Project Number: 3-C2552.1

Gore – 29 Hamilton Street Development – Wastewater and Stormwater Modelling

19 May 2023

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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 wastewater (WW) and storm water (SW) network impact assessment for the future development area in 29 Hamilton Street, Gore. This was done to understand the existing network constraints to development and the potential upgrades required to accommodate the development flows.

The new development site is expected to consist of 24 new residential properties, which will include a total of 104 people. The new area covers approximately 7,600 m^2.

The impact of the development on the wastewater and stormwater network was assessed for five scenarios:

1 Wastewater performance in dry weather flow (DWF)

2 Wastewater performance in wet weather flow (WWF) during a 5-year Average Recurrence Interval (ARI) rainfall event

3 Stormwater performance in WWF during a 5-year ARI rainfall event

4 Stormwater performance in WWF during a 10-year ARI rainfall event

5 Stormwater performance in WWF during a 100-year ARI rainfall event

Each scenario was 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 recent upgrades at Matai Ridge subdivision. The two other areas were not added to the model as they will have no impact on the system in the vicinity of the development.

During the DWF simulation the wastewater network is predicted to have sufficient capacity to receive the additional flow from the 29 Hamilton Street development.

Our WWF assessment found that the connection of the residential development to the wastewater network causes a predicted small increase in existing predicted overflows. However, it is not creating any new overflows during WWF. This is because the wastewater system is already at capacity during a 5-year ARI rainfall event before the addition of the development flows.

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

- The predicted impact of the development flows is small.
- The base model site flows may be underestimated, and the method of estimating development flows are potentially conservative.
- The upgrades required to resolve the increase would be extensive, due to the length of existing sewer that is predicted to be surcharged.
- Attenuation of wastewater flows was discounted as the benefit will not outweigh the operational risk associated with wastewater attenuation.
- The reduction in peak stormwater runoff from the development, discussed below, provides GDC the opportunity to offset the impact of the development. This is because the extra capacity created in the stormwater network will potentially allow stormwater to be separated from the wastewater network.

The stormwater assessment shows that there is no predicted increase in catchment flood extent or flood depth due to the new development. This is based on the pre- and post-development

effective runoff areas provided by Kāinga Ora, which causes a reduction in predicted peak stormwater runoff. If the effective runoff area of the new development increases, it is recommended that the impact of the development be re-assessed.

No differences are predicted between the flood extent and depth pre- and post-development during the 5, 10 and 100-year ARI rainfall events.

The worst-case scenario of 100-year ARI rainfall event (60-minute duration with Climate Change), does not show a flood elevation higher than 73.2 m (Dunedin-Bluff datum).

2 Scope

The assessment included the development area in 29 Hamilton Street of 24 residential lots with a total expected population of 104.

The preliminary drawing of the development site provided by Kāinga Ora (ref SiteTAG_29HamiltonSt_Igniite_UpdatedPlan_20230309.pdf) was used to delineate the approximate wastewater catchment into the model.

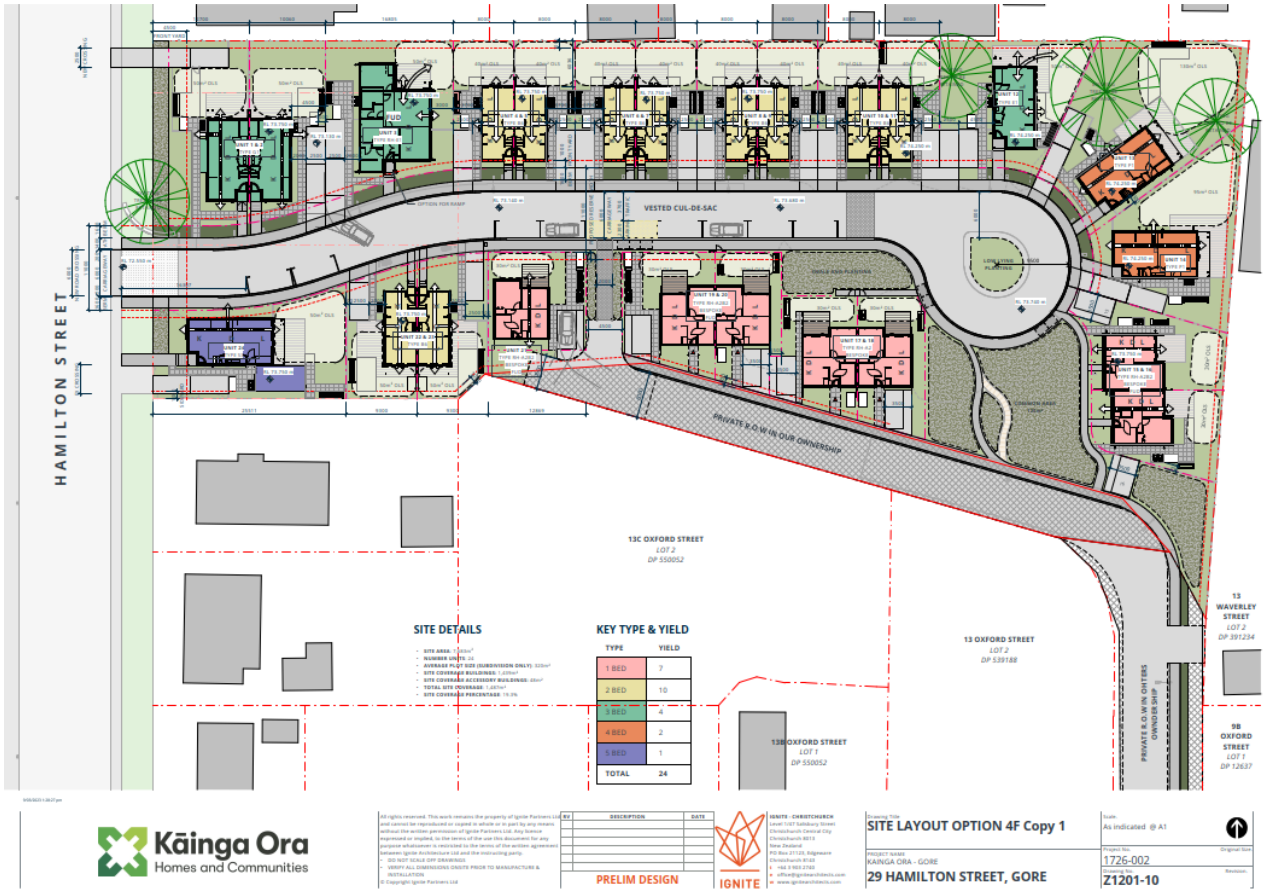


Figure 2-1 Kāinga Ora – Preliminary design – 29 Hamilton Street development

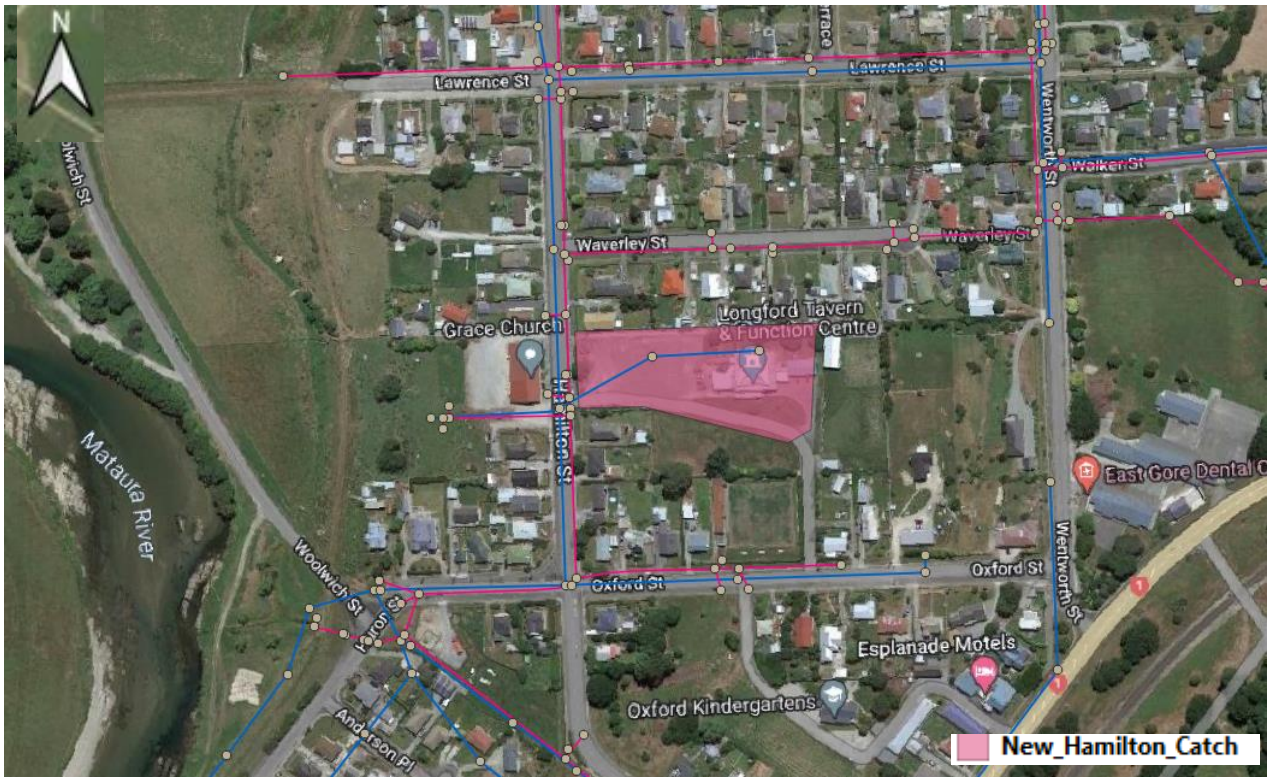


Figure 2-2 29 Hamilton Street, Gore – proposed development area

3 Methodology

The following methodology was undertaken to assess the impact of the development on the existing wastewater and stormwater networks:

- The 'Gore 2016 Update v1-ardwick wigan' is the current model used. The 29 Hamilton Street development scenarios were branched off the base scenario.
- The base model was updated with recent network changes, see section 5.
- The base scenario was updated to match with the pre-development effective area for the stormwater runoff – areas provided by GDC.
- Two new scenarios were created for DWF and WWF comparisons with new subcatchments representing the development added.
- The wastewater DWF scenario was set up with the residential development population to allow the impact of the diurnal flow from the development to be assessed.
- The wastewater WWF scenario was set up with a constant flow added on to the diurnal flow to achieve the peak wet weather flow (PWWF) from the development (1.5 L/s).
- The stormwater scenario was set up with the post-development effective areas.
- Simulations were run to assess the impact of the developments on the existing networks during dry and wet weather (5-year ARI rainfall event for the wastewater, 5, 10 and 100-year ARI rainfall events for the stormwater network. All rainfall events include an allowance for climate change).
- The results were assessed and discussed with GDC to identify if any upgrades were required to accommodate the development flows.

4 Assumptions

4.1 General

- The Gore 2016 Update v1_ardwirck wigan wastewater model was used, which was modelled in InfoWorks ICM v2021.61. This model was last updated to reflect changes in population and new infrastructure in 2016 and with other localised infrastructure upgrades since this time. The model has not been calibrated since it was first built in 2012 (Opus, 2012). However, validation checks have been undertaken during previous studies in some areas and the model results were considered reasonable. Therefore, we consider it suitable for this type of pre and post development comparison.
- Design rainfall, including an allowance for climate change, from the Gore Design Rainfall Analysis Report (Opus, 2012) was used. It should be noted that the percentage change factors to estimate increase in the rainfall depth due to increases in average temperature due to climate change are based on the outdated 2008 MfE guidance and not the latest (2018) guidance. We recommend GDC revise their design rainfall to be in accordance with the latest guidance.
- The model was run with the 5-year ARI rain event with 1-hour duration design events (including climate change allowance) to replicate WWF, as this was previously determined to be the critical storm duration for the wastewater system. Comprehensive modelling of a variety of design rainfall events has not been conducted as part of this assessment.
- Comment and assessment of the infrastructure within the development was excluded from the scope of this project.
- The stormwater model was run with the 5, 10 and 100-year ARI with 1-hour and 2 hours design events (including climate change allowance) to replicate the WWF. The 1-hour duration was determined to be the critical storm.

4.2 Scenario Specific

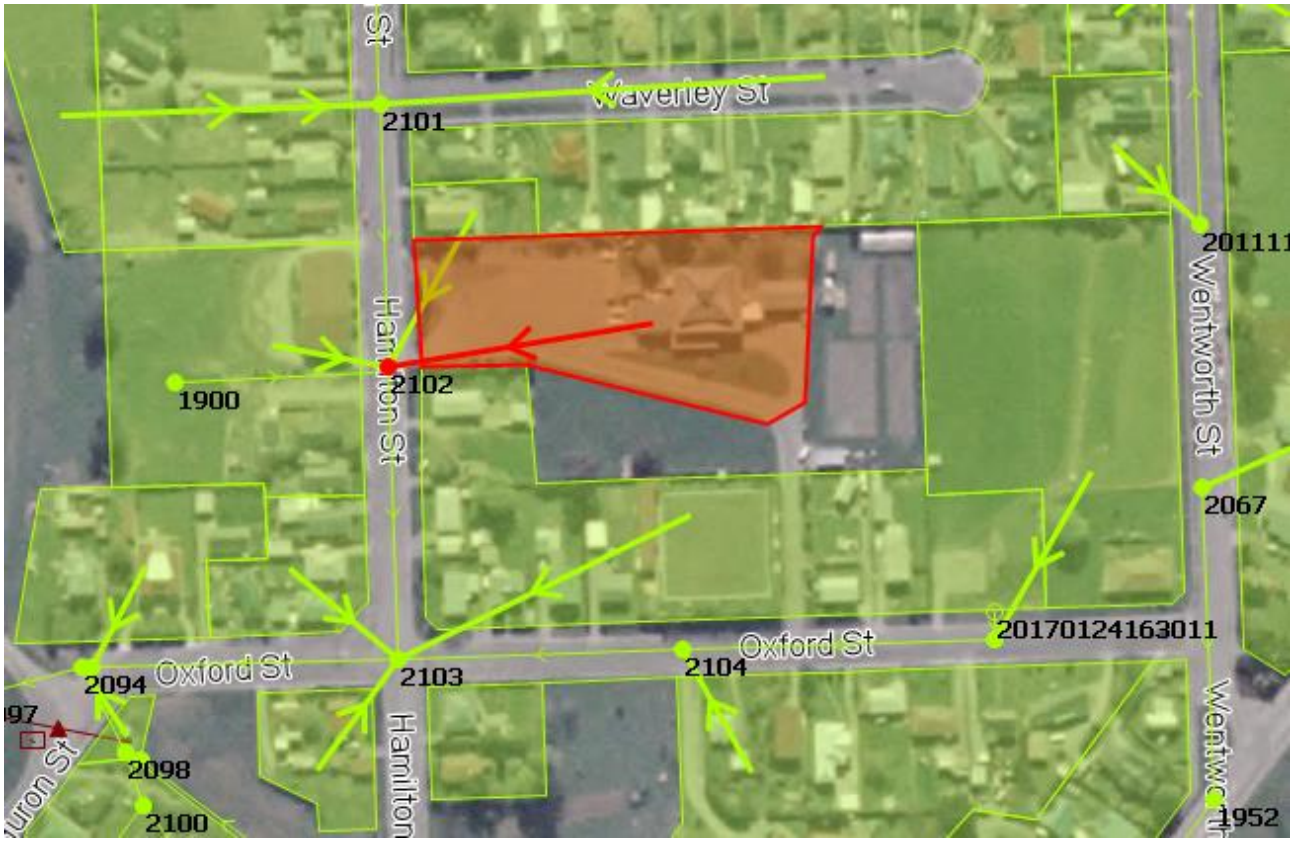
Density and zoning assumptions for the development areas were provided by Kāinga Ora on 6 April 2022: SiteTAG_29HamiltonSt_Ignite_UpdatedPlan_20230309_DesktopReview (A10396349).pdf.

Assumptions for the wastewater assessment are:

- The total population of the development was provided by Kāinga Ora.
- Flows of 250 L/person/day.
- The peak DWF is 2.5 times the average dry weather flow (ADWF).
- During WWF, the peak wastewater wet weather flow (PWWF) from the development is 5 times the ADWF. This WWF allowance has been added as a constant inflow into the model.

Calibre advised that the existing wastewater lateral pipeline on the site will be abandoned. A new wastewater network layout will be constructed and connected to the main wastewater pipe with a new manhole on Hamilton Street. In the model, the 29 Hamilton Street development area was connected to nearest existing manhole on the main pipeline along

Hamilton Street: manhole ID '2102'. See



- Figure 4-2.

Wastewater development flows are summarised in Table 1 and the wastewater profile applied to is shown in Figure 4-1.

Table 1 Development wastewater flows.

Development area	Proposed Lots	Person per Lot	Population	ADWF (L/s)	PDWF (L/s)	PWWF (L/s)
Gore - 29 Hamilton Street	24	4.33	104	0.30	0.75	1.50

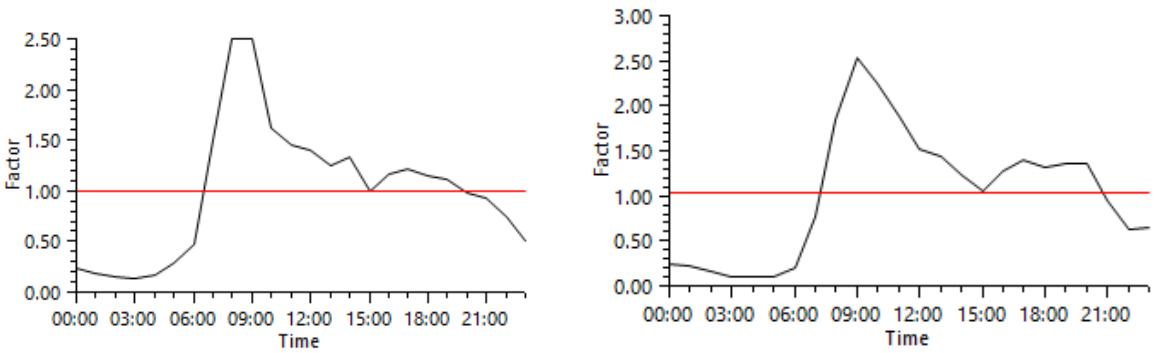


Figure 4-1 Wastewater profiles new development - Weekday (left) and weekend (right).

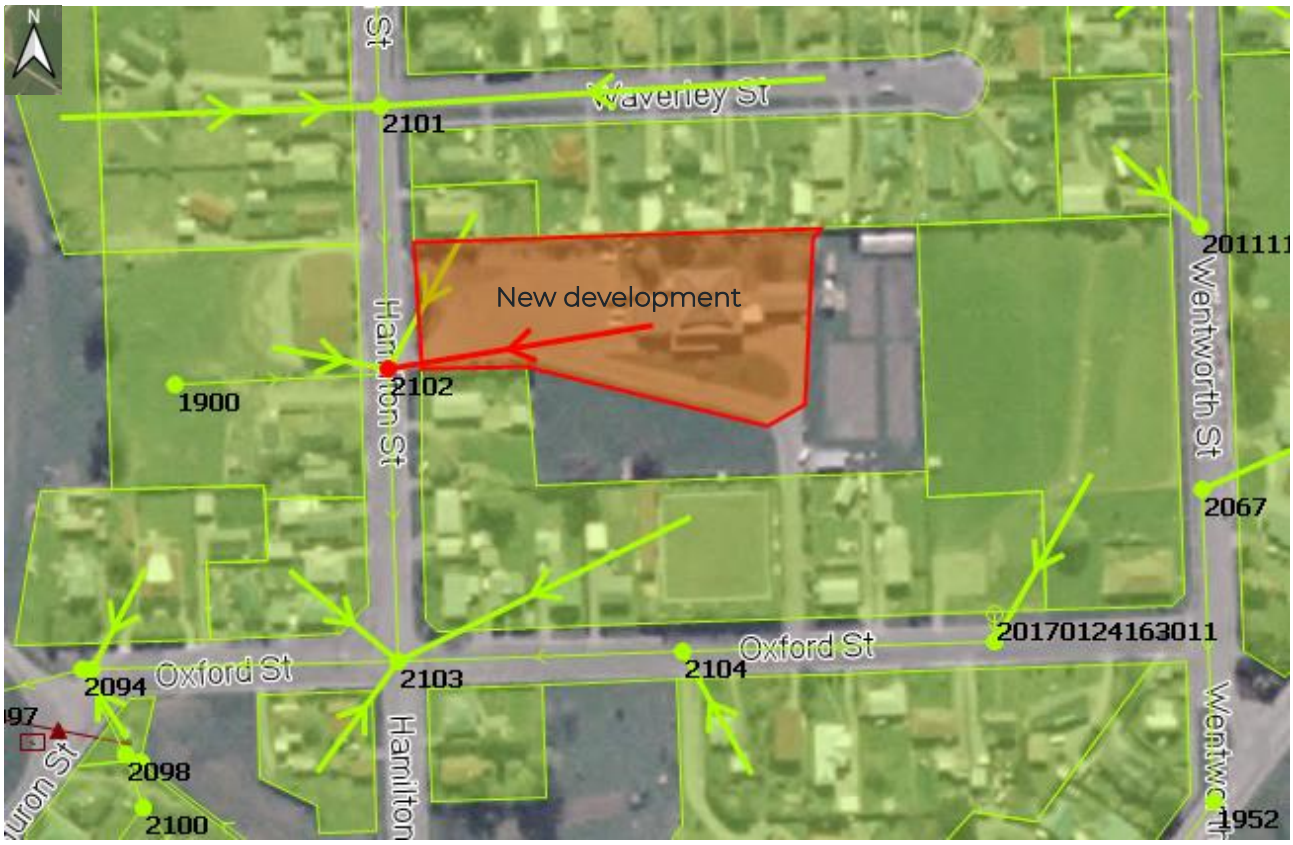


Figure 4-2 Wastewater catchment of the new development (red) connected to node 2102 (red).

Assumptions for the stormwater assessment are:

- The stormwater assessment was done by adding the same new development catchment delineation as the wastewater.
- The runoff parameters are set for the base and for the development scenario based on the effective area values provided by GDC (Calibre report – refer Figure 4-3 and Figure 4-4).
- Calibre advised that a new stormwater network layout will be constructed and connected to the main pipe with a new manhole in Hamilton Street. In the model, the 29 Hamilton Street development area was connected to nearest existing manhole on the main pipeline along Hamilton Street: manhole ID "4811". See Figure 4-5.

Surface Run Off

Surface:	Catchment Areas:		Runoff Coefficients:		Effective Areas:
Roof	A1=	868m²	C1=	0.90	781m²
Paved Areas	A2=	4106m²	C2=	0.85	3490m²
Berm / Garden	A3=	2711m²	C3=	0.30	813m²
Future Development Area	A4=	0m²	C4=	0.65	0m²
Permeable Pavement	A5=	0m²	C5=	0.50	0m²
Total Site Area:		7685m²		Total Effective Area:	5084m²

Figure 4-3 Pre-development Stormwater Flow

Surface Run Off

Surface:	Catchment Areas:		Runoff Coefficients:		Effective Areas:
Roof	A1=	1314m²	C1=	0.90	1183m²
Semi-Permeable Pavers	A2=	617m²	C2=	0.85	525m²
Road / Driveway	A7=	1884m²	C7=	0.85	1601m²
Footpath	A6=	711m²	C6=	0.85	604m²
Berm / Garden	A3=	3159m²	C3=	0.30	948m²
Future Development Area	A4=	0m²	C4=	0.65	0m²
Total Site Area:		**7685m²**	**Total Effective Area:**		**3309m²**

Figure 4-4 Post-development Stormwater Flow

Figure 4-5 Stormwater catchment of the new development (red) connected to node 2102 (red).

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, will be 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.

For the wastewater system, the subdivision is split into two areas. Area 1 going to the North-West and Area 2 going to the South-West. The discharges were set according to the number of lots (17 in area 1, 21 in area 2) and people per lots (3.1) from the 'Design report Final Rev C'.

For the stormwater system, this subdivision included new network that was added to the model, including an attenuation basin of 340 m^3 with an overflow pipe connected to the stormwater main on Wentworth Street.

5.2 East Gore Industrial Zone

This change only concerns the water supply network with no change required to the wastewater and stormwater networks.

5.3 Kaka Street Subdivision

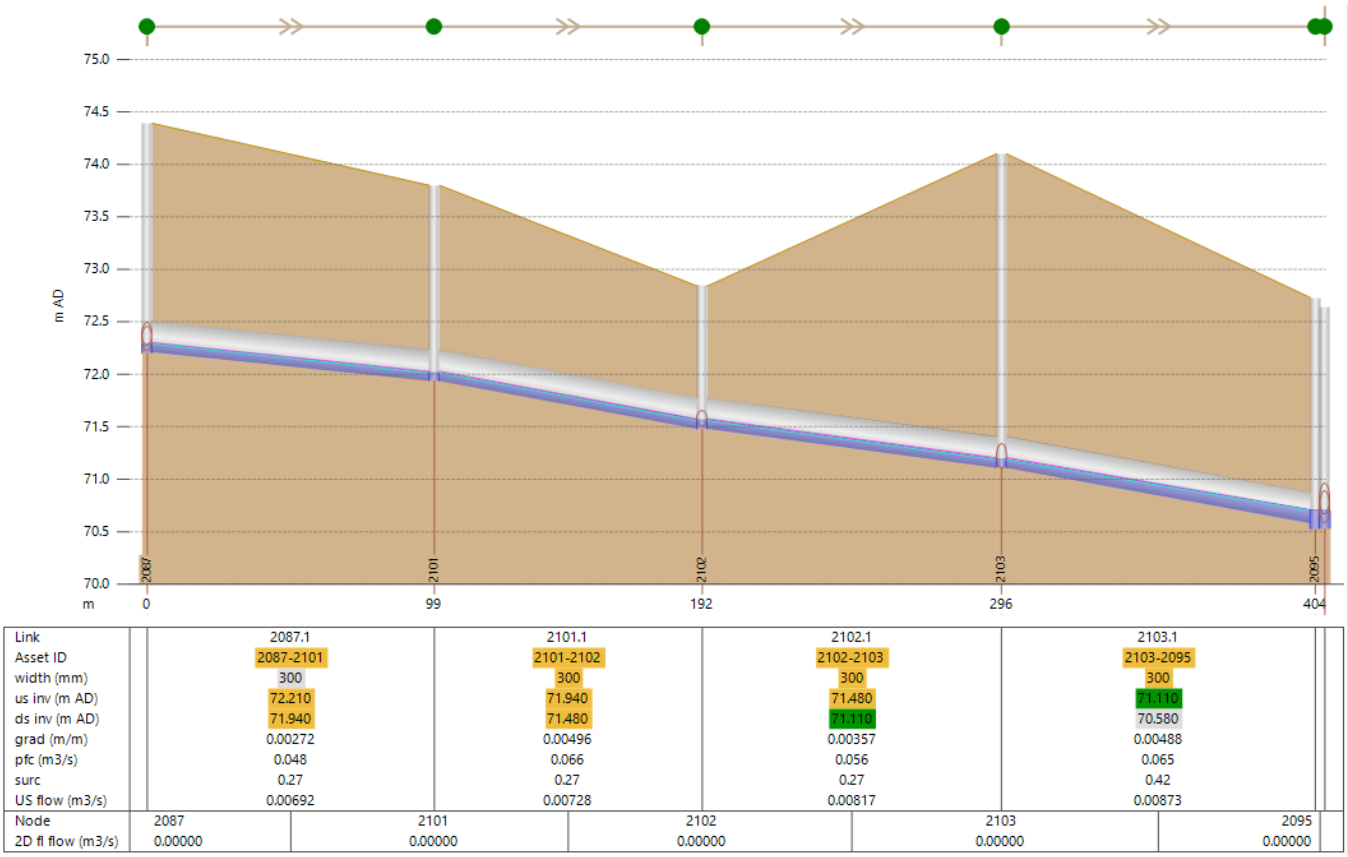
Kaka Street subdivision is located far downstream of the Hamilton Street development on the wastewater and the stormwater networks. The Hamilton Street assessment should not be impacted by this network change. Therefore, this subdivision was not added into the model.

6 Wastewater Results

6.1 Dry Weather Flow

No issues are predicted in the gravity network downstream of the development of 29 Hamilton Street. No overflows were predicted in the base scenario and no overflows are predicted with the additional development flows. Figure 6-1 and Figure 6-2 show the longitudinal profile of the wastewater section along Hamilton Street, with the new development catchment connected to node 2102. Figure 6-2 shows there is a minimal change in the water level between the proposed development (in dark blue) and the base model (in light blue).

Figure 6-1 Location of the longitudinal profile – Network selected in red



Link	2087.1	2101.1	2102.1	2103.1
Asset ID	2087-2101	2101-2102	2102-2103	2103-2095
width (mm)	300	300	300	300
us inv (m AD)	72.210	71.940	71.480	71.110
ds inv (m AD)	71.940	71.480	71.110	70.580
grad (m/m)	0.00272	0.00496	0.00357	0.00488
pfc (m3/s)	0.048	0.066	0.056	0.065
surc	0.27	0.27	0.27	0.42
US flow (m3/s)	0.00692	0.00728	0.00817	0.00873

Node	2087	2101	2102	2103	2095
2D fl flow (m3/s)	0.00000	0.00000	0.00000	0.00000	0.00000

Figure 6-2 Longitudinal profile of wastewater network along Hamilton Street.

6.2 5-year ARI Rainfall Event with Climate Change

The model predicts manhole overflows, and constructed overflows to spill, during the 5-year ARI rainfall event in the existing system. The locations are shown in Figure 6-3, with the manholes in blue being the spilling manholes. The manholes circled in red have a spill volume change between pre- and post-development. A long section of the network downstream of the development is shown in Figure 6-4 and Figure 6-5.

With the addition of the development flows, two existing manhole spills are predicted to increase in volume, but there are no new manhole overflows predicted. The results are shown in Table 2.

Figure 6-3 Surcharged wastewater pipes and overflow points around the new development.

Figure 6-4 Location of the longitudinal profile – selected in red.

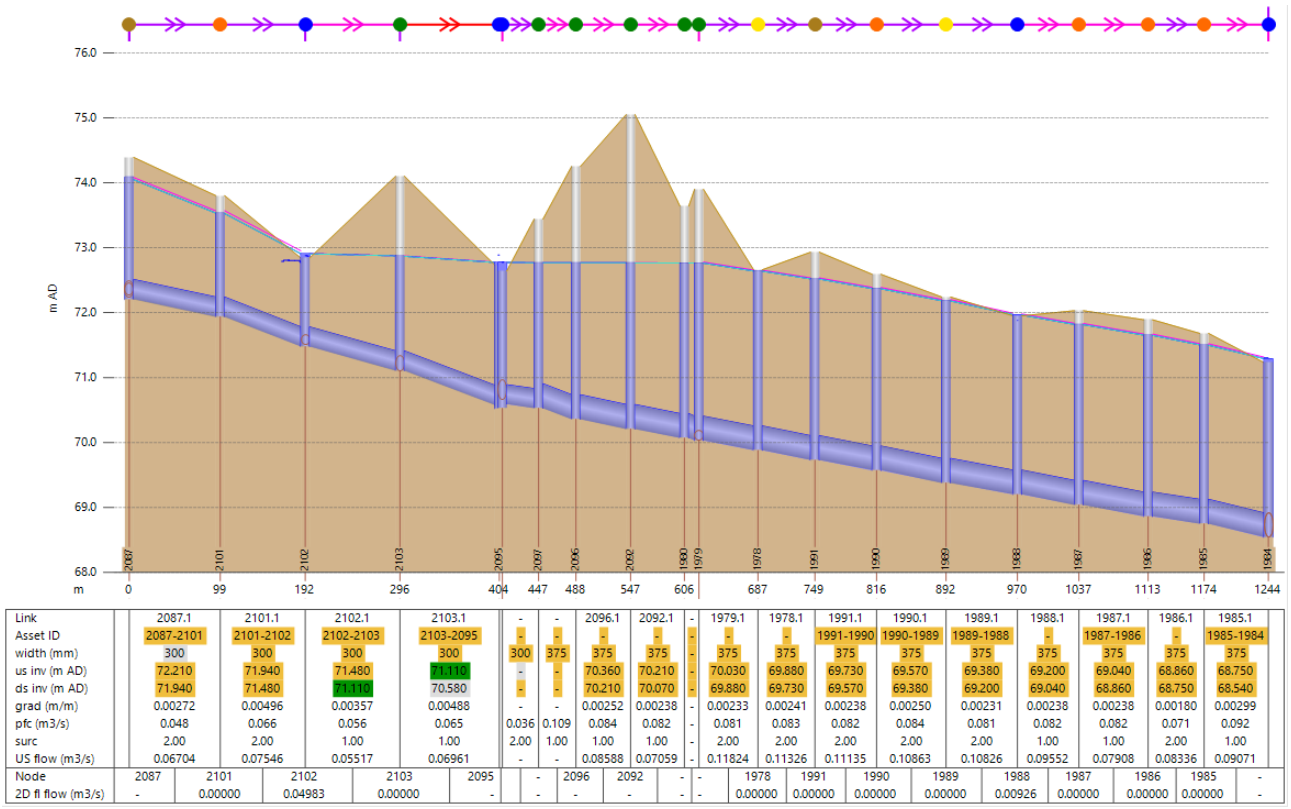


Figure 6-5 Longitudinal profile of the wastewater pipeline - 5-year ARI event.

Table 2 Change in predicted manhole overflow spill volume during a 5-year ARI (+CC) rainfall event.

Model ID	Type	System	Increase in Spill volume (m^3)	Percentage Increase
2102	Manhole	Wastewater	5.2	4.2
2104	Manhole	Wastewater	1.7	0.7

The small increase in predicted overflow volume is within the error margin of the model. The existing site is assumed to have separate wastewater and stormwater systems and there is no allowance made in the model for any inflow and ingress (I&I) into the wastewater system. Whereas the new development has an I&I allowance included as part of the design flows. It is possible that the existing site does contribute some I&I and the new development will contribute less than assumed. Therefore, the difference in spill volume could be less than predicted. As the network is surcharged for a significant length, the required upgrades to the network are disproportionate to the potential issue. In addition, the model predicts the development will reduce the stormwater runoff volume from the site, refer to Section 7. With all these factors considered, we recommend that no upgrades are required to accommodate the wastewater flows from the development.

7 Stormwater Results

Based on the pre- and post-development site details provided, there is a reduction in effective area. Therefore, the model predicts a reduction in peak flows and runoff volumes from the site. This section details the peak flows predicted in the storm events assessed, which are summarised in Table 3. Flood depth maps for each event are also provided in this section.

Table 3 Peak flow and volume pre and post development for each storm event

Storm Event (ARI)	Peak Flow Pre-development (L/s)	Runoff Volume Pre-development (m^3)	Peak Flow Post-development (L/s)	Runoff Volume Post-development (m^3)
5	34	82	31	71
10	51	116	46	104
100	109	236	104	222

7.1 5-year ARI Rainfall Event CC (20%AEP)

The change in the volume from the stormwater system going to the overland is decreased at the connected node 4811. The pre-development scenario shows a runoff volume of 14 m^3 whereas the post-development scenario shows a 12 m^3 runoff volume. This is a decrease of 14%.

The predicted flood extent flows are shown in Figure 7-1 and Figure 7-2. There is no difference with the flood extent without the development.

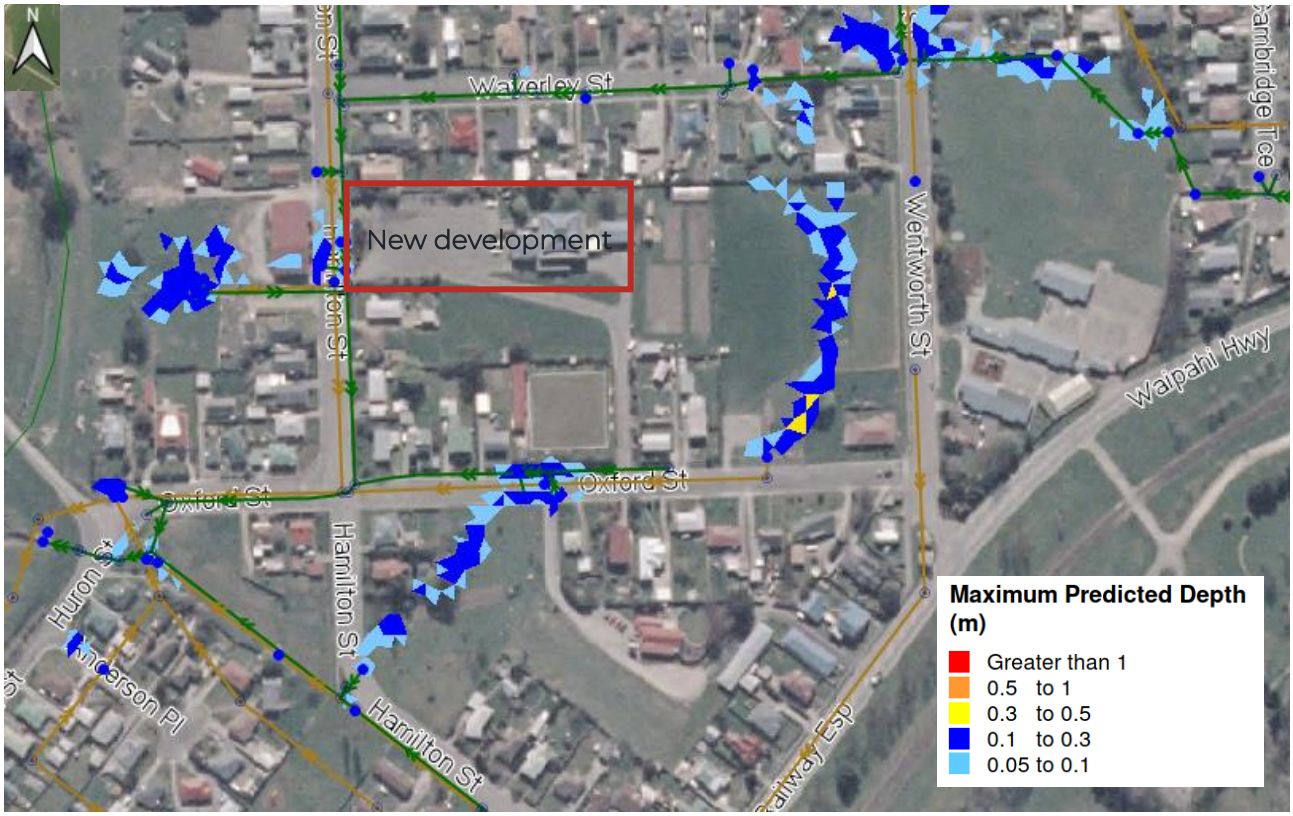


Figure 7-1 Predicted flood extents (m) during 5-year ARI with the development at 29 Hamilton Street.

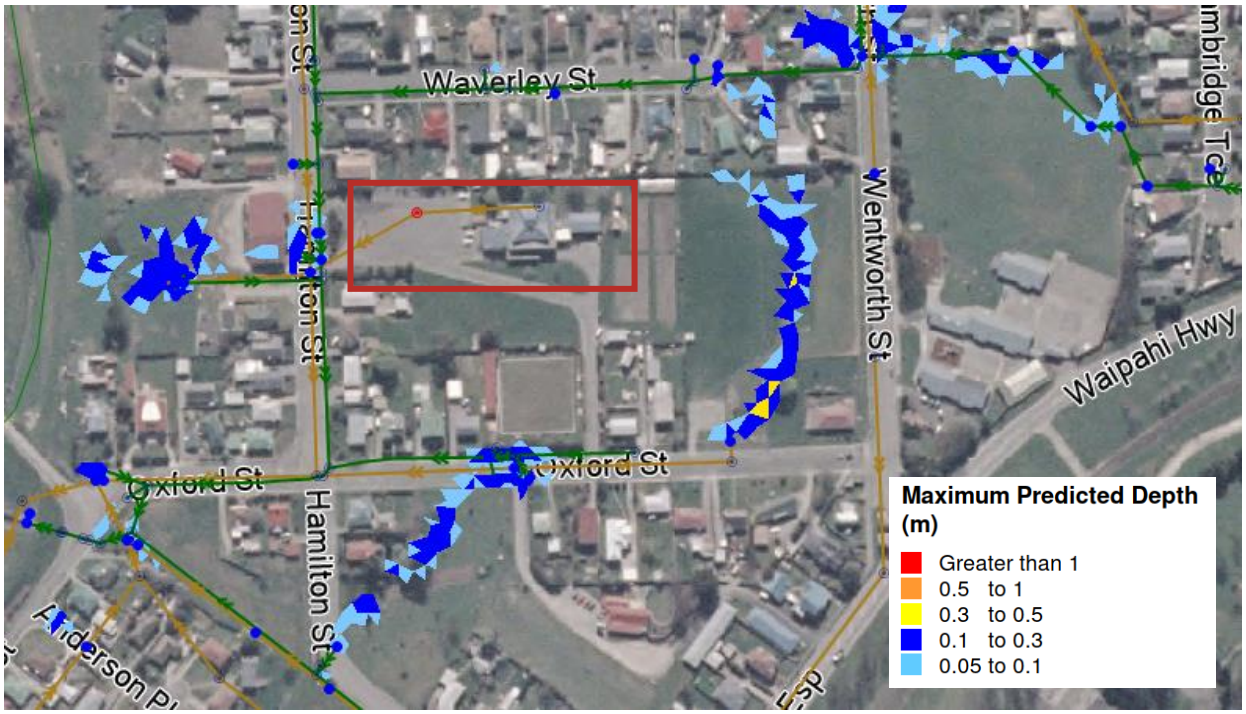


Figure 7-2 Predicted flood extents (m) during 5-year ARI without the development at 29 Hamilton Street.

7.2 10-year ARI Rainfall Event CC (10% AEP)

The peak stormwater outflow modelled from the proposed 29 Hamilton Street development site is 46 L/s (Table 3).

The predicted flood extent flows are shown in Figure 7-3. There is no difference with the flood extent without the development.

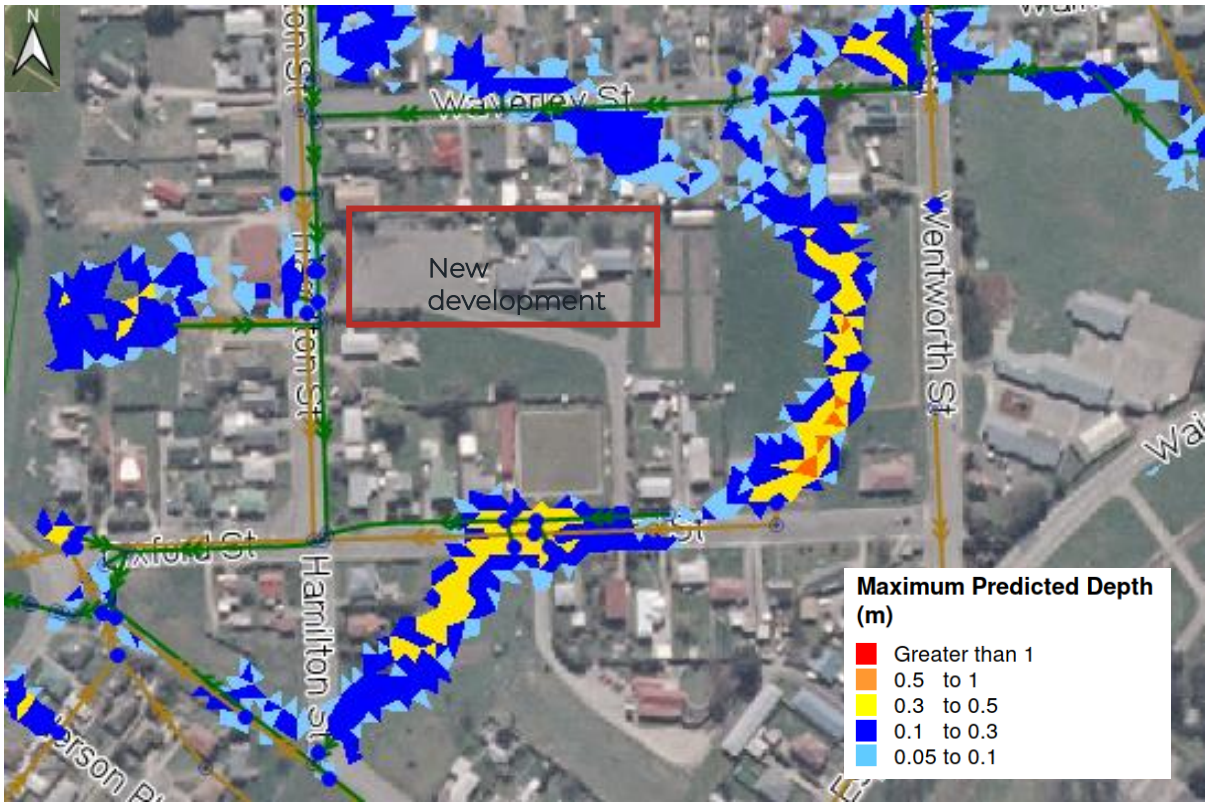


Figure 7-3 Predicted flood extents (m) during 10-year ARI with the development at 29 Hamilton Street

7.3 100-year ARI Rainfall Event CC (1% AEP)

The peak stormwater outflow modelled from the proposed 29 Hamilton Street development site is 104 L/s (Table 3).The predicted flood extent flows are shown in Figure 7-4. The flood extent without the development is showing no differences.

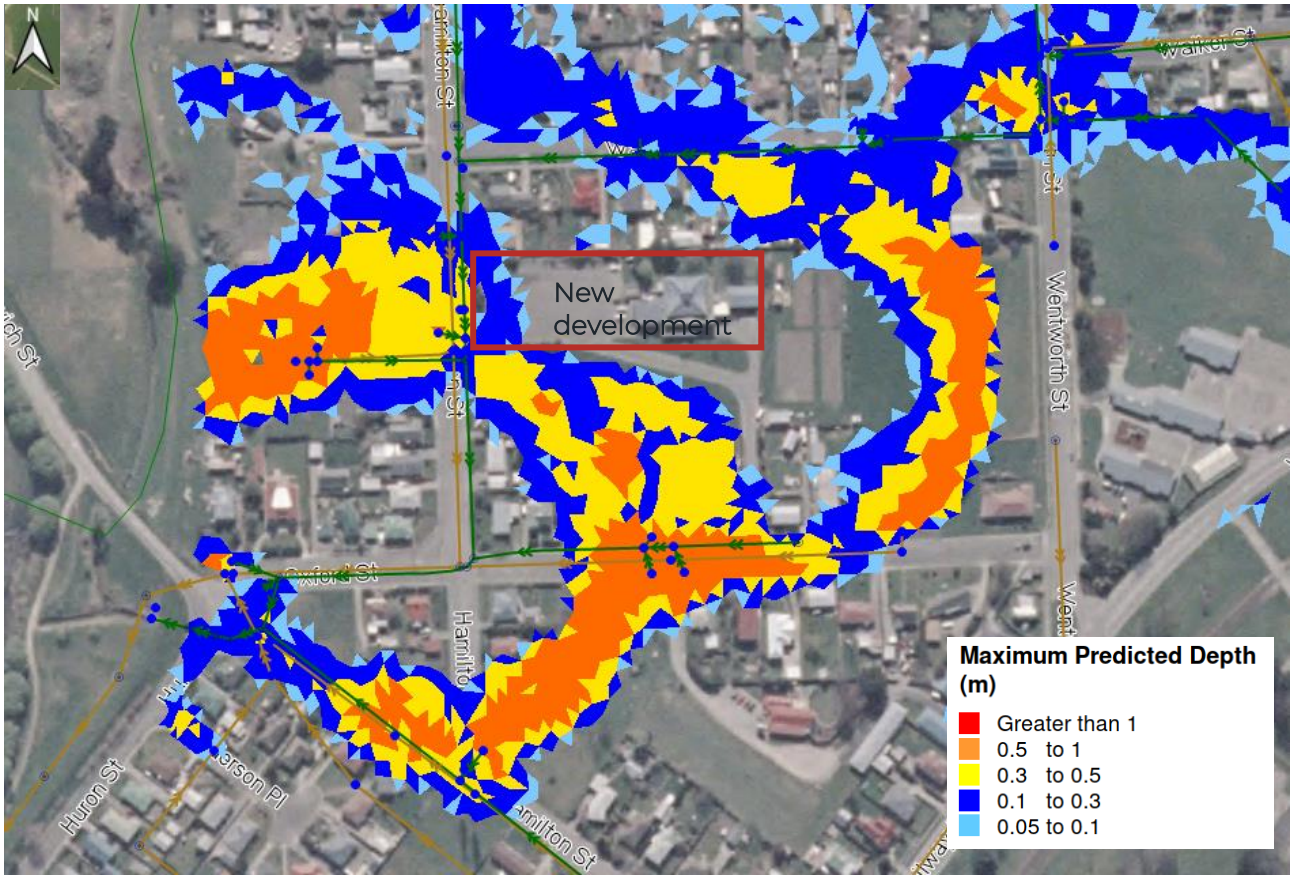


Figure 7-4 Predicted flood extents (m) with the development at 29 Hamilton Street – 100 years ARI rain event 60 minutes duration + Climate change.

The predicted map of the elevation at the site is shown in Figure 7-5. The maximum elevation at the site is below 73.2 m. Note that the model is using the Dunedin-Bluff Vertical 1956 datum. Calibre (consultant) has informed that their levels for the development are based on the NZVD2016 datum and to convert from the Dunedin-Bluff Datum into NZVD2016 the values need to be adjusted by subtracting 0.24 m.

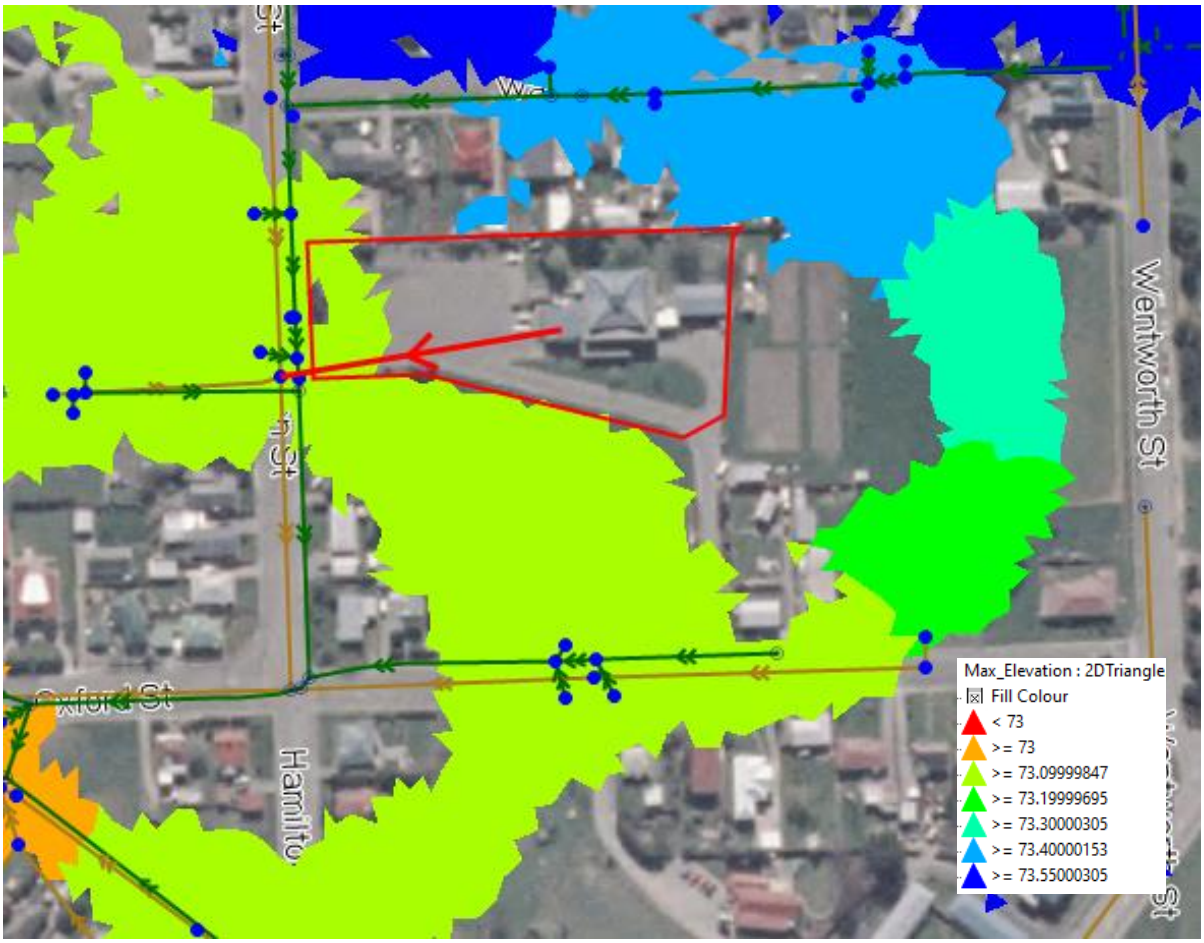


Figure 7-5 Predicted elevation flood extents (m) with the development at 29 Hamilton Street – 100 years ARI rain event 60 minutes duration + Climate change.

8 Conclusion and Recommendation

The model predicts there is not any significant impacts on the existing wastewater and stormwater networks due to the 29 Hamilton Street development.

Based on the current and proposed site details provided, there is a predicted reduction in peak stormwater flows from the site. A comparison of the predicted flood extents before and after the development shows no change in extents and depths are expected.

The Gore wastewater network is already at full capacity during a 5-year ARI rainfall event. The addition of the new development flows is predicted to cause a small increase in the manhole spill volumes in the area downstream of the development. Due to the total length of sewer that is predicted to be surcharged, to resolve these increases would require significant upgrades to the network. The potential extent of upgrades has been considered against; the conservative approach that is used to represent the new development (with an allowance for stormwater flows in the wastewater network), the small increase in spill volumes, and the benefit the development has on the stormwater network. With all these factors considered, we recommend that no upgrades are required to accommodate the wastewater flows from the development.

9 References

Opus. (2012). Gore Design Rainfall Analysis Report.

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 '713093.001 LE 20230324 SW Dispensation App'. Kāinga Ora Hamilton Street Re-Development - Stormwater Attenuation Dispensation Application and Treatment Requirement Confirmation (Calibre 2023).

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Gore – 29 Hamilton Street Development – Water Modelling

29 May 2023

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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.

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

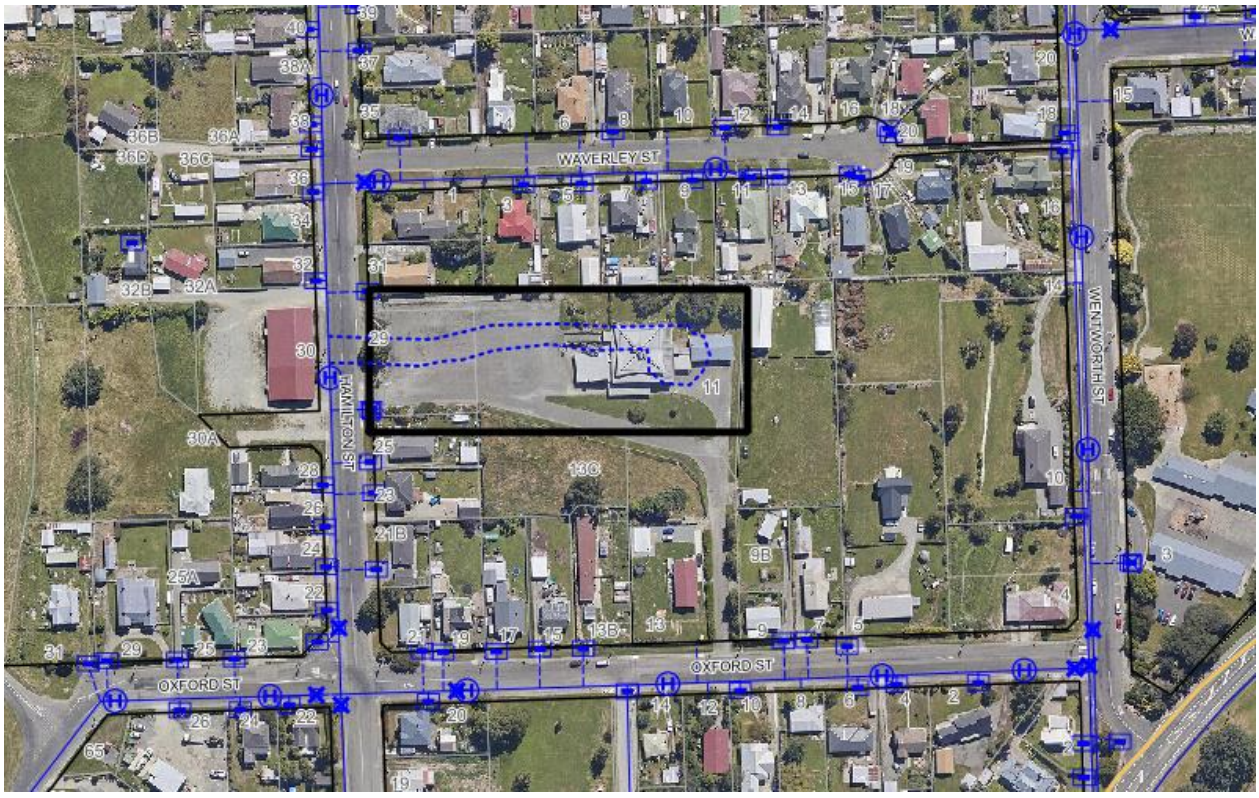

Figure 2-2: 29 Hamilton Street, Gore – proposed development area

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.

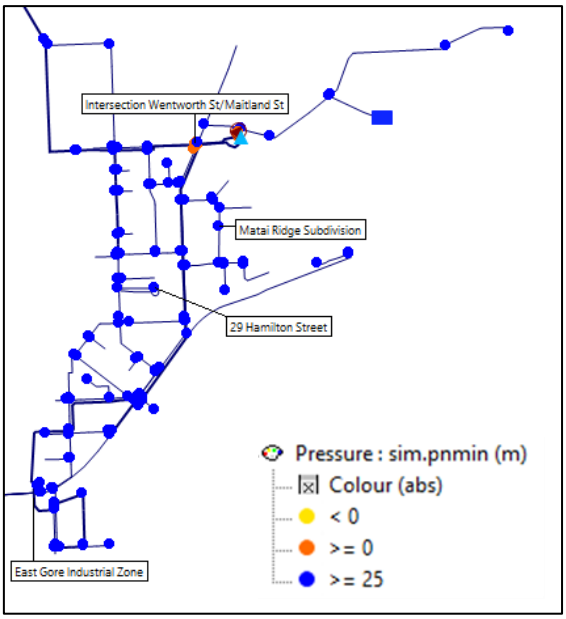

Figure 6-1: Minimum pressures across the network with upgrades and 29 Hamilton St development

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.

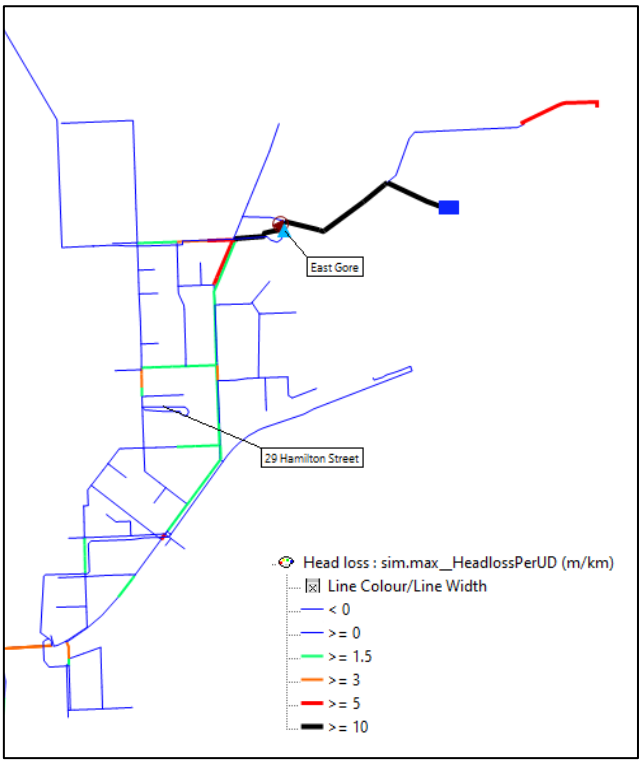

Figure 6-2: Headloss predicted in the network during peak day demand at 29 Hamilton St

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.

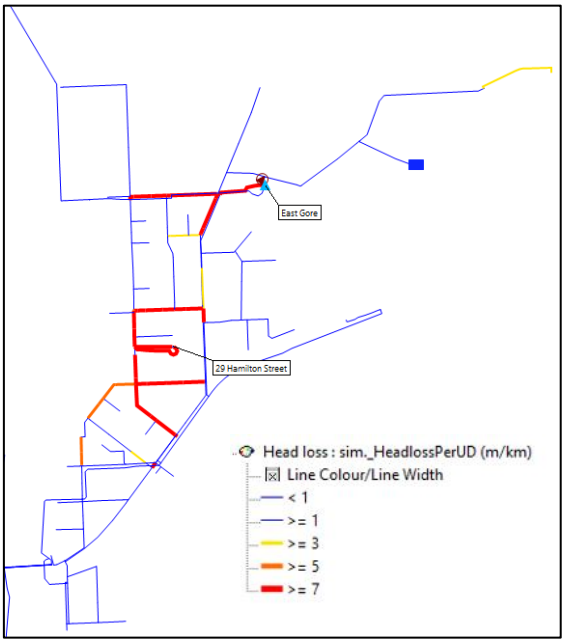

Figure 6-3: Headloss predicted in the network during FW2 (25 L/s) fire flow at 29 Hamilton St

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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