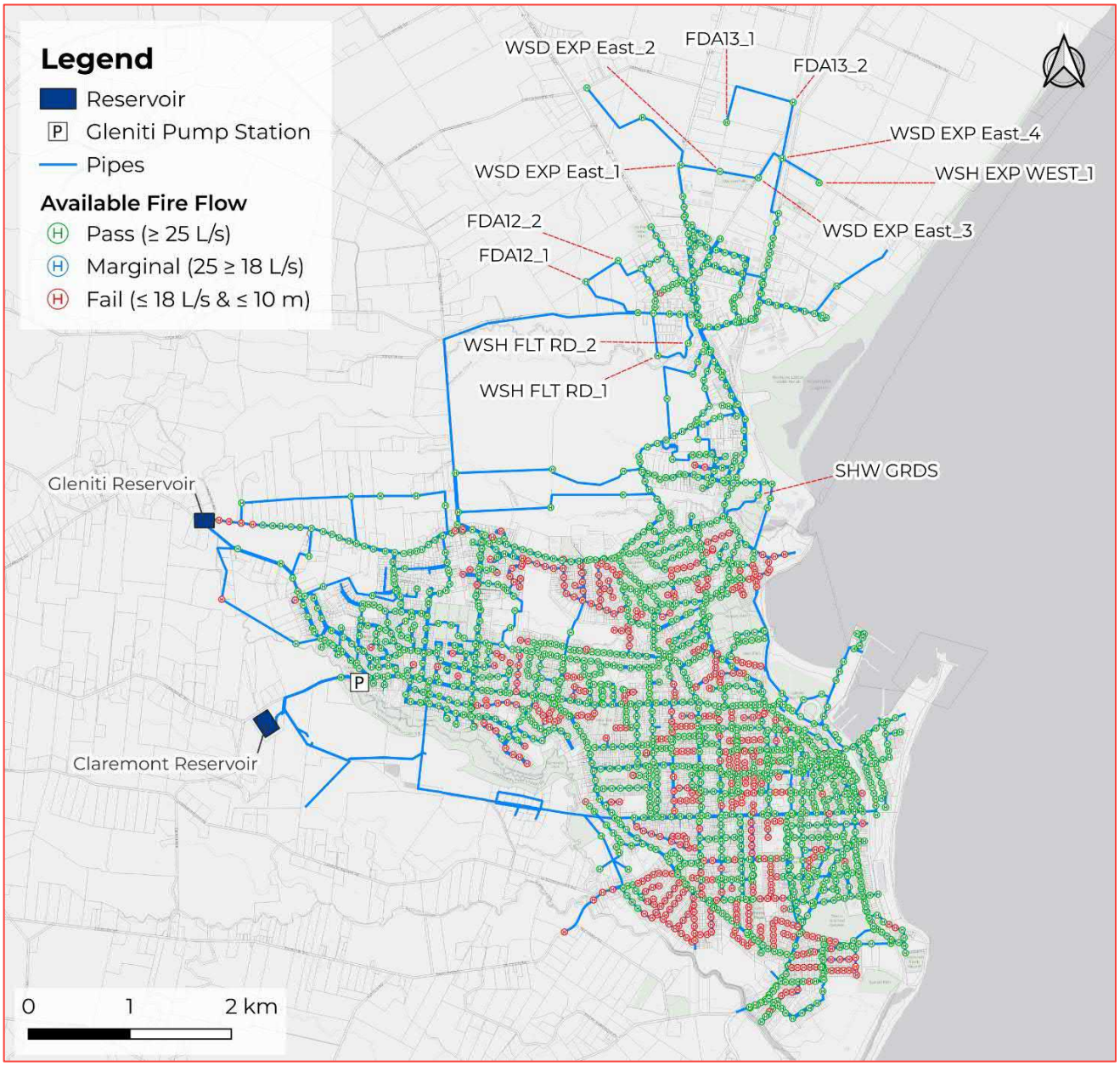


Figure 4-5: Timaru - FW3 fire flow results (ultimate – Washdyke)

4.3.3 TEMUKA

4.3.3.1 SYSTEM PERFORMANCE

The Temuka reticulation does not have any pressure LoS issues for the base and ultimate growth scenarios.

4.3.3.2 FIRE FLOW COMPLIANCE

In Temuka the majority of hydrants are compliant with 36 hydrants failing in the base scenario. However, improved results were observed for the ultimate growth scenario with only 32 hydrants predicted to fail. This was due to the incorporation of the new pipe for supplying the FDA6 growth area that has passed the fire flow compliance of the existing four hydrants, that were previously failing (see Figure 4-7).

No marginally passed hydrants were observed as the majority of failed hydrants were able to provide the minimum fire flow requirement of 25 L/s but did not meet the 10 m residual pressure requirement.

Table 4-5: Temuka - Capacity Assessment Results, FW2 Fire Flow

PERFORMANCE PARAMETER	BASE SCENARIO	ULTIMATE GROWTH SCENARIO
No. hydrants 'Pass'	321	331
No. hydrants 'Marginal'	0	0
No. hydrants 'Fail'	36	32

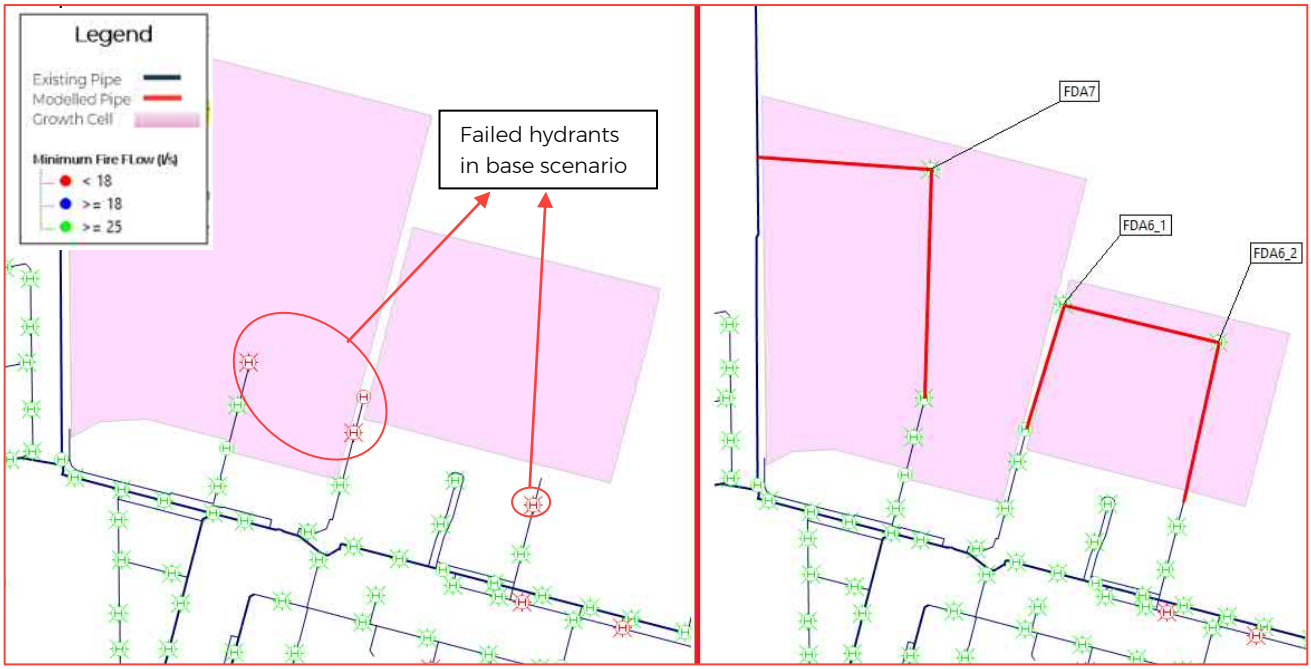


Figure 4-6: Temuka - improved hydrants performance (four no.) with new modelled pipes for growth areas

4.3.4 TIMARU PIPE UPGRADES

We have identified that upgrading the DN 300 Morgans Road pipe with a DN 500 PE 100 PN12.5 pipe will resolve the pressure LoS issues for the existing and new growth development of FDA1 and FDA4 supplied by Claremont reservoir. However, four properties on Morgans Road will still require a boost in pressure to meet the pressure LoS requirement during peak instantaneous demands. The new DN 500 Morgans Road main is also predicted to resolve the pressure LoS at Smithfield (SHEF-FH39081) and further improve the system performance as per Figure 4-7.

An assessment of pipe upgrades to the undersized inlet and outlet pipes at Gleniti PS indicates that pressure LoS issues remain for the existing 26 properties and the new growth areas of FDA9, FDA10, and DEV2. While pressure LoS is achieved for FDA2, the Gleniti reservoir level is not maintained with this additional demand, therefore we do not recommend connecting this development at this point. Further investigation is required to identify the Gleniti PS and pipe upgrade required to resolve these pressure LoS issues whilst also maintaining the Gleniti reservoir level and turnover period. Additionally, this should consider:

1. Whether there are benefits to rezoning properties from the Claremont zone onto the Gleniti zone.
2. Whether additional Gleniti storage and/or chlorine contact tank volume is required.
3. General reconfiguration of how the Gleniti zone is supplied, including the location of the Gleniti PS and a dedicated trunk main to supply the reservoir.

Table 4-6: Timaru Capacity Assessment Results after Upgrades – Pressure LoS

PERFORMANCE PARAMETER	BASE SCENARIO - NO. OF PROPERTIES	ULTIMATE GROWTH – NO. PROPERTIES	ULTIMATE GROWTH W UPGRADES – NO. PROPERTIES
< 20 m pressure LoS	9	• 171 existing • FDA9, FDA10 & DEV2 • FDA1 & FDA4	• 30 existing properties • FDA9, FDA10 & DEV2

Table 4-7: Timaru Capacity Assessment Results after Upgrades – Velocity and Headloss

PERFORMANCE PARAMETER	BASE SCENARIO - PIPES > 200 MM DIA. (M)	ULTIMATE GROWTH - PIPES > 200 MM DIA (M)	ULTIMATE GROWTH WITH DEVELOPMENT UPGRADES – PIPES > 200 MM DIA (M)
Max HL ≥ 5 m / km	3,121	12,965	8,102*
Max. V ≥ 1.5 m/s	361	1,887	1,587

*It should be noted that if the 1.5 km of DN 500 Morgans Road pipe upgrade is progressed first, the total length of the remaining underperforming pipe network is predicted to be 8,102 m as presented in Table 4-7.

Appendix B presents a full list of the pipe upgrades required to resolve the headloss and velocity issues identified in Table 4-7.

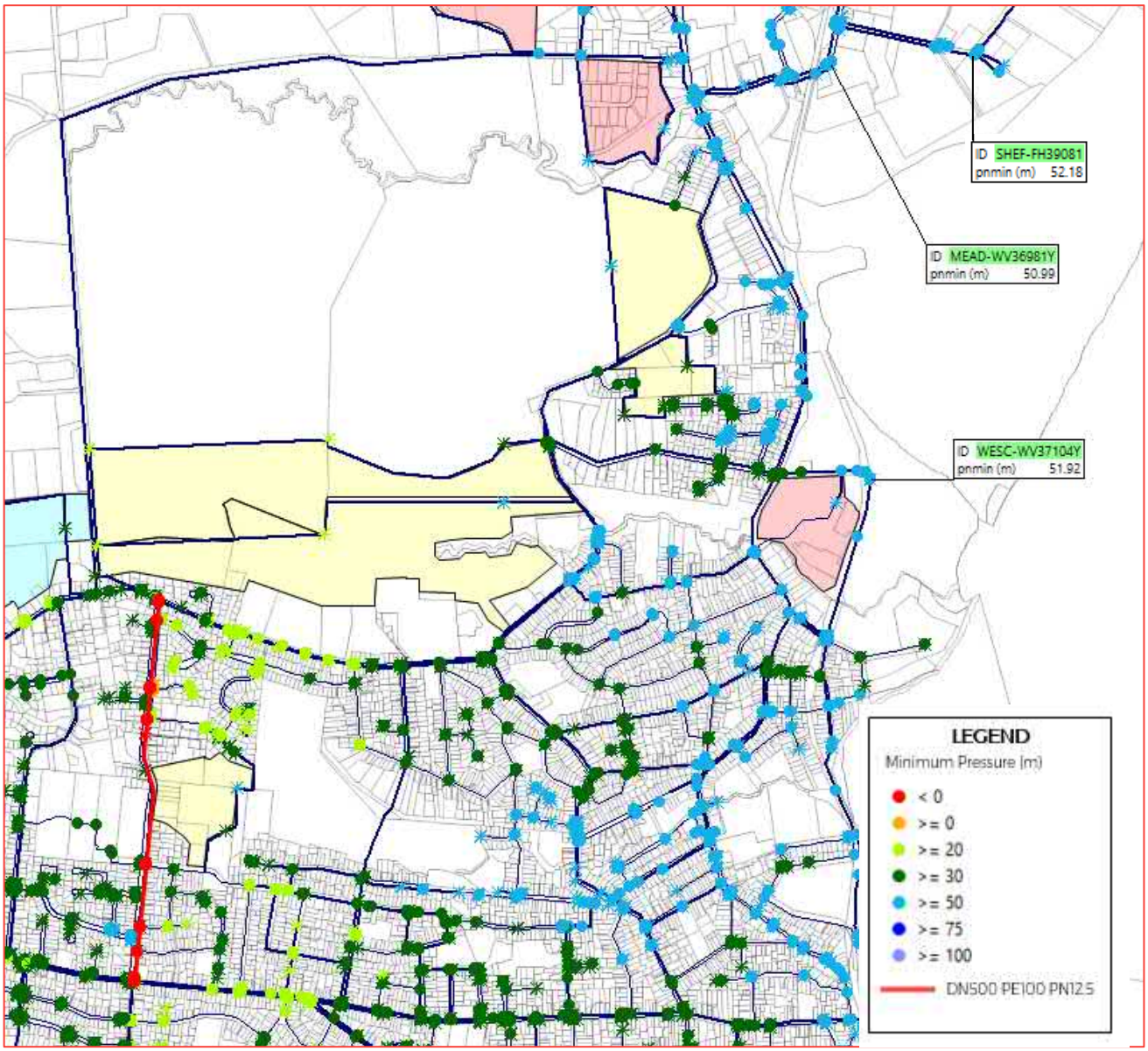


Figure 4-7: Timaru - improved system performance from new DN 500 main in Morgans Road

5 DEVELOPMENT PHASING

5.1.1 TIMARU

A summary of which growth areas in Timaru can go ahead before the network needs to be upgraded is summarised in Table 5-1, and a plan showing these growth areas and staging is provided in Appendix C.

The total number of 200 residential lots that can be developed between FDA1 and FDA4 has been based on 12 lots per hectare, with the developable land area being 60% of 30 ha which is estimated to have a ground elevation of 45 m or less.

Table 5-1: Timaru - Categorisation of growth areas that can be developed prior to the recommended upgrades

REF / NAME	DEVELOPMENT CAN PROCEED BEFORE UPGRADES
FDA1 Elloughton Road South	A total of 200 lots shared with FDA4 at east side nr. Old North Rd / Jellicoe St
FDA2 Kellands Heights East	No – detailed assessment of Gleniti zone and upgrade to Gleniti PS required
FDA4 Elloughton Road North	A total of 200 lots shared with FDA1 at east side nr. Old North Rd / Jellicoe St
FDA14 Kennels Road	Yes
DEV1 Broughs Gully	Yes
DEV2 Gleniti Residential	No – detailed assessment of Gleniti zone and upgrade to Gleniti PS required
FDA9 Gleniti North	No – detailed assessment of Gleniti zone and upgrade to Gleniti PS required
FDA10 Kellands Heights West	No – detailed assessment of Gleniti zone and upgrade to Gleniti PS and required
FDA12 Sir Basil Arthur Park	Yes
FDA13 Seadown Road	Yes
DEV3 Washdyke Expansion	Yes
Washdyke Flat Road	Yes
Showgrounds	Yes
Ascot Street	Yes
St. Vianneys	Yes

REF / NAME	DEVELOPMENT CAN PROCEED BEFORE UPGRADES
Grey Road	Yes
O'Neill Place	Yes
O'Neill Place Extension	Yes
College Road	Yes

5.1.2 TEMUKA

A summary of the growth areas in Temuka which can go ahead without upgrades to the network is shown in Table 5-2, and a plan showing these growth areas is provided in Appendix C.

Table 5-2: Temuka - Categorisation of growth areas that can be developed prior to the recommended upgrades

REF / NAME	DEVELOPMENT CAN PROCEED BEFORE UPGRADES
FDA6 Factory Road	Yes
DEV3 Temuka Northwest	Yes
FDA7 Thompson	Yes

6 CONCLUSIONS AND RECOMMENDATIONS

Temuka

1. No pressure LoS issues are predicted for Temuka. Once the Temuka reservoir and pump station are commissioned the Temuka future development areas can be connected to the existing reticulation.
2. The 2015 Temuka Water Supply Strategy was based on an ultimate demand of 4.5 ML/d. With the latest growth, this has increased to 4.7 ML/d.
3. The ultimate PDD of 4.7 ML/d will result in a turnover at the new 4 ML Temuka reservoir of 20 hours.

Timaru

1. The additional residential and commercial growth results in a significant increase in customers predicted to have pressure LoS below 20 m – from nine to 171 properties.
2. Pressure LoS issues are predicted at FDA9 (Gleniti North), FDA10 (Kellands Heights West), and DEV2 (Gleniti Residential).
3. The Gleniti PS capacity is exceeded, and the inlet and outlet pipework to the PS are undersized. This results in pressure LoS issues for an existing 26 properties. Further investigation is required to confirm the optimal upgrade for the Gleniti PS. This should consider whether there are additional benefits to rezoning Claremont customers onto the Gleniti zone (e.g., Carlisle Place), along with a review of the storage and contact time at the Gleniti reservoir site. We recommend that all the development areas in the Gleniti zone are put on hold until this has been investigated further.
4. Pressure LoS issues are predicted at FDA1 (Elloughton Road South) and FDA4 (Elloughton Road North). This can be resolved by upgrading the existing DN 300 CI main in Morgans Road to DN 500 PE 100 PN12.5. This upgrade also resolves the pressure LoS issue of the key customer Smithfield and further improves system performance.
5. Some development (total 200 lots) for FDA1 and FDA4 can progress in advance of the upgrade to the DN 300 CI main in Morgans Road. However, this will need to be located in the lower ground elevation areas close to Old North Road / Jellicoe Street.
6. Four properties in Carlisle Place are still predicted to have pressure LoS issues after the Morgans Road upgrade.
7. Previous growth assessment and the 2015 Timaru Water Supply Strategy was based on an ultimate demand of 35 ML/day based on existing Timaru sources (Opihi and Pareora) availability. With the latest growth, this has increased to 40 ML/d. It is recommended that a review of the future strategy for Timaru is undertaken to consider, for example:
    a. The demand management that could be achieved from universal metering which TDC currently has programmed to be implemented over 2025-2029.

b Whether demand in Washdyke can be reduced through water-saving initiatives such as greywater recycling or more efficient water use measures by commercial and industrial consumers.

8 The ultimate PDD of 40.4 ML/d will result in a turnover at the Claremont reservoir (2 x 114 ML) of 5.6 days.

7 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Timaru District Council ('Client') in relation to a capacity assessment for Timaru and Temuka ('Purpose') and in accordance with the existing *ACENZ Form of Agreement for Engagement of Consultant between Timaru District Council and WSP* signed 29 April 2011 and *Offer of Service dated 29 August 2023 for 'Timaru and Temuka Growth Capacity* Assessment' ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report and the Offer of Services dated August 2023. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

In preparing this Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('Client Data') provided by or on behalf of the Client. Except as otherwise stated in this Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable for any incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

APPENDIX A - RESULTS

RESULTS – TIMARU PRESSURE LOS

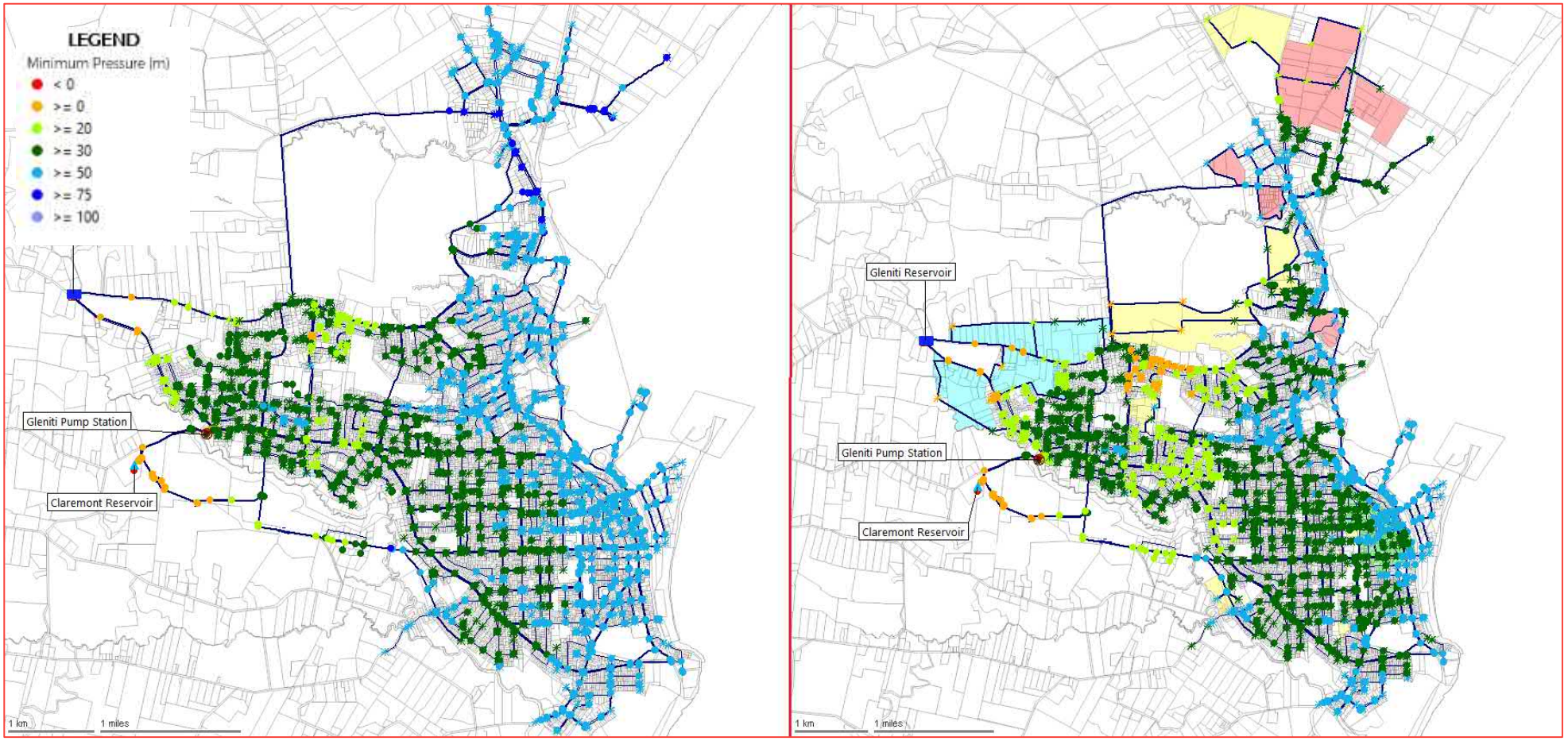


Figure 1: Timaru – comparison of pressure LoS (base model vs ultimate model)

RESULTS – TIMARU FIRE FLOW

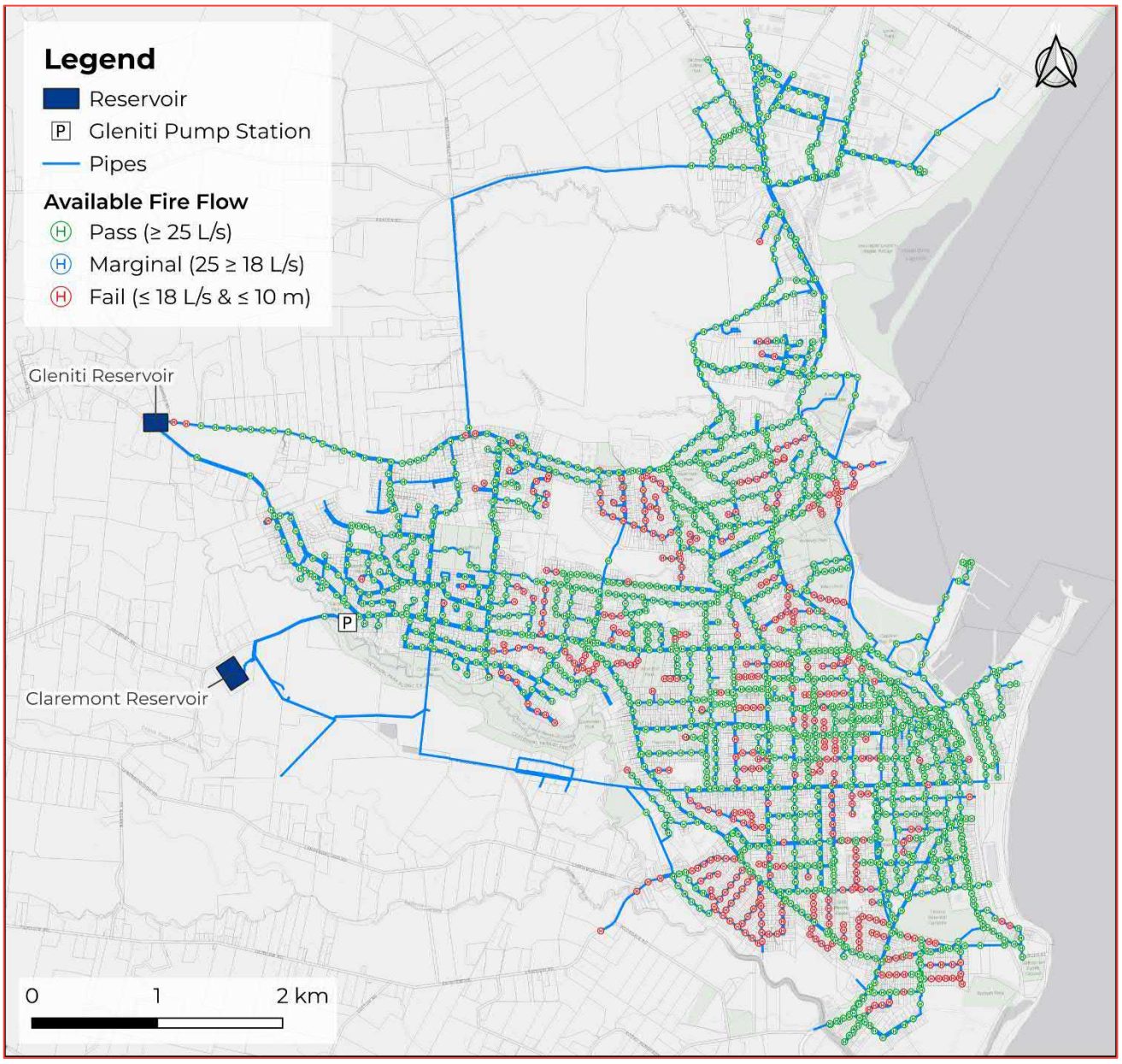


Figure 2: FW2 - base scenario

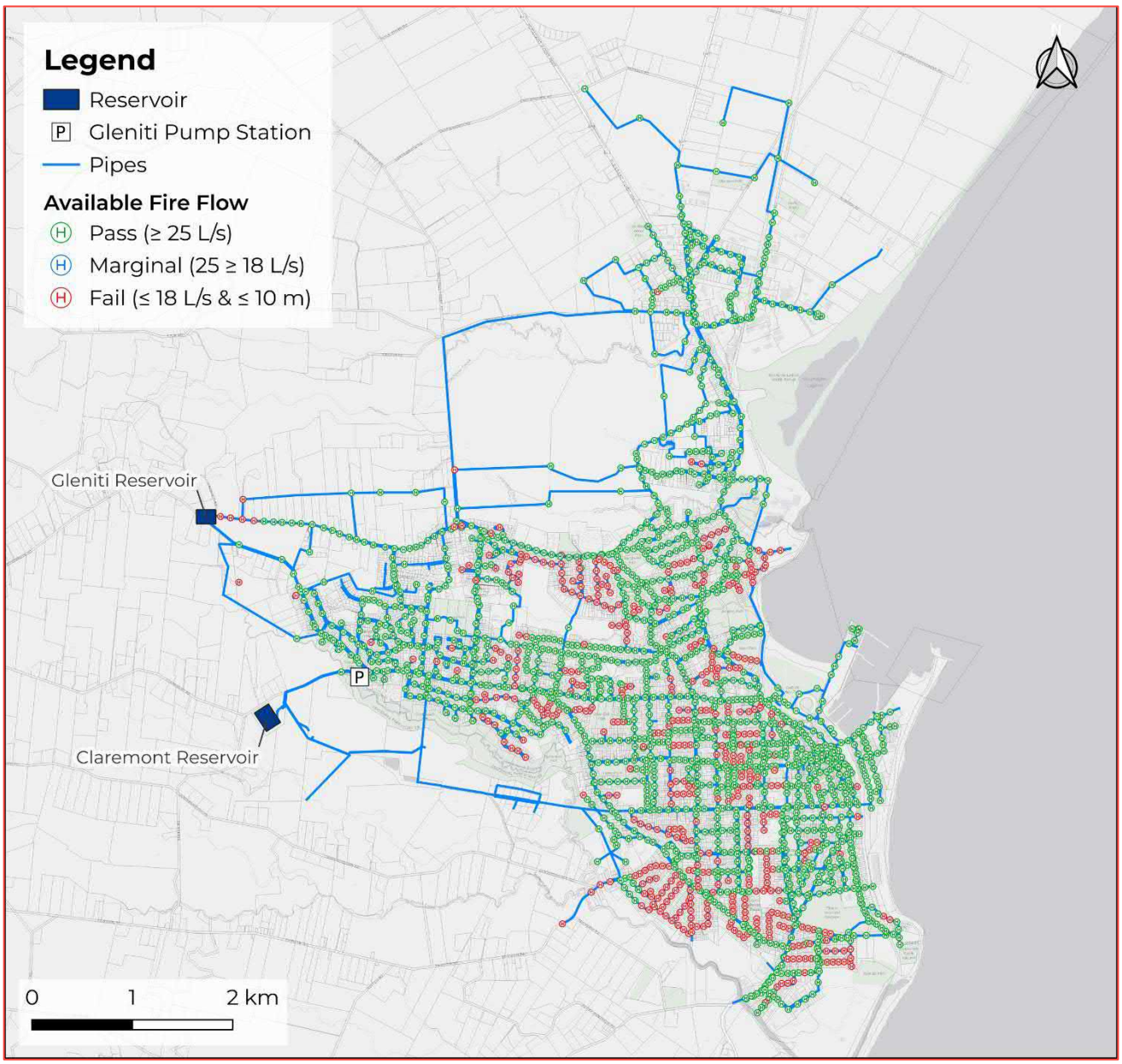


Figure 3: FW2 - ultimate scenario

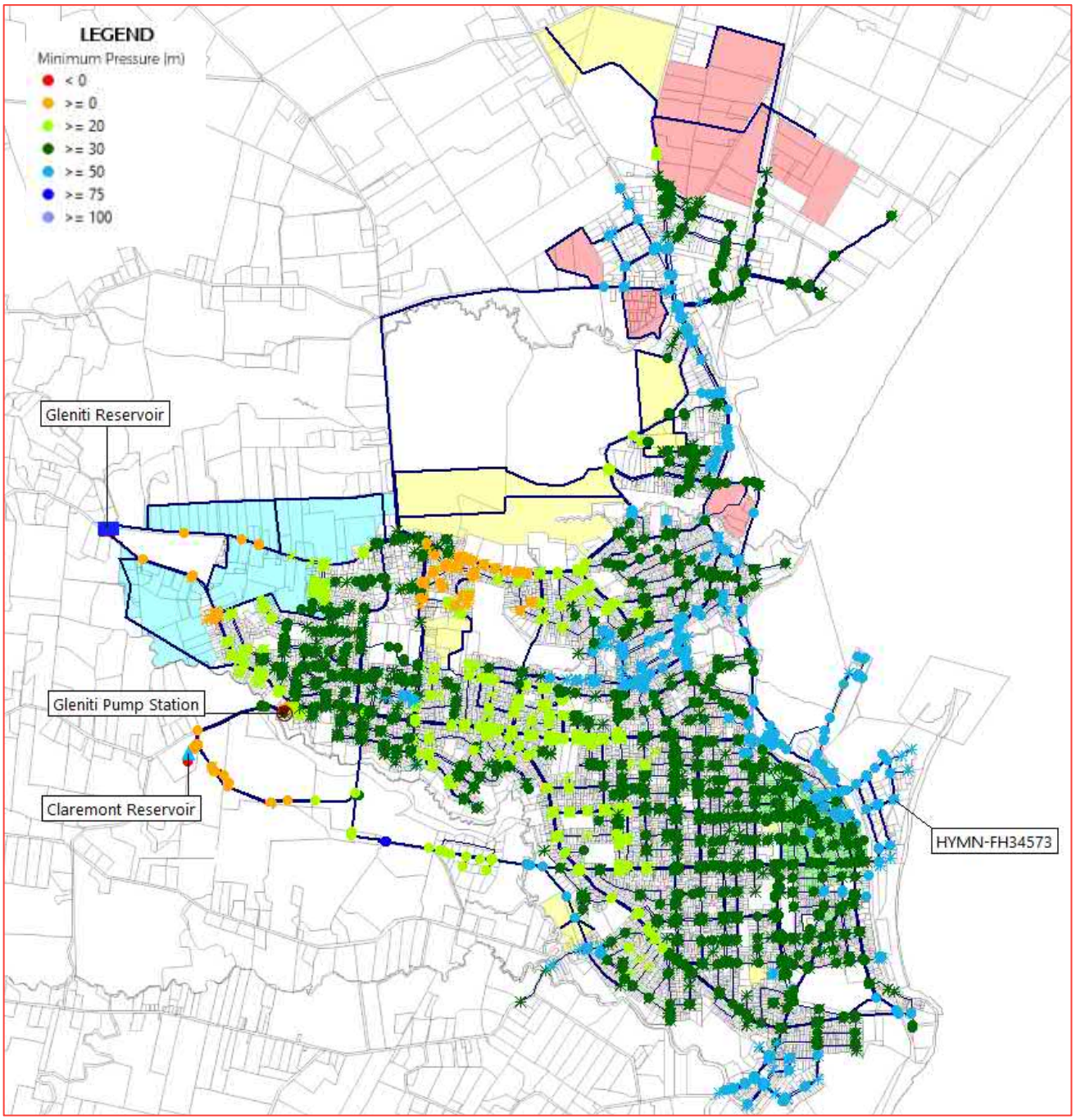


Figure 4: FW3 - ultimate scenario (CBD)

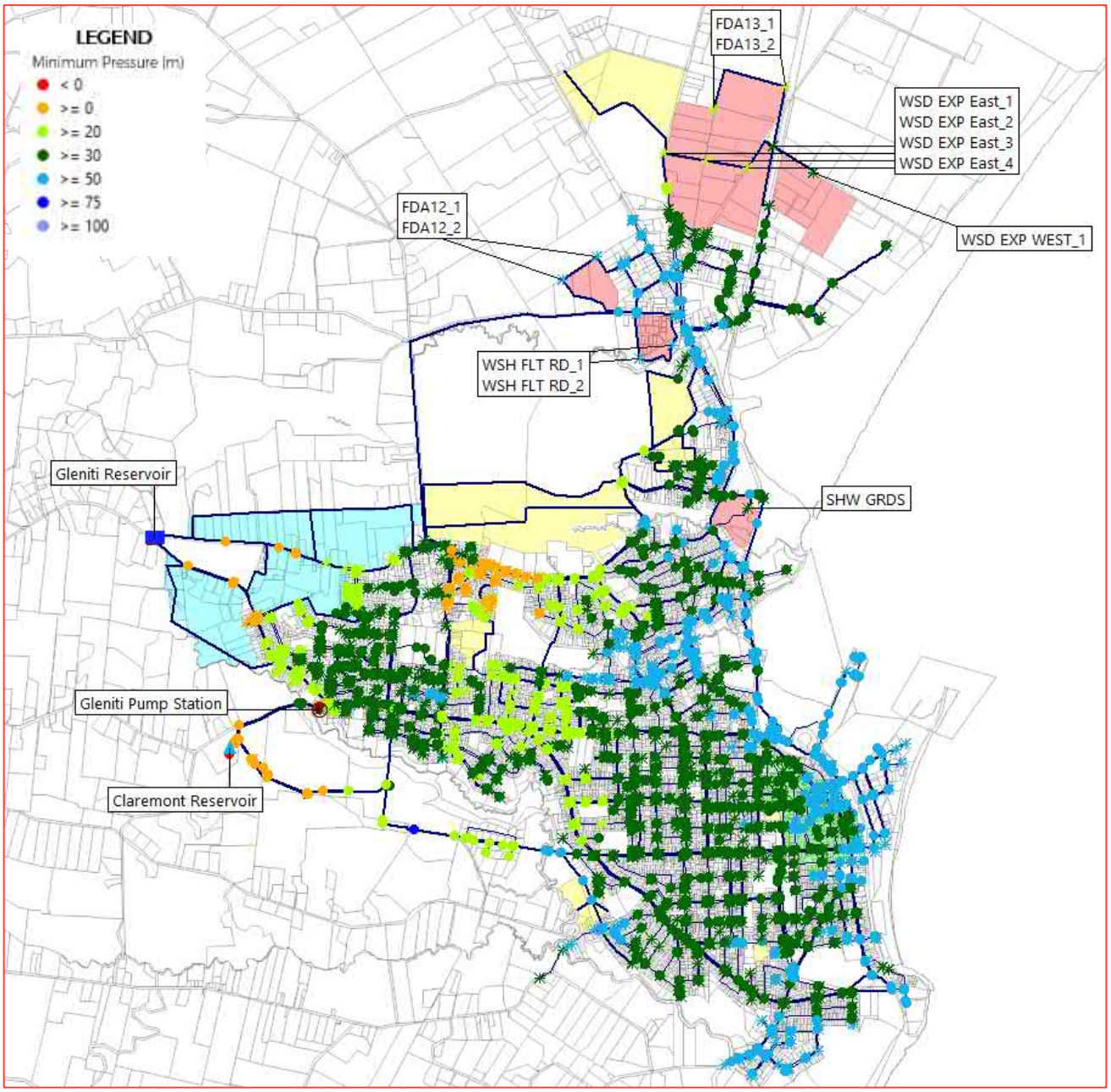
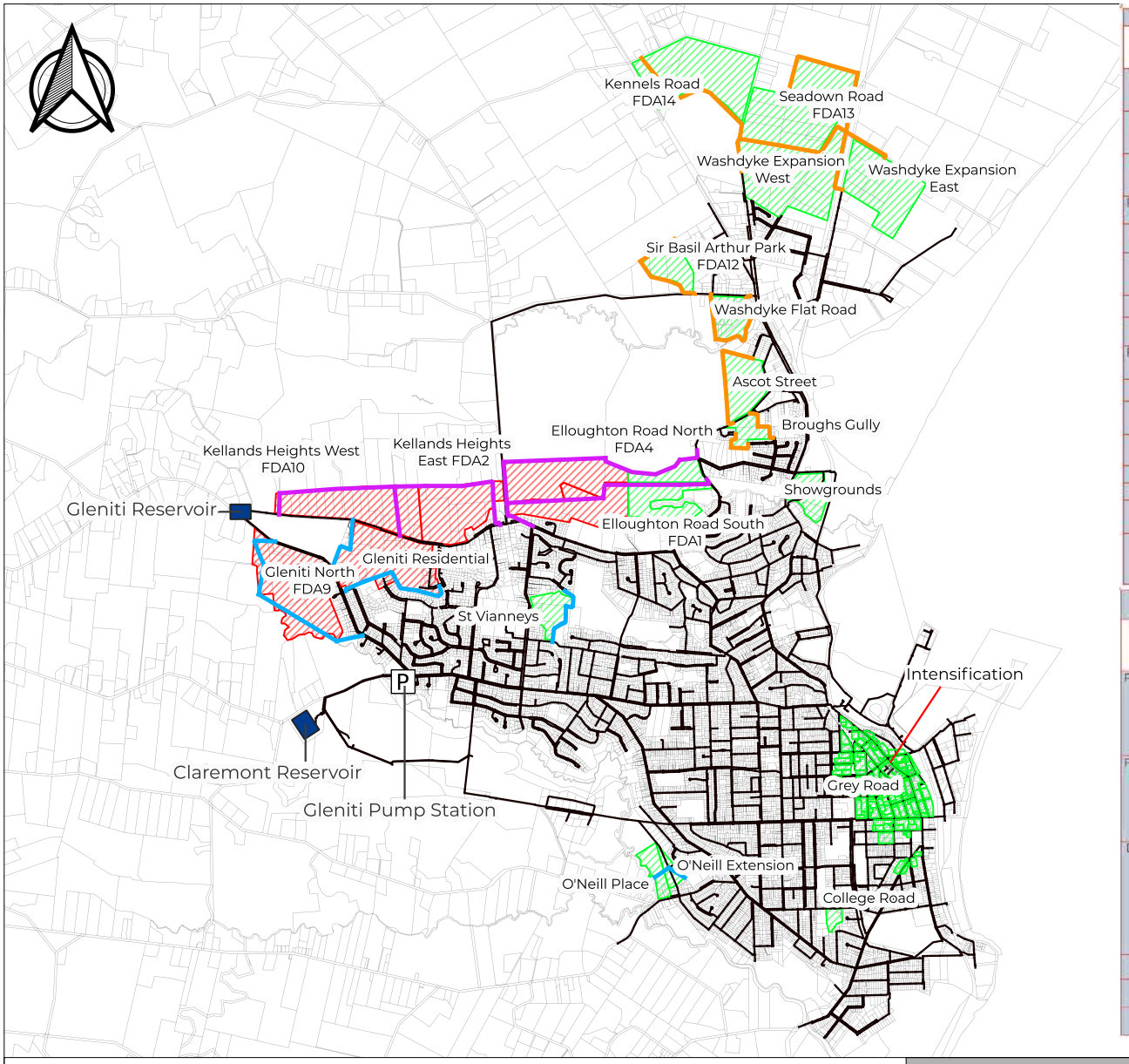


Figure 5: FW3 - ultimate scenario (Washdyke)

APPENDIX B – TIMARU PIPE UPGRADES

TABLE TO BE APPENDED ONCE TDC HAVE ADDED DATA

APPENDIX C – DEVELOPMENT PHASING



RESIDENTIAL						
REF	NAME	TYPE	NO. LOTS	AVG PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID & ELEVATION (M)
FDA1	Elloughton Road South	Future	598	6.7	16.5	FDA1_1 = 56 m FDA1_2 = 49 m FDA1_3 = 25 m
FDA2	Kellands Heights East	Future	440	4.9	12.1	FDA2_1 = 65 m FDA2_2 = 60 m FDA2_3 = 52 m
FDA4	Elloughton Road North	Future	542	6.1	14.9	FDA4_1 = 50 m FDA4_2 = 50 m FDA4_3 = 31 m
FDA14	Kennels Road	Future	646	7.2	17.8	FDA14_1 = 13 m FDA14_2 = 16 m
DEV1	Broughs Gully	Confirmed	200	2.2	5.5	DEV1_1 = 21 m DEV1_2 = 30 m
DEV2	Gleniti Residential	Consented	700	9.5	23.0	DEV2_1 = 81 m DEV2_2 = 79 m DEV2_3 = 63 m
RURAL RESIDENTIAL						
FDA9	Gleniti North	Future	102	1.4	3.4	FDA9_1 = 90 m FDA9_2 = 58 m
FDA10	Kellands Heights West	Future	88	1.2	2.9	FDA10_1 = 90 m FDA10_2 = 70 m
COMMITED DEVELOPMENT - RESIDENTIAL						
iii	Ascot Street	Rural Residential	160	1.8	2.1	ASC ST = 12 m
iv	St Vianneys	Residential	92	1.0	1.2	St. Viny_1 = 23 m St. Viny_2 = 36 m
v	Grey Road	Residential	48	0.5	0.6	CHPL-FH34790 = 19 m
vi	O'Neill Place	Residential	84	0.9	1.1	O'Neil = 8 m
vii	O'Neill Place Extension	Residential	48	0.5	0.6	O'Neil Ext = 25 m
viii	College Road	Medium Density Residential	45	0.5	0.6	COLG-FH34931 = 12 m

COMMERCIAL							
REF	NAME	TYPE	AREA (Ha)	USE	AV. PDD (L/s)	PEAK DEMAND (L/s)	GROWTH NODE ID & ELEVATION (m)
FDA12	Sir Basil Arthur Park	Future	13.3	Light, with potential for wet industries (Medium used)	6	13	FDA12_1 = 10 m FDA12_2 = 8 m
FDA13	Seadown Road	Future	61.0	Light, w potential for wet industries (Medium used)	26	59	FDA13_1 = 11 m FDA13_2 = 9 m
DEV3	Washdyke Expansion	Confirmed	56.1	East – heavy industry	44	101	WSD EXP East_1 = 11 m WSD EXP East_2 = 10 m WSD EXP East_3 = 9 m WSD EXP East_4 = 8 m
			36.7	West – light industry only	9	20	WSH EXP WEST_1 = 6 m
COMMITTED - COMMERCIAL							
i	Washdyke Flat Road	Committed	12.5	Light Industrial	3.0	6.9	WSH FLT RD_1 = 5 m WSH FLT RD_2 = 2 m
ii	Showgrounds	Committed	12.1	Light Industrial	9.4	21.6	SHW GRDS = 10 m

Existing Pipes

No Capacity for Growth

Full Capacity for Growth

Growth Pipes

DN180 PE100 PN12.5

DN200 PE100 PN12.5

DN400 PE100 PN12.5

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Christchurch
8140
New Zealand

PROJECT

Timaru District Council
2 King George Place, Timaru, 7910
Timaru and Temuka Growth Assessment

SHEET

Timaru Development Phasing Centre

DRAWN	APPROVED			
J. Simpson	G. Cooper			
SHEET NUMBER	SCALE	PROJECT NUMBER	REVISION DATE	REVISION
1 of 1	1:62,000	3-C2419.20	18/12/2023	R0

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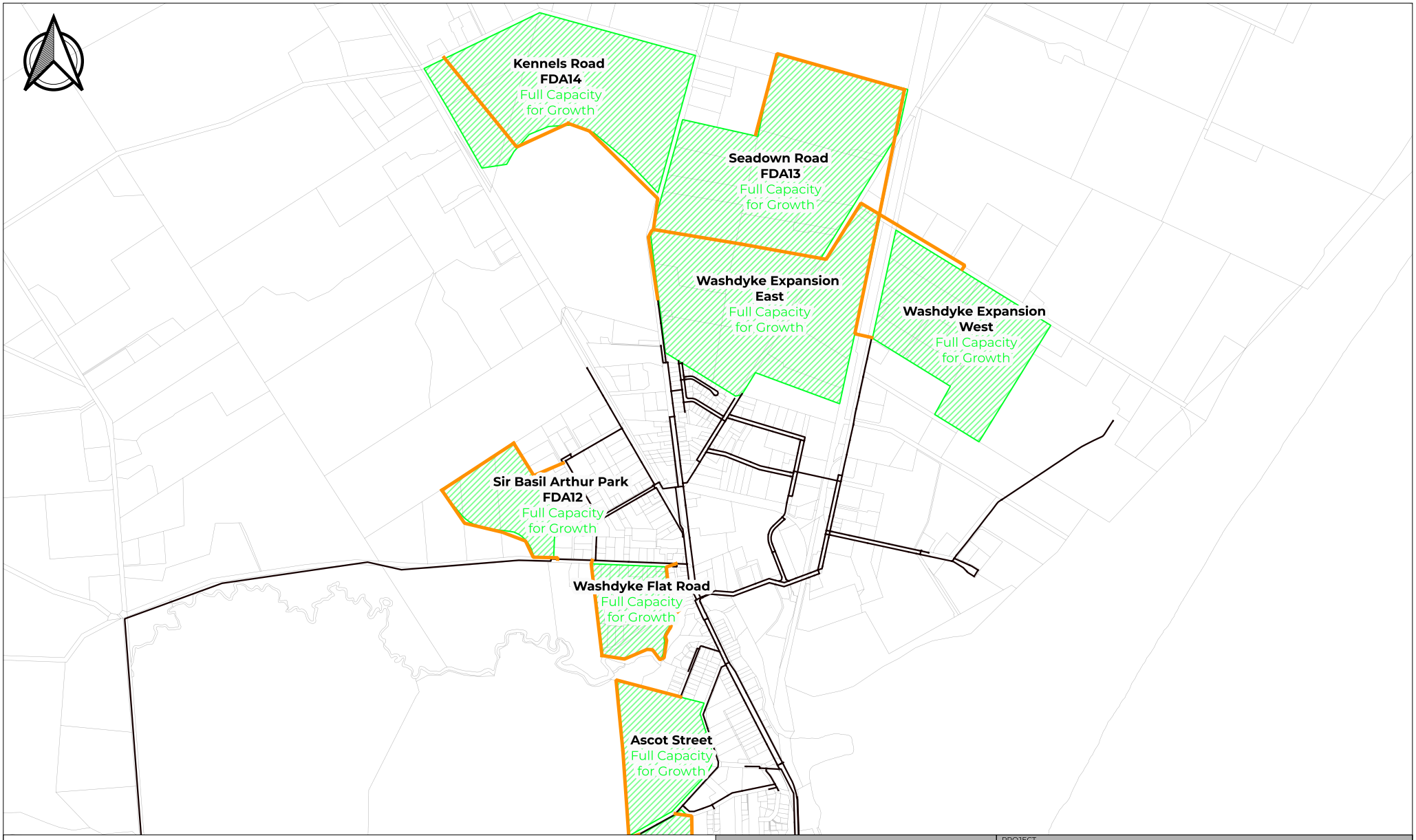

Existing Pipes

Full Capacity for Growth

Growth Pipes

DN400 PE100 PN12.5

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New Zealand

DRAWN	APPROVED
J. Simpson	G. Cooper
SHEET NUMBER	SCALE
1 of 1	1:23,000

PROJECT

Timaru District Council
2 King George Place, Timaru, 7910
Timaru and Temuka Growth Assessment

SHEET

Timaru Development Phasing North

PROJECT NUMBER	REVISION DATE	REVISION
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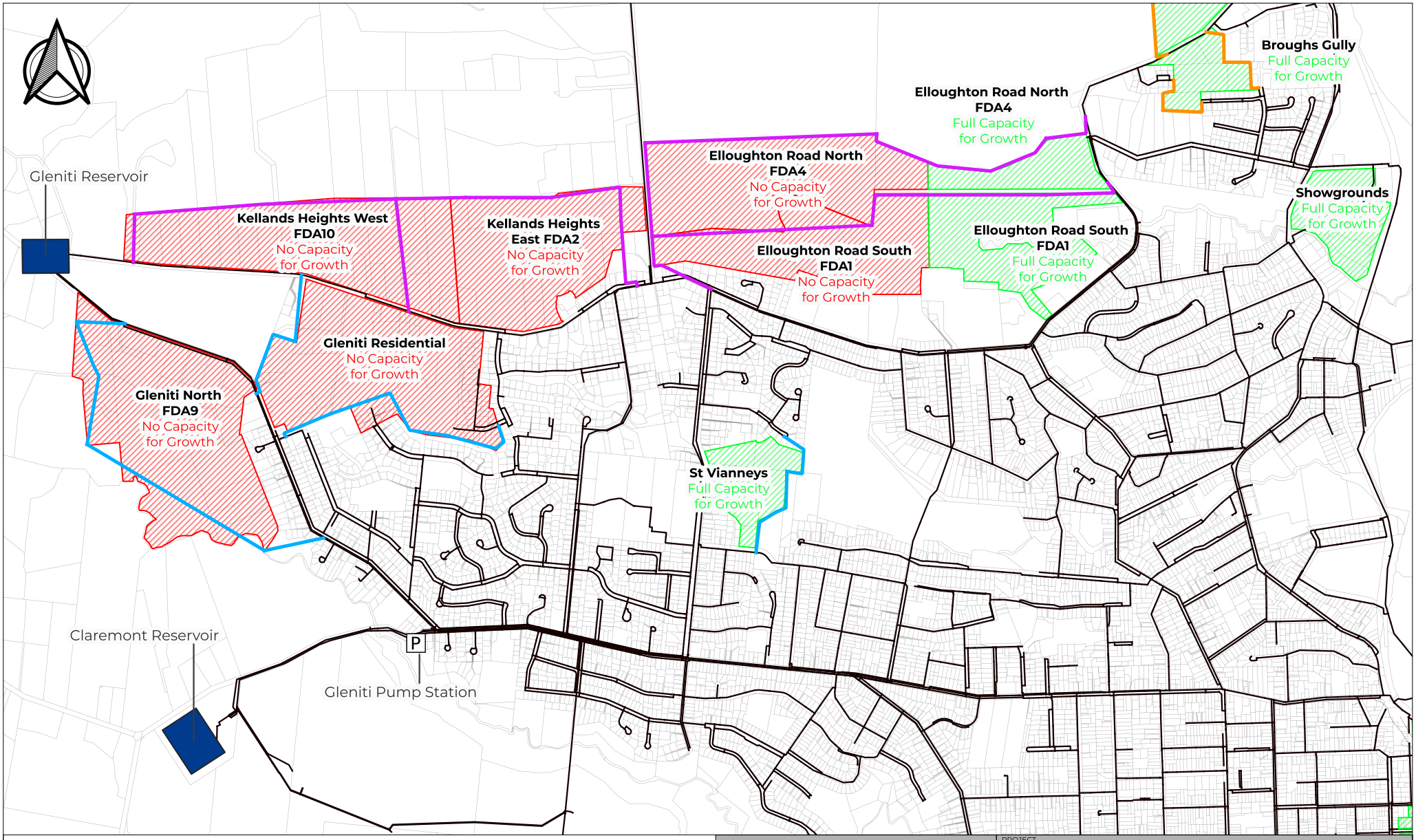

Existing Pipes
No Capacity for Growth
Full Capacity for Growth

Growth Pipes
DN180 PE100 PN12.5
DN200 PE100 PN12.5
DN400 PE100 PN12.5

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PROJECT	
Timaru District Council 2 King George Place, Timaru, 7910 Timaru and Temuka Growth Assessment	
SHEET	
Timaru Development Phasing Centre	

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SHEET NUMBER	SCALE	PROJECT NUMBER	REVISION DATE	REVISION
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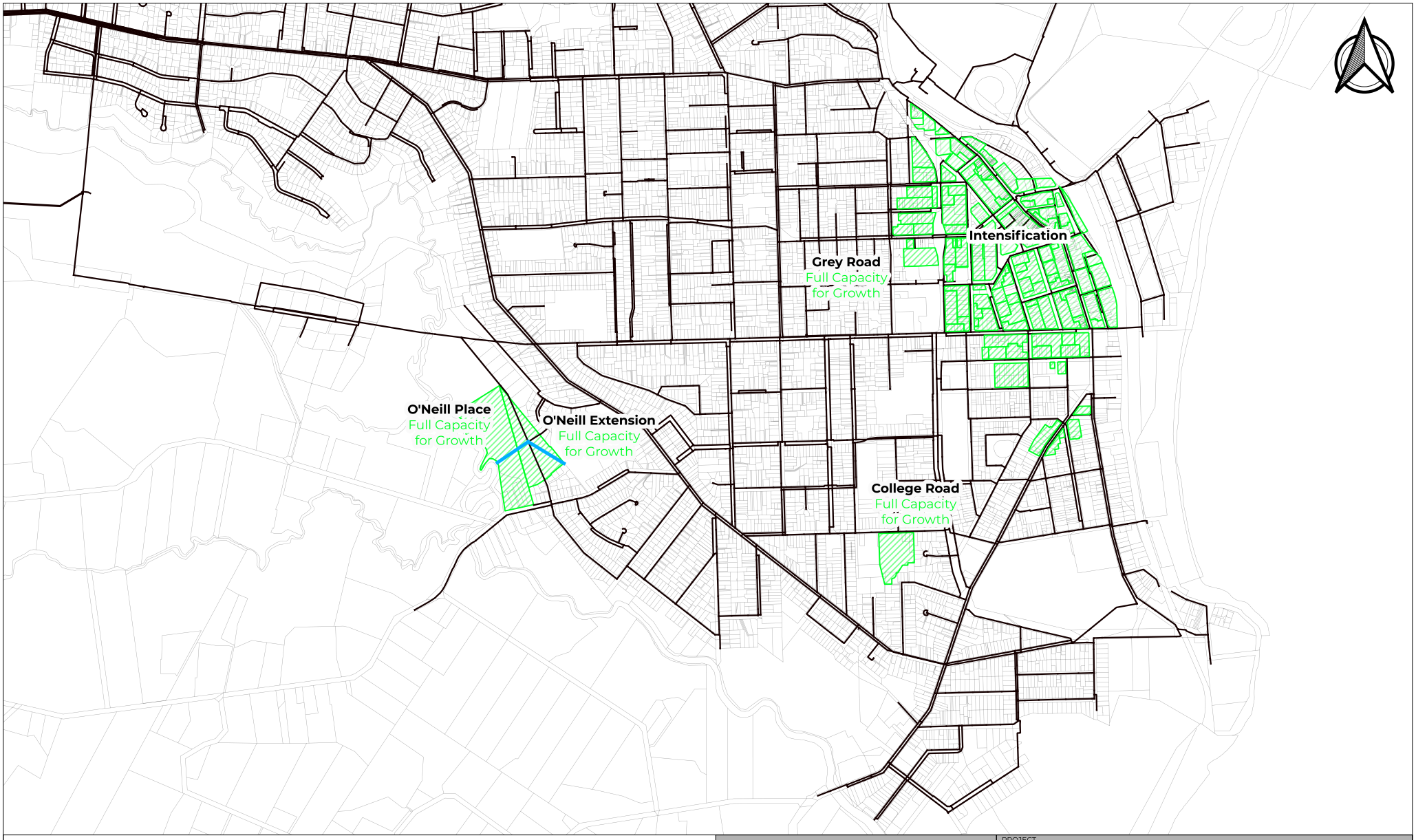

Existing Pipes

Full Capacity for Growth

Growth Pipes

DN180 PE100 PN12.5

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PROJECT

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2 King George Place, Timaru, 7910
Timaru and Temuka Growth Assessment

SHEET

Timaru Development Phasing South

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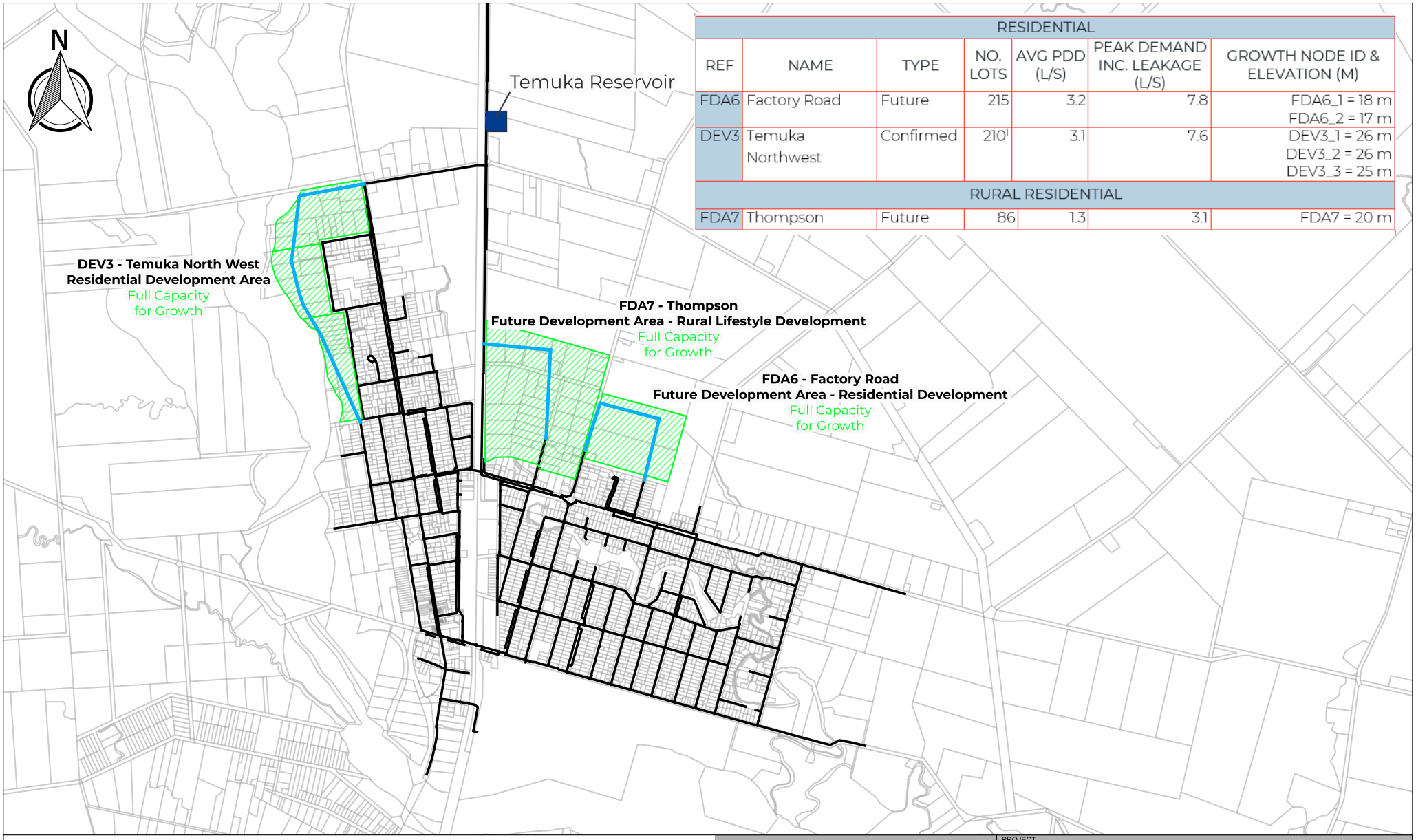

RESIDENTIAL						
REF	NAME	TYPE	NO. LOTS	AVG PDD (L/S)	PEAK DEMAND INC. LEAKAGE (L/S)	GROWTH NODE ID & ELEVATION (M)
FDA6	Factory Road	Future	215	3.2	7.8	FDA6_1 = 18 m FDA6_2 = 17 m
DEV3	Temuka Northwest	Confirmed	210[1]	3.1	7.6	DEV3_1 = 26 m DEV3_2 = 26 m DEV3_3 = 25 m
RURAL RESIDENTIAL						
FDA7	Thompson	Future	86	1.3	3.1	FDA7 = 20 m

Existing Pipes
Full Capacity for Growth
Growth Pipes
DN160 PE100 PN12.5

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PROJECT
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Timaru & Temuka Growth Capacity Assessment

SHEET
Temuka Development Phasing

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J. Simpson	G. Cooper			
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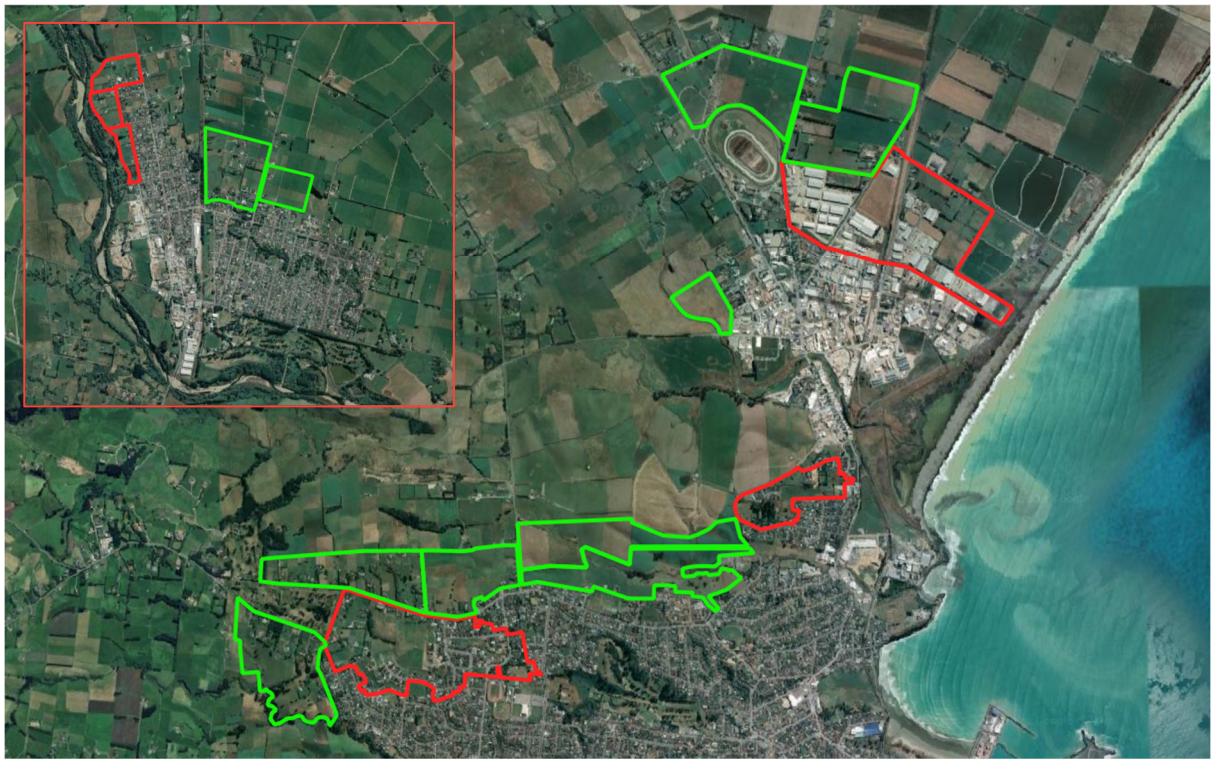
Timaru District Council

TIMARU AND TEMUKA GROWTH CAPACITY ASSESSMENT

WASTEWATER

10 NOVEMBER 2023

CONFIDENTIAL



TIMARU AND TEMUKA GROWTH CAPACITY ASSESSMENT
WASTEWATER

Timaru District Council

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ABBREVIATIONS

ARI	Annual Recurrence Interval
CCZ	City Centre Zone
DWF	Dry Weather Flow
FDA	Future Development Area
GRZ	General Residential Zone
MRZ	Medium Density Residential Zone
MUZ	Mixed Use Zone
PWWF	Peak Wet Weather Flow
WWF	Wet Weather Flow
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

Timaru District Council (Council) wish to quantify the impacts of their proposed future growth areas within Timaru and Temuka on the existing wastewater networks. Additionally, Council wants to identify locations on the wastewater network that have insufficient capacity for the proposed future flows and will require upgrading.

Growth scenarios for the Timaru and Temuka models were created with the growth cells identified by Council added. These growth scenarios were compared to the base model using critical duration 5-year average recurrence interval (ARI) design storms (24-hours for Temuka, and both 1-hour and 24-hours for Timaru).

To assess what upgrades would be required for there to be sufficient growth capacity, copies of the growth scenarios were created for optioneering. Pipes and pump stations were upsized to fulfil the following criteria:

— Removal of overflows caused by growth.

— Manholes downstream of growth need a freeboard of at least 0.5 m, unless impossible due to ground cover issues and the pipe is not surcharged.

— Upgraded pipes do not surcharge, with the maximum water depth less than 70% of the diameter.

From this assessment, it was predicted that significant upgrades to the pipe networks in both Timaru and Temuka are required before most growth can occur. Additionally, several pump station upgrades are also recommended – one in Temuka (Princes Street) and three in Timaru (Queen, Ashbury Park, and Kensington). However, it is also predicted that there is sufficient existing capacity for several growth areas to go ahead without upgrades required in Timaru – primarily in the northern suburbs. For the upgrade and phasing overview results refer to Appendix B and F.

In Ashbury Park in Timaru several manhole overflows are caused by backwater from the trunk main that cannot be resolved by pipes upgrades; hence it is recommended that these manholes are sealed and the addition of another pump station in Ashbury Park is investigated.

This assessment provides an initial indication of capacity for growth and potential pipe upgrades. However, we recommend further master planning and optioneering of upgrade options is undertaken to optimise the long-term plan for wastewater infrastructure in the Timaru district.

1 PROJECT BACKGROUND

WSP was approached by Council to provide engineering services to quantify the impact of proposed future growth areas in Timaru and Temuka. The proposed growth was comprised of committed developments, consented developments, Future Development Areas (FDA) and infill development.

2 FUTURE GROWTH

This section provides details of the development areas identified for inclusion in the growth assessment.

2.1 RESIDENTIAL / URBAN DEVELOPMENT

Eight areas (six in Timaru, two in Temuka) of proposed residential growth were added to the growth scenarios. These are summarised in Table 2-1, and shown in Figure 2-1.

Table 2-1: Residential Growth Areas

TOWN	REF	NAME	TYPE	AREA (ha)	NO. OF LOTS	MODELLED POPULATION	MODELLED DISCHARGE POINT
Timaru	FDA1	Elloughton Road South	Future	49.8	598	1374	OLDN-MH02421
	FDA2	Kellands Heights East	Future	36.7	440	1013	PAGE-MH03250
	FDA4	Elloughton Road North	Future	45.2	542	1248	JELL-MH02559
	FDA14	Kennels Road	Future	53.8	646	1485	MRTN-MH02701
	DEV1	Broughs Gully	Confirmed	28.2	200[1]	460	MAHH-MH03907
	DEV2	Gleniti Residential	Consented	96.3	700[1]	1610	DOBS-FN03969
Temuka	FDA6	Factory Road	Future	17.9	215	494	FACT-MH05302
	DEV3	Temuka Northwest	Confirmed	31.5	210[1]	483	GRNT-MH05223

[1] Lot numbers provided by Council (growth meeting 3rd August 2023)

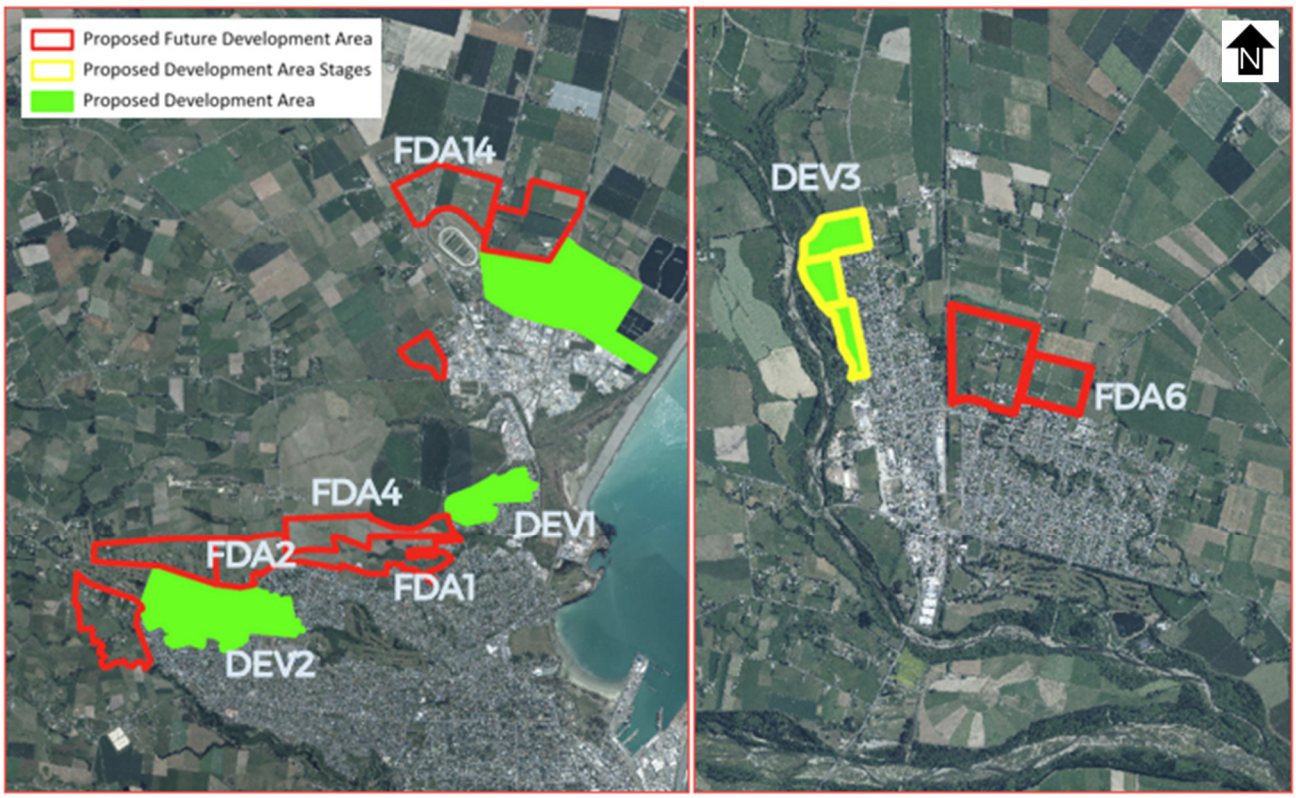


Figure 2-1: Residential Growth Areas.

2.2 RURAL RESIDENTIAL DEVELOPMENT

Three areas (two in Timaru and one in Temuka) of proposed rural residential growth were added to the growth scenarios. These are summarised in Table 2-2, and shown and labelled in Figure 2-2.

Table 2-2: Rural Residential Growth Areas

TOWN	REF	NAME	TYPE	AREA (ha)	NO. OF LOTS	MODELLED POPULATION	MODELLED DISCHARGE POINT
Timaru	FDA9	Gleniti North	Future	51.2	102	236	GLIT-MH01382
	FDA10	Kellands Heights West	Future	44.1	88	203	PAGE-MH03250
Temuka	FDA7	Thompson	Future	42.9	86	197	MCNR-MH05300

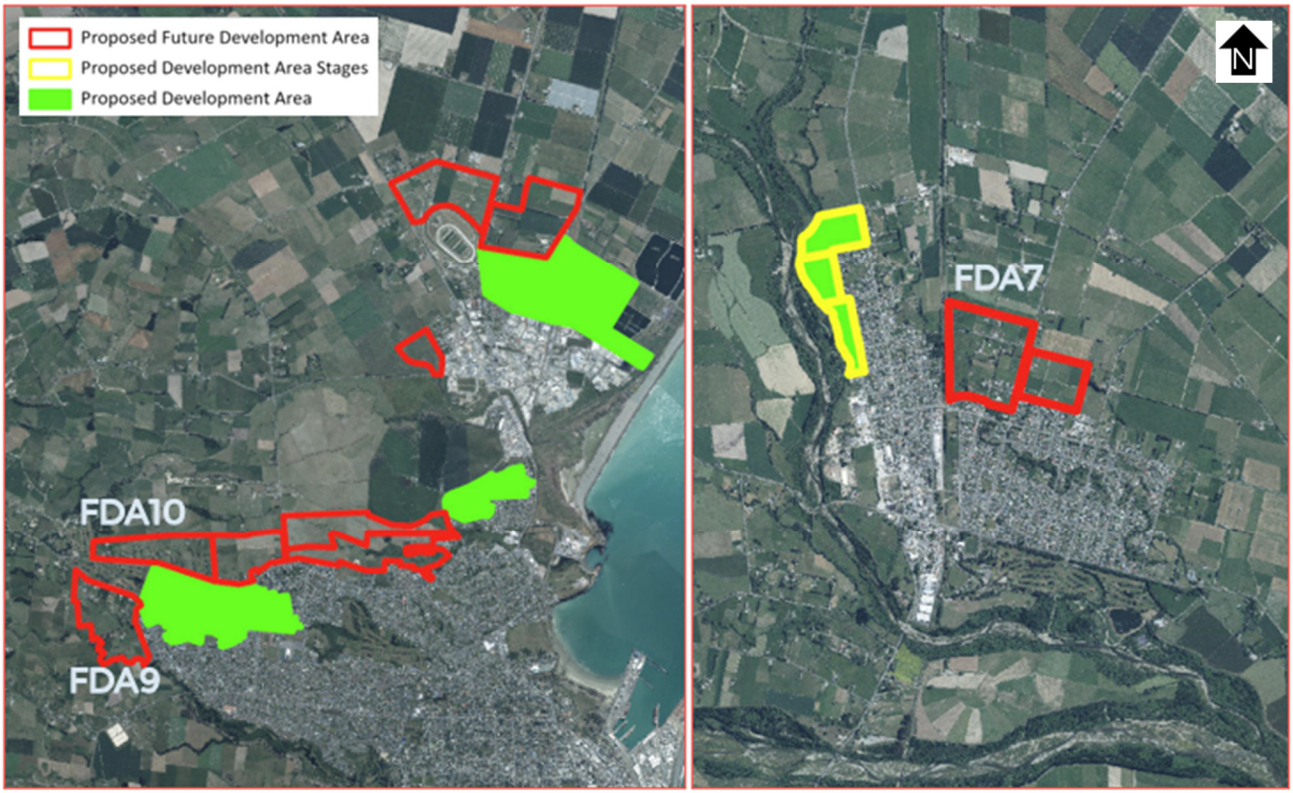


Figure 2-2: Rural Residential Growth Areas

2.3 COMMERCIAL DEVELOPMENT

Three areas (all in Timaru) of proposed commercial growth were added to the growth scenario. Modelled trade flows have been generated using Table 5.1 of NZS4404:2010. An estimated building footprint of 60%[2] of the total development area has been used, as there is no specific guidance within Council's District Plan. The commercial areas are summarised in Table 2-3, and shown and labelled in Figure 2-3.

Table 2-3: Commercial Development

REF	NAME	TYPE	AREA (ha)	USE	TRADE FLOW (L/S)	MODELLED DISCHARGE POINT/S
FDA12	Sir Basil Arthur Park	Future	13.3	Light, with potential for wet industries (Medium flow values used)	6	WASF-MH02678
FDA13	Seadown Road	Future	61.0	Light, with potential for wet industries (Medium flow values used)	26	HLTN-MH02720

[2] Source: xlstructural.co.nz

REF	NAME	TYPE	AREA (ha)	USE	TRADE FLOW (L/S)	MODELLED DISCHARGE POINT/S
DEV3	Washdyke Expansion	Confirmed	56.1 36.7	East – heavy industry West – light industry only	44 9	MEAD-MH03866 MEAD-MH03865

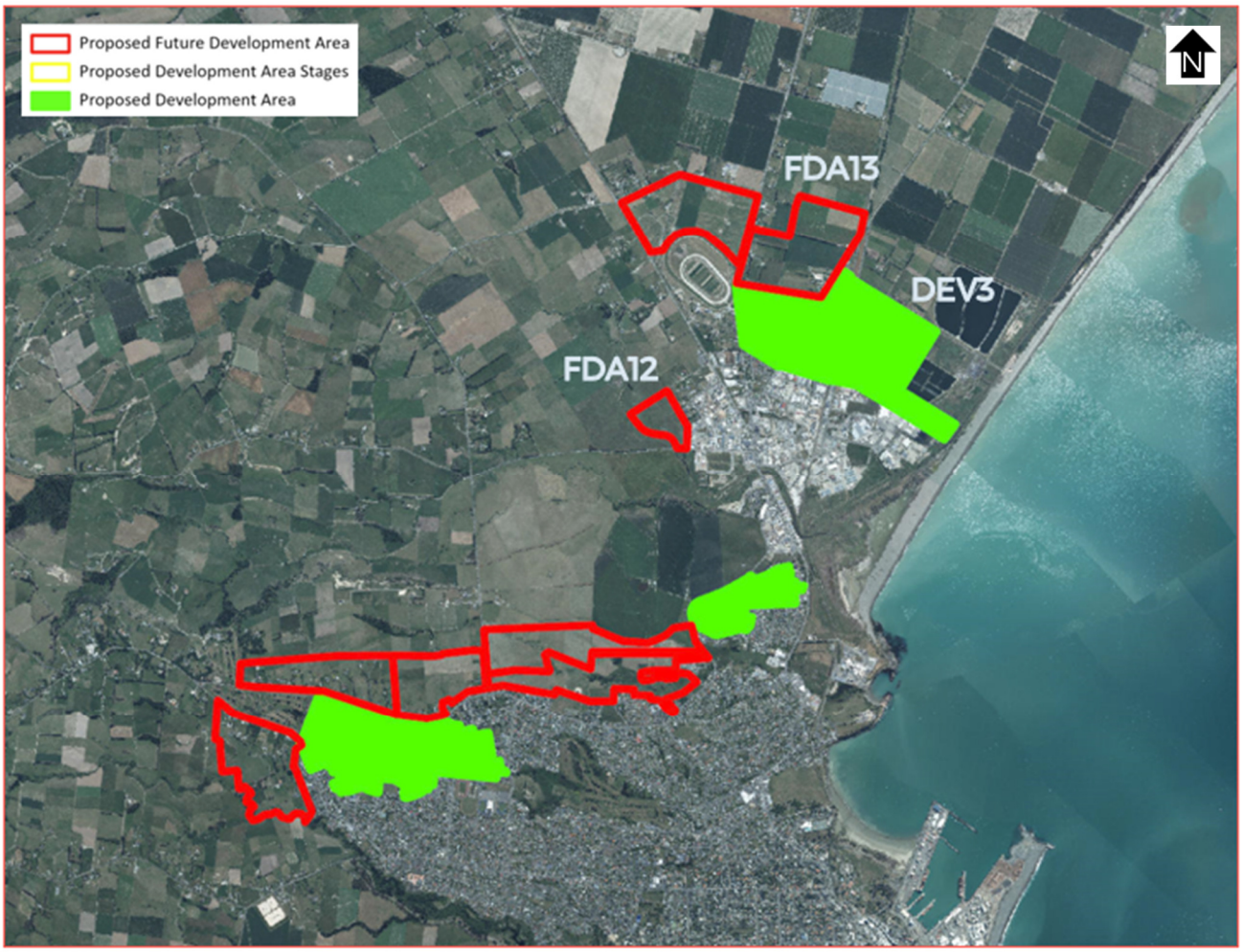


Figure 2-3: Commercial Development

2.4 COMMITTED DEVELOPMENT

A number of sites in Timaru have either already been granted consent or are under construction, but are not yet included within the model. These were added to the growth scenario. As for the future commercial development, modelled trade flows have been generated using NZS4404:2010, assuming a building footprint of 60% of the total development area. For the Showgrounds development we have used the Timaru District Plan commercial design flows (1.37 l/s/ha) over the retail/commercial lot areas of Stage 1 and 2 (5.98 ha).

Committed developments are summarised in Table 2-4, and shown and labelled in Figure 2-4.

Table 2-4: Committed Development

REF	NAME	TYPE	AREA (ha)	TRADE FLOW (L/S)	NO. OF LOTS	MODELLED POPULATION	MODELLED DISCHARGE POINT
i	Washdyke Flat Road	Light Industrial	12.5	3	-	-	WASF-MH02680
ii	Showgrounds	Commercial	12.1	8			EVAN-MH02566
iii	Ascot Street	Rural Residential	19.2	-	160[3]	368	HLTN-MH02645
iv	St. Vianneys	Residential	10.7	-	92	212	DOUG-MH01953
v	Grey Road	Residential	1.4	-	48	110	THEO-MH00970
vi	O'Neill Place	Residential	4	-	84	193	CNOR-MH00209
vii	O'Neill Place Extension	Residential	7	-	48	110	WATL-MH00232
viii	College Road	Medium Density Residential	2.5	-	45	104	COLG-MH03006

[3] Assuming 1,200m² sections (growth meeting 3rd August 2023)

Figure 2-4: Committed Development

No unmodelled committed developments were identified in Temuka.

2.5 INTENSIFICATION

Intensification has been included within areas zoned as Medium Density Residential (MRZ), City Centre (CCZ) and Mixed Use (MUZ).

Existing subcatchments within MRZ areas in Timaru were updated with a population equal to 41.4 per hectare. This is based on Council's preferred density of 18 lots per hectare within the MRZ and 2.3 people per lot. Figure 2-5 shows the residential zones across Timaru based on the 2022 District Plan.

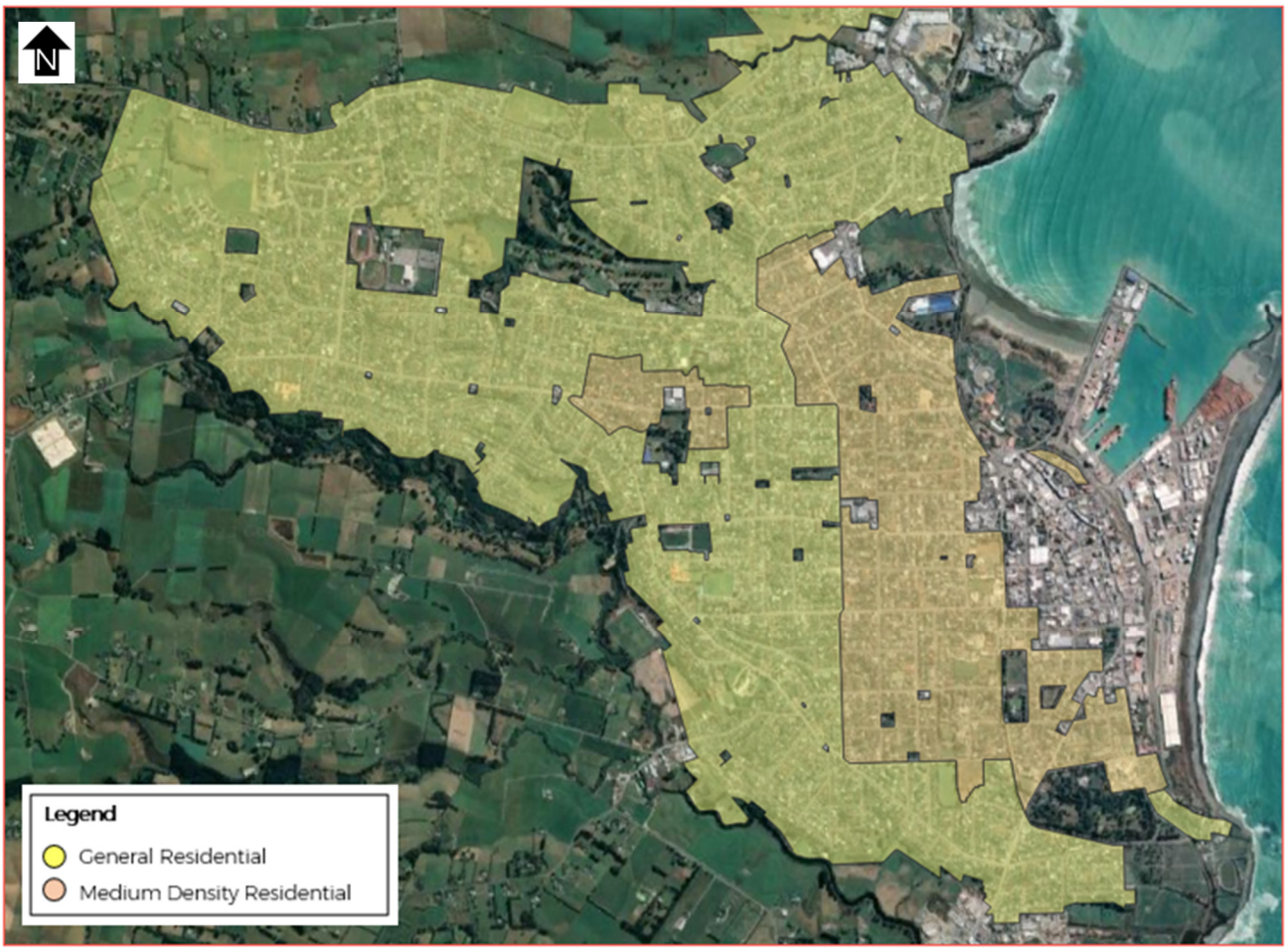


Figure 2-5: District Plan 2022 Residential Zones in Timaru

Where an existing subcatchment already had a higher current modelled population, no change was made.

Council provided an estimate of 160 households to be accounted for within the Timaru CBD in areas zoned as CCZ or MUZ. This equates to an additional population of 368. This has been distributed across the subcatchments in these zones, on an area weighted basis. Figure 2-6 shows the extent of these zones in Timaru.

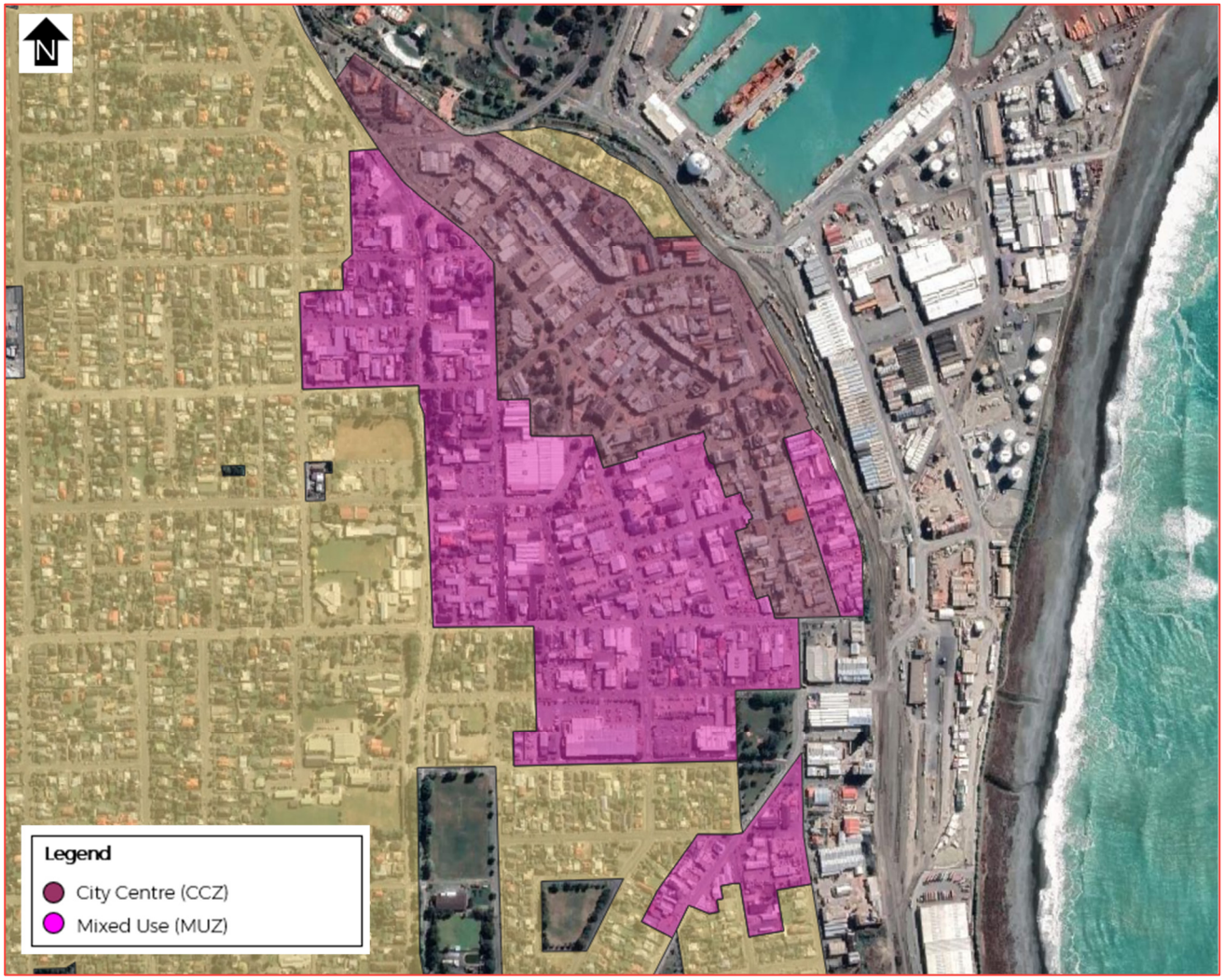


Figure 2-6: District Plan 2022 CBD Zones

As there are no areas zoned MRZ, CCZ or MUZ in Temuka, intensification has not been accounted for in the Temuka growth model.

3 ASSUMPTIONS MADE

3.1 GENERAL

1. The Timaru wastewater model, modelled in InfoWorks ICM 2023.0.1, will be used for the Timaru assessment, and is described in the ***Timaru Wastewater Model: Model Build, Calibration, and System Performance Report*** (WSP, October 2021).
2. The Inland Towns wastewater model, modelled in InfoWorks ICM 2023.0.1, will be used for the Temuka assessment, and is described in the ***Inland Towns Wastewater Model: Model Build, Calibration, and System Performance Report*** (WSP, December 2021).
3. These reports contain assumptions and limitations that apply to this project. The key assumptions and limitations from these are listed below (note that these are not all the assumptions, just key assumptions relevant to this assessment):
    i. Baseflow is assumed to be constant, i.e. it does not vary seasonally with changes in the water table.
    ii. Model calibration was undertaken using data obtained from a short-term flow survey between April and September 2020. A good calibration was achieved.
    iii. Calibration parameters were averaged over the upstream monitored catchment; hence confidence is high at the flow monitoring location and decreases in the upstream branches. The model predictions of peak flows, depths, velocities, etc. are more accurate for the trunk sewer system and less accurate for pump stations that have small inflows and for the local reticulation in the upper sections of larger catchments. Therefore, consideration should be given as to the confidence in flows at the location of interest; generally, the further away from the flow monitor, the lower the confidence in the flow.
4. The climate change adjusted rainfall will be from ***High Intensity Rainfall Design for Timaru District*** (Timaru District Council, 23 April 2019). This is based on the now outdated 2008 Ministry for the Environment guidance, updated guidance was released in 2018 which may increase climate change rainfall based on the climate change scenario Council decide to use. **WSP recommend Council review the climate change adjusted design rainfall to ensure projects are future proofed**.

3.2 PROJECT SPECIFIC

1. Future developments were added to the model using new subcatchments assigned to assumed discharge locations.
2. Residential development was added using 12 lots per hectare (unless specific lot numbers were available). This is the minimum density suggested for new subdivisions on greenfield land (Planz Consultants, 2022).
3. Rural residential development was added using 2 lots per hectare. It has been assumed that all rural residential lots will be connected to the wastewater network, hence providing conservative flow estimations.

4 Intensification development was added to all existing subcatchments zoned as Medium Density Residential (MRZ), using 18 lots per hectare.

5 Populations will be set assuming 2.3 people per lot. The 2.3 people per lot was estimated using Figure 3-4 of ***Timaru District Council – Population and Household Projections 2013-2063*** (Jackson, August 2014).

6 Commercial / industrial developments were modelled using design flows as per NZS 4404:2010 – Land Development and Subdivision Infrastructure. Flows have been calculated using the assumption that the building footprint will be 60% of the total development area.

7 Flows assumption for the existing current catchment are as per the calibrated model, though the population may be increased in some areas, as listed above.

8 Inflow and infiltration (I&I) and baseflow have been set assuming the calibrated value for the current catchment i.e. assumes the future network will be as leaky as the current situation and no I&I reduction has been undertaken.

9 To better replicate the likely extent of impermeable area within residential development areas, subcatchment contributing areas were reduced based on their planning zone and appropriate Standard for coverage from the District Plan.

10 We have included the proposed Douglas Street Sewer Main Upgrade (Contract 2472 – Douglas Sewer Main Upgrade) in the ultimate growth model.

11 Other than the inclusion of the above discussed development flows, no other amendments have been made to the model.

12 For upgrades/upsizing we have only increase pipe sizes and pump discharge (if applicable), and the outfalls to the Timaru WWTP and Temuka oxidation ponds have been set to a free discharge.

4 MODELLING ASSESSMENT

4.1 METHODOLOGY

Using both the existing Timaru and Inland Towns wastewater models for this assessment, we undertook the following:

- Created a new growth scenario in the Timaru model and inclusion of development and planned growth using assumptions as detailed in Section 3.2.
- Added residential development and planned growth for Temuka to the existing Inland Towns Growth scenario using assumptions as detailed in Section 3.2.
- Ran the base and growth scenario models for the critical duration 1-hour (Timaru) and 24-hour (Temuka) 5-year ARI design rainfall events with climate change adjusted rainfall.
- Compared the base and growth scenario results to assess the impact of the development on pipe capacity during peak wet weather flow (PWWF).
- For Timaru only – assessed the performance of the trunk mains under growth conditions with a longer 24-hour storm event.

4.2 RESULTS

4.2.1 TIMARU

The assessment of the Ultimate Growth scenario has been undertaken across the whole of the Timaru City wastewater network.

Table 4-1 presents a comparison of the results for the two scenarios in terms of available network capacities. The numbers in brackets represent the percentage of the network. These results are displayed visually in Figure 4-2. For clarity, this figure shows the differences between the base and ultimate scenarios in terms of predicted flood volume. Further comparison figures are presented in Appendix A.

Table 4-1: Timaru Capacity Assessment Results

PEAK FLOW CRITERIA	BASE MODEL		ULTIMATE GROWTH SCENARIO	
	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)
Flow Depth < 50% of pipe diameter	1068 (49)	76445 (50)	991 (46)	71490 (47)
Flow Depth = 50 – <70% of pipe diameter	260 (12)	19985 (13)	248 (11)	19231 (13)
Flow Depth = 70 – <100% of pipe diameter	162 (7)	11985 (8)	152 (7)	11069 (7)
Pipe surcharged by backwater condition (Slope HGL < pipe grade)	435 (20)	28313 (19)	479 (22)	30952 (20)
Pipe surcharged due to limited capacity (Slope HGL < pipe grade)	244 (11)	15286 (10)	299 (14)	19273 (13)
	NO. OF OVERFLOWS (%)	VOLUME OF OVERFLOWS (m^3)	NO. OF OVERFLOWS (%)	VOLUME OF OVERFLOWS (m^3)
Constructed Overflows	2 (22)	10	2 (22)	15
Manhole Overflows	30 (2)	583	39 (2)	3904

As expected, the predicted increases in surcharge and manhole overflows are downstream of the growth areas. This is particularly apparent with the addition of six new manhole overflows in Washdyke.

The new constructed overflow predicted to spill in the growth scenario is at Ashbury Pump Station.

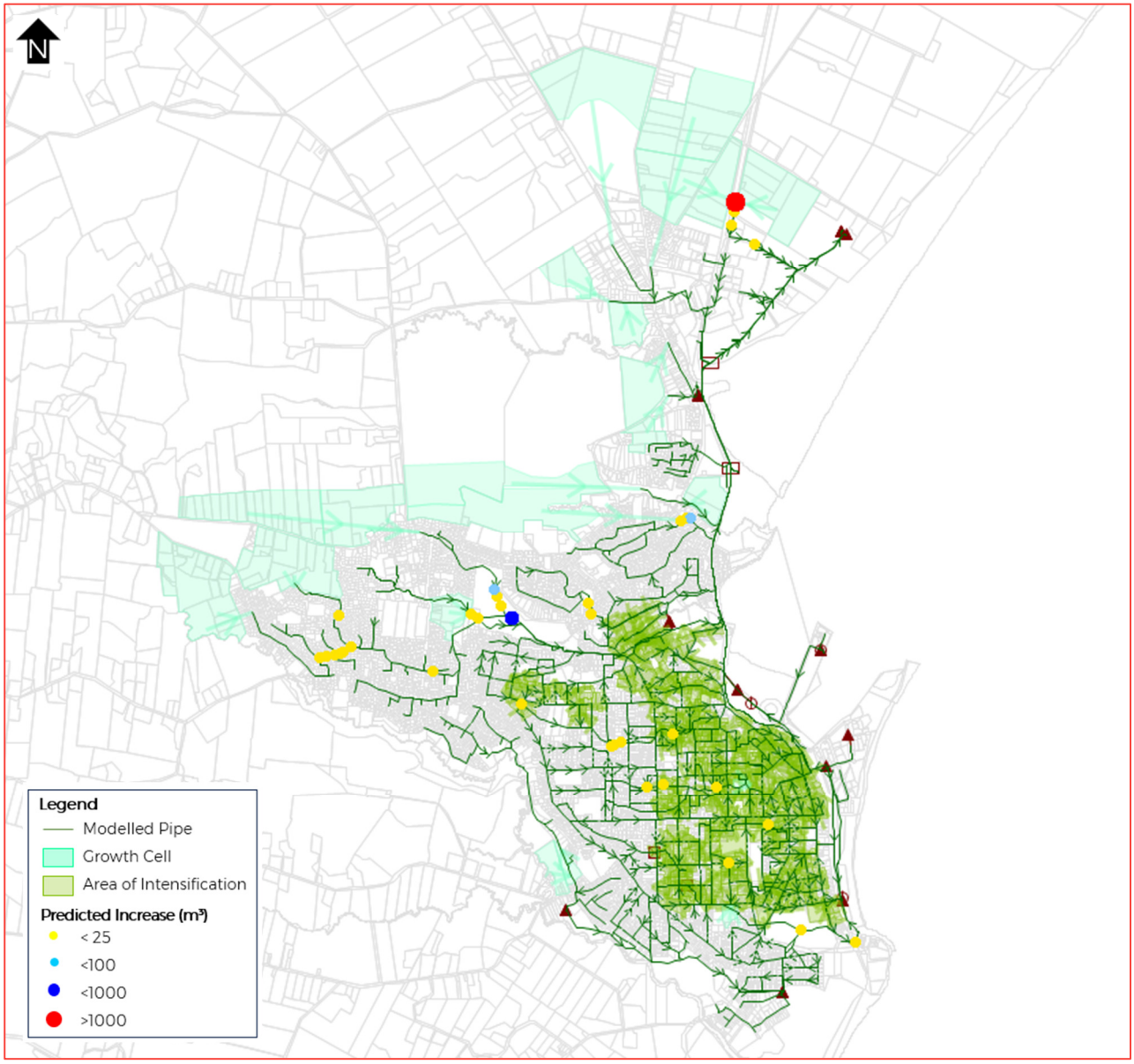


Figure 4-1: Comparison of Predicted Manhole Overflow Flood Volume

A secondary check to identify any potential negative impacts on the two trunk mains has also been carried out for Timaru using a longer 24-hour event. Capacity results for this assessment are presented in Table 4-2.

Table 4-2: Timaru Capacity Assessment Results – 24-hour Event

PEAK FLOW CRITERIA	BASE MODEL		ULTIMATE GROWTH SCENARIO	
	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)
Flow Depth < 50% of pipe diameter	1298 (60)	93250 (61)	1227 (57)	87877 (58)
Flow Depth = 50 – <70% of pipe diameter	215 (10)	15827 (10)	216 (10)	15922 (10)
Flow Depth = 70 – <100% of pipe diameter	120 (6)	8945 (6)	120 (6)	9803 (6)

PEAK FLOW CRITERIA	BASE MODEL		ULTIMATE GROWTH SCENARIO	
	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)
Pipe surcharged by backwater condition (Slope HGL < pipe grade)	369 (17)	23396 (15)	410 (19)	25628 (17)
Pipe surcharged due to limited capacity (Slope HGL < pipe grade)	167 (8)	10597 (7)	196 (9)	12784 (8)
	NO. OF OVERFLOWS (%)	VOLUME OF OVERFLOWS (m^3)	NO. OF OVERFLOWS (%)	VOLUME OF OVERFLOWS (m^3)
Constructed Overflows	1 (11)	119	2 (22)	181
Manhole Overflows	24 (1)	4447	36 (2)	9377

4.2.2 TEMUKA

The assessment of the Ultimate Growth scenario has been undertaken on the Inland Towns wastewater network. The results for Temuka are shown below. Geraldine and Pleasant Point have not been included in the results.

Table 4-3 presents a comparison of the results for the two scenarios in terms of available network capacities. The numbers in brackets represent the percentage of the network. These results are displayed visually in Figure 4-2.

Table 4-3: Temuka Capacity Assessment Results

PEAK FLOW CRITERIA	BASE MODEL		ULTIMATE GROWTH SCENARIO	
	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)	NUMBER OF PIPES (%)	LENGTH OF PIPES (m) (%)
Flow Depth < 50% of pipe diameter	231 (56)	15755 (55)	207 (50)	13949 (49)
Flow Depth = 50 – <70% of pipe diameter	42 (10)	2680 (9)	35 (8)	2267 (8)
Flow Depth = 70 – <100% of pipe diameter	27 (6)	1953 (7)	23 (6)	1481 (5)
Pipe surcharged by backwater condition (Slope HGL < pipe grade)	78 (19)	5299 (18)	107 (26)	7296 (25)
Pipe surcharged due to limited capacity (Slope HGL < pipe grade)	38 (9)	3059 (11)	44 (11)	3754 (13)
	NO. OF OVERFLOWS (%)	VOLUME OF OVERFLOWS (m^3)	NO. OF OVERFLOWS (%)	VOLUME OF OVERFLOWS (m^3)
Constructed Overflows	1 (20)	1690	1 (20)	2450
Manhole Overflows	5 (1)	170	8 (2)	930

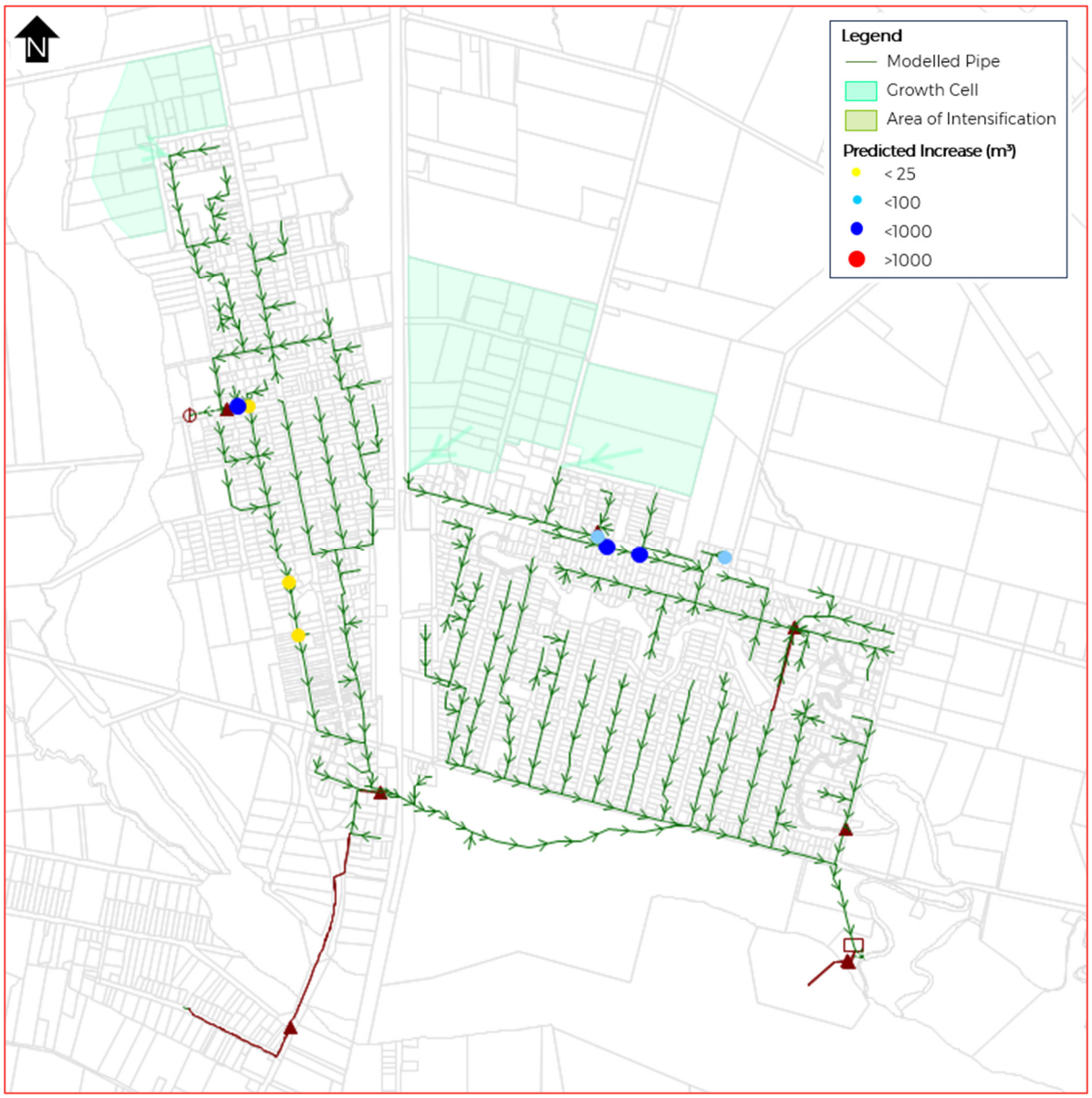


Figure 4-2: Comparison of Predicted Manhole Overflow Flood Volume

As expected, the predicted increases in surcharge and manhole overflows are downstream of the growth areas. This is particularly apparent with the addition of two new manhole overflows on SH1 near the junction with Redwood Street.

The only constructed overflow predicted to spill in either scenario is at the Temuka WWTP inlet pump station.

5 FUTURE-PROOFING THE TIMARU AND TEMUKA NETWORKS

5.1 METHODOLOGY

To develop upgrades to cater for growth, using both the existing Timaru and Inland Towns wastewater models for this assessment, we carried out the following:

- Upsized pipes on existing line and level to convey the PWWF for the ultimate growth scenario only.
- A pipe was deemed to need upgrading where manhole and/or constructed overflows increased, or the hydraulic grade line was within 0.5 m of ground level as a result of the growth flows.
- Pipe upgrades were sized so that they were not surcharged, with depth at most 70% for the 5-year ARI event where possible (unless due to a backwater issue).
- In some cases, surcharging in pipes with proposed upgrades was considered acceptable if it was considered likely that surcharging would not occur with a more average grade over the length of the upgrade section.
- Pump stations were upsized to pass forward peak flows without backing up the upstream system.
- Note that for the Timaru model, both 1-hour duration and 24-hour duration storm events were used in the assessment, as the critical duration for the network differs from upstream to downstream. Only the 24-hour duration event was used for the Temuka model.
- Investigated how much development could take place before network upgrades were required.

5.2 RESULTS

5.2.1 TIMARU

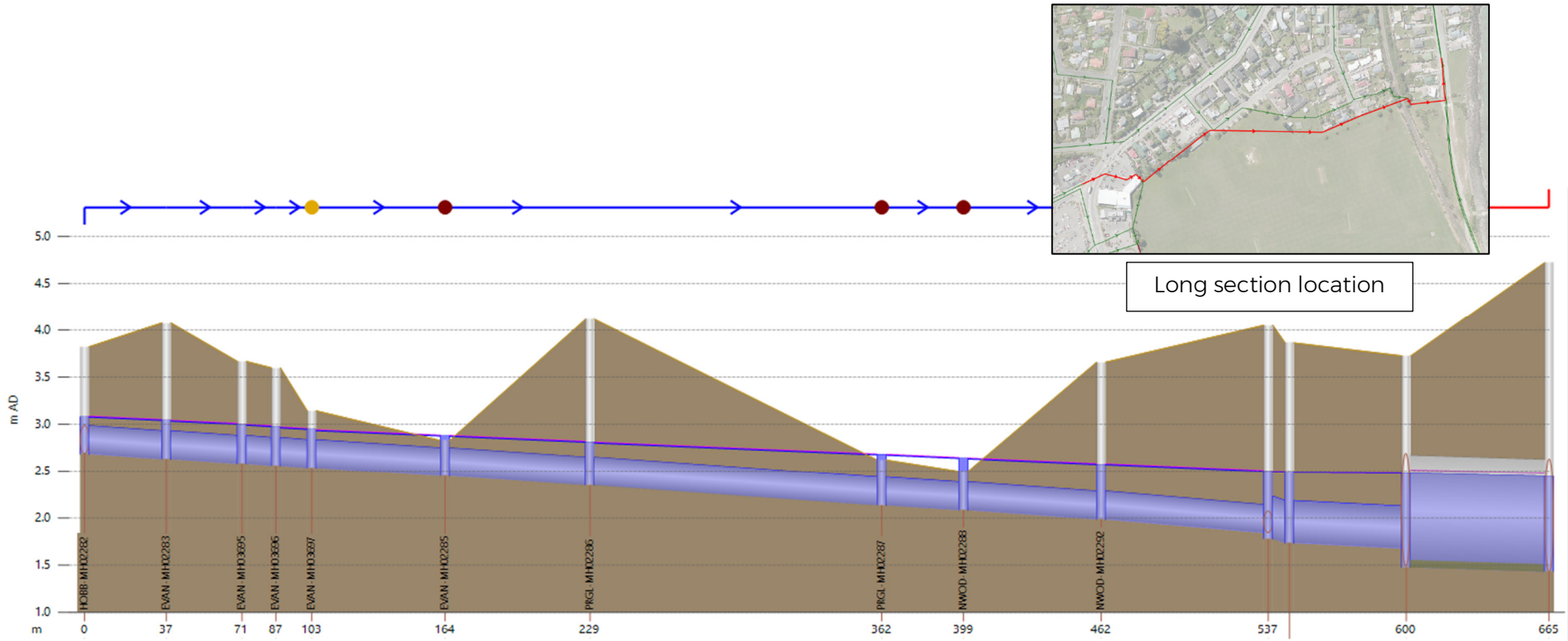
To identify the extent of upsizing that would be required to remove new predicted overflows as a result of the growth flows, a number of iterations were undertaken. An “Ultimate” solution for Timaru involves upsizing a number of sections of the local reticulation. Some upgrades to the trunk mains are required. Queen Pump Station (PS) (model reference SPS31), Ashbury Park PS (SPS35), and Kensington PS (SPS30) all require upgrades to the pump rates. From this assessment, it has been estimated that these pump rates would need to be increased to total pump rates of 360 L/s, 41 L/s, and 110 L/s respectively. The effect on the rising mains has not been considered. These pump rate suggestions and the effect on the rising mains should be investigated further in the case that they progress to the detailed design phase.

Several manholes in the northern area of Ashbury Park were predicted to spill due to backwater from the trunk main, due to the vertical position of the connection. Additionally, one manhole (GRAS-MH03791) in the south-eastern part of the park is predicted to spill in the 24-hour storm due to surcharging in the trunk main. Because these spills would not be resolved through the upsizing of the pipes, these manholes were set to sealed in the model.

These manholes are summarised in Table 5-1, and long sections of the affected pipes to the north and south are shown in Figure 5-1 and Figure 5-2 respectively. It is recommended that Council investigate adding a new pump station just before the trunk main to convey flows from these pipes.

Table 5-1: Ashbury Park Manholes set to Sealed

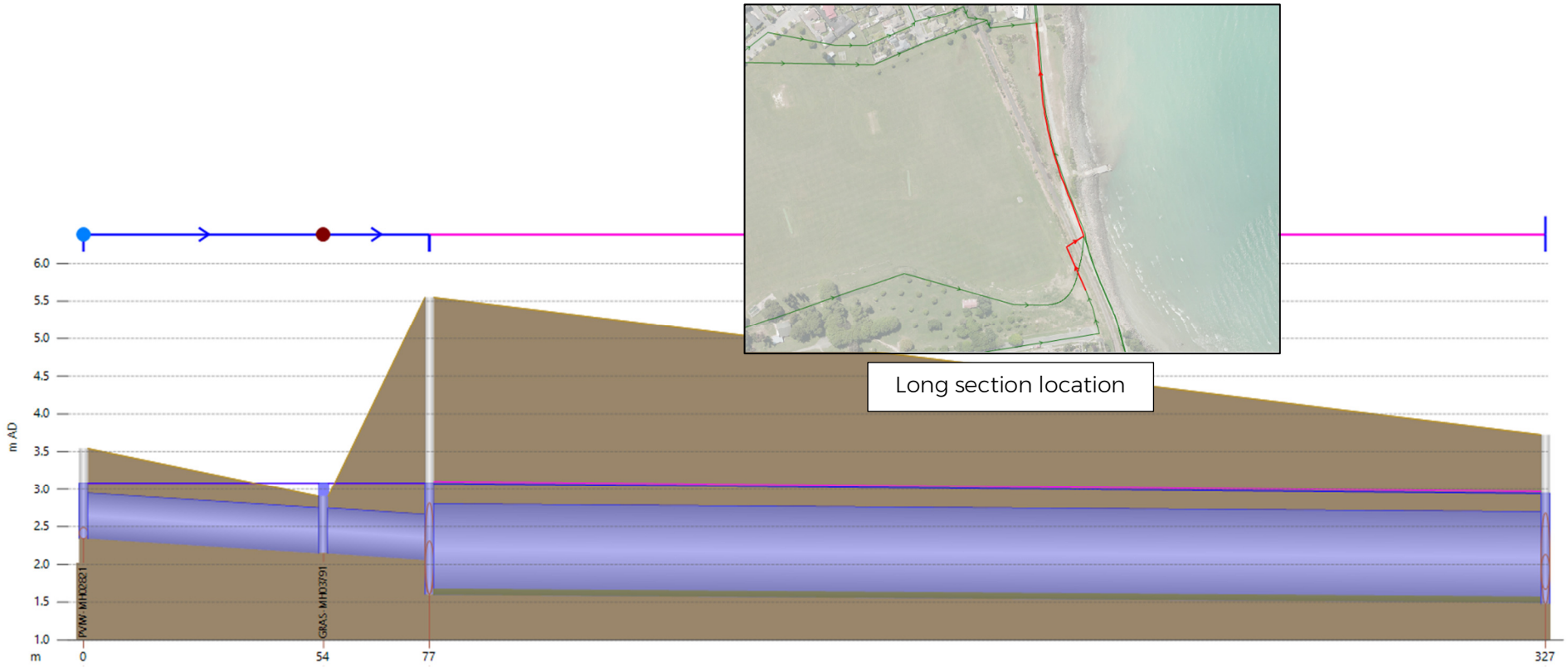
NODE ID	ASSET ID
EVAN-MH02285	2853
EVAN-MH03697	140049
NWOD-MH02288	2918
PRGL-MH02287	2917
GRAS-MH03791	151706



Link	-	-	-	-	EVAN-MH03697.1	EVAN-MH02285.1	PRGL-MH02286.1	-	NWOD-MH02288.1	NWOD-MH02292.1	-	RCMD-MH03707.1	RCMD-MH03674.1
US node ID	-	-	-	-	EVAN-MH03697	EVAN-MH02285	PRGL-MH02286	-	NWOD-MH02288	NWOD-MH02292	-	RCMD-MH03707	RCMD-MH03674
Link suffix	1	1	1	1	1	1	1	1	1	1	1	1	1
Asset ID	1443	1444	-	-	1445	1446	8070	8066	31056	31055	-	140504	140497
width (mm)	300	300	300	300	300	300	300	300	300	300	-	450	1200
us inv (m AD)	2.685	2.630	2.581	2.558	2.535	2.448	2.350	2.134	2.082	1.984	-	1.733	1.475
ds inv (m AD)	2.630	2.581	2.558	2.535	2.448	2.350	2.134	2.082	1.984	1.840	-	1.675	1.430
r.pfc (l/s)	37	37	37	37	37	38	39	36	39	42	-	94	956
surc	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	1.00	0.84
DS depth (m)	0.412	0.420	0.417	0.412	0.428	0.461	0.542	0.557	0.590	0.660	-	0.804	1.012
DS flow (l/s)	38.72	39.24	39.19	39.13	38.93	38.49	36.44	35.39	32.86	32.68	-	63.92	867.80

Node	-	-	-	-	-	EVAN-MH02285	PRGL-MH02286	PRGL-MH02287	-	NWOD-MH02292	-	-	RCMD-MH03674	-
Asset ID	2876	2851	140047	-	140049	2853	2916	2917	2918	2906	2907	140462	135179	140460
ground (m AD)	-	4.075	3.666	-	3.143	2.828	4.115	2.621	2.499	3.658	4.050	3.863	3.725	4.720
Ch floor lev (m AD)	-	2.630	2.581	-	2.535	2.448	2.350	2.134	2.082	1.984	1.780	1.733	1.475	1.430
Flood type	Lost	Lost	Lost	-	Sealed	Sealed	Lost	Sealed	Sealed	Lost	Lost	Lost	Lost	Lost

Figure 5-1: Long section of pipes along northern section of Ashbury Park



Link	PVIW-MH02821.1	GRAS-MH03791.1	RCMD-MH03708.1
US node ID	PVIW-MH02821	GRAS-MH03791	RCMD-MH03708
Link suffix	1	1	1
Asset ID	153258	153259	140495
width (mm)	600	600	1200
us inv (m AD)	2.343	2.147	1.600
ds inv (m AD)	2.147	2.060	1.495
r.pfc (l/s)	370	370	742
surc	1.00	1.00	2.00
DS depth (m)	0.936	1.023	1.446
DS flow (l/s)	3.56	4.30	838.16

Node	PVIW-MH02821	GRAS-MH03791	RCMD-MH03708	RCMD-MH03674
Asset ID	4052	151706	140463	135179
ground (m AD)	3.543	2.902	5.550	3.725
Ch floor lev (m AD)	2.343	2.147	1.600	1.475
Flood type	Lost	Sealed	Lost	Lost

Figure 5-2: Long section of pipes along south-eastern section of Ashbury Park

No changes to either the vertical or horizontal alignments of the network were considered. The potential for the WWTP to receive the increased flows has not been assessed.

Table 5-2 shows a summary of the potential upgrades required.

Table 5-2: Potential Upsizing

PROPOSED DIAMETER (mm)	LENGTH OF PIPE (m)
225	1890
300	2590
375	6360
475	1900
500	1420
600	550
700	930
1200	1890

The extent of the necessary upsizing to eliminate growth overflows from the Timaru network is provided in Appendix B. A full summary of all of the recommended pipe upgrades for Timaru, their current diameters in the model, and their recommended upgrade diameter is provided in Appendix D.

Figure 5-3 shows the performance of the Ultimate Growth network in the 1-hour duration storm event if all proposed upsizing takes place, whilst Figure 5-4 shows the performance in the 24-hour storm. Further improvements will be possible if amendments to vertical and horizontal alignments are also considered.

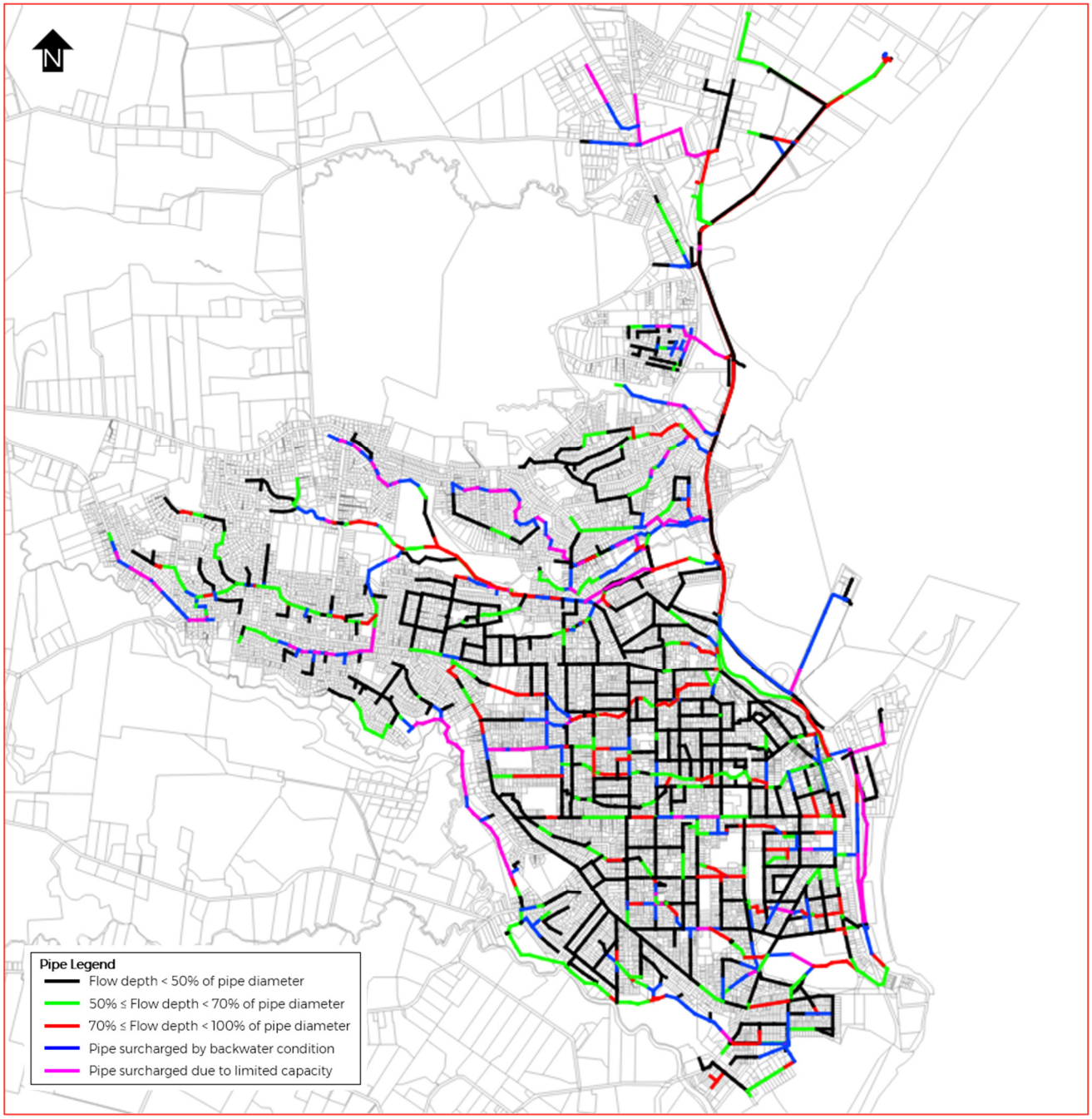


Figure 5-3: Predicted Network Performance after Upsizing in the 1-hour storm event

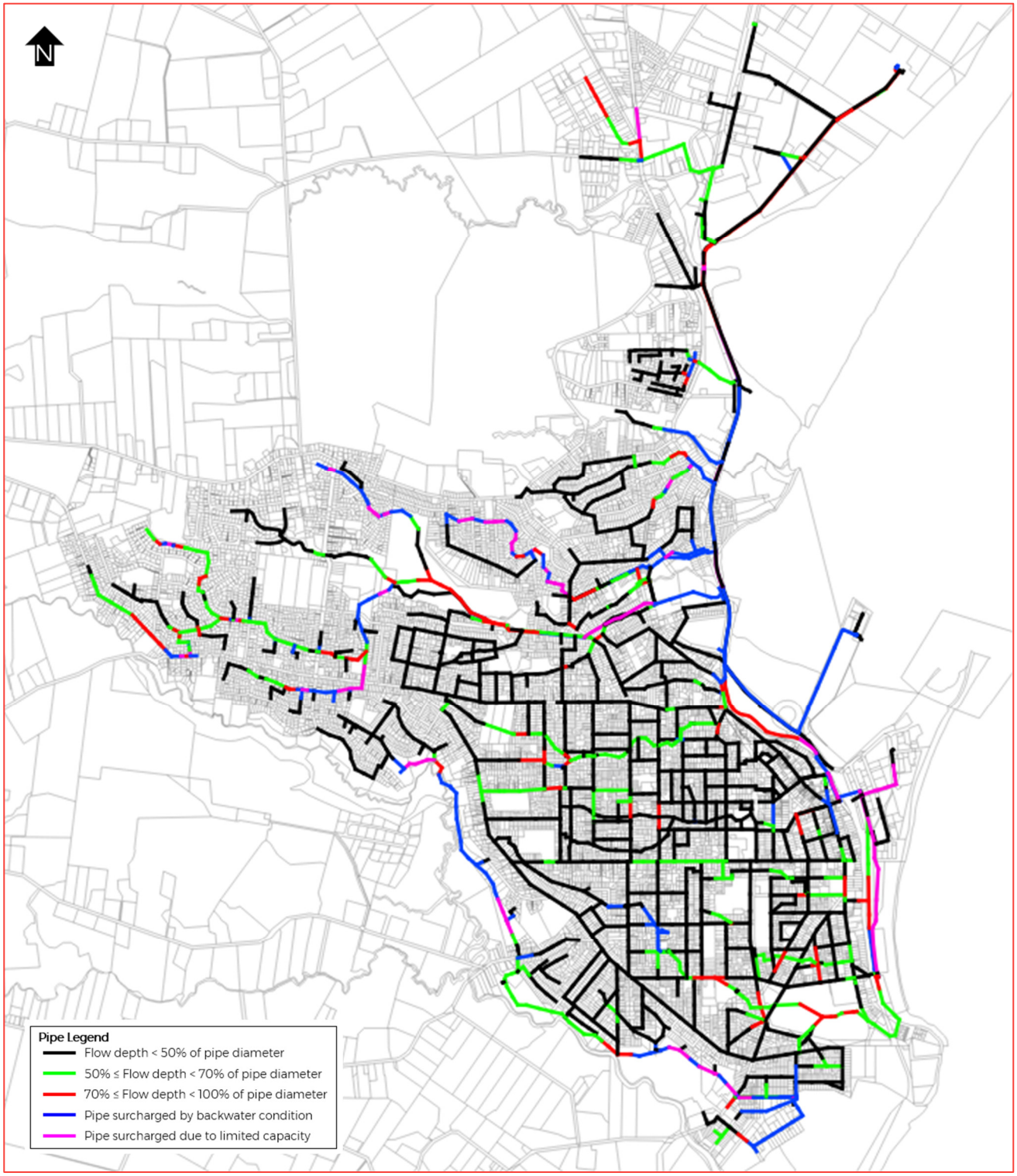


Figure 5-4: Predicted Network Performance after Upsizing in the 24-hour storm event

Note that in the 24-hour event results, shown in Figure 5-4, there is surcharging predicted in the pipe section from the Gleniti Residential (DEV2) growth cell. This is likely because the land use properties (copied from the surrounding existing subcatchments) are conservative for the growth cell, and results in a large volume of ground infiltration.

5.2.2 TEMUKA

An “Ultimate” solution for Temuka involves upsizing a significant portion of the network and removing the flow control device at the oxidation ponds. Pump rates at Princes Street PS (SPS40) and the Oxidation Ponds (STP45W1) have also been increased.

No changes to either the vertical or horizontal alignments of the network were considered. The potential for the affected rising mains, Temuka oxidation ponds and Inland Towns pipeline to receive the increased flows has not been assessed. The model currently predicts flows to the oxidation ponds of approximately 90 L/s, increasing to 110 L/s with all suggested upsizing in place. These would be investigated in greater detail should any improvements progress to the design stage.

Table 5-3 shows a summary of the potential upgrades required.

Table 5-3: Potential Upsizing

PROPOSED DIAMETER (mm)	LENGTH OF PIPE (m)
225	370
300	2100
375	1080
475	340

The extent of the necessary upsizing to eliminate growth overflows from the Temuka network is provided in Appendix E. A full summary of all of the recommended pipe upgrades for Temuka, their current diameters in the model, and their recommended upgrade diameter is provided in Appendix F.

Figure 5-5 shows the performance of the Ultimate Growth network if all proposed upsizing takes place. Further improvements will be possible if amendments to vertical and horizontal alignments are also considered.

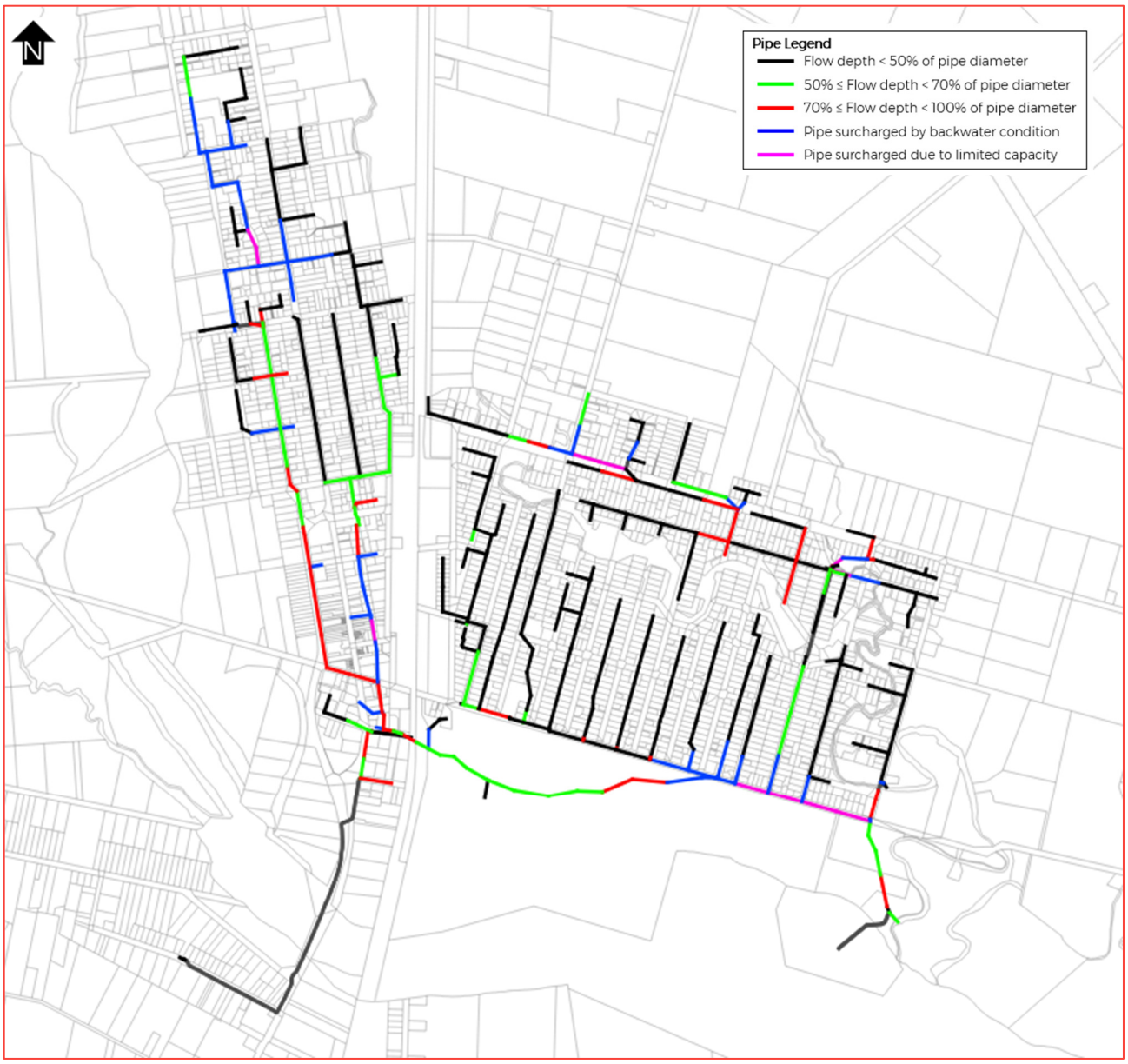


Figure 5-5: Predicted Network Performance after Upsizing in the 24-hour storm event.

5.3 DEVELOPMENT PHASING

5.3.1 TIMARU

A summary of which growth cells in Timaru can go ahead before the network needs to be updated is summarised in Table 5-4, and a plan showing these growth areas and the recommended upgrades is provided in Appendix B.

For the intensification areas, 25% of the subcatchments can grow in population without upgrades to the network. A plan of these intensification subcatchments is provided in Appendix C.

Table 5-4: Timaru Growth Areas that can Proceed without Infrastructure Upgrades

REF / NAME	GROWTH ALLOWED PRIOR TO UPGRADES?
FDA1 Elloughton Road South	No
FDA2 Kellands Heights East	No
FDA4 Elloughton Road North	Yes
FDA14 Kennels Road	Yes
DEV1 Broughs Gully	Yes
DEV2 Gleniti Residential	No
FDA9 Gleniti North	No
FDA10 Kellands Heights West	No
FDA12 Sir Basil Arthur Park	Yes
FDA13 Seadown Road	Yes
DEV3 Washdyke Expansion	No
Washdyke Flat Road	Yes
Showgrounds	Yes
Ascot Street	Yes
St. Vianneys	No
Grey Road	No
O'Neill Place	No
O'Neill Place Extension	No
College Road	No

5.3.2 TEMUKA

A summary of which growth areas in Temuka can go ahead without upgrades to the network is shown in Table 5-5, and a plan showing these growth areas and the recommended upgrades is provided in Appendix E.

Table 5-5: Temuka Growth Areas that can Proceed without Infrastructure Upgrades

REF / NAME	GROWTH ALLOWED PRIOR TO UPGRADES?
FDA6 Factory Road	No
DEV3 Temuka Northwest	No
FDA7 Thompson	No

6 CONCLUSIONS AND RECOMMENDATIONS

The results of the assessment indicate that upgrades are required in both Temuka and Timaru ahead of future growth. These proposed upgrades include both pipe diameter upgrades and upgrades to existing pump stations.

In Timaru, it is also recommended to investigate adding a pump station in Ashbury Park, since it is predicted that backwater from the trunk main will cause several manhole overflows that cannot be resolved simply through pipe upgrades.

It is predicted that there is sufficient existing capacity for several growth areas in Timaru – primarily growth areas in the northern suburbs such as Washdyke. Otherwise, it is predicted that most growth areas in Timaru and all growth areas in Temuka will require network upgrades first.

Further master planning and optioneering of upgrade options is recommended to optimise the long-term plan for wastewater infrastructure in the Timaru district.

7 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Timaru District Council ('Client') in relation to a capacity assessment for Timaru and Temuka ('Purpose') and in accordance with the existing *ACENZ Form of Agreement for Engagement of Consultant between Timaru District Council and WSP* signed 29 April 2011 and *Offer of Service dated 29 August 2023 for 'Timaru and Temuka Growth Capacity* Assessment' ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report and the Offer of Services dated August 2023. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

In preparing this Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('Client Data') provided by or on behalf of the Client. Except as otherwise stated in this Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable for any incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

APPENDIX A

RESULTS – COMPARISON FIGURES

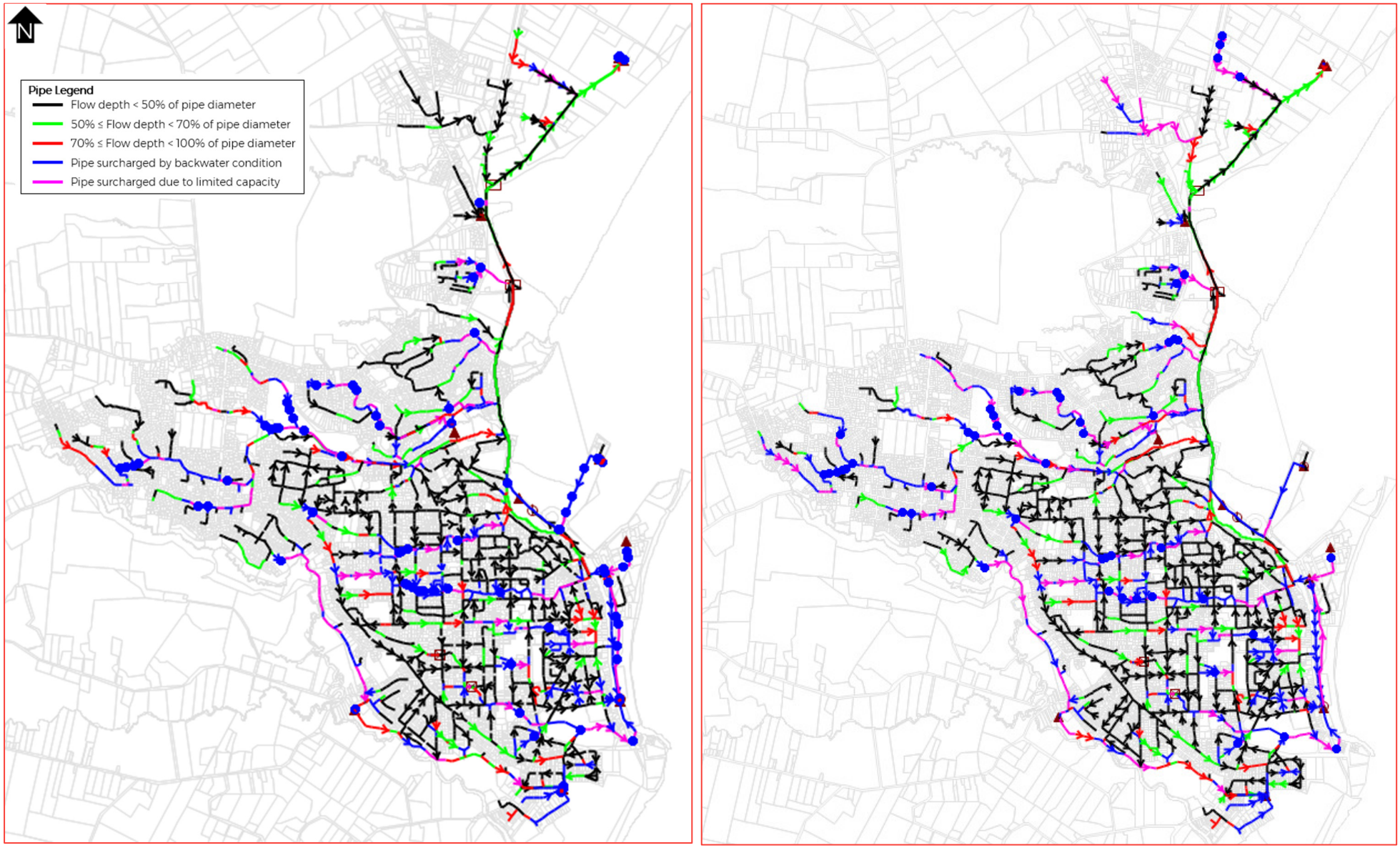


Figure A-0-1: Comparison of Network Performance: Base (left) against Ultimate Growth (right)

Figure A-0-2: Comparison of Network Performance: Base (left) against Ultimate Growth (right)

APPENDIX B

DEVELOPMENT PHASING - TIMARU