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# Gore – 29 Hamilton Street Development – Water Modelling

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CONFIDENTIAL



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## Disclaimers and Limitations

This report (**'Report'**) has been prepared by WSP exclusively for Kāinga Ora (**'Client'**) in relation to the letter 29 Hamilton Street Development (**'Purpose'**) and in accordance with the Short Form Agreement with the Client dated 30 March 2023. The findings in this Report are based on and are subject to the assumptions specified in the Report are based on and are subject to the assumptions specified in the report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

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# 1 Summary

WSP was engaged by Kāinga Ora to complete a water network impact assessment for the future development area in 29 Hamilton Street, Gore. This was done to understand any existing network constraints to development and the potential upgrades required to accommodate the development demand.

The new development site is expected to consist of 24 new residential properties.

The impact of the development on the water network was assessed for two scenarios:

- 1 Current peak day demand
- 2 Current peak day with FW2 (residential fire flow) at 2/3 of peak day demand

Both scenarios were compared to the base network to assess the issues related to the specific development.

GDC provided WSP with three locations that have been constructed since the last model update: Matai Ridge subdivision, East Gore Industrial Zone, and Kaka Street subdivision. The base model was updated with the additional demand added for the Matai Ridge and Kaka Street subdivision, and the DN 150 PE 100 pipe added to network to supply the East Gore Industrial Zone area.

During the peak day demand simulation the water network is predicted to have sufficient capacity to supply the demand to the 29 Hamilton Street development.

During the FW2 fire flow simulation the water network is predicted to maintain pressures above the fire flow requirement of 10 m residual pressure for all current properties. This is not the case for the new development at 29 Hamilton Street where the pressure drops to 8.5 m. However this is considered to be a marginal failure for fire flow and within the confidence of the current peak day model for the Gore water supply. There are also existing high headloss issues in the network around 29 Hamilton Street which contribute to this marginal pressure result.

No upgrades to the water network are recommended to accommodate the development, for the following reasons considered together:

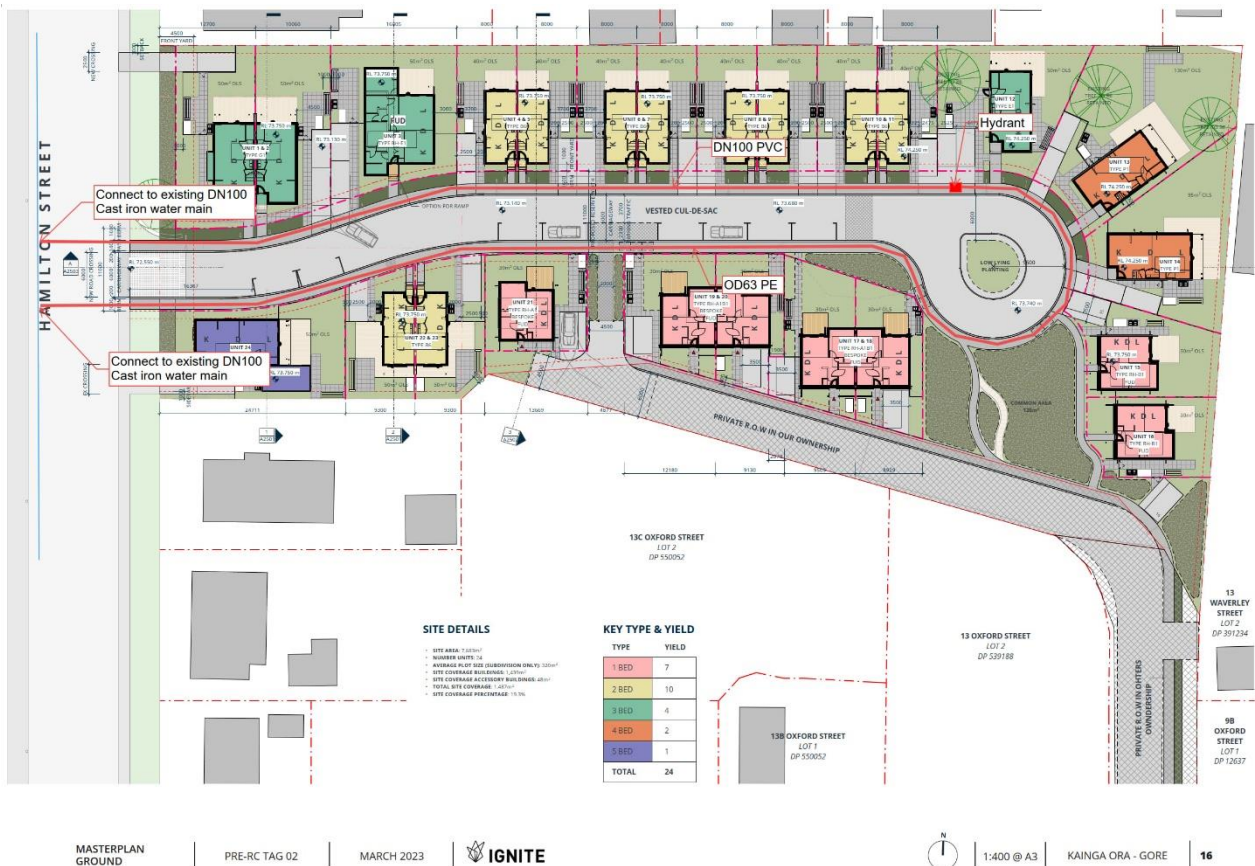
- During normal operation there is minimal impact on the existing network pressure levels of service, and current headloss issues in the network are not significantly increased.
- The drop in pressure during FW2 fire flow to 8.5 m at the end of the proposed DN 100 PVC-U / DN 63 PE 100 pipe is considered a marginal failure and within the confidence level of the current peak day model.

# 2 Scope

The assessment included the development area in 29 Hamilton Street of 24 residential lots.

The preliminary drawing of the development site provided by Kāinga Ora (ref SiteTAG\_29HamiltonSt\_Igniite\_UpdatedPlan\_20230309.pdf) was used to model the water supply reticulation for the development.





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Figure 2-1: Kāinga Ora - Preliminary design - 29 Hamilton Street development

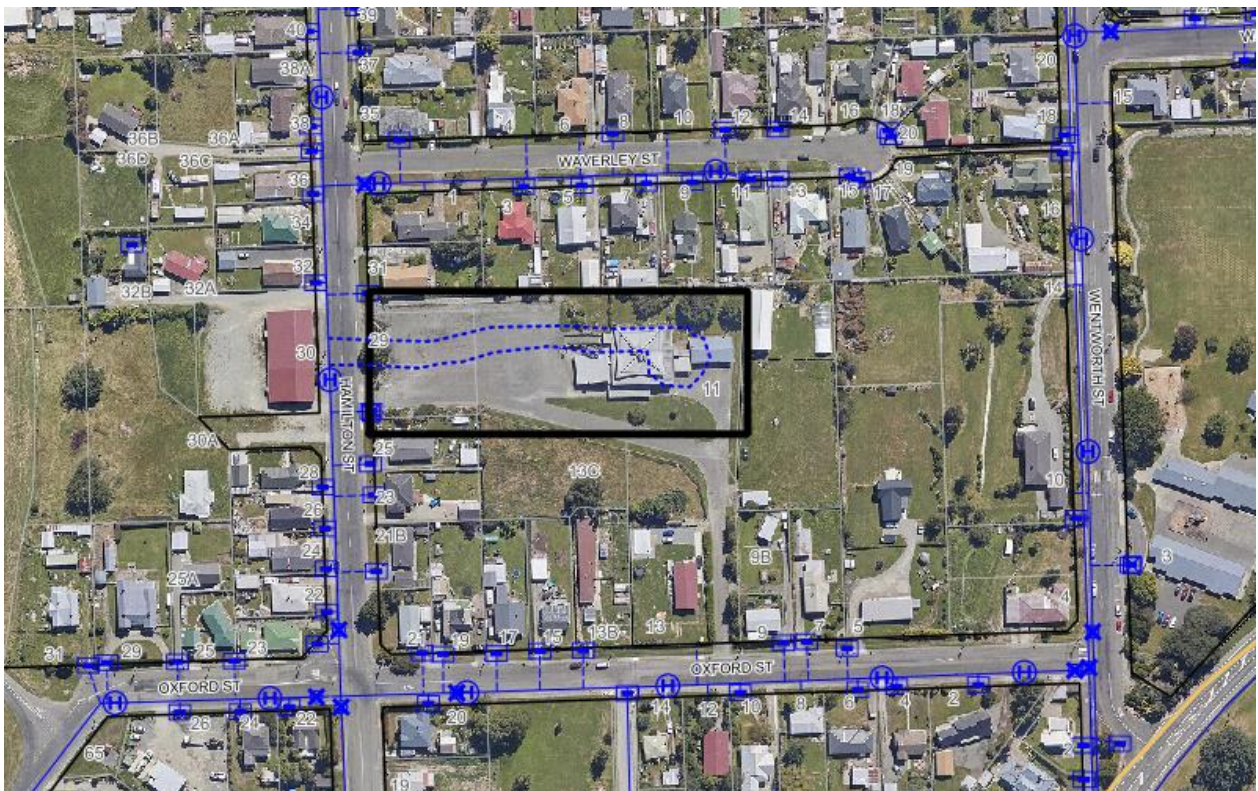


Figure 2-2: 29 Hamilton Street, Gore - proposed development area

## 3 Methodology

The following methodology was undertaken to assess the impact of the development on the existing water network current level of service:

- The model used for this assessment was the updated Gore ADPW model, this being the model used to undertake the Thomas Street Development Water Supply Capacity Assessment (WSP, 12 July 2022). The existing ADPW residential demand profile was used.
- The additional residential demand for the 24 no. units at 29 Hamilton Street were added in at the demand value of 757.4 L/property/day, and a leakage value of 200 L/property/day, as outlined in the offer of service.
- The normal operation pressure level of service was checked against the Gore District Council requirement of 25 m.
- The fire flow assessment was completed based on FW2 requirements with fire flow drawn at a rate of 12.5 L/s for 20 minutes from two hydrants. These two hydrants were the proposed hydrant location along the 29 Hamilton Street development, and the nearest existing hydrant, outside 30 Hamilton Street. Hydrant flow was scheduled at 2/3 of the peak demand for the peak day model.

## 4 Assumptions

### 4.1 General

- The Gore 2016 Average Day Peak Week (ADPW) model was used to carry out the modelling. The model was last updated and calibrated in 2011. We have assumed that the operation of the network is still the same as it was in 2011 (refer to 'Gore SND Mataura Water Supply Model report, 2011, OPUS').
- The new properties in the two subdivisions that were included in the updates were added as residential properties with the residential demand value of 757.4 L/property/day and the existing leakage value of 465 L/property/day. This is based on the demand and leakage currently present in the network in these areas.
- Changes to network assets, including hydrants and nodes, were assumed to be outside the scope of the network updates and excluded from this assessment.

## 5 Base Model Updates

GDC provided details of three areas of network changes since the last model update:

### 5.1 Matai Ridge Subdivision

Matai Ridge subdivision, designed by WSP, was completed in summer 2023. As-built and original design details were provided by GDC on 17 of April 2022 for inclusion in the model. Refer to the 'Design Report Final Rev C' delivered by WSP to GDC in 2018 and the as built drawings '6-VG109.02\_C00-C25' delivered by GDC.

The 38 new properties' residential demand (757.4 L/property/day) and leakage (465 L/property/day) were added to the model and allocated to a new DN 125 PVC-U PN 12 pipe based on as built drawings.

### 5.2 East Gore Industrial Zone

East Gore industrial zone water supply network upgrade was completed in the first quarter of 2023. The design drawing, with mark ups, was provided by GDC on 17 of April 2022. Refer to the 'East Gore Industrial Zone – Red pen mark-up' delivered by GDC.



The new DN 150 PE 100 PN 12.5 supplying the East Gore industrial zone water supply network was added to the model based on the red pen mark-up drawing.

### 5.3 Kaka Street Subdivision

Kaka Street Subdivision was completed since the last model update in 2022. Asbuilt plan, 'Kaka St – Asbuilt Plan', was provided by GDC on 17 of April 2022.

The six new properties' residential demand (757.4 L/property/day) and leakage (465 L/property/day) were added to the model and allocated to the new DN 63 PE 100 PN 12.5 pipe based on the as built drawing.

## 6 Water Results

### 6.1 Peak Day

The development at 29 Hamilton Street has been assessed against the following targets for peak day demand:

- A minimum pressure level of service of 25 m
- Pipe headloss of 3 m/km for pipes > DN 200, < 5 m/km for pipes < DN 150
- Pipe velocities < 1.5 m/s

The ADPW model, with the three network updates as above, predicted the following results relating to pressures:

- Minimum pressure in the 29 Hamilton Street subdivision of 39 m.
- Under normal operation there is minimal impact on the existing network pressure levels of service as shown below (0.3 m reduction in pressure).

Table 6-1 shows the predicted impact on pressures in the Gore reticulation.

*Table 6-1: ADPW model predicted minimum pressures*

Peak Day Model – Demand Scenario	Minimum Pressure (m)	
	Intersection Wentworth St / Maitland St	30 Hamilton Street
Base model, inc. Matai Ridge, East Gore Ind Zone & Kaka St added	19.2	41.1
29 Hamilton Street added	19.1	40.8

Figure 6-1 shows the predicted minimum pressures in the north-east area of the Gore network.

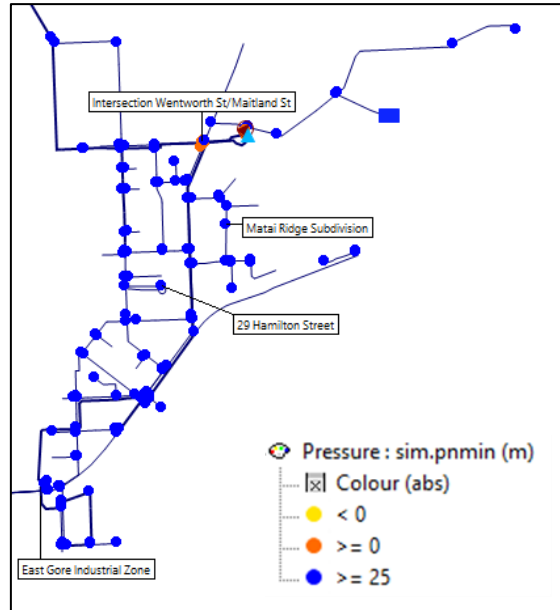


Figure 6-1: Minimum pressures across the network with upgrades and 29 Hamilton St development

Figure 6-2 shows the predicted headloss in the network during peak day demand. Velocities in the reticulation network are predicted to stay below 1.5 m/s.

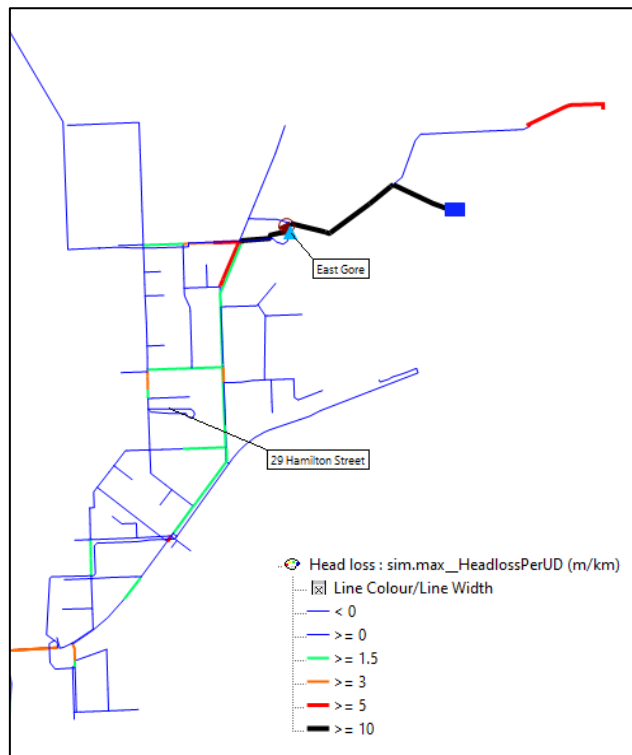


Figure 6-2: Headloss predicted in the network during peak day demand at 29 Hamilton St

## 6.2 Fire Flow

The FW2 (25 L/s) fire flow response across the network was simulated at 2/3 of the peak day demand. The assessment was based on achieving a residual pressure of 10 m at hydrants during fire flow. The model predicts a pressure of 8.5 m at the hydrant in the 29 Hamilton Street development. The rest of the reticulation pressures are predicted to remain above 10 m.

Figure 6-3 shows the predicted headloss in the network which contributes to a marginal pressure result at 29 Hamilton Street.

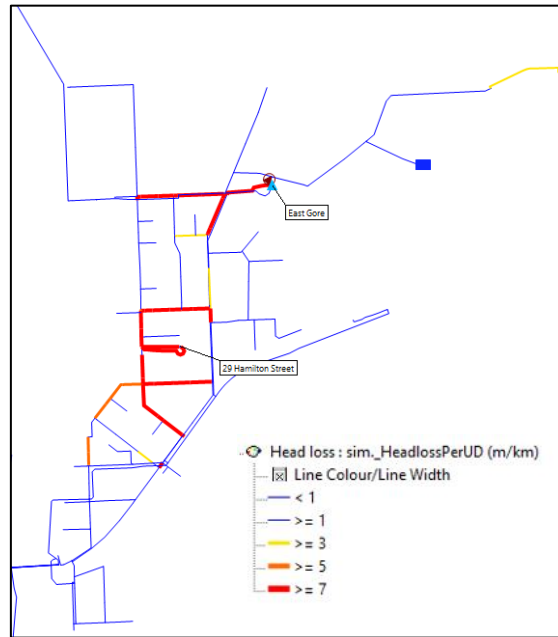


Figure 6-3: Headloss predicted in the network during FW2 (25 L/s) fire flow at 29 Hamilton St

## 7 Conclusion and Recommendation

The model predicts no significant impact on the existing water network when the additional demand for 24 new residential properties at the 29 Hamilton Street development is added.

- For a peak day demand the model predicts a 0.3 m decrease of pressure across the network in the vicinity of 29 Hamilton Street. Pressures remain above the 25 m minimum pressure level of service
- The pressure at the hydrant in the 29 Hamilton Street development is predicted to drop to 8.5 m during FW2 (25 L/s) fire flow. This is marginally below the required minimum residual pressure of 10 m and is acceptable given current confidence in the peak day model and simulated headlosses. There are existing high headlosses predicted during fire flow in the network around 29 Hamilton Street which contribute to this marginal pressure result.

WSP makes the following recommendations based on the predictions of this modelling assessment:

- The 29 Hamilton Street development can proceed with the pipe specifications and hydrant location as outlined on the Preliminary Design.
- A full model update and calibration should be completed to further investigate the areas of piping where head loss falls below the recommended values.

## 8 References

Opus. (2012). Gore Wastewater and Stormwater Model Build and Calibration Report.

PDF '6-VG109.02\_C00-C25'. Gore District Council McDougall Street, East Gore. Matai Ridge Residential Land Development Project (2022).

PDF '625 - Matai Ridge Asbuilts - Wilson Contractors - Rev C'. (Wilson Contractor 2017)

PDF 'Design Report Final Rev C'. Matai Ridge Residential Land Development Project - Infrastructure Design Report (WSP 2018).

PDF 'Kaka St - Asbuilt Plan'(Clark Fortune McDonald 2022)

PDF 'East Gore Industrial Zone - Red pen mark-up'. (Southern Horizons 2022)

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