Report

Hamilton St Gore – Civil Design Features Report for Resource Consent

Prepared for Kāinga Ora

18 May 2023

Calibre Consulting Ltd
149025

Turning Knowledge Into Value

QUALITY ASSURANCE STATEMENT

TASK	NAME	SIGNATURE
Project Manager	Wayne Blanchfield	
Prepared by	Michael Tam	
Reviewed by	Brendan Hurring	
Approved for Issue by	Wayne Blanchfield	

DOCUMENT CONTROL

ISSUE	DATE	ISSUE DETAILS	AUTHOR	CHECKED	APPROVED
1	18.05.2023	For resource consent	MT	BH	WB

Contents

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1. Introduction

Calibre Consulting Limited have been engaged by Southbase Construction Ltd to provide civil design services for a proposed 24 Lot residential development at 29 Hamilton Street in Gore, for Kāinga Ora (KO) – Homes and Communities.

This Design Feature Report (DFR) has been prepared to support the application for Resource Consent demonstrating that the roading and servicing for the site can be adequately provided. It also records design criteria, and key discussions with Council and outcomes related to the civil design for this project. It outlines catchments, modelling assumptions, council requirements, design standards and considerations undertaken for this development.

2. Property Details

Property Address:	29 Hamilton St, 11 Oxford St, East Gore, Gore
Legal Description:	Lot 9 & 10 DP 1219 and Lot 3 DP 391234
Record of Title ID:	366119
Parcel Area:	810m^2, 810m^2 & 6,073m^2 (7,683m² Total)
Registered owner:	Housing New Zealand Limited
Zoning:	Gore District Plan:

- Residential A Zone (Planning Map GOR 04)
- Mataura River Floodplain (Hazards and Utilities GOR 04)

3. Site Location and Description

The site is the former Longford Tavern and Function Centre located in East Gore off Hamilton St. It is shown in red on **Figure 1** below. The site is comprised in one Record of Title with a total area of 7,683m^2 but is made up of 3 parcels.

Figure 1: Site location

Pre-development, the site contained one large commercial building, the tavern and functional centre, with a basement underneath. The site has large car park and a Right of Way (RoW) abutting the southern boundary providing access to 13C Oxford Street. The remainder of the site (approximately 2,175m^2) comprises grass and gardens and is mostly located near the eastern end of the site.

The site can be described as generally flat however it has approximately 1m of fall with the highest area adjacent to the eastern boundary and the lowest area at the western boundary adjacent to Hamilton Street.

A pre-development site survey was undertaken by Terramark Ltd in February 2023. The levels taken are in terms of NZVD 2016. A copy of the site survey (drawing numbers 230032/1A 230032/2) is attached in the drawing set with this report.

Demolition works to facilitate the proposed 24-unit residential development have commenced.

4. Design Standards

The applicable design standards were utilised in the civil design of the proposed development;

- **New Zealand Building Code** (D1-Access Routes / E1-Surface Water / E2-External Moisture / G13-Foul Water Drainage)
- **Gore District Council** (Subdivision and Land Development Bylaw 2019)
- **New Zealand Transport Agency** (Traffic Control Devices manual / Manual of traffic signs and markings).
- **NZS 4404 2010** – Land Development and Subdivision Infrastructure

5. Earthworks

The proposed site levels and cut and fill depths are shown on plans 713093.001-C200 and C201.

5.1 Earthworks

The site will be earthworked to create building platforms and to grade the site appropriately for access and drainage. The proposed site levels are shown on plan 713093.001-C200.

Cut and fill depths and volumes have been calculated by comparison of the pre-development surface and the finished ground surface. The maximum total depth of cut and fill are 0.8m and 1.3m, respectively. Total cut and fill across the site are 647m^3 and 1,318m^3 respectively. This indicates a net volume of 671m^3 of material will be required to be imported during earthworks to achieve the finished surface levels. Additional earthworks are expected to include but not limited to excavating and backfilling of trenches for sewer, stormwater, water, other services relating to the site and the demolition and of the existing buildings.

The earthworks volumes provided above are approximate only and are subject to change in detailed design, depending on the final scheme layout and final finished ground levels. The volumes given are however a good approximation of the total volume required.

5.2 Erosion and Sediment Control

Erosion and sediment control for the site will be designed as part of the detailed civil engineering design as requirements may be altered by the final design. This will be carried out in accordance with GDC Subdivision and Land Development Bylaw 2019 (Bylaw). For this size of site these will primarily consist of creating a stabilised entranceway, silt fences and protecting adjacent sumps with sediment filtering soaks and filter fabric under the grates.

6. Roading

The proposed road layout and typical cross sections are shown on plans 713093.001-C300, C305 and C310.

The existing vehicle access to the site is from a vehicle crossing at the Hamilton Street road frontage, adjacent to the south west corner of the site. There is a second access to the site from Oxford Street. This second assess is a right of

way over part of Lot 2 DP 539188 (13 Oxford Street). Lot 2 DP 550052 (13C Hamilton Street) also uses this existing RoW and also has a RoW over Lot 2 DP 539188 and part of the subject site to gain access to that lot. These existing rights of way will remain in place following the development of the site.

A new cul-de-sac (Road 1) will be constructed intersecting with Hamilton Street. Road 1 will grade upwards from Hamilton Street to the cul-de-sac head. This cul-de-sac will have a total road reserve of 11metres and a carriageway width of 6 metres. Footpaths will be constructed on both sides of the road. The cul-de-sac will have a turning head with a radius of 9.5metres. This cul-de-sac will provide access to most of the lots and will be vested in Council to become legal road.

The proposed vested road will form an intersection with Hamilton Street. This intersection will be to a road that is below arterial class, therefore is required to have a kerb radii of 9.0m as per GDC Bylaw 2019 section 3.3.7. New pedestrian cutdowns will be provided at the intersection to provide existing footpath continuation. Tactile pavers will be provided at the pedestrian cutdowns.

Lots 1 and 24 will gain access directly from Hamilton Street via new crossings to be formed on that road. The access for Lot 1 is located adjacent to the northwest corner of the site. Lot 24 access is adjacent to the southwest corner of the site and will replace the existing crossing that is in this location. Lots 2 to 15, 22 and 23 will gain legal and physical access from Road 1. The remaining 6 Lots (Lots 16 to 21) are proposed to access via RoW 1, the RoW from Oxford Street. These lots will however all also have pedestrian access from Road 1.

The portion of the right of way from Oxford Street to where it bends to the west is an existing right of way with a varying legal width of 10.65m to 11.0m because the two side boundaries of the RoW are not parallel. This portion of the RoW has a formed carriageway to a nominal width of 5.8m and has a raised nib kerb on one side. The remaining width of the RoW cross section is landscaped. This part of the right of way rises up from Oxford Street. There is no existing drainage for this portion of the right of way. No change will be made to this portion of the right of way except for providing a sump at the roadside end of the RoW that will be connected to the adjacent stormwater main. The pavement make up will be checked during construction to confirm materials and depth. As it has been used for access to the former land use it is expected that the pavement will be sufficient for the proposed land use and no upgrade would be required.

The portion of the RoW that is within the subject lot and runs adjacent to the will be 7.5m wide. This will consist of a 6.0m wide carriageway and 1.5m wide footpath. It will slope downwards towards west from the bend. The turning area and footpath that connects through to Road 1 will allow for overland flow in events that exceed the capacity of the piped system.

7. Stormwater

7.1 Flood Hazard and Finished Floor Level

The Gore District Plan shows the area of the subdivision to be within the Mataura River Floodplain. Environmental Southland (ES) has also advised that there are flood risks associated with the site as the site is situated within a basin formed by the stopbank to the west, natural high ground to the north and south and the road formation on Railway Esplanade to the southeast. This generally aligns with what is currently shown by the LIDAR contours available on the GDC GIS system.

ES has also noted the existing stopbank was designed to provide 100-year event flood protection for the area. However, the February 2020 flood event showed that the existing stopbank system through Gore and Mataura was near the maximum capacity of the flood banks. From that event ES has estimated the existing stopbank system only provides flood protection for approximately the 70-year event with updated data considered. ES has advised the existing stopbank is being assessed and is planned to be upgraded to provide a 100-year flood protection.

The designs for the subdivision have therefore not taken into account the possibility of the stop bank capacity being exceeded and the flood level is therefore calculated by assessment of the 100-year event rainfall intensity, the existing piped network and topography of the area.

Flood hazard analysis has been carried out by WSP New Zealand Ltd (WSP) on behalf of GDC for the subject site for the 1 in 100-year rainfall event. This has shown that the western extent of the site will be subject to some inundation in this rainfall event. Figure 2 below is the flood level model produced by WSP that shows 1 in 100-year water levels surrounding the site.

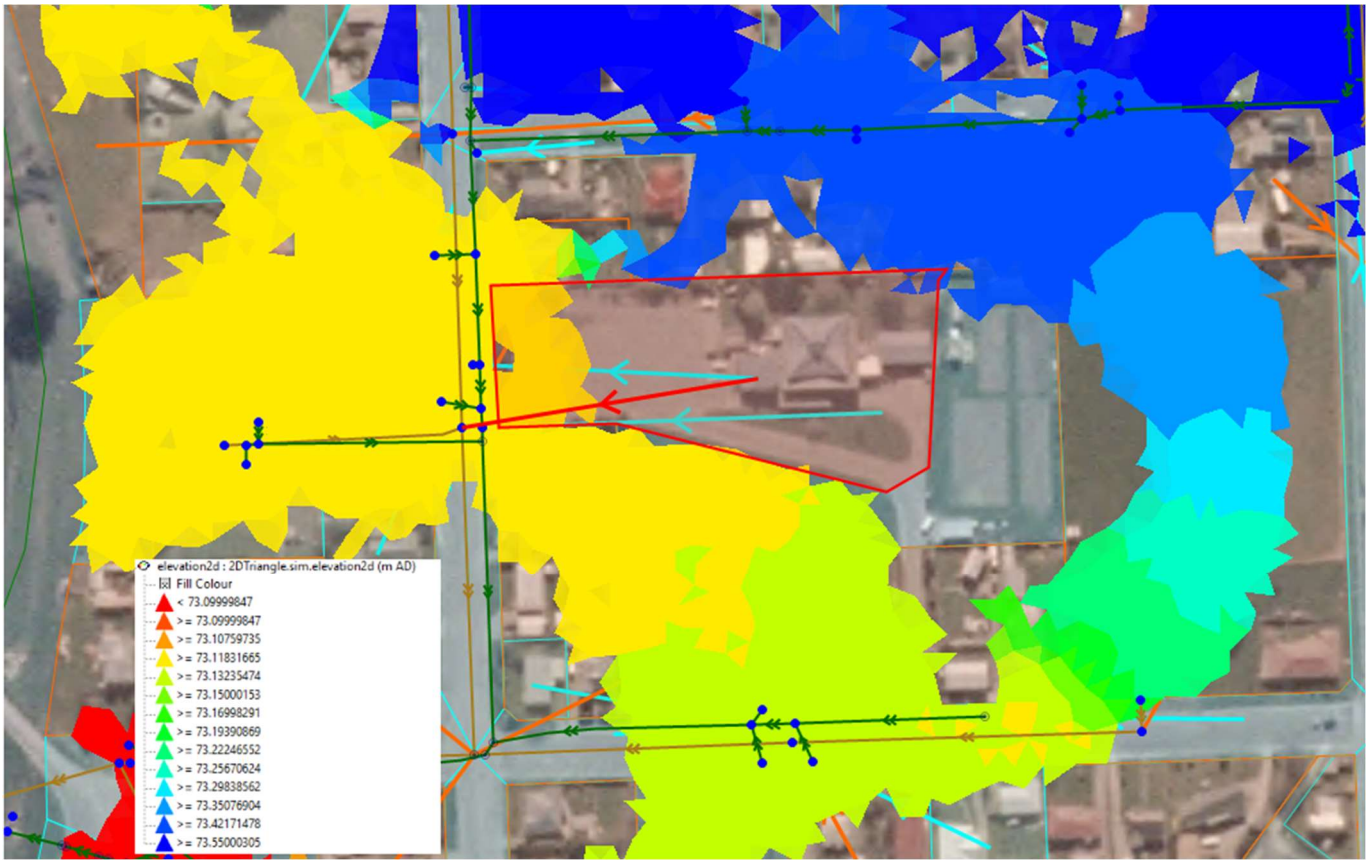


Figure 2: WSP water levels for the 1 in 100-year rainfall event

The levels shown on the above are in terms of Dunedin-Bluff vertical datum. The site survey and civil engineering designs have been carried out in terms of New Zealand Vertical Datum 2016 (NZVD) as this is the datum referred to in the Council Bylaw. These levels need to be reduced by 0.24m to bring them into terms of NZVD. The flood level at the Hamilton Street frontage is therefore RL 72.87.

There will continue to be some inundation of the site following the completion of the development and finished floor levels will be set in accordance with this flood level and the required 0.6m freeboard stated in the bylaw.

7.2 Existing Stormwater Reticulation

There is an existing 450 diameter stormwater main in Hamilton Street. The existing reticulation that drained the building roof water and carpark runoff connects to this main adjacent to the southeast corner of the site. The main drains to the south along Hamilton St then Oxford St and under the stop bank before discharging to the Mataura River.

WSP New Zealand Ltd (WSP) infrastructure capacity assessment shows that the existing reticulation in Hamilton Street has some above ground level surcharging in the 1 in 5 year (20% AEP) events.

The secondary flow path from the site is to Hamilton Street at the west of the site.

7.3 Proposed Stormwater

The proposed stormwater design is shown on plan 713093.001-C401.

To re-develop the site to a 24-unit residential housing development, stormwater design including primary and secondary systems, stormwater management and mitigation have been considered.

7.3.1 Primary System

The primary stormwater system for the proposed development is a gravity piped system connecting to the existing reticulation in Hamilton Street. It includes piped lot connections, road sumps, manholes and stormwater mains. It is sized to accommodate the 10-minute duration, 20% AEP storm event with the rainfall data used being the climate adjusted rainfall intensity of RCP8.5 for the period 2081-2100 HIRDS online data obtained from NIWA.

GDC has noted that there are stormwater capacity issues within their existing network. However, the proposed development will have a reduced impervious area, and attenuation will be provided. The total runoff post development will therefore be less than predevelopment as there will be less impervious surfaces and more gardens and greenspace post development. As runoff from the site will be reduced there is no negative effect on the existing network from the development. Pre and post-development flow calculations are provided in Appendix B of this report.

7.3.2 Secondary System

When the capacity of the piped network is exceeded or becomes blocked the secondary flow path for stormwater runoff will be along the Right of Way 1 and Road 1 towards Hamilton Street. Flow direction arrows are shown on drawing C401 show the direction of overland flow in these events. The secondary flow path is designed to cope with 1% AEP design storms without flooding adjacent properties except for those properties that are below the expected 1 in 100-year flood level. Those properties will continue to be flooded.

Once these flow reach Hamilton Street they will continue to flow through the existing route identified on the WSP flood analysis through private property to Oxford Street and beyond.

7.3.3 Stormwater Management and Mitigation

Typically, stormwater attenuation is required to mitigate the effects of increased runoff from a new development. To establish the allowable discharge rate and attenuation a comparison between the pre- and post-development runoff is carried out. The post development allowable flow rate is set to the predevelopment flow rate and the required attenuation volume is calculated accordingly. For this development these calculations were carried out and these showed a decrease in flow from predevelopment to post development due to the net decrease in impermeable surfaces. Calculations are attached in Appendix B of this report.

GDC has noted that the critical stormwater event for their network is 5-year 60-minute storm. The attached calculations show that the post-development runoff for this event is 20.1l/s compared to the pre-development runoff of 21.5l/s. There is therefore a net decrease the stormwater runoff generated from the site.

Bylaw section 4.2.4 requires all new residential buildings to provide a minimum capacity of 3,000 litres rainwater storage tank. GDC representative Matt Bayliss has clarified that even though the new development does not intend to reuse rainwater, a capacity of 3,000-litre tank still has to be provided for each new building for the purpose of stormwater attenuation. As such, there have been discussions with GDC about the necessity of the attenuation tanks. A dispensation application of the rainwater tanks was submitted to GDC as no attenuation should be required because the development causes a net decrease in stormwater runoff. The dispensation application was however declined. There has been further correspondence with GDC and it has been accepted that the required total attenuation volume would be the total runoff generated from the proposed roof areas for the critical event. Table 1 in Appendix D records the key discussions and outcomes with respect to the stormwater management and mitigation for the proposed development.

Two attenuation options have been proposed for the development. One option is to have individual rainwater tanks for each building based on each individual roof area. The other option is to attenuate stormwater using oversized pipes located within the road system that have a restricted outlet. The oversized pipes would have a low flow pipe connecting into the GDC network restricting outflow. The oversized pipes provide the required storage volume generated by the 5-year 60-minute storm. An overflow pipe will allow flows in excess of the required storage. The oversized pipe option is the option that is preferred and has been shown on the design plans. This design will be progressed through detailed design for Engineering Approval and Building Consent.

The treatment requirements have also been discussed with GDC and it has been accepted that a proprietary system such as a Stormwater360 Stormfilter, Stormwater360 Cascade Separator, Hynds Downstream Defender or First Defence High Capacity System could be used. The treatment devices listed are able to either treat the first 25mm of rainfall or 5mm/hr of rainfall intensity of the hardstand areas in the proposed vested Road and RoW. Final design will be discussed further with Council and final details will be provided at the time of seeking Engineering Approval for the detailed design.

8. Wastewater

The proposed wastewater system is shown on plan 713093.001-C

A preliminary assessment of the GDC wastewater network capacity around the proposed development has been completed by WSP. As with the stormwater, the assessment shows that there are overflow issues in the 20% AEP stormwater events due to stormwater infiltration to the wastewater system. However, those issues are observed in the base model without the proposed development. The assessment also stated that the proposed development creates an increase in the flow within the wastewater network but the increase is not significant.

The wastewater system comprises a single DN150 main located approximately on the centreline of Road 1. All Lots have individual DN100 laterals connecting to this main. The wastewater system has been designed in accordance with Table 5.3, 5.4 and 5.5 of the GDC Bylaw 2019.

See Appendix, WSP and GDC Email.

9. Water Supply

The proposed water reticulation plan is shown on plan 7130093.001 C450.

The preliminary infrastructure assessment completed by WSP for the proposed water supply for the development shows that the proposed development will cause 0.2m drop in pressure in the network. GDC has confirmed this would be acceptable.

The water reticulation system for the proposed development mainly consists of a DN100 PVC watermain and an OD63 PE sub-main. These pipes will connection to the existing DN100 cast iron water main on the western side of Hamilton Street. The new DN100 water main will run along the northern side of Road 1 and will terminate at the cul-de-sac head with a fire hydrant. The OD63 sub-main will carry on from the fire hydrant and loop around the cul-de-sac head and link back to the existing watermain in Hamilton St on the southern side of the road.

The fire hydrant proposed provides sufficient site coverage to meet the requirements in accordance with New Zealand Fire Service Fire Fighting Water Supplies Code of Practice (SNZ PAS4509:2008).

See Appendix C, WSP Capacity Confirmation email.

10. Accessibility

Units 15-21 of the proposed development are Full Universal Design (FUD). This means that the unit must comply with all of the standards and guidelines pertaining to accessibility. The main limitations associated with accessibility come in the form of maximum gradients and crossfalls of the pavement areas. Detailed Design will confirm if the FUD units can be provided.

Appendix A Civil Design Plans

KĀINGA ORA – HOMES AND COMMUNITIES

Kāinga Ora
Homes and Communities

PACKAGE GORE
29 HAMILTON STREET
EAST GORE, GORE

DRAWING INDEX	
SHEET NUMBER	**SHEET TITLE**
C000	COVER SHEET
230032/1A	TOPOGRAPHICAL SURVEY (BY OTHERS)
230032/2	TOPOGRAPHICAL SURVEY (BY OTHERS)
C200	FINISHED GROUND CONTOURS PLAN
C201	CUT AND FILL DEPTH CONTOURS PLAN
C300	PAVEMENT PLAN
C305	ROAD LONGSECTION
C310	ROAD TYPICAL SECTIONS
C400	COMBINED SERVICES PLAN
C401	STORMWATER PLAN
C450	WASTEWATER PLAN
C500	WATER SUPPLY PLAN

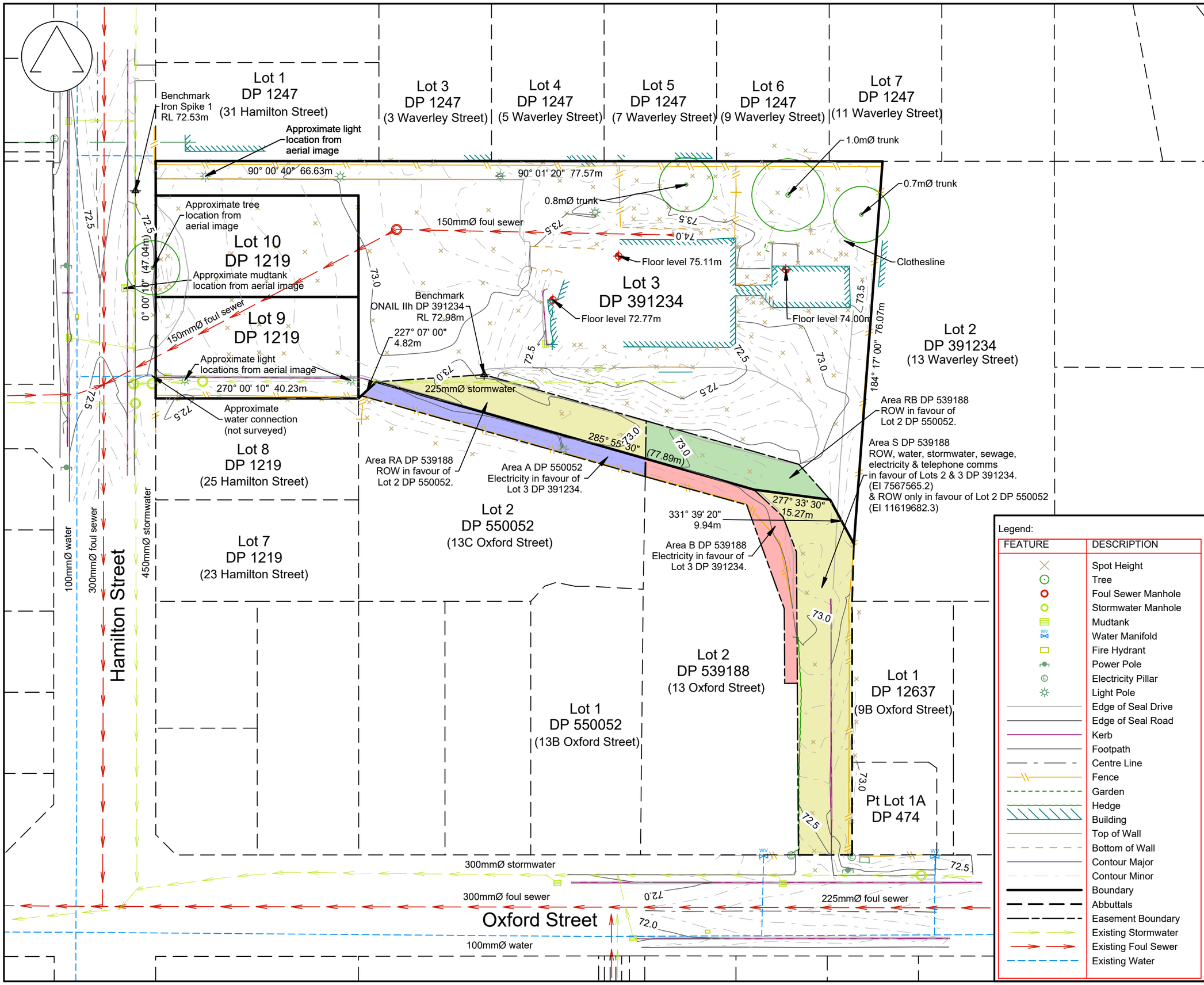
calibre

Advisory
Surveying
Urban Development
Infrastructure Buildings
Structural Engineering
Civil Engineering

calibregroup.com

ISSUED FOR RESOURCE CONSENT

Project No	Sheet	Revision
713093.001	C000	0



Legend:

FEATURE	DESCRIPTION
	Spot Height
	Tree
	Foul Sewer Manhole
	Stormwater Manhole
	Mudtank
	Water Manifold
	Fire Hydrant
	Power Pole
	Electricity Pillar
	Light Pole
	Edge of Seal Drive
	Edge of Seal Road
	Kerb
	Footpath
	Centre Line
	Fence
	Garden
	Hedge
	Building
	Top of Wall
	Bottom of Wall
	Contour Major
	Contour Minor
	Boundary
	Abbuttals
	Easement Boundary
	Existing Stormwater
	Existing Foul Sewer
	Existing Water

terramark
setting new boundaries
Surveying, Resource Management, & Engineering Consultants

Notes:

1) Horizontal Datum: North Taieri 2000

2) Height Datum: NZVD2016

3) Origin of Levels: LP I DP 12637 (F2D6)
- Reduced Level: 72.28m

4) Contour interval is:
Major - 0.5m
Minor - 0.1m

5) Areas and dimensions are subject to verification upon survey.

6) Easements, covenants and other legal instruments relating to this site may not be represented on this plan. A full investigation of legal records should be undertaken to confirm.

7) Not all public & private drainage information has been shown on the plan.

8) The position and alignment of services shown on this plan may have been obtained from Council records and are subject to the errors or omission of that data, they should not be used for design purposes. all services should be located on site before any design work is undertaken.

9) Critical levels are to be checked and confirmed prior to design and construction.

10) The contours shown on this plan have been electronically calculated between the survey fixed positions and may not represent the true ground levels.

11) The size and positions of any trees shown on this plan is approximate and tree types should be confirmed by an aborist if critical.

12) These notes are an intergral part of the plan.

Client
Southbase

Address
29 Hamilton Street
& 11 Oxford Street

Legal Description
Lots 9 & 10 DP 1219
& Lot 3 DP 391234

Area	Record of Title
7683m²	366119

Drawing Title
Topographical Survey

Date	Scale (A3)
03/02/2023	1:700

Client Ref.	Drawing Reference.
230032	230032/1A

Legend:

- Post
- Spot Height
- Tree
- Foul Sewer Manhole
- Stormwater Manhole
- Mudtank
- Water Manifold
- Fire Hydrant
- Power Pole
- Electricity Pillar
- Light Pole
- Edge of Seal Drive
- Edge of Seal Road
- Kerb
- Footpath
- Centre Line
- Fence
- Garden
- Hedge
- Building
- Top of Wall
- Bottom of Wall
- Contour Major
- Contour Minor
- Boundary
- Abbuttals
- Easement Boundary
- GDC GIS Stormwater
- GDC GIS Foul Sewer
- GDC GIS Water
- GPR Stormwater
- GPR Foul Sewer
- GPR Water
- GPR Electricity
- GPR Telecomms

Surveyed 31/01/2023 & 15/02/2023
Surveyed 06/04/2023

Lot 1
DP 7680
(28 Hamilton Street)

Lot 2
DP 7680
(26 Hamilton Street)

Lot 3
DP 7680
(24 Hamilton Street)

Lot 4
DP 7680
(22 Hamilton Street)

Lot 5
DP 7680
(23 Oxford Street)

Lot 8
DP 1219
(25 Hamilton Street)

Lot 7
DP 1219
(23 Hamilton Street)

Lot 1
DP 9389
(21B Hamilton Street)

Lot 2
DP 9389
(21 Hamilton Street)

Lot 2
DP 474
(19 Oxford Street)

Lot 3
DP 1219
(17 Oxford Street)

Lot 1
DP 550052
(15 Oxford Street)

Lot 1
DP 550052
(13B Oxford Street)

Lot 2
DP 550052
(13C Oxford Street)

Lot 2
DP 539188
(13 Oxford Street)

Lot 2
DP 1959
(24 Oxford Street)

Lot 1
DP 1959
(22 Oxford Street)

Lot 4
DP 104
(20 Oxford Street)

Lot 3
DP 104
(19 Hamilton Street)

Lot 1
DP 8249

Lot 8
DP 8249
(14 Oxford Street)

Hamilton Street

Oxford Street

100mmØ water
450mmØ stormwater
225mmØ stormwater
300mmØ stormwater
300mmØ foul sewer
525mmØ stormwater
100mmØ water
Road Sign
Sluice Valve
SV

terramark
setting new boundaries
Surveying, Resource Management, & Engineering Consultants

Notes:

1) Horizontal Datum: North Taieri 2000

2) Height Datum: NZVD2016

3) Origin of Levels: LP I DP 12637 (F2D6)
- Reduced Level: 72.28m

4) Contour interval is:
Major - 0.5m
Minor - 0.1m

5) Areas and dimensions are subject to verification upon survey.

6) Easements, covenants and other legal instruments relating to this site may not be represented on this plan. A full investigation of legal records should be undertaken to confirm.

7) Not all public & private drainage information has been shown on the plan.

8) The position and alignment of services shown on this plan may have been obtained from Council records and are subject to the errors or omission of that data, they should not be used for design purposes. all services should be located on site before any design work is undertaken.

9) Critical levels are to be checked and confirmed prior to design and construction.

10) The contours shown on this plan have been electronically calculated between the survey fixed positions and may not represent the true ground levels.

11) The size and positions of any trees shown on this plan is approximate and tree types should be confirmed by an aborist if critical.

12) GPR measurements have been undertaken by KB Contractors. All water, foul sewer, and stormwater lines with a prefix of 'GPR' are based on measurements to these GPR markings and visible surface features. Cover to these services are based on the GPR information provided.

13) Refer to plan 230032/1B for additional site topographical detail from 31/01/2023 & 15/02/2023.

14) These notes are an intergral part of the plan.

Client: Southbase

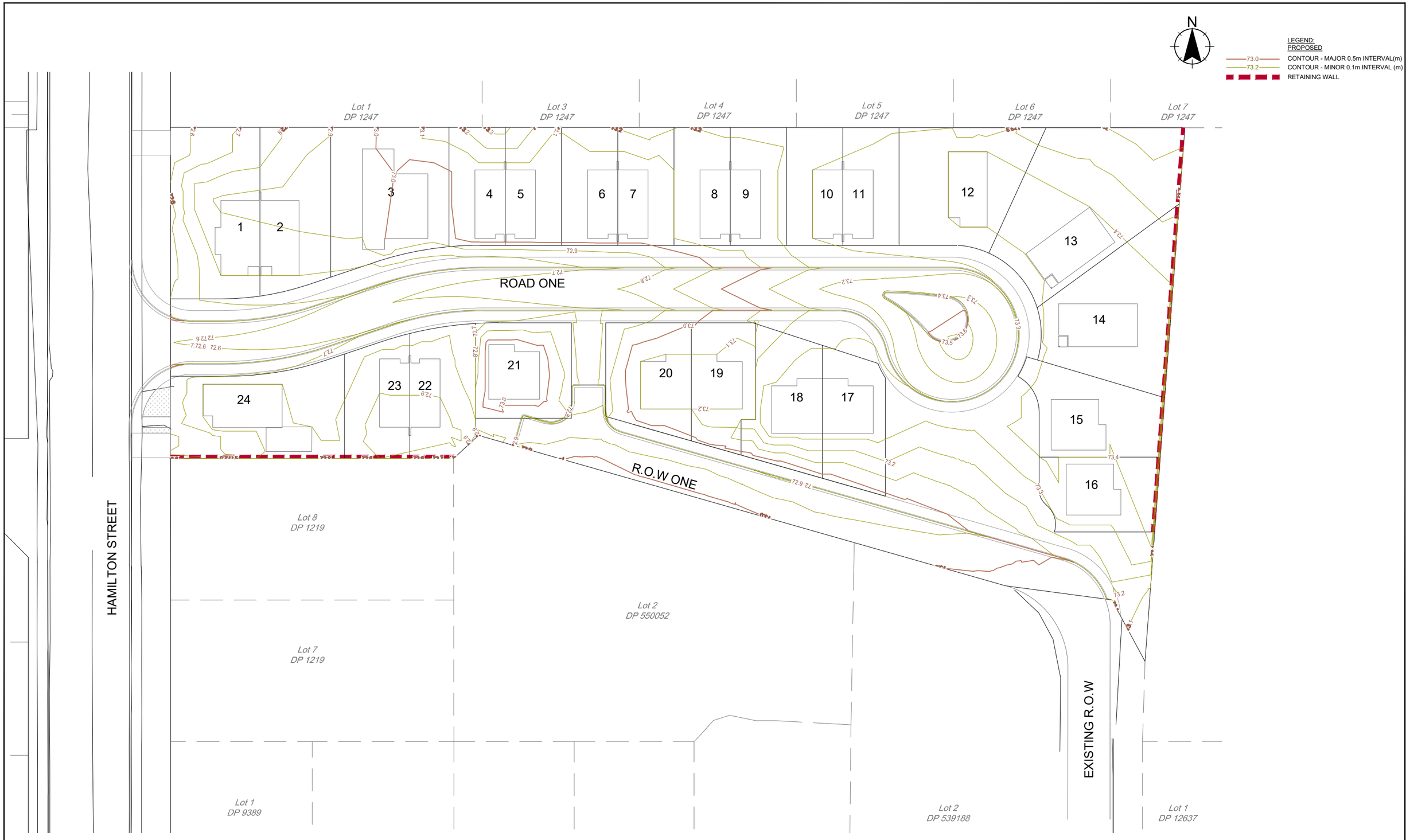
Address: 29 Hamilton Street & 11 Oxford Street

Legal Description: Lots 9 & 10 DP 1219 & Lot 3 DP 391234

Area	Record of Title
7683m²	366119

Drawing Title: **Topographical Survey**

Date	Scale (A3)
13/04/2023	1:600
Client Ref.	**Drawing Reference.**
230032	230032/2



ISSUED FOR
RESOURCE CONSENT

Revision		App	Date
0	RESOURCE CONSENT	WB	16.05.23

Surveyed	TERRAMARK	13.04.2023
Designed	M.TAM	09.05.23
Drawn	M.TOLEDO	09.05.23
Reviewed	B.HURRING	09.05.23
Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

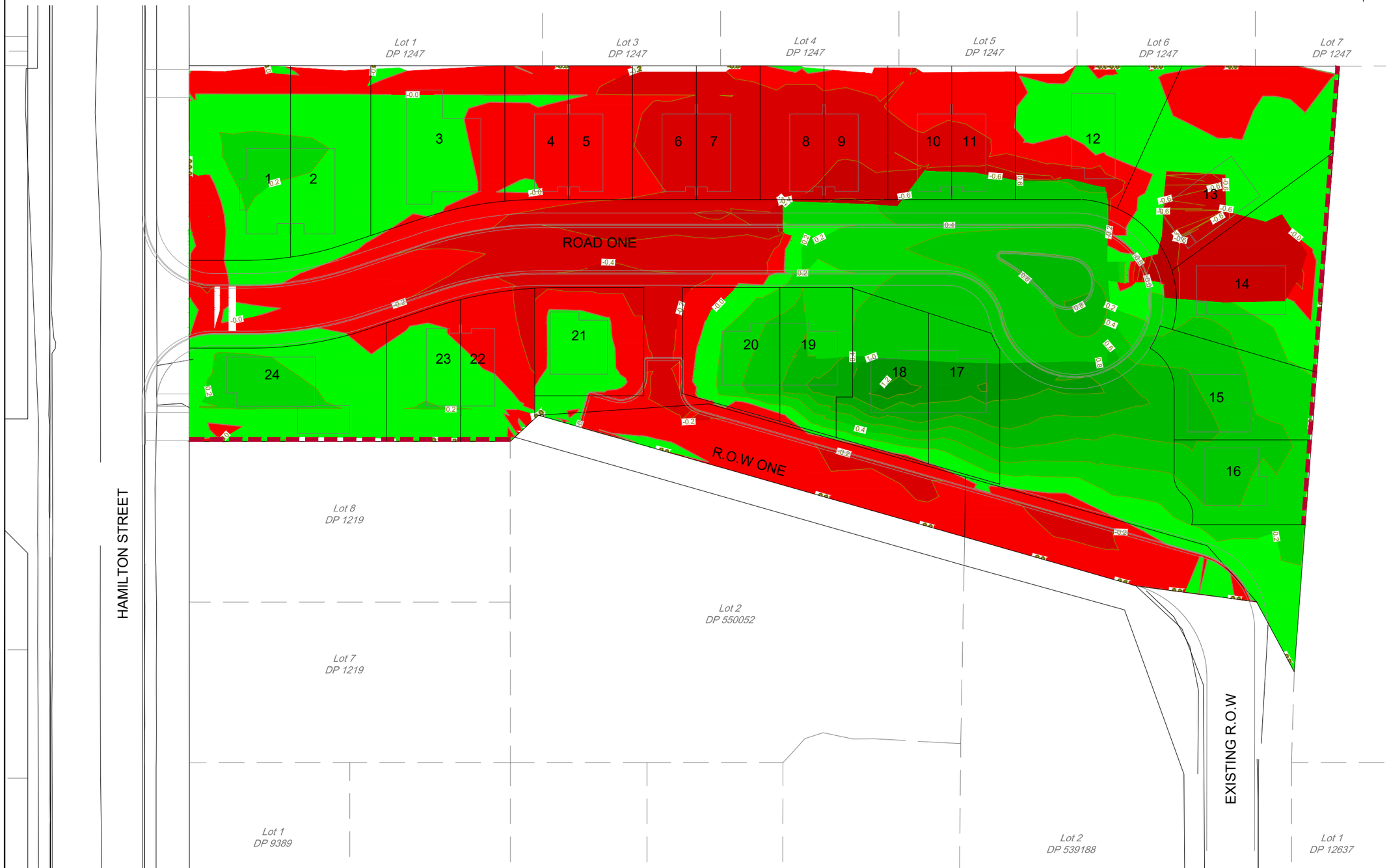
Sheet Title: FINISHED GROUND CONTOURS PLAN

Level 1
214 Durham Street South,
Christchurch Central
Christchurch 8011
+64 3 374 6515
calibregroup.com

Scale (A1 Original) 1:250 (A3) 1:500
5 2.5 0 5 10 15 m

Project No	Sheet	Revision
713093.001	C200	0

\\calibre.network\NZ\Projects\CHC\7130xx\713093.001 Southbase - CIVIL - Hamilton Rd, Gore\320 Drawings\3_Drawing\713093.001-C200.dwg, Plotted By Jonnie Kerr at 17/05/2023 4:16:33 pm Scale 1:15.796



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EARTHWORKS NOTES

1. ALL EARTHWORKS IS TO BE COMPLETED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND THE LOCAL TERRITORIAL AUTHORITIES' CODES OF PRACTICE FOR LAND DEVELOPMENT.
2. THESE DRAWINGS DO NOT NECESSARILY SHOW ALL EXISTING SERVICES. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ACCURATELY LOCATE AND PROTECT EXISTING SERVICES BEFORE EXCAVATION AND TAKE ALL CARE TO PROTECT THEM DURING CONSTRUCTION. THE CONTRACTOR SHALL LIAISE WITH THE APPLICABLE SERVICE PROVIDERS BEFORE COMMENCING ANY WORK.
3. THE CONTRACTOR PROVIDE EROSION AND SEDIMENT CONTROL (ESC) MEASURES IN ACCORDANCE WITH THE PROJECT DRAWINGS SPECIFICATIONS AND REGIONAL COUNCIL (ES) GUIDELINES.
   ALL ESC MEASURES MUST BE OPERATIONAL PRIOR TO ANY OTHER WORKS COMMENCING ON SITE. THE CONTRACTOR HAS SOLE RESPONSIBILITY FOR ENSURING THAT ESC MEASURES ARE MAINTAINED AND EFFECTIVE AT ALL TIMES.
4. THE CONTRACTOR GRADE EARTHWORKS TO THE LEVELS SHOWN, HOWEVER, FINAL MARRYING IN AND SHAPING OF EARTHWORKS IS SUBJECT TO THE ENGINEER'S APPROVAL. EARTHWORKS ARE TO BE UNDERTAKEN AND COMPLETED WITHIN THE MINIMUM POSSIBLE TIME FRAME. ONCE EARTHWORKS ARE COMPLETED IN AN AREA AND FINAL LEVELS ARE REACHED, THE AREA SHALL BE STABILISED BY AN APPROVED METHOD AS SOON AS PRACTICABLE.
5. ALL EXCAVATIONS OF UNSUITABLE OR SATURATED MATERIALS ARE TO BE INSPECTED BY THE ENGINEER PRIOR TO FILLING.

CUT / FILL DEPTHS				
	LOWER VALUE		UPPER VALUE	COLOUR
CUT	-1.0	to -0.8	m	
	-0.8	to -0.6	m	
	-0.6	to -0.4	m	
	-0.4	to -0.2	m	
	-0.2	to 0.0	m	
	0.0	to 0.2	m	
	0.2	to 0.4	m	
	0.4	to 0.6	m	
	0.6	to 0.8	m	
	0.8	to 1.0	m	
	1.0	to 1.2	m	
FILL	1.2	to 1.4	m	

CUT AND FILL VOLUMES		
VOLUME CUT (m^3)	VOLUME FILL (m^3)	NET (m^3)
647	1,318	671

NOTES:

1. EARTHWORKS VOLUME ARE MEASURED FROM EXISTING SURFACE TO FINISHED GROUND SURFACE AND ARE APPROXIMATE ONLY. NO TOPSOIL OR SUBGRADE LEVELS HAVE BEEN CONSIDERED.

ISSUED FOR
RESOURCE CONSENT

Revision		App	Date
0	RESOURCE CONSENT	WB	16.05.23

Surveyed	TERRAMARK	13.04.2023
Designed	M.TAM	09.05.23
Drawn	M.TOLEDO	09.05.23
Reviewed	B.HURRING	09.05.23
Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: CUT AND FILL
DEPTH CONTOURS PLAN

Level 1
214 Durham Street South,
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Scale (A1 Original) 1:250 (A3) 1:500

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Project No	Sheet	Revision
713093.001	C201	0

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N

NOTES:

1. REFER SHEET C305 FOR ROAD AND KERB LONG SECTIONS.
2. REFER SHEET C400 SERIES FOR SERVICES PLAN.

LEGEND
PROPOSED

- PROPOSED BOUNDARY
- KERB & CHANNEL
- FFL 000.00 FINISHED FLOOR LEVEL
- RETAINING WALL
- BUILDING
- VEHICLE AREA
- PATH/ PATIO AREA
- FOOTPATH
- VEHICLE CROSSING
- TIMBER DECK
- LANDSCAPE AREA
- BERM

REFER ARCHITECTURAL PLANS FOR PAVEMENT FINISH TYPE

Lot 1 DP 1247 | Lot 3 DP 1247 | Lot 4 DP 1247 | Lot 5 DP 1247 | Lot 6 DP 1247 | Lot 7 DP 1247

STANDARD DROP CROSSING TO GDC BYLAW R03

EXISTING KERB AND FOOTPATH TO BE REMOVED

STANDARD DROP CROSSING TO GDC BYLAW R03

HAMILTON STREET

ROAD ONE

KERB & CHANNEL

MOUNTABLE KERB

R3.12

R9.50

R8.70

R8.70

R.O.W ONE

KERB & CHANNEL

4.66

4.50

6.00

3.00

3.00

1.50

1.50

A C310

B C310

C C310

Lot 8 DP 1219

Lot 2 DP 550052

Lot 7 DP 1219

Lot 1 DP 9389

Lot 2 DP 539188

EXISTING R.O.W

Lot 1 DP 12637

ISSUED FOR
RESOURCE CONSENT

Revision		App	Date
0	RESOURCE CONSENT	WB	16.05.23

Surveyed	TERRAMARK	13.04.2023
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Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: PAVEMENT PLAN

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214 Durham Street South,
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Christchurch 8011
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Project No	Sheet	Revision
713093.001	C300	0

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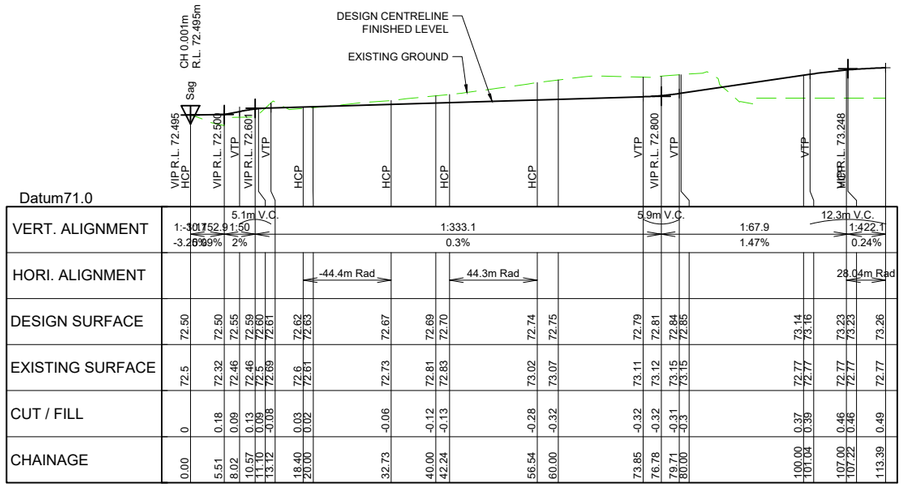
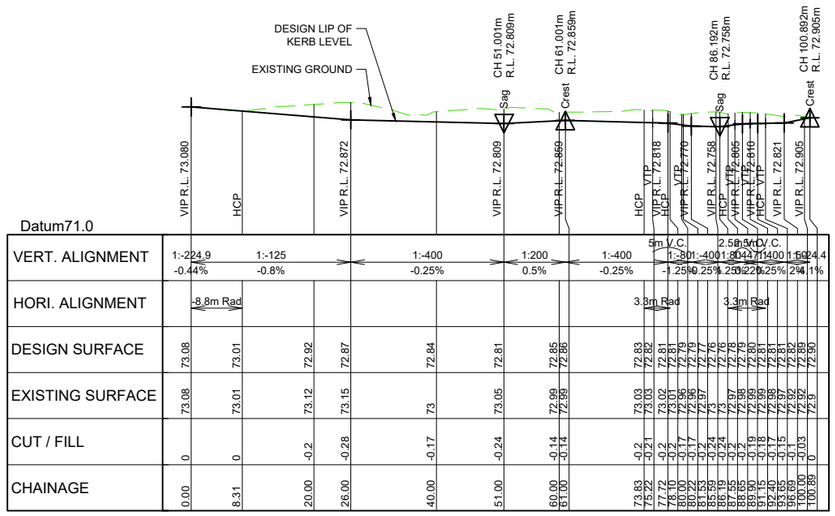
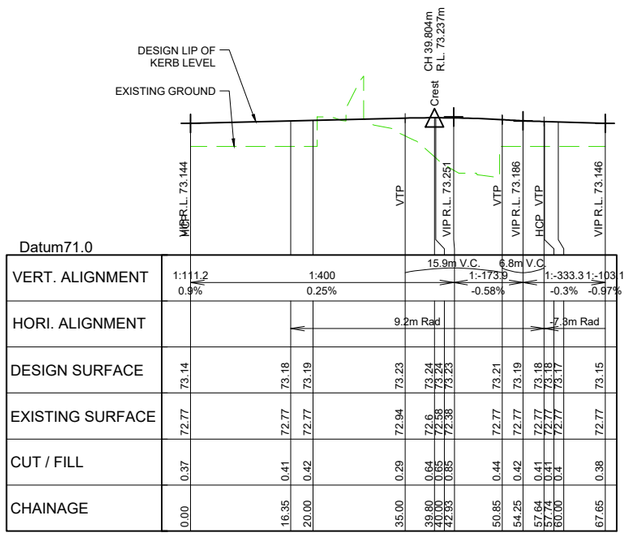


LONGITUDINAL SECTION VESTED ROAD
Horizontal scale 1:500
Vertical scale 1:50



LONGITUDINAL SECTION KERB AT R.O.W
Horizontal scale 1:500
Vertical scale 1:50



LONGITUDINAL SECTION KERB AT CUL-DE-SAC
Horizontal scale 1:500
Vertical scale 1:50

ISSUED FOR
RESOURCE CONSENT

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0 RESOURCE CONSENT	WB	16.05.23

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Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: ROAD LONGSECTIONS

Level 1
214 Durham Street South,
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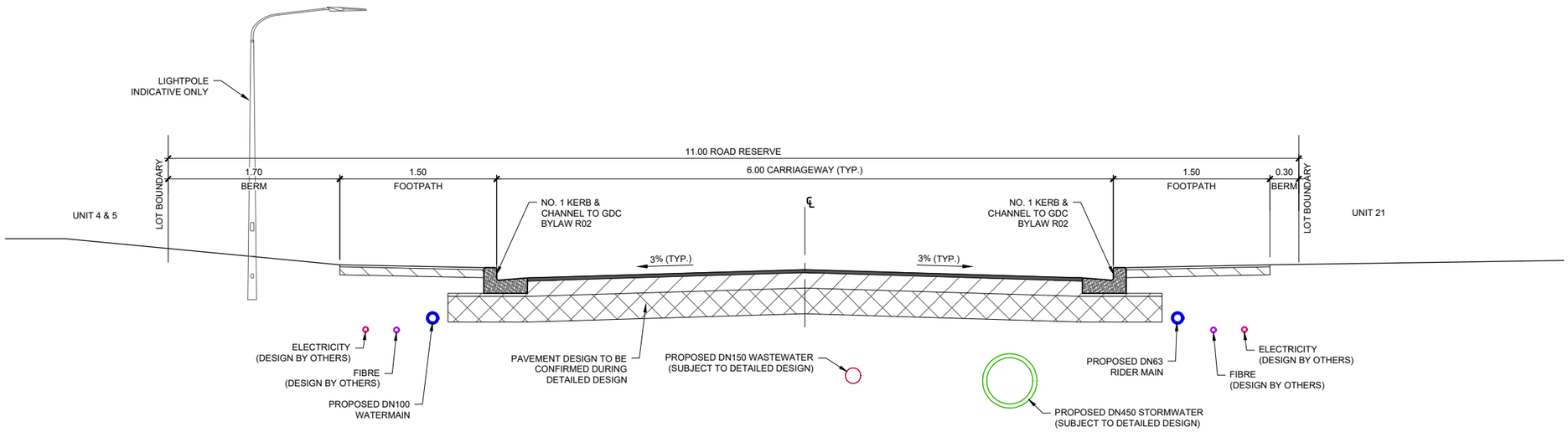
Scale (A1 Original): SCALE AS NOTED

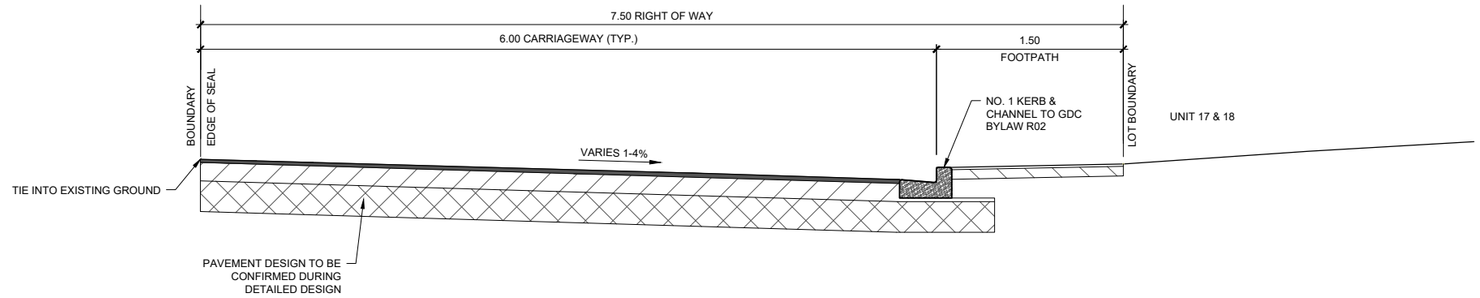
Project No	Sheet	Revision
713093.001	C305	0



VESTED ROAD TYPICAL SECTION A

1:25 @ A1
1:50 @ A3

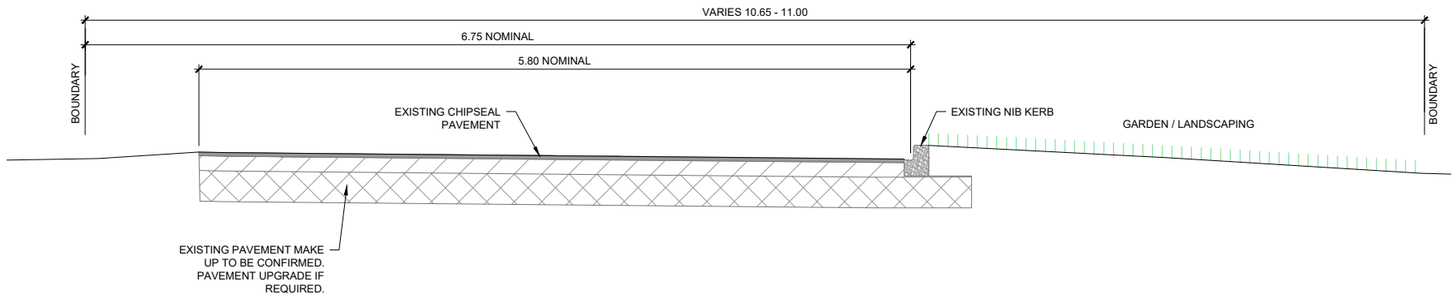
C300



RIGHT OF WAY TYPICAL SECTION B

1:50 @ A1
1:100 @ A3

C300



EXISTING RIGHT OF WAY TYPICAL SECTION C

1:25 @ A1
1:50 @ A3

C300

ISSUED FOR
RESOURCE CONSENT

Revision	App	Date
0 RESOURCE CONSENT	WB	16.05.23

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Approved	W.BLANCHFIELD	09.05.23

Client
Kāinga Ora
Homes and Communities

Project Title
PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title
ROAD TYPICAL SECTIONS

Level 1
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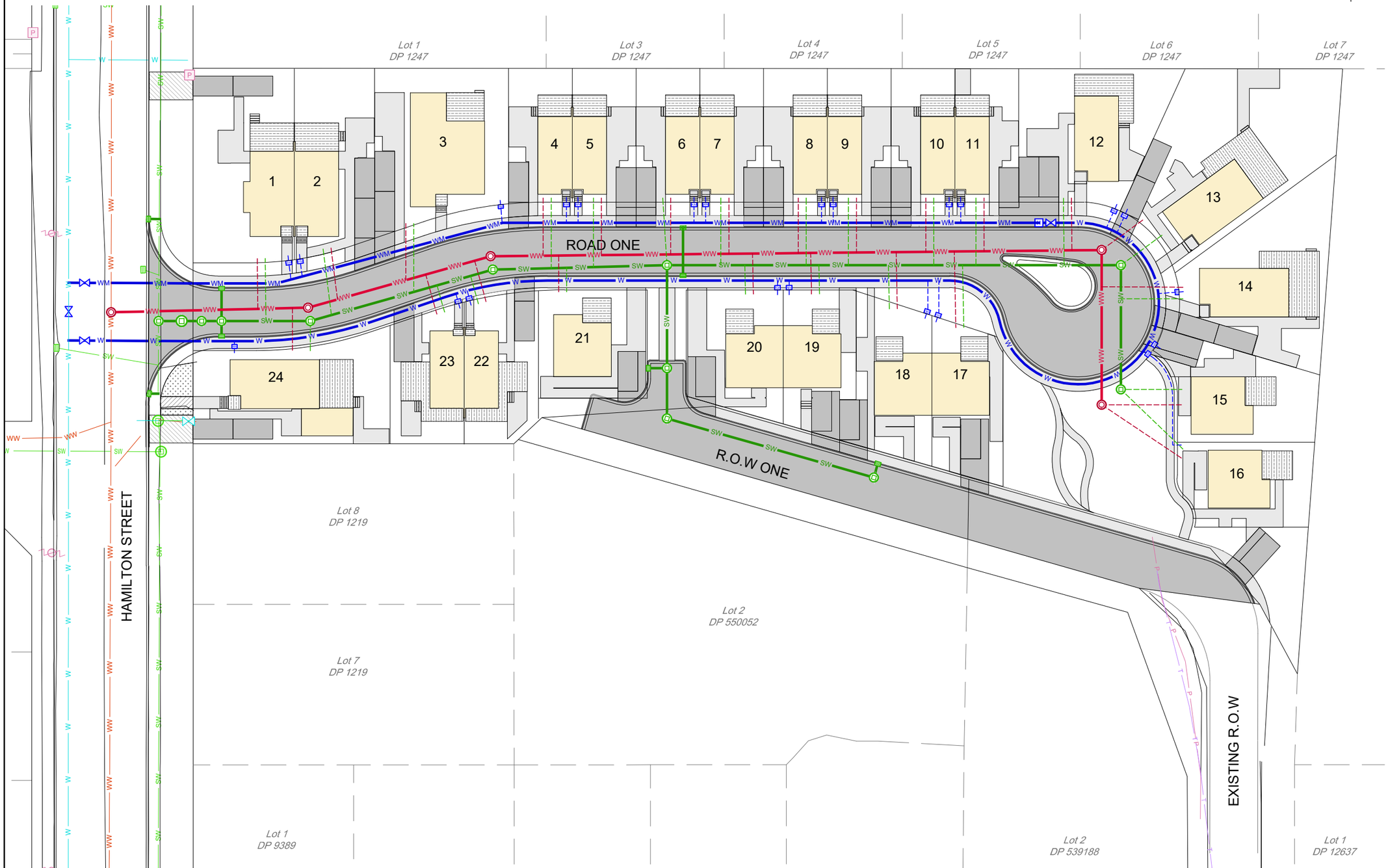
Scale (A1 Original)
SCALE AS NOTED

Project No	Sheet	Revision
713093.001	C310	0



NOTES:

1. REFER INDIVIDUAL SERVICE PLAN FOR NOTES.

LEGEND
EXISTING

- SW — STORMWATER
- STORMWATER MH
- SUMP (SINGLE)
- WW — WASTEWATER
- WASTEWATER MH
- W — WATER
- WATER VALVE
- P — POWER
- POWER PILLAR
- POWER POLE
- LIGHT POLE
- T — TELECOM

PROPOSED

- SW — STORMWATER
- STORMWATER LATERALS
- STORMWATER FLOW DIRECTION
- STORMWATER MH
- SINGLE SUMP
- WW — WASTEWATER
- WASTEWATER LATERALS
- WASTEWATER FLOW DIRECTION
- WASTEWATER MH
- WM — WATERMAIN
- W — RIDER MAIN
- WATER LATERALS
- H — FIRE HYDRANT
- WM — WATER METER
- WATER VALVE
- BUILDING
- VEHICLE AREA
- PATH/ PATIO AREA
- FOOTPATH
- VEHICLE CROSSING
- TIMBER DECK
- BERM

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Reviewed	B.HURRING	09.05.23
Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: COMBINED SERVICES PLAN

Level 1
214 Durham Street South,
Christchurch Central
Christchurch 8011
+64 3 374 6515
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Scale (A1 Original) 1:250 (A3) 1:500

5 2.5 0 5 10 15 m

Project No	Sheet	Revision
713093.001	C400	0

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DRAINAGE NOTES

1. ALL DRAINAGE WORKS TO BE IN ACCORDANCE WITH NZBC E1/AS1: SURFACE WATER AND G13/AS2 FOUL WATER AND CSS 2019 PART 3.
2. STORMWATER INFRASTRUCTURE TO BE LAID AND INSTALLED IN TERMS OF THE APPROVED BUILDING CONSENT.
3. ALL CONNECTIONS TO COUNCIL DRAINS AND WATERWAYS MUST BE CARRIED OUT BY A COUNCIL AUTHORISED DRAINLAYER, A LIST OF WHOM IS AVAILABLE ON THE COUNCIL WEBSITE.
4. CONTRACTOR IS TO PROVIDE AS-BUILT RECORDS OF ALL BURIED SERVICES TO THE ENGINEER & COUNCIL OFFICERS.
5. PIPE MATERIALS SHALL BE:
   - DN 100 uPVC SN16 TO AS/NZS1260
   - DN 150 uPVC SN16 TO AS/NZS1260
6. ALL PIPES LAID AT A MINIMUM GRADE OF 1:120 OR GREATER UNLESS STATED OTHERWISE.
7. ALL LATERALS DN100 UNLESS STATED OTHERWISE.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ENSURING ALL INSPECTIONS AND APPROVALS REQUIRED BY THE BUILDING CONSENT ARE COMPLETED.
9. THE CONTRACTOR IS TO NOTIFIY THE COUNCIL INSPECTORS 48HRS BEFORE ANY PIPES ARE BACKFILLED FOR INSPECTION.
10. ALL SUMP LEADS ARE TO BE DN225 uPVC SN8 UNLESS STATED OTHERWISE.

NOTES FOR DRAINAGE WORK CARRIED OUT IN THE LEGAL ROADWAY OR ON COUNCIL OWNED LAND.

1. ALL DRAINAGE WORKS WITHIN THE LEGAL ROADWAY OR ON COUNCIL OWNED LAND ARE TO BE CARRIED OUT IN ACCORDANCE WITH CHRISTCHURCH CITY COUNCILS CSS SPECIFICATION 2019 PARTS 1 -7 AND INFRASTRUCTURE DESIGN STANDARD (IDS).
2. ONLY AUTHORISED DRAIN LAYERS SHALL BE PERMITTED TO CARRY OUT WASTEWATER AND STORMWATER RETICULATION WORK WHERE IT CONNECTS INTO COUNCIL RETICULATION OR WHERE INFRASTRUCTURE IS GOING TO BE VESTED IN COUNCIL OWNERSHIP.
3. ALL DRAINAGE PIPES TO BE uPVC UNLESS STATED OTHERWISE ON THE PLAN.
4. ALL uPVC DN100, DN150 AND DN175 DRAINAGE PIPES TO HAVE A MINIMUM PIPE CLASS OF SN16.
5. ALL uPVC DN225 DRAINAGE PIPES AND GREATER ARE TO HAVE A MINIMUM PIPE CLASS OF SN8.
6. ALL uPVC PIPES TO HAVE A MINIMUM COVER AS PER NZBC - G13 AND E1.
7. ALL PIPE HAUNCHING AND BACKFILLING TO COMPLY WITH CCC CSS SPECIFICATIONS.

LEGEND

EXISTING

- SW — STORMWATER
- SW — STORMWATER MH
- SUMP (SINGLE)
- WW — WASTEWATER
- WW — WASTEWATER MH
- W — WATER
- W — WATER VALVE
- P — POWER
- P — POWER PILLAR
- POWER POLE
- LIGHT POLE
- T — TELECOM

PROPOSED

- SW — STORMWATER
- SW — STORMWATER LATERALS
- STORMWATER FLOW DIRECTION
- STORMWATER MH
- SINGLE SUMP
- OVERLAND FLOWPATH DIRECTION
- WW — WASTEWATER
- WASTEWATER FLOW DIRECTION
- WASTEWATER MH
- WM — WATERMAIN
- W — RIDER MAIN
- H — FIRE HYDRANT
- WM — WATER METER
- WATER VALVE
- BUILDING
- VEHICLE AREA
- PATH/ PATIO AREA
- FOOTPATH
- VEHICLE CROSSING
- TIMBER DECK
- BERM

ISSUED FOR RESOURCE CONSENT

Revision	App	Date
0 RESOURCE CONSENT	WB	16.05.23

Surveyed	TERRAMARK	13.04.2023
Designed	M.TAM	09.05.23
Drawn	M.TOLEDO	09.05.23
Reviewed	B.HURRING	09.05.23
Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: STORMWATER PLAN

Level 1
214 Durham Street South,
Christchurch Central
Christchurch 8011
+64 3 374 6515
calibregroup.com

Scale (A1 Original) 1:250 (A3) 1:500

5 2.5 0 5 10 15 m

Project No	Sheet	Revision
713093.001	C401	0

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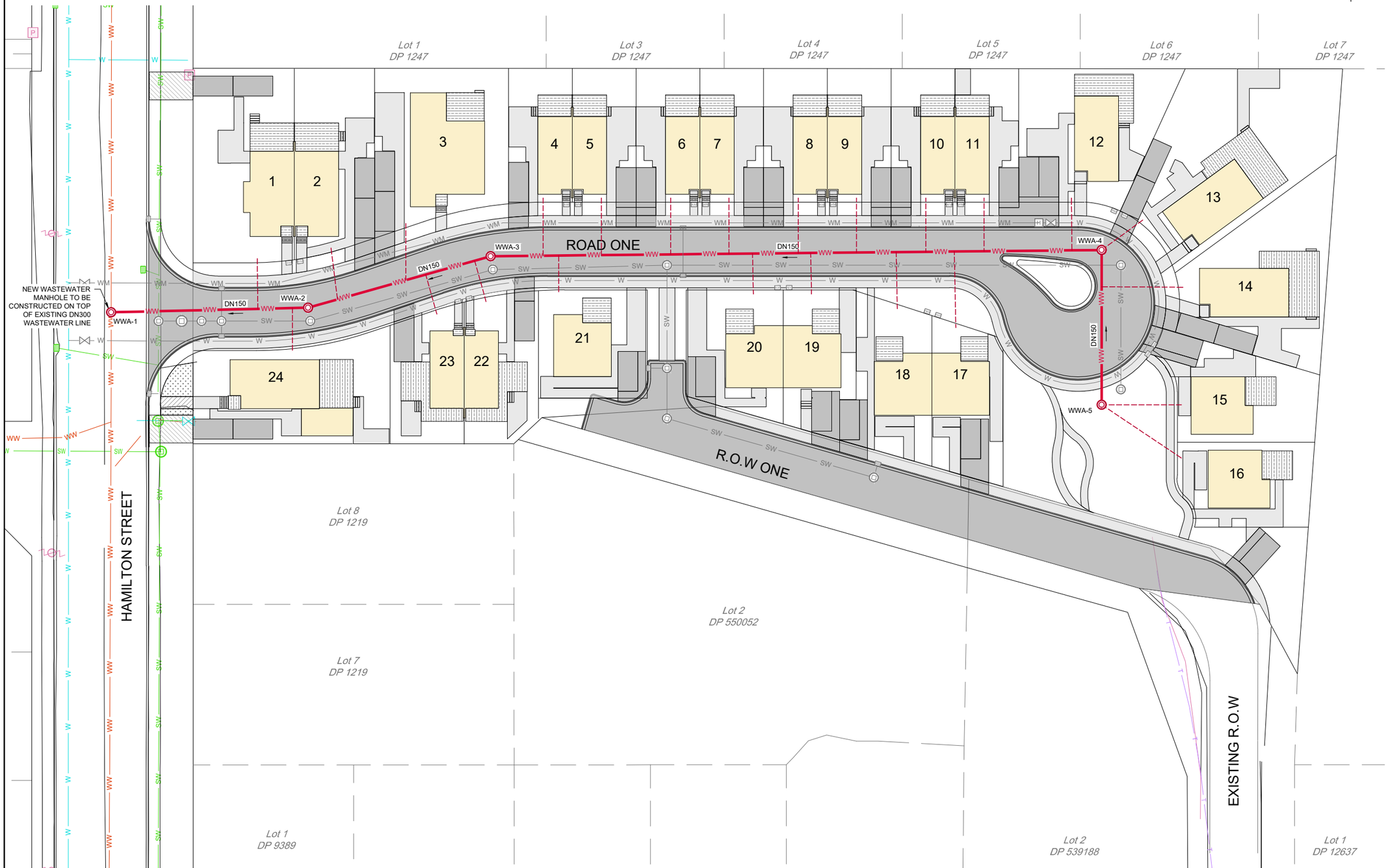

DRAINAGE NOTES

1. ALL DRAINAGE WORKS TO BE IN ACCORDANCE WITH NZBC E1/AS1: SURFACE WATER AND G13/AS2 FOUL WATER AND CSS 2019 PART 3.
2. STORMWATER INFRASTRUCTURE TO BE LAID AND INSTALLED IN TERMS OF THE APPROVED BUILDING CONSENT.
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NOTES FOR DRAINAGE WORK CARRIED OUT IN THE LEGAL ROADWAY OR ON COUNCIL OWNED LAND.

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2. ONLY AUTHORISED DRAIN LAYERS SHALL BE PERMITTED TO CARRY OUT WASTEWATER AND STORMWATER RETICULATION WORK WHERE IT CONNECTS INTO COUNCIL RETICULATION OR WHERE INFRASTRUCTURE IS GOING TO BE VESTED IN COUNCIL OWNERSHIP.
3. ALL DRAINAGE PIPES TO BE uPVC UNLESS STATED OTHERWISE ON THE PLAN.
4. ALL uPVC DN100, DN150 AND DN175 DRAINAGE PIPES TO HAVE A MINIMUM PIPE CLASS OF SN16.
5. ALL uPVC DN225 DRAINAGE PIPES AND GREATER ARE TO HAVE A MINIMUM PIPE CLASS OF SN8.
6. ALL uPVC PIPES TO HAVE A MINIMUM COVER AS PER NZBC - G13 AND E1.
7. ALL PIPE HAUNCHING AND BACKFILLING TO COMPLY WITH CCC CSS SPECIFICATIONS.

LEGEND

EXISTING

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- STORMWATER MH
- SUMP (SINGLE)
- WW — WASTEWATER
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- W — WATER
- WATER VALVE
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- POWER PILLAR
- POWER POLE
- LIGHT POLE
- T — TELECOM

PROPOSED

- SW — STORMWATER
- STORMWATER FLOW DIRECTION
- STORMWATER MH
- SINGLE SUMP
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- WASTEWATER LATERALS
- WASTEWATER FLOW DIRECTION
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ISSUED FOR RESOURCE CONSENT

Revision	App	Date
0 RESOURCE CONSENT	WB	16.05.23

Surveyed	TERRAMARK	13.04.2023
Designed	M.TAM	09.05.23
Drawn	M.TOLEDO	09.05.23
Reviewed	B.HURRING	09.05.23
Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: WASTEWATER PLAN

Level 1
214 Durham Street South,
Christchurch Central
Christchurch 8011
+64 3 374 6515
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Scale (A1 Original) 1:250 (A3) 1:500

5 2.5 0 5 10 15 m

Project No	Sheet	Revision
713093.001	C450	0

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N

WATER NOTES

1. EACH LOT TO HAVE INDIVIDUAL OD25 MDPE SERVICE CONNECTIONS.
2. PIPE MATERIALS TO BE OD25 MDPE PN12.5 TO AS/NZS 4130 UNLESS STATED OTHERWISE.
3. VALVES POSITION INDICATIVE ONLY.

LEGEND

EXISTING

- SW — STORMWATER
- SW — STORMWATER MH
- SW — SUMP (SINGLE)
- WW — WASTEWATER
- WW — WASTEWATER MH
- W — WATER
- W — WATER VALVE
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- P — POWER PILLAR
- P — POWER POLE
- LIGHT POLE
- T — TELECOM

PROPOSED

- SW — STORMWATER
- SW — STORMWATER FLOW DIRECTION
- SW — STORMWATER MH
- SW — SINGLE SUMP
- WW — WASTEWATER
- WW — WASTEWATER FLOW DIRECTION
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- WM — WATERMAIN
- W — RIDER MAIN
- W — WATER LATERAL
- H — FIRE HYDRANT
- WM — WATER METER
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- PATH/ PATIO AREA
- FOOTPATH
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- TIMBER DECK
- BERM

Lot 1 DP 1247 | Lot 3 DP 1247 | Lot 4 DP 1247 | Lot 5 DP 1247 | Lot 6 DP 1247 | Lot 7 DP 1247

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

NEW WATER CONNECTIONS TO EXISTING DN100 WATERMAIN

DN100 uPVC WATERMAIN

DN100 - OD63

OD63 PE RIDER MAIN

ROAD ONE

R.O.W ONE

HAMILTON STREET

EXISTING R.O.W

Lot 8 DP 1219

Lot 2 DP 550052

Lot 7 DP 1219

Lot 1 DP 9389

Lot 2 DP 539188

Lot 1 DP 12637

ISSUED FOR
RESOURCE CONSENT

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Approved	W.BLANCHFIELD	09.05.23

Client: Kāinga Ora Homes and Communities

Project Title: PACKAGE GORE
29 HAMILTON STREET
EAST GORE
GORE

Sheet Title: WATER SUPPLY PLAN

Level 1
214 Durham Street South,
Christchurch Central
Christchurch 8011
+64 3 374 6515
calibregroup.com

Scale (A1 Original) 1:250 (A3) 1:500

5 2.5 0 5 10 15 m

Project No	Sheet	Revision
713093.001	C500	0

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Appendix B Stormwater Calculations

Pre Development Flow - Internal Site Area

Project: KO - 29 Hamilton St, Gore
Job No. 713093.001

Date: 24/03/2023
Designed by: Michael Tam
Reviewed by: Brendan Hurring

Notes:

1. **Catchment is based on topographical survey "230032/1B" recieved from Terramark on 23/02/2023.**
2. **The pre-development runoff discharges are based on historical rainfall internsity data from HIRDS.**
3. **This runoff calculation sheet is for pre- and post-development flow discharge comparison purposes only, no**

Rational Method as per NZBC E1 Surface Water

Rainfall =	Historical Data from HIRDS	
Average Slope =	0 - 2%	
Storm Return Period =	10 Years	
Time of Concentration	Tc = 10	mins
Total Site Area	A = 7685	m^2

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**

Rainfall Intensity Data:

Source : Historical Data from HIRDS — *Units : mm/h*

Duration (min) NB: in hours below								
Return Period Years	10min 0.2hr	20min 0.3hr	30min 0.5hr	60min 1.0hr	120min 2.0hr	360min 6.0hr	720min 12.0hr	1440min 24.0hr
2	29.5	20.2	16.1	10.9	7.3	3.7	2.4	1.6
5	42.8	28.9	22.8	15.2	10.0	5.0	3.2	2.0
10	54.2	36.2	28.4	18.7	12.2	6.0	3.8	2.4
20	67.4	44.6	34.8	22.7	14.6	7.2	4.5	2.8
50	88.3	57.7	44.8	28.8	18.4	8.8	5.5	3.4
100	107.0	69.4	53.6	34.1	21.6	10.2	6.3	3.8

Runoff Discharges: — *Units : m³/h*

	10min	20min	30min	60min	120min	360min	720min	1440min
2	150.0	102.7	81.9	55.4	36.9	19.0	12.4	8.0
5	217.6	146.9	115.9	77.3	50.7	25.5	16.4	10.4
10	275.6	184.1	144.4	95.1	62.0	30.7	19.5	12.3
20	342.7	226.8	176.9	115.4	74.2	36.4	22.9	14.2
50	449.0	293.4	227.8	146.4	93.6	44.7	27.8	17.1
100	544.0	352.9	272.5	173.4	109.8	51.9	31.9	19.5

Runoff Discharges: — *Units : l/s*

	10min	20min	30min	60min	120min	360min	720min	1440min
2	41.7	28.5	22.7	15.4	10.2	5.3	3.4	2.2
5	60.4	40.8	32.2	21.5	14.1	7.1	4.5	2.9
10	76.5	51.1	40.1	26.4	17.2	8.5	5.4	3.4
20	95.2	63.0	49.1	32.1	20.6	10.1	6.4	4.0
50	124.7	81.5	63.3	40.7	26.0	12.4	7.7	4.7
100	151.1	98.0	75.7	48.2	30.5	14.4	8.9	5.4

Runoff Volumes: — *Units : m³*

	10min	20min	30min	60min	120min	360min	720min	1440min
2	25.0	34.2	40.9	55.4	73.7	114.1	148.3	191.6
5	36.3	49.0	58.0	77.3	101.4	153.1	196.5	248.9
10	45.9	61.4	72.2	95.1	124.1	184.3	234.3	294.1
20	57.1	75.6	88.5	115.4	148.5	218.4	274.6	341.7
50	74.8	97.8	113.9	146.4	187.1	268.5	333.7	410.0
100	90.7	117.6	136.3	173.4	219.6	311.2	383.2	467.4

Post Development Flow - Internal Site Area

Project: KO - 29 Hamilton St, Gore
Job No. 713093.001

Date: 24/03/2023
Designed by: Michael Tam
Reviewed by: Brendan Hurring

Notes:

1. **Catchment is based on architectural plan "Z1201-9" recieved from Ignite Architects on 16/03/2023.**
2. **The post-development runoff discharges are based on RCP8.5 climate factor for the period 2081-2100 rainfall internsity data from HIRDS.**
3. **This runoff calculation sheet is for pre- and post-development flow discharge comparison purposes only, no upstream catchment is considered.**

Rational Method as per NZBC E1 Surface Water

Rainfall = RCP8.5 for the period 2081-2100 from HIRDS
Average Slope = 0 - 2%
Storm Return Period = 10 Years

Time of Concentration Tc = 10 mins
Total Site Area A = 7685 m^2

Surface Run Off

Surface:	Catchment Areas:		Runoff Coefficients:		Effective Areas:
Roof	A1=	1284m²	C1=	0.90	1156m²
Semi-Permeable Pavers	A2=	795m²	C2=	0.85	676m²
Road / Driveway	A7=	2063m²	C7=	0.85	1753m²
Footpath	A6=	502m²	C6=	0.85	426m²
Berm / Garden	A3=	3042m²	C3=	0.30	913m²
Future Development Area	A4=	0m²	C4=	0.65	0m²
	Total Site Area:	**7685m²**		**Total Effective Area:**	**3585m²**

Rainfall Intensity Data:

Source : RCP8.5 for the period 2081-2100 from HIRDS *Units : mm/h*

Duration (min) NB: in hours below								
Return Period Years	10min 0.2hr	20min 0.3hr	30min 0.5hr	60min 1.0hr	120min 2.0hr	360min 6.0hr	720min 12.0hr	1440min 24.0hr
2	38.8	26.6	21.2	14.3	9.4	4.7	3.0	1.9
5	57.0	38.4	30.4	20.2	13.1	6.4	4.0	2.5
10	72.5	48.4	38.1	25.0	16.1	7.7	4.8	2.9
20	90.5	59.9	46.8	30.5	19.5	9.2	5.6	3.4
50	119.0	77.8	60.4	38.8	24.5	11.4	6.9	4.1
100	145.0	93.7	72.3	46.1	28.8	13.2	7.9	4.7

Runoff Discharges: *Units : m^3/h*

	10min	20min	30min	60min	120min	360min	720min	1440min
2	139.1	95.4	76.0	51.3	33.8	16.8	10.6	6.7
5	204.3	137.7	109.0	72.4	47.0	22.9	14.3	8.8
10	259.9	173.5	136.6	89.6	57.7	27.7	17.1	10.4
20	324.4	214.7	167.8	109.3	69.9	33.0	20.2	12.2
50	426.6	278.9	216.5	139.1	87.8	40.9	24.6	14.7
100	519.8	335.9	259.2	165.3	103.2	47.3	28.4	16.7

Runoff Discharges: *Units : l/s*

	10min	20min	30min	60min	120min	360min	720min	1440min
2	38.6	26.5	21.1	14.2	9.4	4.7	3.0	1.9
5	56.8	38.2	30.3	20.1	13.0	6.4	4.0	2.4
10	72.2	48.2	37.9	24.9	16.0	7.7	4.8	2.9
20	90.1	59.6	46.6	30.4	19.4	9.2	5.6	3.4
50	118.5	77.5	60.1	38.6	24.4	11.4	6.8	4.1
100	144.4	93.3	72.0	45.9	28.7	13.1	7.9	4.7

Runoff Volumes: *Units : m^3*

	10min	20min	30min	60min	120min	360min	720min	1440min
2	23.2	31.8	38.0	51.3	67.6	100.7	127.8	160.0
5	34.1	45.9	54.5	72.4	93.9	137.2	171.2	211.6
10	43.3	57.8	68.3	89.6	115.4	166.3	205.6	250.4
20	54.1	71.6	83.9	109.3	139.8	198.1	242.2	291.7
50	71.1	93.0	108.3	139.1	175.7	245.2	295.5	351.9
100	86.6	112.0	129.6	165.3	206.5	283.9	340.3	401.8

Pre- and Post-development Stormwater Calculations Summary

Project: KO - 29 Hamilton St, Gore
Job No. 713093.001

Date: 24/03/2023
Designed by: Michael Tam
Reviewed by: Brendan Hurring

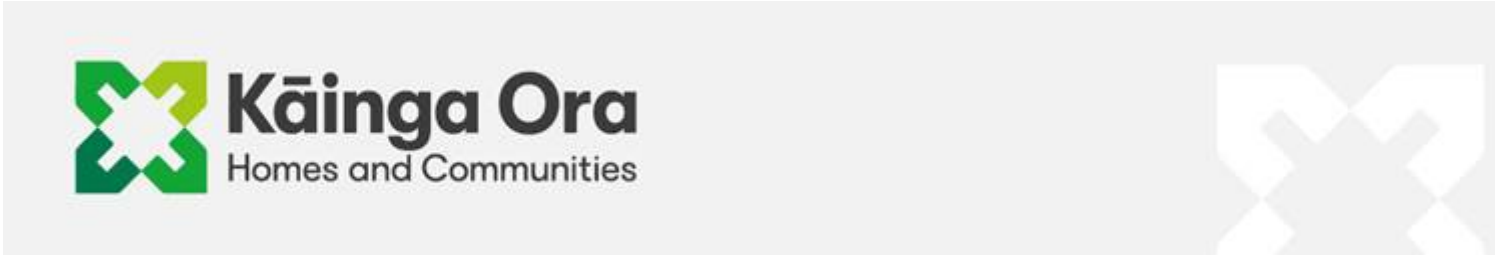
Summary for Q10 Storm Event	Pre-development	Post-development	Post-development
Rainfall data	Historical data from HIRDS	Historical data from HIRDS	RCP8.5 for the period 2081-2100 from HIRDS
Q10 runoff discharge (l/s)	76.5	49.8	72.2
Q10 runoff volume (m^3)	45.9	29.9	43.3
Runoff discharge changes in % compared to pre-development	N/A	-34.9	-5.7
Runoff volume changes in % compared to pre-development	N/A	-34.9	-5.7
Is post-dev runoff < pre-dev runoff?	N/A	Yes	Yes

Summary for Q100 Storm Event	Pre-development	Post-development	Post-development
Rainfall data	Historical data from HIRDS	Historical data from HIRDS	RCP8.5 for the period 2081-2100 from HIRDS
Q100 runoff discharge (l/s)	151.1	98.4	144.4
Q100 runoff volume (m^3)	90.7	59.0	86.6
Runoff discharge changes in % compared to pre-development	N/A	-34.9	-4.5
Runoff volume changes in % compared to pre-development	N/A	-34.9	-4.5
Is post-dev runoff < pre-dev runoff?	N/A	Yes	Yes

Appendix C WSP Capacity Confirmation Email

Michael Tam

From: Carmen Knobloch <Carmen.Knobloch@kaingaora.govt.nz>
Sent: Wednesday, April 26, 2023 1:58 PM
To: Michael Tam
Subject: FW: Review email for Matt Bayliss - GDC - Preliminary results and ask if they want to run an option for 29 Hamilton street
Attachments: image004.wmz; image012.wmz



Carmen Knobloch

Programme Manager
Programme Delivery Team 5
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Freephone: 0800 801 601 | Kāinga Ora - Homes and Communities
PO BOX 2628 Wellington 6140 | New Zealand Government | **www.kaingaora.govt.nz**

From: Matt Bayliss <MBayliss@goredc.govt.nz>
Sent: Wednesday, 26 April 2023 1:51 PM
To: Foglia, Marion <Marion.Foglia@wsp.com>
Cc: Ripley, David <david.ripley@wsp.com>; Carmen Knobloch <Carmen.Knobloch@kaingaora.govt.nz>; PJ Alberts <PJ.Alberts@kaingaora.govt.nz>
Subject: RE: Review email for Matt Bayliss - GDC - Preliminary results and ask if they want to run an option for 29 Hamilton street

Hi Marion,

Thanks for the update.

Comments as follows:

- Water supply - a 0.2 m pressure drop is obviously pretty low and I think that would be acceptable.
- Wastewater – the key thing to understand is what the volume and percentage increase in overflows is occurring at the various overflow points
- Stormwater – you mention at the bottom of your email that you are looking for direction as to need look at solutions for Stormwater and Wastewater, however I also note that you are saying there is no increase in SW flooding from the development – are you suggesting some form of stormwater attenuation could be used to offset the increase in wastewater overflows? FYI any direction around consideration of solutions would need to come from KO – from my point of view I think it would be best to get a draft report of the results before starting to look at any solutions.

Thanks

Matt Bayliss | 3 Waters Asset Manager
T: 03 209 0330 | **DDI:** 03 209 0382 | **M:** 027 405 8411
E: mbayliss@goredc.govt.nz | **W:** www.goredc.govt.nz
Gore District Council, 29 Bowler Avenue, PO Box 8, Gore, 9740

From: Foglia, Marion <Marion.Foglia@wsp.com>
Sent: Wednesday, 26 April 2023 1:26 PM
To: Matt Bayliss <MBayliss@goredc.govt.nz>
Cc: Carmen Knobloch <Carmen.Knobloch@kaingaora.govt.nz>; PJ Alberts <PJ.Alberts@kaingaora.govt.nz>; Ripley, David <david.ripley@wsp.com>
Subject: FW: Review email for Matt Bayliss - GDC - Preliminary results and ask if they want to run an option for 29 Hamilton street

Hi Matt,

I am contacting you about the 3 waters modelling project in 29 Hamilton Street development conducting by Kainga Ora for GDC.

We are at the first stage with preliminary results for the water supply, wastewater and stormwater network.

- For the water supply, 24 no. lots residential demand have been added to the current ADPW Gore model. An assumed DN63 PE100 PN12.5 pipe is laid to supply the 24 no. lots.

Note that the pipe renewals / new connections that have been constructed since the Gore ADPW model was last updated (based on the Gore DC .shp files / as builts sent earlier this week) have not been added.

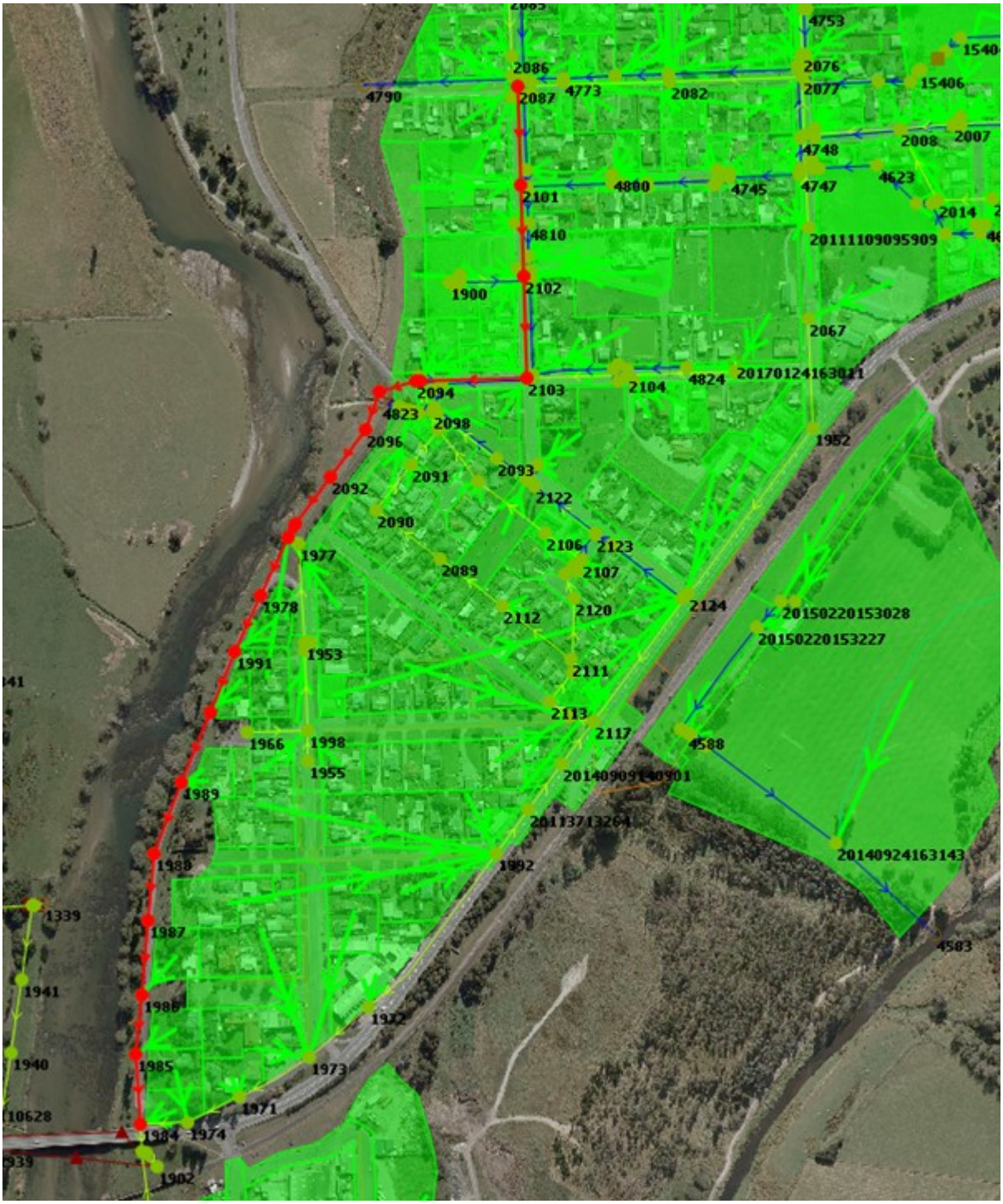
Initial indications suggest that ADPW model shows a very marginal pressure drop of around 0.2 m. However as the model has not been updated with the new connections that have gone in since it was last updated, the results are expected to slightly changed.

- For the wastewater network, a catchment covering the development with 104 people were added and connected directly to the main pipe on Hamilton Street into the closest downstream existing manhole ID 2102. Note that from the changes that have been sent by GDC last week, only the Matai Ridge subdivision on the North Est were added. Because of time restriction and also being far downstream in the South of Gore the Kaka St subdivision is assumed to probably have little impact around the assessed development.

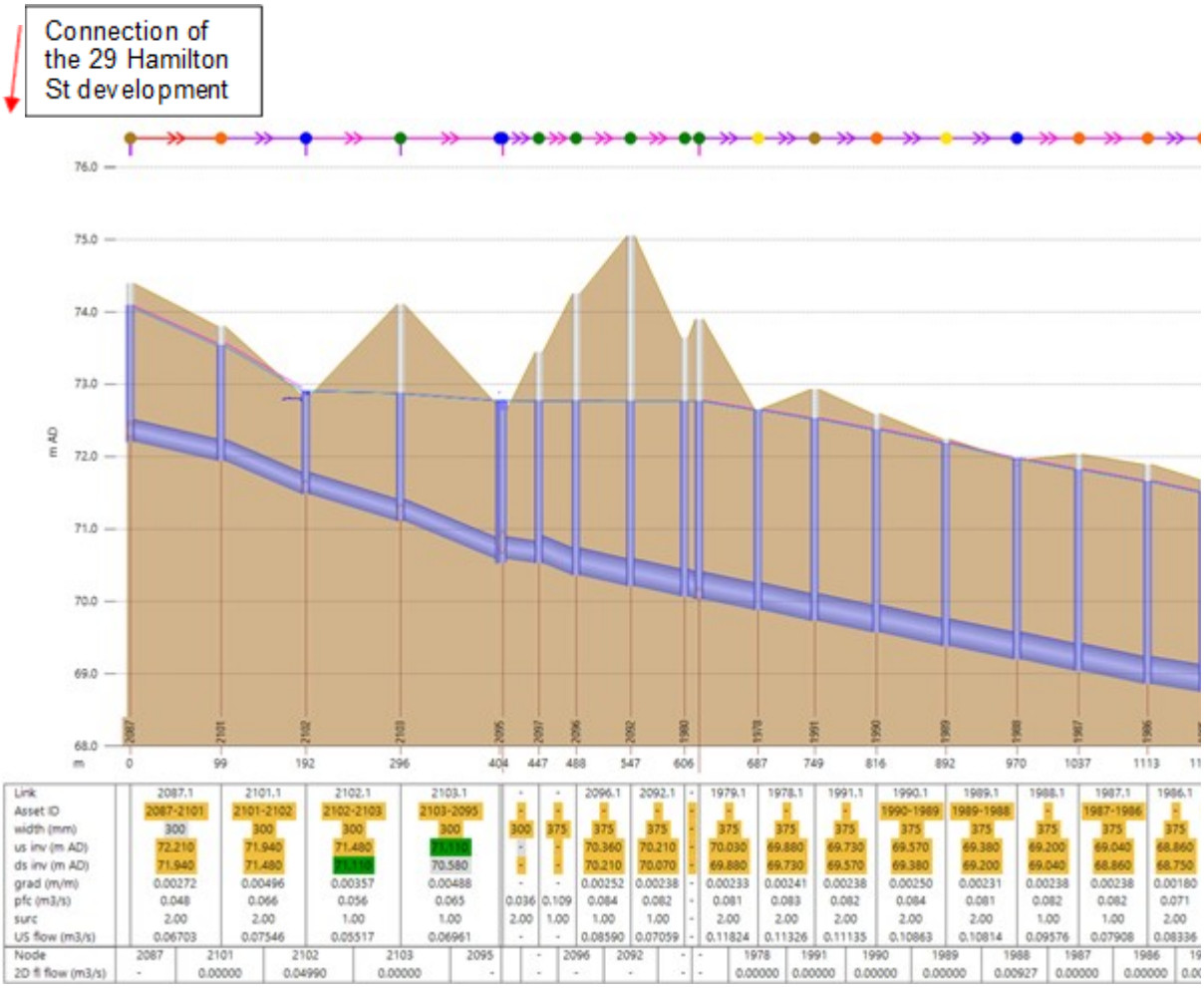
    - The DWF model results do not show any issues in the network. No overflows are predicted

    - The 5yr ARI shows issues **already highlighted in the base scenario** (without the development), there is only a small increase when the development flows are added.
    - The following screenshot shows the overflow nodes (in dark blue) from the wastewater network (left vertical pipe – Catchment connection in orange) and from the stormwater network (right vertical pipe – Catchment connection in light blue).
      The wastewater network profile is shown below.
    - Extra flooding onto the 2D zone is observed.

Location of the longitudinal profile highlighted in red



Longitudinal profile along the wastewater network for a 5 yr ARI event



- For the stormwater network, a stormwater catchment is covering the full development area + the surrounded field as set into the base model.
    - For the stormwater network there is slight increase into the total volume and flow but there is no increase into the flood depth. As shown in the screenshot below the difference between the base and development model is showing a very small blue light area (less than 2cm).

Flood map with the 29 Hamilton Street development – 5 yr ARI

New development

Difference in the flood map between base and development scenario during a 5yr ARI event.

To this point:
The water supply assessment will be carry on and deliver more detailed during the week.
The wastewater and stormwater assessment with the 5yr ARI event shows overflow and flooding issues. However, those issue are observed in the base model (without the 29 Hamilton Street development). The additional development triggers an increase into the volume and flow within the wastewater network but the increase is not significant.
The expecting flood is showing no depth differences between the base and the development scenario.

From those preliminary results we would appreciate to have the income from GDC either or not to carry on with an option for the wastewater and stormwater to accommodate the development.
I am happy to have a call if you want to discuss further about the results.

Thank you

Marion Foglia
Engineer – Water

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Appendix D Floor Level and Attenuation Correspondence

Table 1: Record of key discussions and outcomes with respect to stormwater management and mitigation.

20/02/2023	Email	**GDC - M. Bayliss** Confirmed dispensation for the 3000l tank requirement can be granted if the attenuation / soakage is greater than the pre-development flows. Confirmed first flush treatment is required. Onsite soakage is acceptable to provide treatment and attenuation of flows at the same time. Confirmed the development can discharge to the existing stormwater network on Hamilton Street as long as the post development flows do not exceed the pre-development flows. Preference would still be to have some form of attenuation incorporated into the treatment component even the post-development peak flow is less than the pre-development peak flow.
27/02/2023	Email	**GDC - M. Bayliss** Further confirmed some other forms of attenuation were still required even if the dispensation on the rainwater tanks were granted. Suggested to refer to Bylaw section 4.3.7 for guidance on the need to incorporate green infrastructure. Suggested a soakage / attenuation system that provided a capacity to take the first 72,000l of a rainfall event (24 proposed units x 3000l of rainwater storage) might meet both the rainwater tank and green infrastructure requirements. Suggested if the attenuation / soakage system was going to be entirely for the development, vested in Council ownership was not encouraged.
15/03/2023	Design team meeting	**Calibre - W. Blanchfield** Recommended the attenuation basin to be located at the downstream end of the catchment, which is the frontage of the development with Hamilton Street. This would work the best for secondary flow path. Flow needs to be directed into Hamilton Street as Kainga Ora do not have the right to drain water through to Oxford Street Suggested to obtain dispensation from GDC about the requirement of having the 3000l rainwater tank for each new dwelling. Suggested to confirm with GDC regarding stormwater attenuation and treatment requirements. **Kainga Ora - PJ. Albert** Changing layout is not an option at this point. Vesting of soakage is not needed. It can be incorporated into landscape
22/03/2023	Meeting	**GDC - M. Bayliss** Would consider dispensation for the 3,000l tank requirement, but suggested to include attenuation into the design via green infrastructure.

		Would not intend the pond being vested in Council ownership. Rainfall intensity for the development can be taken from High Intensity Rainfall Design System (HIRDS) Rational method formula from the Building Code E1 can be used to work out the peak runoff
29/03/2023	Email	**Calibre - W. Blanchfield** A letter with supporting calculations, seeking a dispensation for the stormwater attenuation and acceptance of treatment methodology, had been submitted to Matt Bayliss from GDC.
05/04/2023	Email	**GDC - M. Bayliss** The primary function of the 3,000l rainwater tanks was to allow capture and reuse of rainwater, not for stormwater attenuation. If there is no intention to reuse for rainwater stored onsite, the 3,000l tank was still required for attenuation. The site required post-development flows to be less than the pre-development flows excluding any benefit gained from having the 3,000l rainwater tanks. The critical storm event the GDC downstream network was the 60-minute 20% AEP. Climate change needs to be taken into consideration. Confirmed that the Hynds Downstream Defender, First Defence High Capacity System or Stormwater 360 Cascade Separator designed to treat the first 25mm of rainfall or rainfall intensity of 5mm/hr would be acceptable for this development.
06/04/2023	Pre-application meeting	**Calibre - B. Hurring** Stated that no attenuation should not be required as calculations were provided to GDC in the dispensation application that the proposed development would generate less runoff than the pre-development situation. Commented if the 3000l tanks were for rainwater re-use, it could not be for attenuation which required releasing stormwater slowly instead of storing it. It could not be functional as rainwater re-use and stormwater attenuation at the same time as they contradict. **GDC - M. Bayliss** Would re-consider if the tanks were still required for attenuation.
13/04/2023	Email	**Calibre- M. Tam** The only option to attenuate stormwater based on the latest scheme was using tanks, subject to GDC final decision on whether attenuation is required. Each building would need to have approximately 1.8m^3 of tank based on the last response from GDC.
17/04/2023	Email	**Southbase - M. Gibowicz** Asked if the removal of landscape in the middle of the cul-de-sac would cause a impact on the attenuation requirements.

		Calibre - M. Tam Confirmed the removal of landscape in the middle of the cul-de-sac would not cause a significant issue to the attenuation requirement, but would contribute to slight increase in required attenuation volume.
26/04/2023	Email	**Matt Bayliss – GDC** Confirmed that treatment of the hardstand area in the vested road and RoW will be sufficient.
27/04/2023	Email	**GDC - Matt Bayliss** *Option 1: Attenuation using tanks* Preference would be to have the tank size based on the roof size of each building. Low flow out to be sized to fill the tank during the 60-minute critical event. Low flow to be 200mm above the bottom of the tank to prevent debris blocking. High flow out to be sized to have a capacity for the 5-year 10-minute storm. *Option 2: Attenuation using piped system* More preferrable by GDC. The low flow outlet needs to be sized to ensure the attenuation fills up in a 5-year 60-minute storm. GDC predicts hydraulic grade of pipes in Hamilton St to be above ground level immediately outside the development during a 5-year 60-minute storm event.

Table 2: Record of key discussions and outcomes with respect to minimum FFL

Date	Communications	Comments
25/01/2023	Email	**ES - G. Gilder** ES was not enforcing any level changes but could provide a recommendation. Recommended to raise the site above the adjacent roads. Flood modelling was being prepared on behalf of ES with results due in May. This would address any potential improvements / upgrades to the flood protections, stopbanks etc.
08/02/2023	Email	**ES - G. Gilder**

		A minimum FFL of 73.75m NZVD 2016 would be required based on the low point at the intersection of Railway Esplanade and Hamilton Street. A minimum FFL of 74.25m NZVD 2016 would be required to allow for 0.2m depth of water flowing over tipping level and 0.3m of freeboard for wave effects from vehicles driving through the flood water. The minimum FFL of 74.25m NZVD 2016 was deemed to be impractical for the site.
13/02/2023	Email	**GDC - M. Bayliss** Suggested a minimum FFL of 73.3 NZVD 2016, approximately 300mm above the current ground level for most of the site. Deferred to ES to define the minimum FFL.
20/02/2023	Design team meeting	**Kainga Ora - PJ Albers** Verbally requested the minimum FFL for the development to be designed for a 200-year event **General** Contact Matt Bayliss for any 3-water queries
22/02/2023	Email	**Kainga Ora - PJ Alberts** Requested comments from Calibre on the flood risk around the FFL's based on the current design taking into consideration that mitigation would be introduced and the current hardstand against permeable areas in the proposed design. **Calibre - M. Sawirs** Summarised the comments and recommendations provided by ES: • The stopbank could only manage up to 70-year event. • The system was controlled by the low point at the intersection of Hamilton Street, and Railway Esplanade at RL73.50m NZVD 2016 (not from survey). • The minimum FFL of 73.75m suggested by ES was 250mm above the level of the low point, and 74.25m was 750mm above the low point (NZVD 2016). The FFL of 73.75m would be 1.25m above the crown of the road, and the FFL of 74.25m would be 1.75m above the crown of the road. Designing the floor levels considering this stopbank being failure would need to be above RL 75.0m NZVD 2016. Commented conservative approach with respect to flooding, increasing the heights any further may displace too much water onto adjacent lots. Commented conservative approach with respect to value engineering, increasing the heights any further becomes very costly.
22/03/2023	Email	**GDC - M. Bayliss** Sent the previous pre-application meeting notes (25/01/2023) to Calibre and Southbase.

		The pre-application meeting notes: • Included a picture that showed most of the site areas were not flooded for a 100-year event • Suggested a minimum FFL of 73.3m (300mm above the current ground level for most of the site) • Deferred to ES in terms of natural hazard flooding
06/04/2023	Pre-application meeting	**ES - G. Glider** Advised that there would be a flood modelling due in May 2023, which would potentially be beneficial for defining the minimum FFL. Advised that there would be an upgrade to the existing stopbank which would be designed to have a 100-year flood protection. **GDC - M. Bayliss** Advised that the 100-year flood level provided by GDC was purely based on their internal infrastructure.
11/04/2023	Email	**GDC - M. Bayliss** Confirmed the 100-year flood level in the area of 29 Hamilton Street is 73.0m. Advised that Bylaw required 600mm freeboard from the 100-year flood level for any habitable dwellings. However, dispensation can be considered if a request and justification was provided. **Calibre - W. Blanchfield** Asked if KO would accept the development to be designed for a 100-year event only. **Kainga Ora - C. Knobloch** KO would prefer to work towards a 200-year event.
17/04/2023	Email	**ES - G. Gilder** Asked what datum GDC was based on. The heights suggested by ES were in terms of NZVD 2016. Commented ES did not have a firm opinion on a minimum floor level as it might be that the appropriate mitigation was impractical. ES did not have the 200-year flood level.
18/04/2023	Email	**Calibre - M. Tam** Recommended to retain the existing design FFL 73.75m in terms of NZVD 2016 subject to confirmation from GDC regarding their datum and if the 100-year flood level provided allowed for climate change factor. **GDC - M. Bayliss** Confirmed the 100-year flood level is 73.0m in terms of NZVD 2016.

		Confirmed GDC have not had any information regarding the 200-year flood level. Questioned the value in trying to design for a 200-year storm event.
04/05/2023	Email	**Property Group - J. Skuse** Confirmed that the 100-year flood level GDC had previous provided as 73.0m had not included an allowance for climate change. Stated "if climate change is going to make a substantial difference to this site it will also result in flooding of a large area of the surrounding land – when/if the Council upgraded the stormwater network in this area of town an allowance for climate change will be included – based on this, a minimum floor level of 73.60m would be acceptable.
08/05/2023	Email	**WSP - M. Foglia** Provided a 100-year flood map with climate change after construction of the development. It shows there are some flooding immediately outside of the development on Hamilton Street, and the 100-year flood level is 71.12m. There is minor flooding at the north-east corner of the development with a 100-year flood level of 73.42m Noted that the climate change is based on the outdated 2008 MfE guidance, not the latest 2018 guidance.

Contact Us

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