

Kapiti Coast District Council (KCDC) – Manu Park, Waikanae North Development Report

This report has been prepared for the benefit of Kapiti Coast District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.

Rev. No.	Date	Description	Prepared By	Checked By	Reviewed By	Approved By
0	14-06-21	Draft	A Brotherston	B Davies	B Davies	B Davies
1	17-06-21	Developer Comments	A Brotherston	B Davies	B Davies	B Davies

1 Introduction

KCDC has engaged Stantec to report on the water supply available for Stages 2-5 of the proposed Waikanae North development. Stage 2-5, also known as Manu Park, is the current phase of development and consists of 147 properties. This will be followed by Stage 1F (29 properties), Stage 6 (95 properties) and a school in the future. The location of the development is shown in Figure 1-1 below.

This document describes the requirements for water supply at the development site.



Figure 1-1: Location of Proposed Development

1.1 Network Configuration

The proposed development lies within the Waikanae, Paraparaumu and Raumati (WPR) Network. The WPR network is supplied from the Waikanae River Water Treatment Plant (WTP), where it is pumped along separate mains – North to Waikanae, and South to Paraparaumu and Raumati. The proposed development is located within Hemi Street DMA, which is highlighted in the network schematic below (Figure 1-2).

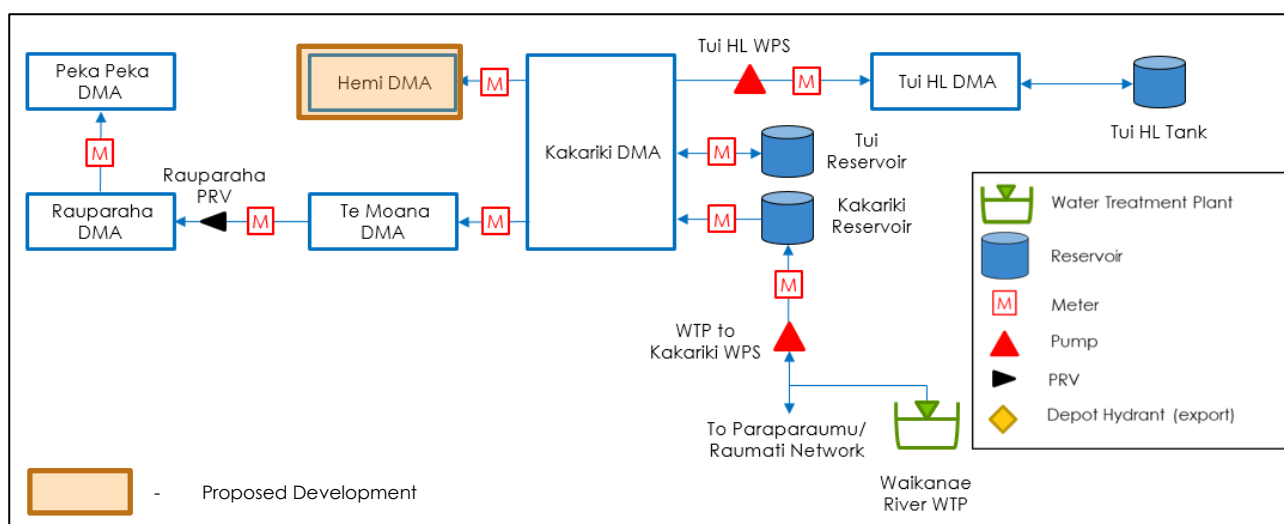


Figure 1-2: Paraparaumu Network Schematic

2 Water Supply Requirements

2.1 Design Pressure

Schedule 6 of the Kapiti Coast District Councils Subdivision and Development Principles and Requirements, 2012 (SDPR), states that the design pressure (i.e. during Average Day Peak Week demand) shall be between 250kPa and 900kPa (25m to 90m head) at the point of supply.

2.2 Available Fire Flow

Table 2 of SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice (Fire Code) states the minimum firefighting water supply required is 12.5L/s flow within a distance of 135m of the building and a further 12.5L/s within 270m, with minimum 10m pressure at each source during 60% of annual peak demand.

3 Network Modelling

For reference, the modelling is based on the master planning model KCDC WS MPL05, using the 2018 and 2047 upgraded scenario. A variation named "KCDC WS MPL05 C09 Manu Park, Waikanae North" has been created for this assessment.

Demand from recent developments which were not in the model were added to the base scenario. These were:

- Stage 1, Waikanae North Development (39 properties)
- Winara Avenue Development (81 properties)
- Ngarara Road Development (55 properties)
- Summerset Development (retirement village + 23 properties)

The model was also updated to include recently built properties around the proposed development which were in the customer GIS layer, but not in the model. This includes the retirement village, which was added as a single large, metered customer (LMC) point.

3.1 Proposed Water Supply Network

147 properties are shown in the proposed development layout plan provided by the developer, with key mains added in red, along with proposed mains sizes (Figure 3-1).

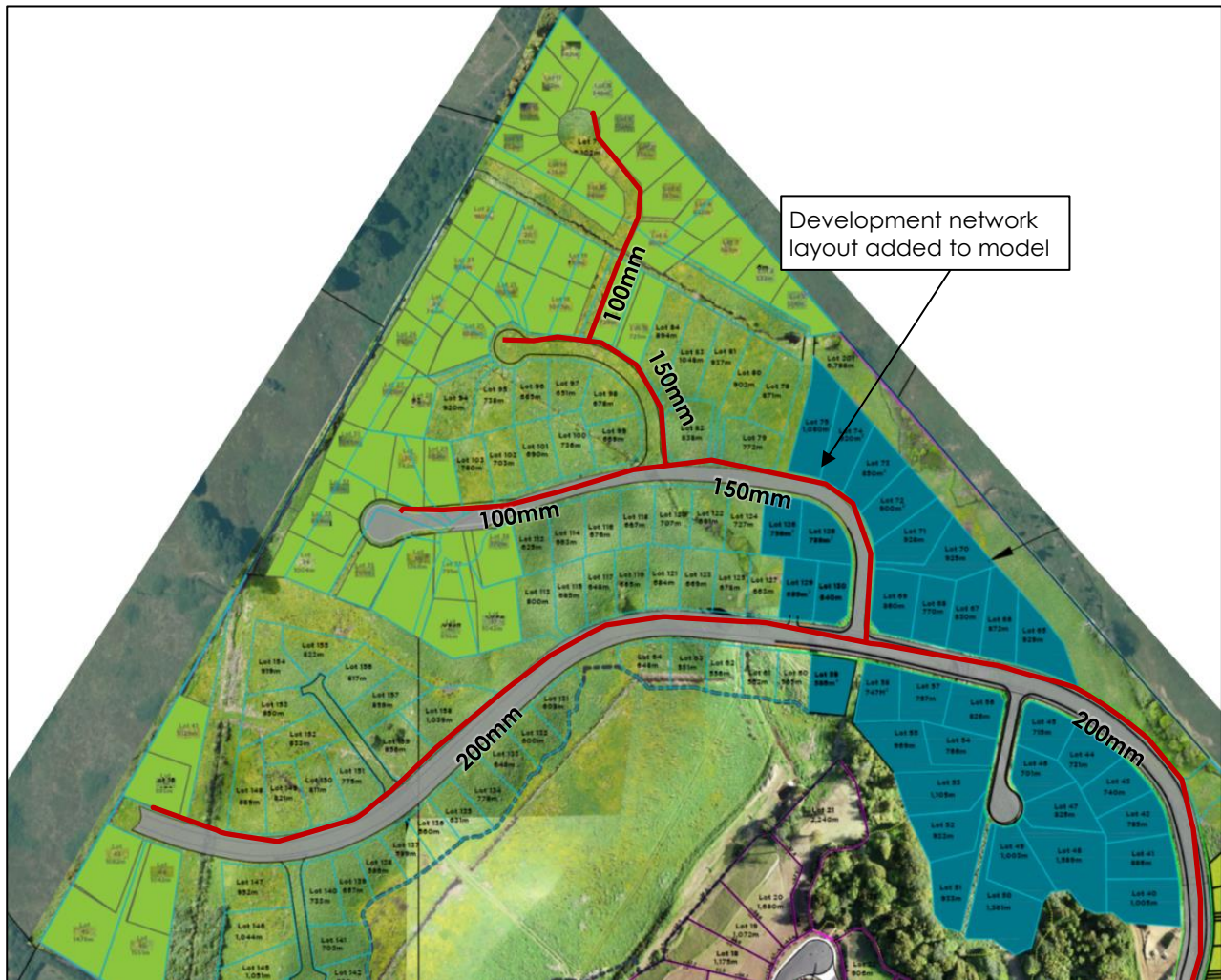


Figure 3-1: Development Layout Plan

Using this plan and after discussions with the developer, pipes have been added to the model following the road layouts. 200mm pipe is proposed as the size for the onsite mains along the main road, with 150mm mains along branches. Rider mains (50mm size) have been proposed wherever necessary to avoid property service lines crossing the road.

The road at the bottom left of Figure 3-1 appears that it may extend further West in the future. The developer has confirmed that further development may occur along this road and the mains considered as part of this study have been sized with this expectation. This has not been modelled however, and an alternative supply may be required depending on the size of any future development.

Hydrants are proposed at 135m distance as per requirements of The Fire Code (described in 2.2).

3.2 Demands

In both current and future peak demand models, demand has been allocated to properties around the proposed route of the onsite mains.

Elevations of properties were inferred from the 'Wellington LiDAR 1m DEM (2013-2014)' dataset from LINZ. Elevations of properties in the proposed development range between 6m and 31m.

An average demand of 1225 l/prop/day is assigned to each dwelling as a standard demand used for greenfield development. The demand profile used for the proposed development demand is the existing residential profile – "DMA_Hemi".

An assessment was also done on the internal network using NZS:4404 figures for demand. For this scenario, a demand of 625 l/prop/day (250l/person/day x 2.5 occupancy) was applied with a peaking factor of 5. This was found to have only minor differences compared to the network-wide assessment during peak flow.

4 System Performance

4.1 Current Peak Day Scenario (2018)

In the current peak day scenario (2018), minimum pressure of 25m can be met all at nodes with the addition of the proposed development. Minimum pressure predicted at the development site is 60m (Figure 4-1).

The addition of proposed development has small impact on the pressures at the existing properties as seen in the pressure comparison graph close to the point of supply (Figure 4-2).

Pressures near Tui Reservoir are already low due to the relative elevation to the reservoir outlet, these are expected to have a small reduction in minimum pressure after the development is added to the model.

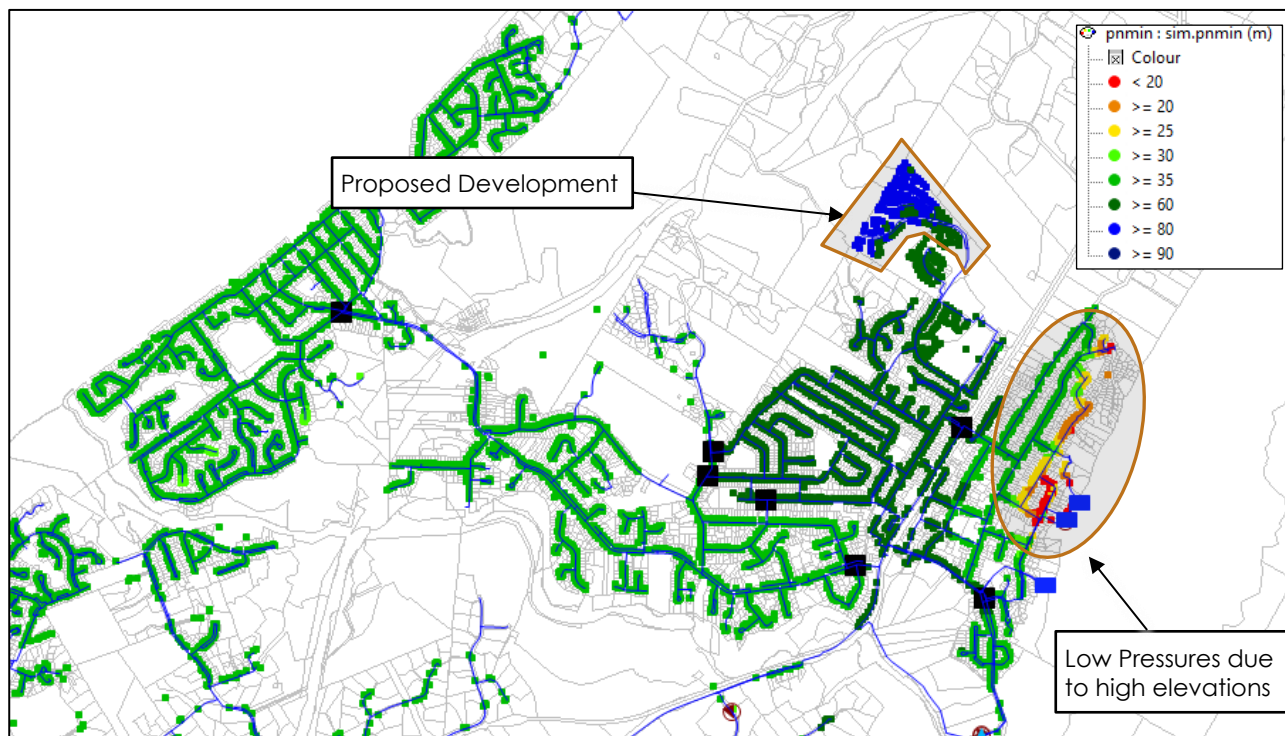


Figure 4-1: Minimum pressures in the WPR network with Stage 2-5 demand (Current Peak Day)

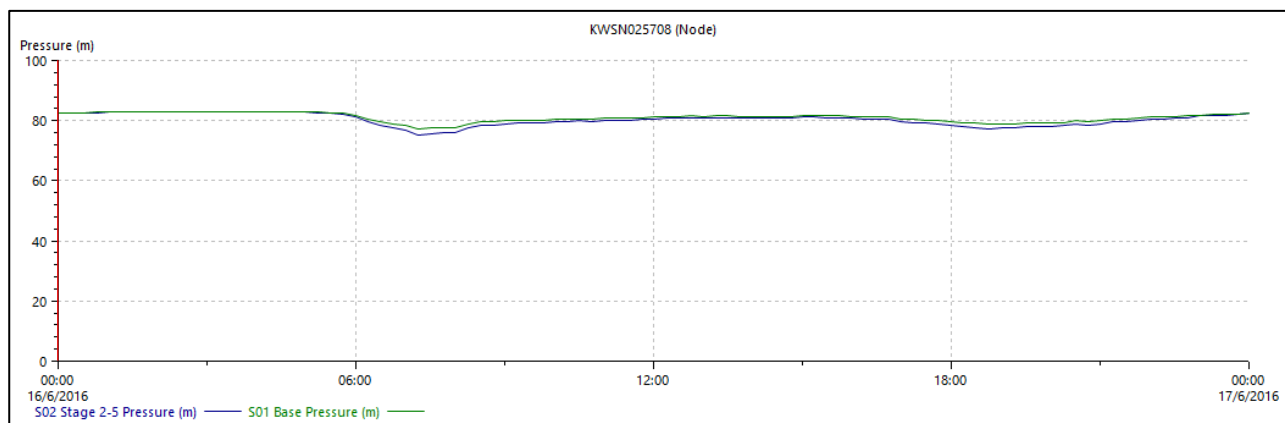


Figure 4-2: Pressure comparison close to point of supply

The available fire flow has been assessed at the onsite hydrants while maintaining a residual pressure of 10m. The fire flow requirement of 25 l/s can be met at all properties supplied by either a single or two hydrants within 270m (Figure 4-3).

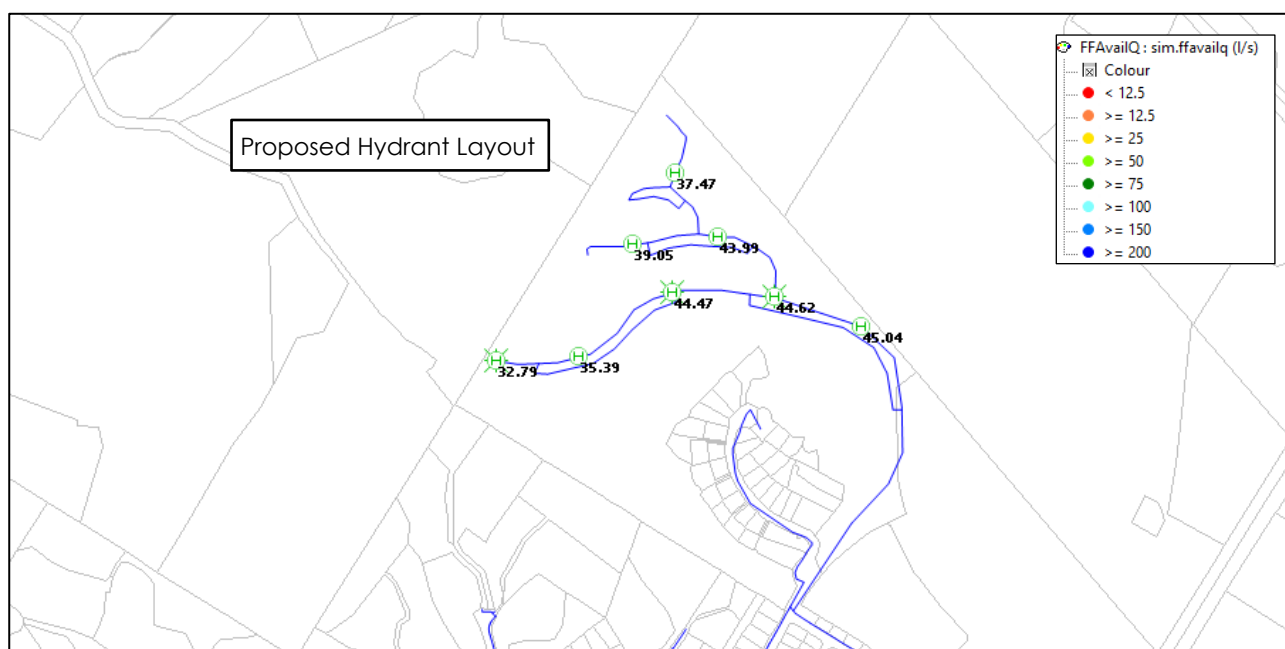


Figure 4-3: Available Fire Flow at hydrants with Stage 2-5 demand (Current Peak Day)

4.1.1 Hemi Street Headloss

The 150mm diameter Hemi Street inlet to Hemi DMA is currently undersized and reaches 8 m/km. This exceeds the generally accepted maximum rate of head loss of 5m/km. The recently opened feed into Hemi DMA also has headloss above 5m/km. The headloss before and after the development is shown in Figure 4-4.

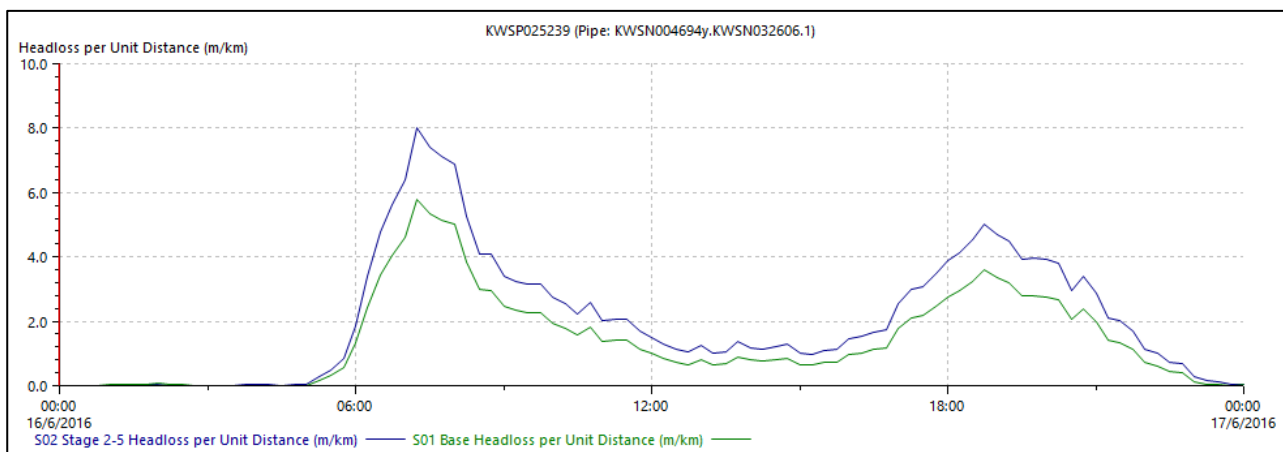


Figure 4-4: Headloss in Hemi Street with Stage 2-5 demand

Although 5 m/km is a generally accepted standard for designing pipes, for pipes already in the ground higher head losses are sometimes acceptable so long as network pressures do not suffer. As these stretches of main are short and do not cause any immediate problems with pressures in Hemi DMA or the relatively low-lying development, we do not feel there is an immediate need for upgrade.

However, the high head loss indicates this part of the system is at capacity, and small increases in future demand are likely to have a disproportionately large effect on pressures in the Hemi DMA.

4.2 Future Peak Day Scenario (2047)

A future peak day scenario was set up to represent network performance in 2047.

The 2047 scenario includes anticipated growth in Waikanae which is expected to grow to a population of 14,036 by the end of 2046. Ngarara greenfield development (850 properties) has also been added to the model as a single demand point. This will be supplied from the proposed Ngarara Loop upgrade; as this upgrade is yet to be finalised, this demand has been assigned to the connection point of the Ngarara Loop upgrade on Elizabeth Street.

In this scenario there are apparent pressure problems in other parts of the network – these are addressed through other upgrades. However, the addition of the proposed Manu Park development has negligible impact on the pressures at the existing properties and the minimum pressure within the development site is above 60m (Figure 4-5).

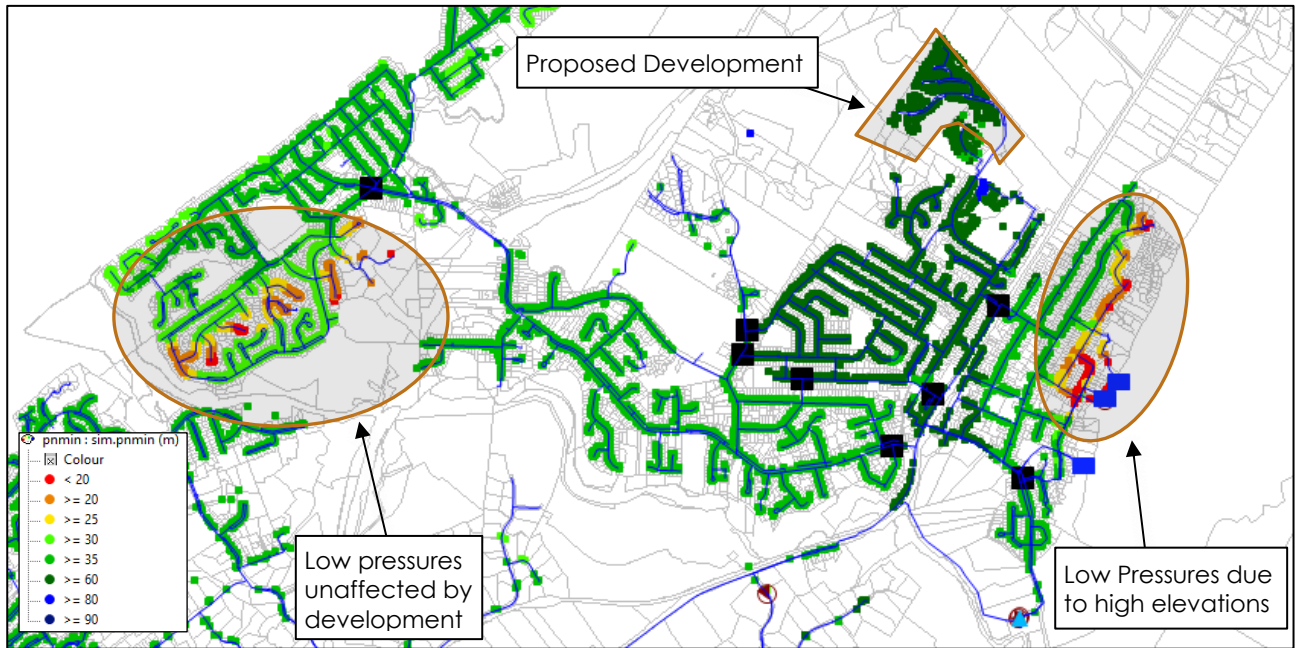


Figure 4-5: Minimum pressures in the WPR network after Stage 1F (Future Peak Day)

5 Further Development

The network performance was assessed after additional phases of the development were added to the model. Stage 1F consists of 29 properties and Stage 6 consists of 95 properties. In addition, land has been reserved for a primary school with a roll of 450 pupils.

These development stages were assessed at a high level to anticipate any issues with adding these demands to the network. Figure 5-1 below shows the proposed layout for the Waikanae North development, including Stage 1F and Stage 6.



Figure 5-1: Proposed network layout for the Waikanae North development

5.1 Stage 1F

5.1.1 Current Day Peak Scenario (2018)

There is only a small impact after adding demand for Stage 1F to the model, and adequate fire flow can be provided for this part of the development. However, even the small increase in number of houses drives the head loss in Hemi Street above 8 m/km.

5.2 Stage 6 + School

The rest of the development is a significant increase in demand, and the model predicts this to have a large impact on pressures in the development network, both in the current peak day scenario and in the future peak day scenario.

This is not expected to decrease minimum pressures below the level of service, but the large increase in peak flow through the inlet to Hemi DMA is a significant issue. We also note heads losses in the network upstream of Hemi also cause issues.

In previous work (see report “Waikanae North Water Modelling”, MWH, May 2011), an upgrade to the Hemi Street main was found to be sufficient to accommodate growth. However, changes in expected growth patterns and ongoing development in other parts of the network may mean upgrade of the Hemi Street pipe alone may not be enough to address issues in the wider network.

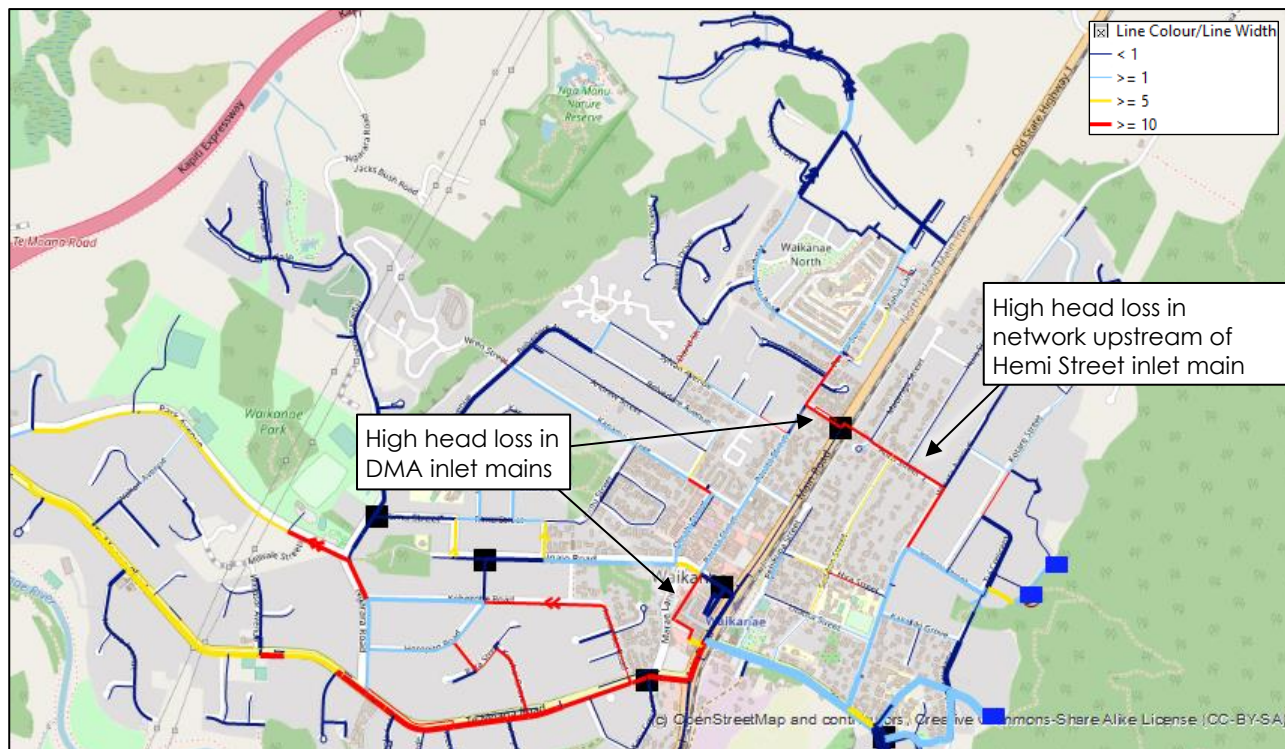


Figure 5-2: Network head loss in 2047 after development demand has been added to model

If Stage 6 and the school are to be implemented, we recommend a review of options for network upgrades to ensure future demand in this development and in other parts of the network can be accommodated.

5.2.1 Stage 6 Upgrade Options

As discussed above, upgrade of the Hemi Street pipe alone will not be sufficient for supply to the fully developed development. There are two options for upgrades to adequately supply Stage 6 and the school:

1. Pipe upgrades upstream of Hemi

In this option, pipe upgrades east of Main Road (the old SH1) will be required as well as upgrade of Hemi Street itself to ensure water can be delivered effectively to the development. This will likely take the form of a 150mm or larger upgrade along Main Road from Elizabeth Street to Hemi Street. In addition, pipe upgrades in David Street and Sylvan Avenue will be required to provide an effective second supply to the Waikanae North development as a whole. These upgrades are shown in Figure 5-3, with proposed mains sizes.

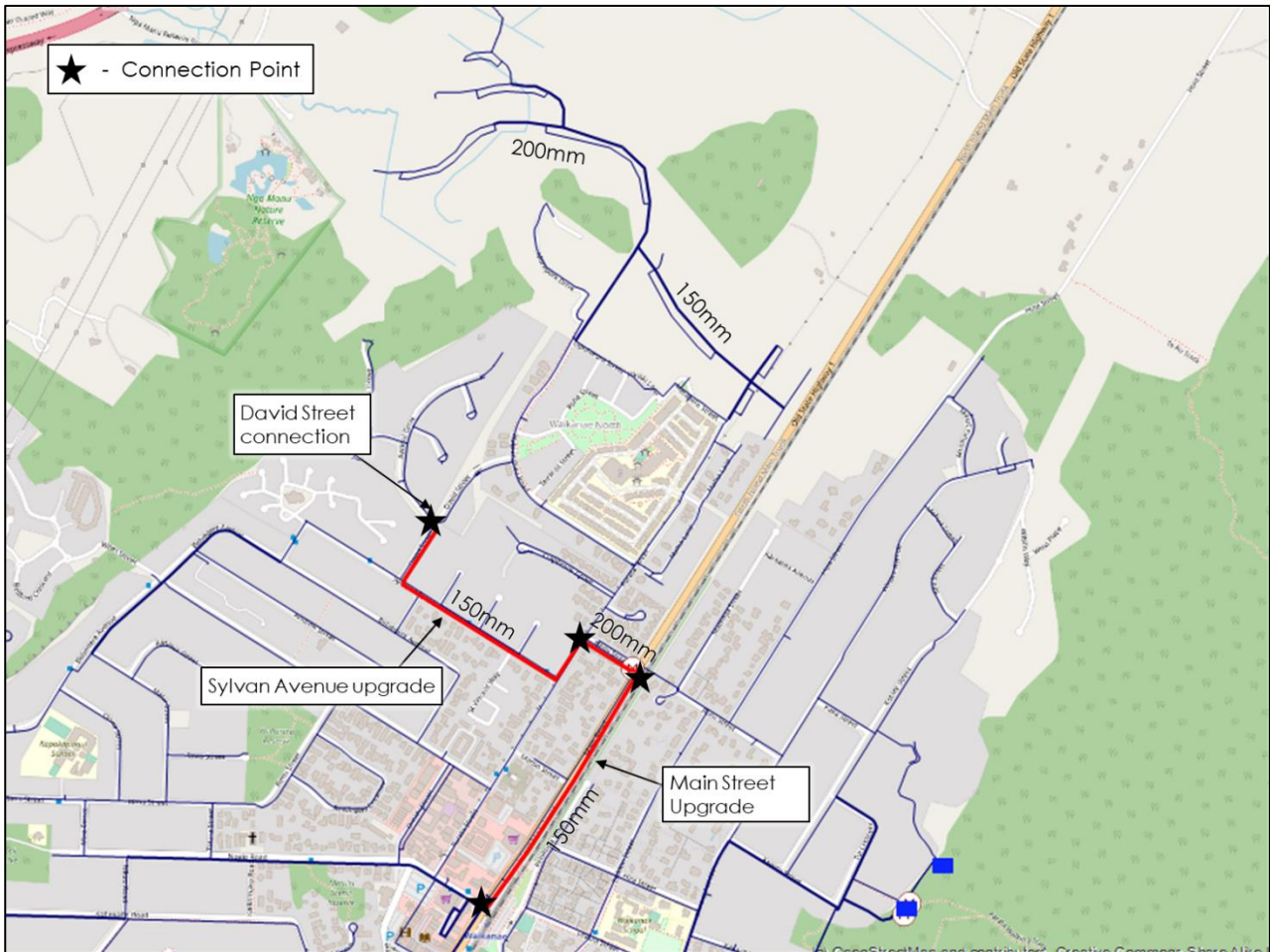


Figure 5-3: Pipe upgrades upstream of Hemi DMA

2. Use of the proposed Ngarara Loop upgrade

As set out in Section 4.2, the Ngarara Loop upgrade has been proposed to deliver water to a proposed development area in Ngarara. Although the exact route of the proposed Ngarara Loop upgrade has not been confirmed, the proposed route is shown in Figure 5-4.

This could be used to bring additional supply into Hemi DMA. By connecting the initial 250mm section of this main between Elizabeth Street and Omaha Street, the load on the current inlet mains to Hemi DMA would reduce to below 10m/km.

An additional section of 150mm mains would reduce the load on an existing 100mm mains which feed the proposed development via David Street. This 150mm upgrade would form an extension to the existing 150mm main in Belvedere Avenue. These upgrades are shown in Figure 5-4, with proposed mains sizes.

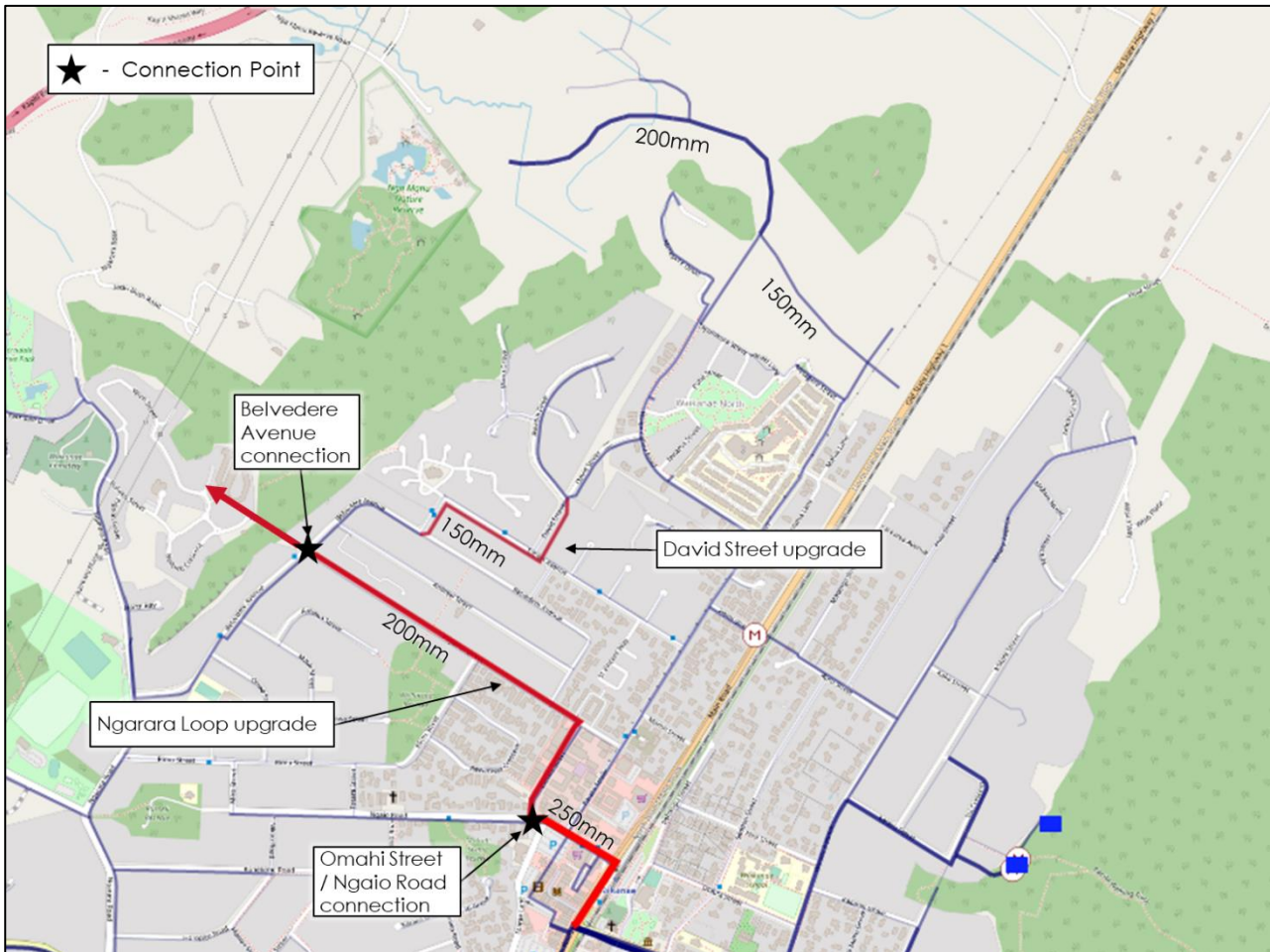


Figure 5-4: Ngarara Loop upgrade sizing, with additional upgrades for development

6 Conclusion

6.1 Stage 2-5

The currently proposed phase of the Waikanae North development is expected to have a low impact on minimum pressures in the water supply network. However, pressures are predicted to remain well above the level of service in and around the development.

Existing customers at high elevations near Tui Reservoir currently experience minimum pressures below the level of service. This would reduce slightly after the development has been added to the network, but it is understood other network upgrades are proposed to address this issue.

A network layout has been proposed which provides adequate fire flow at hydrants in the development network.

Inlets to the DMA at Hemi Street and Ngaio Street are currently close to capacity, as indicated by high head loss. head loss issues will continue to get worse with the addition of any further demand downstream.

6.2 Further Development

Stage 1F is a relatively small addition to demand and has little effect on network performance, although head loss at DMA inlets is increased above 8 m/km.

Addition of Stage 6 and the school to the development would drive the at-capacity supply points at Hemi Street and Ngaio Street above acceptable head loss and may even cause problems for existing properties upstream of Hemi Street. If these stages are to be considered, network upgrade options should be reviewed in light of recent changes to network configuration and ongoing development. Two options for upgrades to support Stage 6 have been proposed for consideration.

7 Recommendations

The analysis undertaken on the network has resulted in the following recommendations:

- Stage 2-5 of the development will not cause any significant problems.
- Stage 1F of the development will not cause any significant problems.

If Stage 6 of the development and the proposed school are to be connected to the network, options for network upgrades should be considered to ensure head losses and resulting low pressures are effectively managed.