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PLANNING + SURVEYING + ENGINEERING

Preliminary Services Design Report

25 Ashley Gorge Road, Oxford

Prepared for Morgan McIntosh Limited

15742

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Ashburton: 03 307 7021
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Preliminary Services Design Report

25 Ashley Gorge Road, Oxford

Prepared for Morgan McIntosh Limited

Project number: 15742

Quality Control Certificate

Survus Consultants

survus.co.nz

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Status:	Final		
Release date:	19 October 2023		
Reference no:	15742		
Distributed to:	Morgan McIntosh Limited Waimakariri District Council		

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1. Introduction

1.1. Purpose

This Preliminary Services Design Report has been prepared in support of a submission by Morgan McIntosh Limited for the rezoning of an approximate 49.70 ha area of land from Rural to Large Lot Residential Zone (LLRZ), located at 25 Ashley Gorge Road, as shown in Figure 1.

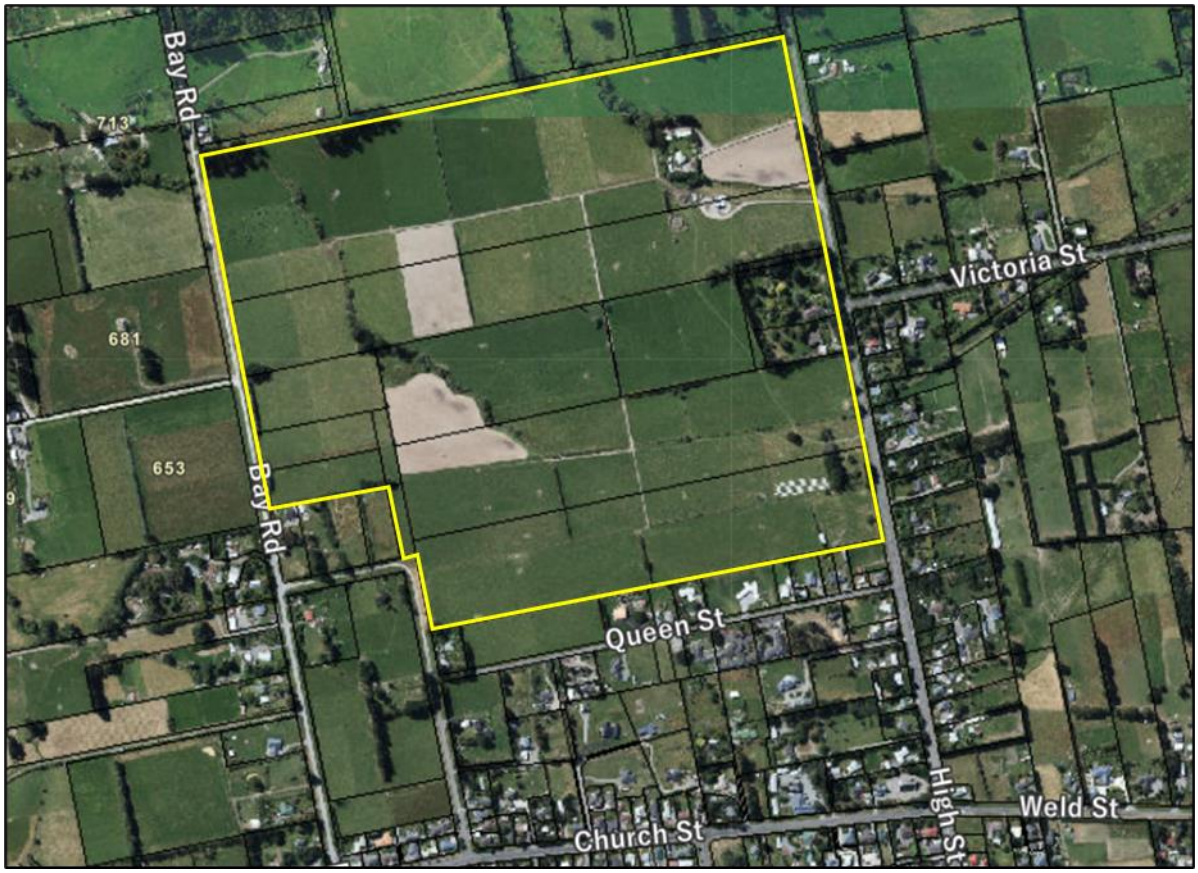

Figure 1. Plan Change Zone Boundary

1.2. Scope

This report addresses the servicing requirements for stormwater, wastewater, water supply and utility services (power and telecommunications).

The following information is provided within the Appendices.

Appendix A: Proposed Subdivision Scheme Plan.

Appendix B: Stormwater Preliminary Design Calculations.

Appendix C: Correspondence.

2. Site Description

2.1. Location and Surrounds

The proposed submission area is located at the addresses shown in Table 1.

Table 1. Proposed Submission Area Addresses

Legal Description	Owner	Adress	Area (ha)
RS 1391	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	16.2024 (calculated)
RS 1560	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	7.9789 (calculated)
Part RS 1561	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	1.4163 (surveyed)
Part RS 1561	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	0.8093 (surveyed)
Part RS 1561	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	0.8093 (surveyed)
Part RS 1626	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	4.0468 (surveyed)
Part RS 1626	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	2.4584 (surveyed)
RS 1956	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	8.0937 (surveyed)
RS 2405	Morgan McIntosh Limited	25 Ashley Gorge Road, Oxford	7.8888 (surveyed)

The plan change area is bounded by Bay Road to the west and High Street & Ashley Gorge Road to the east. The northern outskirts of Oxford Township borders the plan change area southern boundary and residential properties are also located to the west and east. Predominantly to the east, west and north of the site is rural pastureland.

Lots 1 & 2 DP 430450 are located centrally along the site eastern boundary and contain existing residential dwellings. An existing residential dwelling is also located near the northeast corner of the plan change area within RS 1391.

The site is currently pastureland, with scattered vegetation and shelterbelts. Frahms Creek (centrally located), an unnamed stream (northeast corner) and a stormwater drain (southern) traverse through the site.

2.2. Topography

The site is hilly in the northwest and then drops in elevation to a shallower slope. On average the site has a west to east grade of approximately 1 in 80. Generally, there is an approximate 10 m drop in elevation between the western and eastern boundaries.

Figure 2 shows the elevation profile across the site.

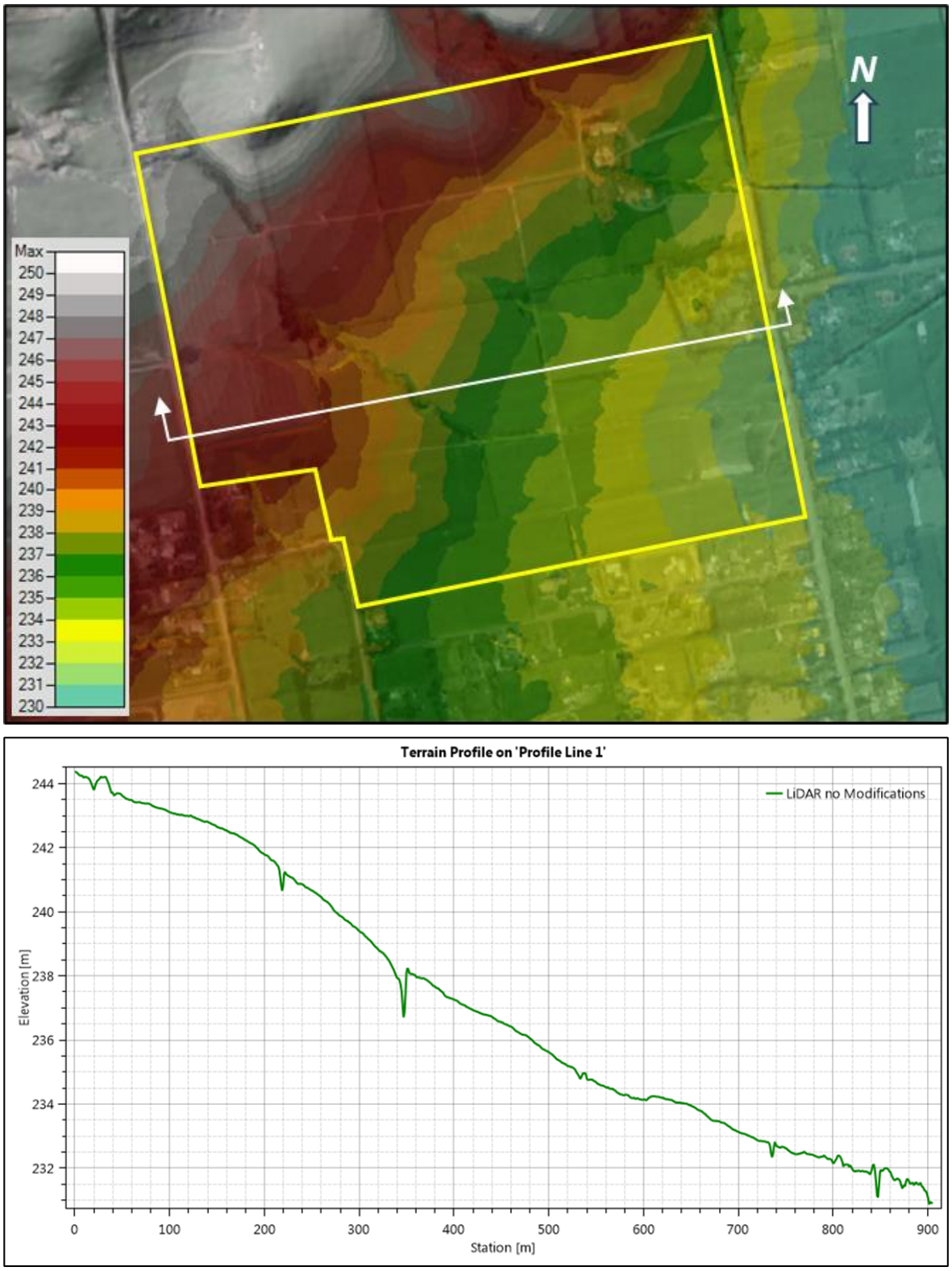

Figure 2. Topography and Elevation Profile

2.3. Geology

Tetrad (2023) has carried out a geotechnical investigation and natural hazards assessment of the site. The Natural Hazards Assessment Report (September 2023) is not appended to this report but has been submitted as part of the plan change submission.

The geotechnical reporting states that published geology indicates the site comprises late Pleistocene to Holocene alluvial fan deposits underlain by Late Pleistocene river deposits over Charteris Bay Sandstone of the Eyre Group. The alluvial fan thickness varies due to accumulation of colluvium material from erosion of the lower hillside slopes and accumulation of alluvial outwash from the flood plains.

Tetrad (2023) onsite investigations comprised of nine shallow test pit holes excavated to a depth of 3.0 m below ground level (bgl) across the plan change area, to confirm the subsurface soil profile.

The test pit locations are shown in Figure 3.

Figure 3. Tetrad (2023) Test Pit Locations

The simplified soil profiles identified across the site are provided in Table 2

Table 2. Summary of Test Pit Soil Profiles

Test Pit Location	Top of Soil Unit (m bgl)	Description	Density
TP1 – TP4	0.0	Organic SILT	Soft
	0.3	SILT	Soft to Firm
	0.4 – 2.2	GRAVEL	Dense
TP5 – TP6	0.0	Organic SILT	Soft
	0.3	SILT	Firm
	0.8	SAND	Medium Dense
	2.6	SILT	Firm to Stiff
TP7 – TP9	0.0	Organic SILT	Soft
	0.3	Sandy SILT	Firm
	0.5	Silty SAND	Medium Dense
	2.0 – 2.8	Clayey SILT	Firm

Practical refusal of the Scala testing was encountered at 0.4 – 1.7 m bgl in suspected rock material with resistance values exceeding 15 blows/100 mm.

2.4. Groundwater

2.4.1. Aquifer Type

The plan change area is located above the unconfined/semiconfined aquifer and piezometric contours indicate that groundwater generally flows to the southeast (Canterbury Maps, 2023).

2.4.2. Springs

There are no springs shown on Canterbury Maps within the plan change area or outlying vicinity.

2.4.3. Community Drinking Water Protection Zones

There are no community drinking water supply wells or protection zones within the site or the outlying vicinity.

2.4.4. Groundwater Depth

The closest groundwater monitoring well is L35/0023, located 40 m from the site eastern boundary (centrally). Groundwater records between 1952 to 1986 indicate a seasonal groundwater fluctuation of between 1.24 m to 3.61 m bgl with an average of 2.61 m bgl. Well records within the vicinity of the site also have recorded similar groundwater levels.

During geotechnical testing carried out by Tetrad (September 2023) encountered groundwater across the site at depths between 1.5 m to 2.8 m bgl. The groundwater depth tended to be deeper in the north of the site around Test Pits (TP) 7, 8 and 9.

2.5. Surface Water

There are three main surface waters that traverse through the site, as shown in Figure 4.

1. Frahms Creek (northwest and centrally located within the site)).
2. An unnamed stream (located within the northeast corner of the site).
3. A shallow stormwater drain (located within the south of the site)

Frahms Creek is a part of the Environment Canterbury river network and mapped as a stream. It enters the site at the northwest corner and meanders at a roughly 45 degree angel before re-orientating in a general easterly directly through the centre of the site towards Ashley Gorge Road, at which point the stream connects to a concrete culvert and exists beneath the road.

Survey data indicates that Frahms Creek has a top of bank width ranging from 3 m to 4.5 m (on average) and an average depth of approximately 1.0 m – 1.2 m.

The unnamed stream is shown on Canterbury Maps as a "stream" and conveys runoff from the upper hill catchment. The unnamed stream runs through the northeast corner of the site at an approximate 45 degree angle towards Ashley Gorge Road, at which point the stream connects to a concrete culvert and exists beneath the road.

Survey data indicates the unnamed stream has a variable top of bank width of 4 m to 7 m and an average depth of approximately 0.8 m – 1 m.

Historical aerial imagery of the property from 1942 shows both watercourses having a defined channel present.

There is a shallow (normally dry) stormwater drain that runs through the south of the site in an easterly direction and discharges to the High Street Drain. However, this drain appears to be redundant and at some point the main stormwater drainage network was diverted down Queen Street further to the south.

All watercourses noted are mapped as being a part of the WDC stormwater drainage network.

Figure 4 shows the watercourse locations.

Figure 4. Watercourse Locations within the Plan Change Area (WDC Drainage Network, 2023)

There are a number stormwater drainage channels within the locality, most notably is the open channel which runs down the eastern road verge of High Street.

2.6. Contamination

The site is not registered on the Environment Canterbury (ECan) Listed Land Use Register (LLUR) as having the historical HAIL activities.

2.7. Flood Hazard

The site is shown in the Waimakariri District Council (WDC) Flood Hazard Maps as being subject to inundation during the 0.5% Annual Exceedance Probability (AEP). The flood hazard category is low (shallow depth and low velocity).

3. Wastewater

3.1. Existing Network

The Oxford wastewater scheme is a mixture of gravity and Septic Tank Effluent Pump (STEP) systems which discharge to a treatment plant located to the southeast of Oxford Township. The treated effluent from Oxford is discharged onto an area of land to the south of the Eyre River.

The Wiamakariri District Council (WDC) ArcGIS Mapping network indicates there is a gravity nominal diameter (DN) 150 UPVC sewer main within High Street, which discharges to a DN200 sewer main at the intersection with Queen Street. There is also a short section of DN100 UPVC sewer main within Bay Road which discharges to a DN150 at the intersection with Wilsons Road, as shown in Figure 5.

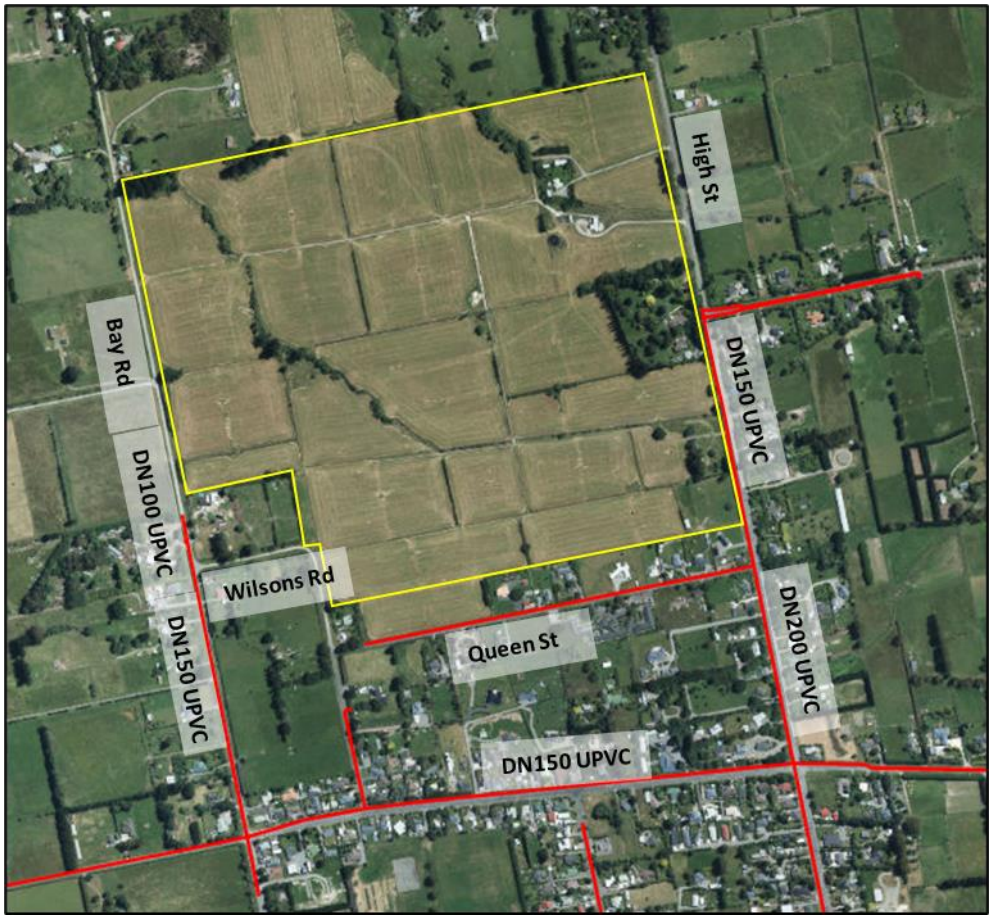

Figure 5. Existing Wastewater Services (WDC, 2023)

3.2. Wastewater Flows

The proposed wastewater network has undergone preliminary design calculations for confirmation of the discharge rate. Based on the WDC Engineering Code of Practice Part 6, the following discharge rates for the 79 Lot plan change area are expected.

- Average dry weather flow = 2.7 people/dwelling x 250 L/person/day x 79 dwellings = **0.617 L/s**
- Peak dry weather flow = 0.627 L/s x 2.5 = **1.543 L/s**
- Peak wet weather flow = 1.543 x 3.4 = **5.246 L/s**

3.3. Proposed Network

WDC will need to confirm that the existing wastewater network and treatment plant facility have capacity to cater for the additional wastewater flow that will be generated by a future subdivision, and this will have a bearing on the design of the internal sewer network (or any potential upgrades the WDC external network).

It is considered there are three potential wastewater network design options as discussed in the following sections.

3.3.1. Option 1: Gravity Sewer

There is an approximate 10 m drop in elevation between the site western and eastern boundaries over a distance of approximately 800 m, which equates to a fall of approximately 1 in 80. The DN150 sewer main within High Street has an approximate invert level of 1.3 m bgl. Therefore, subject to a detailed design, the discharge of wastewater via a gravity network to the DN150 UPVC sewer main within High Street does appear feasible.

The buried depth of the DN100 sewer pipe within Bay Road is not known and Council would need to confirm its capacity to accept an additional wastewater discharge, however potentially properties fronting Bays Road can discharge to this sewer main or it could be upgraded to a DN150.

The DN150 within High Street would need to be extended up Ashley Gorge Road and the DN100 with Bay Road would also need to be extended up to service the proposed plan change area northern Lots. Depending on the existing pipe capacity WDC may request that the DN150 with High Street be upgraded to a DN200 and it is expected that the DN100 would need to be upgraded to a DN150.

The gravity network would be designed in accordance with the WDC Engineering Code of Practise Part 6 (Wastewater).

3.3.2. Option 2: Low Pressure Sewer

Should it be deemed that the existing infrastructure does not have capacity to cater for the additional Lots, Low Pressure Sewer (LPS) is a viable alternative network, as wastewater flows can be attenuated and discharged to the downstream network during off peak periods.

Residential dwellings would drain effluent via a gravity pipe to a pump unit (pump and chamber), located within each individual property boundary. Each pump unit would have at least 24 hours storage capacity and would be controlled by an IOTA OneBox control panel which allows for automation and external control of the pump. The pump unit would discharge effluent to a pressure sewer main located within the street berm.

At the time of subdivision construction, each residential dwelling would be provided with a boundary kit (containing valves and isolation points). The boundary kit would be located just outside the property boundary (within the road reserve services strip). A lateral (pipe) would extend from the boundary kit into each property for later connection of the pump unit.

LPS networks require an odour control unit to be positioned just prior to the discharge point to the existing gravity main. The odour control unit provides treatment for potential hydrogen sulphide discharges.

3.3.3. Option 3: Gravity Sewer and Pump station

Should during the design stage it be determined that the site cannot discharge via gravity to the existing wastewater network (which is unlikely), then a pump station or lift station can be installed. The plan change area would discharge via gravity to the pump station, prior to being pumped to the existing gravity network.

Pump stations can also be used as an alternative to the LPS network if there is a capacity constraint. Generally, the WDC Engineering Code of Practice requires that pump stations have 8 hours of storage

for the average daily dry weather flow, the storage capacity also includes the upstream capacity of manholes and reticulation.

4. Stormwater

4.1. Existing Network

There is no piped stormwater infrastructure within the vicinity of the proposed plan change area. There is an open drain which runs down the eastern verge of High Street and a second open drain which runs down Wilsons Road and Queens Street. Figure 6 shows the drainage network.

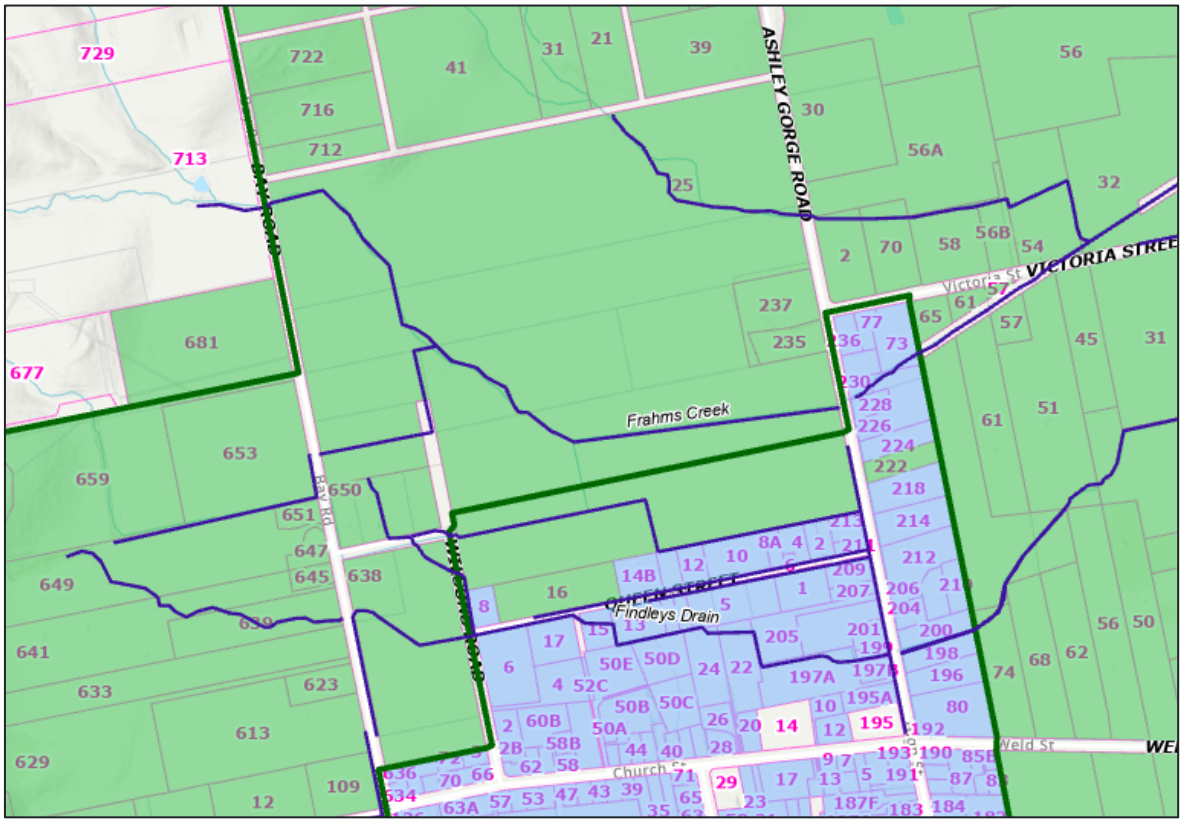

Figure 6. Open Drainage Network (WDC Drainage Maps, 2023)

4.2. Proposed Stormwater Network

Tetrad (2023) geotechnical testing identified the subsoils across the site as primarily being a silt (sandy SILTS, Silty SANDS, clayey SILTS), with some potentially isolated areas of gravel and sand identified. Groundwater records indicate a seasonal high ground water of approximately 1.3 m bgl, however potentially the groundwater table maybe lower in the north of the site (due to the higher elevation topography).

Due to the silt content of the soils and the potential high groundwater it is unlikely that the discharge of stormwater into land via soakage pits will be feasible across most of the site, and stormwater generated by a future development will be required to discharge to either Frahms Creek, the northeast unnamed stream, or the open drain within High Street. All three watercourses are mapped as being part of the WDC drainage network.

There is the potential to investigate the feasibility of the northern, higher elevation Lots discharging stormwater via soakage pits; however, further investigation of the underlying soils and groundwater fluctuation within each Lot would be required for confirmation. For the purpose of this plan change reporting it is assumed soakage will not be feasible.

4.2.1. Primary Conveyance Network

Stormwater runoff from residential Lots, reserves and roading will be conveyed by kerb and channel, sumps and pipe reticulation and/or swales.

Stormwater discharged from Lots will be to the kerb via a PVC kerb entry adaptor (or directly into swales).

The stormwater network will be sized to convey the 20% Annual Exceedance Probability (AEP) storm (5 year return period) critical duration rainfall runoff in accordance with the requirements of the WDC Engineering Code of Practice Part 5 (Stormwater & Land Drainage).

The stormwater network will discharge to one of three Stormwater Management Areas (SMA's) which will provide treatment and attenuation, prior to discharging to and adjacent surface water.

4.2.2. Secondary Conveyance Network

Stormwater runoff flow rates beyond the pipe or sump capacities will discharge into the internal road network and will be conveyed within the road reserve to one of the three SMA's. The roading network will be designed to convey the 2% AEP (50 year return period) runoff generated by the upstream catchment. If swales are utilised these will also convey the 2% AEP flow.

4.2.3. Stormwater Attenuation (Detention)

Overview

To ensure the downstream environment is not subject to increased inundation resulting from additional stormwater runoff from the future subdivision impervious areas (roof, roads, driveways and miscellaneous hardstand), stormwater detention will be provided to ensure that the post development runoff generated by the subdivision does not exceed the pre-development state (pasture) for all rainfall events up to an including the 2% AEP critical duration storm.

Roof Stormwater Detention

Stormwater runoff generated by all roof areas will discharge to an onsite detention storage tank, located within the boundary of each Lot. The tanks will be installed in accordance with the WDC Engineering Code of Practice Standard Drawing 600 Sheet 251. The detention tanks have a small bore orifice that restricts the discharge of stormwater back to pre-development runoff rates. The Christchurch City Council (CCC) recommends 5 m^3 of storage per 100 m^2 of roof area for attenuation of the 2% AEP storm.

Road & Driveway Stormwater Detention

All roading, driveways and right of way stormwater runoff will discharge to one of three SMA's, where it will be detained within detention basins, prior to being slowly released via a restricted orifice outlet, to an adjacent surface water.

Figure 7 shows the three proposed SMA locations; Road 1 (including right of ways and driveways) will discharge to SMA 1. Road 2 (including right of ways and driveways) will discharge to SMA's 2 & 3.

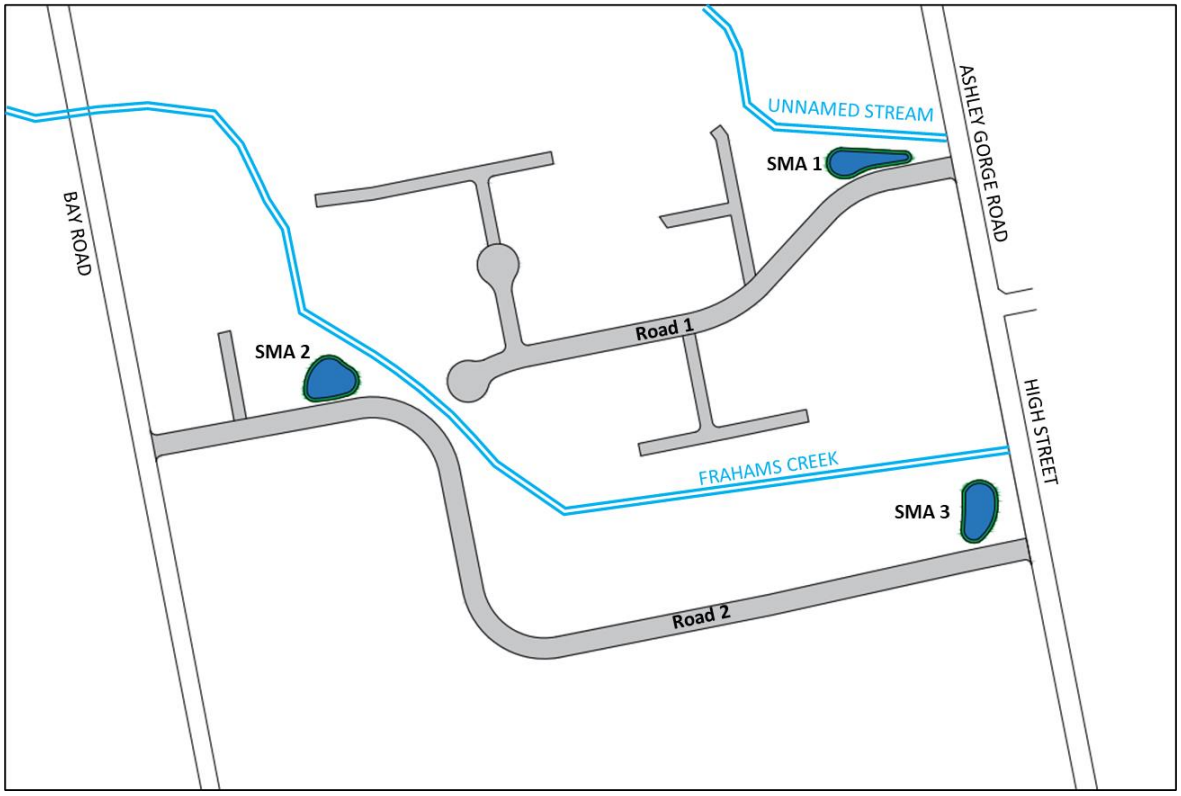

Figure 7. Stormwater Management Area Locations

Critical Duration

The upstream catchment is approximately 150 ha (measured from Google Maps, 2023) and has an approximate critical duration of 1 to 4 hours (time for the peak stormwater runoff discharged from the upper catchment to enter the proposed plan change area).

Figure 8 shows the approximate upstream catchment area and the three main surface water flow paths which discharge into the site.

The critical duration calculations are provided in **Appendix B** and are considered conservative, potentially the critical duration could be as low as 0.5 hours and would be fully calculated during the future detailed design phase.

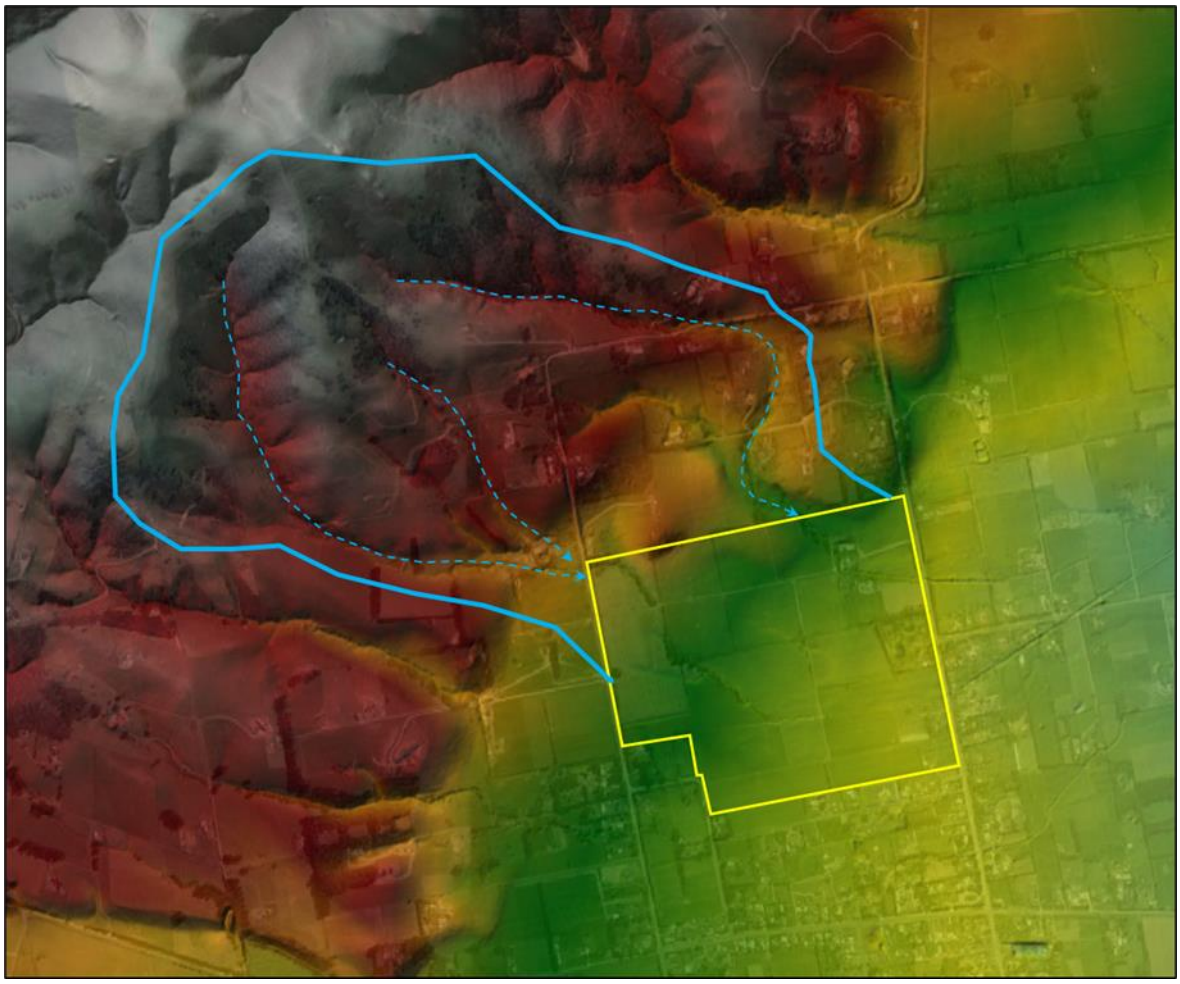

Figure 8. Upstream Catchment Area

Detention Storage Requirement

Table 3 provides the approximate 2% AEP critical duration (4 hours) pre and post development stormwater runoff volume generated within the plan change area and the detention storage volume requirement. The rainfall runoff volumes have been calculated using the rational method (simplistic calculations).

Table 3. 2% AEP Critical Duration Pre and Post Development Runoff From Roads 1 & 2

Catchment	Pre-Development Runoff Volume (m^3)	Post-Development Runoff Volume (m^3)	Detention Volume (m^3)
Road 1	546	1,343	797
Road 2	535	1,121	587
Total			1,384

The propped detention basins located within each SMA must have sufficient storage volume to ensure the restricted discharge to the downstream surface water does not exceed the pre-development rate (insufficient storage would result in an overflow from the basins into the surface water). SMA 1 will discharge to the northern-most unnamed stream and SMA's 2 & 3 will discharge to Fahams Creek.

Survey data indicates that the surface water channel depths range from 0.8 m to 1.2 m (the unnamed stream tends to be shallower).

Table 4 provides an estimate of the potential water storage volume within each SMA zone (e.g. each detention basin). The storage volumes have been calculated assuming a basin water depth of 0.8 m and bank batters of 1 in 3. It should be noted that the precise basin volumes will not be known until the future detailed design phase when the basin shapes are finalised.

Table 4. SMA Water Storage Capacity

Catchment	Basin Top Bank Area (m^2)	Water Depth (m)	Water Storage Capacity (m^3)
SMA 1	1,600	0.8	1,000
SMA 2	1,700	0.8	1,150
SMA 3	1,700	0.8	1,150
Total			3,300

The total detention volume requirement for the 2% AEP critical duration storm is approximately 1,384 m^3 (refer to Table 3) and a preliminary estimate suggests the combined SMA's have a capacity to store approximately 3,300 m^3. The additional water storage availability will allow flexibility in design when the site undergoes stormwater runoff modelling of all rainfall events to confirm the detention storage requirement across a range of durations.

4.2.4. Stormwater Treatment

The bulk of contaminant loadings are to be found mainly in the water quality volume or flow, often referred to as the "first flush" which requires treatment prior to discharging into land or to a surface water. The site will be required to provide stormwater treatment for rainfall runoff generated during the first 25 mm rainfall depth (volume based treatment devices) or the 10 mm/hour rainfall intensity (flow based treatment devices).

Roof stormwater runoff is generally considered clean and it is recommended that it be directed to a detention storage tank which will have a restricted orifice outlet slowing the release of stormwater discharged to the downstream network. Therefore, treatment for the most part will only be required for driveway and road areas.

When determining the preferred treatment method, the type and concentration of expected contaminants, desired treatment outcome and site characteristic need to be taken into account. There are various treatment options available for the site and the four main types which are likely to be suitable are detailed below:

1. **Proprietary treatment devices:** These are manufactured package treatment plants that can be purchased from suppliers, such as hydrodynamic separators, cartridge filter units and biofiltration/bioretention units. The advantage of proprietary treatment units is that they have a small footprint, provide an acceptable contaminant removal and are easily maintained.
2. **First Flush Basins:** First flush basins are a grassed basin which provide primary treatment for stormwater runoff and are usually upstream of a secondary treatment device such as a wetland. However, in some instances Council may allow them to be used as the sole treatment.

3. **Swales:** Swales can be located adjacent to roads (next to a berm or foot path) and can be used for treatment and conveyance of stormwater.
4. **Wetlands:** Wetland treatment systems can be used for both treatment and detention storage, as well as providing an aesthetically pleasing environment and public amenity. Care must be taken when selecting a wetland design to ensure the underlying groundwater and soils are conducive, thereby ensuring the wetland environment is not subject to prolonged periods of drying out or conversely a high groundwater that may submerge the wetland vegetation for prolonged periods.

It is recommended that the type of treatment be selected in consultation with WDC during the conceptual and detailed design phases.

5. Water Supply

5.1. Existing Network

The plan change area is mapped as being located within the Oxford Urban Water Supply Scheme.

Figure 9 shows the water supply network, within the vicinity of the plan change area. The piped network generally ranges from DN150 to DN200 UPVC water supply mains; the pipes not highlighted are small diameter submains which would not have sufficient capacity to service the site.

There is a DN200 UPVC water supply main with Bay Road and a 180 OD PE water supply main within High Street.

Figure 9. Existing Water Supply Network

5.2. Water Supply Demand

The proposed water supply network has undergone preliminary design calculations for confirmation of the firefighting and potable water supply demands. Based on the WDC Engineering Code of Practice Part 7 and SNZ PAS 4509:2008 *New Zealand Fire Service Fire Fighting Water Supplies Code of Practice*, the following demand for the 79 Lot development is expected.

- Peak potable residential demand = 7.9 L/s
- Firefighting demand (FW2) = 12.5 L/s within 135 m of a dwelling and 12.5 L/s within 270 m of a dwelling (25 L/s total demand).
- Peak demand (firefighting + 60% of the peak potable demand) = 29.74 L/s.

5.3. Proposed Network

WDC will need to confirm whether the existing infrastructure has sufficient capacity to supply an additional 79 Lots or whether a restricted supply is required. For the purposes of this report it is assumed that an on demand supply is possible.

The potable water supply network would be designed in accordance with the WDC Engineering Codes of Practice and SNZ PAS 4509:2008 *New Zealand Fire Service Fire Fighting Water Supplies Code of Practice*. The firefighting water supply classification will be FW2 in keeping with a residential area. If required fire hydrants will be placed at no more than 135 m intervals in accordance with this standard.

The potential reticulated potable water network through the site would consist of a DN150 main linking High Street with Bay Road (through Road 2, as shown in Figure 6). Road 1 will be serviced by either a DN100 or DN150 main. OD63 PE submains would be laid within the berms. All lots will be serviced by OD20 PE pipes and connected to standard DN15 water meters at the street boundaries in accordance with the Engineering Code of Practice.

6. Utility Services

6.1. Power and Telecommunications

Power and telecommunications will be provided to service the site in accordance with utility company and industry standards at the time of development. All cables and ducts will be placed below ground, and kiosks will be placed within individual allotments.

MainPower and Chorus have provided confirmation that their networks have capacity to service the electrical and telecommunication needs of the proposed plan change area. The respective capacity confirmation letters are located in **Appendix C.**

7. Conclusion

The site can be serviced for wastewater, stormwater, potable water, power, and telecommunications subject to preliminary and detailed design in conjunction with appropriate Council confirmations and consents being obtained. On this basis the submission for rezoning can be supported in respect of servicing capacity.

Disclaimer

This report has been prepared by Survus Consultants Limited (Survus) only for the intended purpose as a Services Design Report.

The report is based on:

- Subdivision Plan and survey data.
- WDC Services Maps.
- Canterbury Maps.
- Information provided by service suppliers.

Where data supplied by Morgan McIntosh Limited or other external sources, including previously issued drawings or reports have been relied upon, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Survus for incomplete or inaccurate data supplied by other parties.

Whilst every care has been taken during our investigation and interpretation of available data to ensure that the conclusions drawn, and the opinions and recommendations expressed, are correct at the time of reporting, Survus has not performed an assessment of all possible conditions or circumstances that may exist at the site. Variations in conditions may occur between data sources and Survus has provided conclusions in this report based on the best available information at the time of writing. Survus does not provide any warranty, either express or implied, that all conditions will conform exactly to the assessments contained in this report.

The exposure of conditions or materials that vary from those described in this report may require a review of our recommendations. Survus should be contacted to confirm the validity of this report should any of these occur.

This report has been prepared for the benefit of Morgan McIntosh Limited and the Selwyn District Council for the purposes as stated above. No liability is accepted by Survus or any of their employees with respect to the use of this report, in whole or in part, for any other purpose or by any other party.

Appendix A. Proposed Subdivision Scheme Plan

NOTES :

1. THIS SURVEY HAS NOT INCLUDED SITE MARKING OF THE BOUNDARY POSITIONS UNLESS OTHERWISE INDICATED.

2. NO UNDERGROUND SERVICE INFORMATION IS SHOWN ON THIS PLAN. THE LOCATION OF ANY SUCH SERVICES SHOULD BE CONFIRMED WITH THE RELEVANT LOCAL AUTHORITY OR UTILITY SERVICE PROVIDER.

3. THE SITE DATUM FOR THIS SURVEY IS:

   SEE PLAN FACE FOR 4 SITE BENCHMARKS
   DATUM: NZVD 2016

4. "SPOT HEIGHT" POSITIONS ARE SHOWN IN THE FOLLOWING FORMAT X AND ARE EXPRESSED IN METRES IN TERMS OF THE SITE DATUM FOR THE SURVEY. THE HEIGHTS OF THESE POSITIONS HAVE AN ACCURACY RELATIVE TO THE SITE DATUM AS FOLLOWS:

   × HARD SURFACES eg CONCRETE, ASPHALT +/- 0.030m @ 95% CONFIDENCE LEVEL.
   × SOFT SURFACES eg GRASS +/- 0.050m @ 95% CONFIDENCE LEVEL.

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REV	DATE	REVISION DETAILS	
A	02/10/23	FOR SUBDIVISION CONSENT	SRS

DESIGNED | VERIFIED

APPROVED

DATE

PROJECT
MORGAN McINTOSH LTD - 25 ASHLEY GORGE ROAD, OXFORD

TITLE
PROPOSED SUBDIVISION OF RS's 1391, 1956 & 2405; PT RS 1560 AND PT's RS's 1561 & 1626
RT's CB17A/179, CB376/298, CB376/258, CB19B/73, CB19B/74 & CB20A/174; Deeds Index 9D234, 36D637 & 88D741

INFORMATION ONLY

PROJECT NO 15742

SCALE 1:2000 (A1) | SIZE A1

DRAWING NO SC-01 | REV A

Appendix B. Stormwater Preliminary Design Calculations

RAINFALL DATA (HIRDS RCP8.5 FOR THE PERIOD 2081-2100)

ARI	AEP	10m	20m	30m	1h	2h	4h	6h	12h	24h	48h
1.58	**0.633**	6.47	8.47	10.1	14.1	19.8	26.95	34.1	47.1	64.1	83.7
2	**0.5**	7.36	9.62	11.5	16	22.5	30.5	38.5	53.2	71.8	93.7
5	**0.2**	10.7	13.9	16.5	22.8	31.9	43	54.1	74.3	99.4	129
10	**0.1**	13.4	17.3	20.6	28.3	39.4	52.9	66.4	90.8	121	156
20	**0.05**	16.5	21.2	25.1	34.3	47.6	63.7	79.8	109	144	185
30	**0.033**	18.4	23.6	27.9	38.1	52.8	70.5	88.2	120	158	203
40	**0.025**	19.8	25.4	30	40.9	56.6	75.5	94.4	128	169	216
50	**0.02**	21	26.9	31.7	43.2	59.7	79.45	99.2	134	177	227
60	**0.017**	22	28.1	33.2	45.1	62.2	82.6	103	140	184	235
80	**0.013**	23.6	30.2	35.5	48.3	66.4	88.2	110	148	195	249
100	**0.01**	24.9	31.8	37.4	50.7	69.7	92.35	115	155	204	260
250	**0.004**	30.5	38.7	45.4	61.2	83.7	110.35	137	184	240	304

CRITICAL DURATION

Parameter	Value	Comments
Average overland flow length (m)	250	*Measure from Canterbury Maps*
Average slope (%)	2	*Slopes range from 1.5% to 20%*
Hortons surface roughness	0.4	*Table 21-2 WWDG for Dense Shrubbery*
Time (minutes)	215	
Time (hours)	3.6	
Channel flow (hours)	0.5	*No calculations, this is an assumed value*
Critical duration (hours)	4	

ROAD 1: 2% AEP DETENTION STORAGE REQUIREMENT

Catchment	Area (ha)	Runoff Coefficient	2% AEP 4 Hour Rainfall Depth (mm)	Runoff Volume (m3)
Carriageway	0.5782	0.85	79.45	390
Berm	0.4654	0.3	79.45	111
Footpath	0.1991	0.85	79.45	134
Right of Ways	0.9471	0.85	79.45	640
Driveways	0.1	0.85	79.45	68
Total	2.2898			1343
Pre-Development	2.2898	0.3	79.45	546
Difference (Post - Pre)				**797**

ROAD 2: 2% AEP DETENTION STORAGE REQUIREMENT

Catchment	Area (ha)	Runoff Coefficient	2% AEP 4 Hour Rainfall Depth (mm)	Runoff Volume (m3)
Carriageway	0.81	0.85	79.45	547
Berm	0.9	0.3	79.45	215
Footpath	0.3	0.85	79.45	203
Right of Ways	0.103	0.85	79.45	70
Driveways	0.13	0.85	79.45	88
Total	2.243			1121
Pre-Development	2.243	0.3	79.45	535
Difference (Post - Pre)				**587**

Appendix C. Correspondence

03/10/2023- via email

Network Reference: 00056551

MainPower New Zealand Limited
172 Fernside Road, RD 1 Kaiapoi 7691
PO Box 346, Rangiora 7440
T. 0800 30 90 80

C Mars
Servus Consultants
PO Box 5558
Papanui 8542

Dear Cameron,

Re: Power Connection for Proposed Subdivision. RS 1391, 1956 and others 25 Ashley Gorge Road Oxford

MainPower confirms that the High voltage Network in the vicinity of 25 Ashley Gorge Road Oxford has the capacity to supply the proposed subdivision.

This letter is to advise you that MainPower's network has the capacity for the proposed subdivision. This does not mean that there is an electrical supply to the boundary of the proposed lots.

Please do not hesitate to contact the MainPower NZ Ltd NSR Team on 03 311 8311 or NSR@mainPower.co.nz if you have any questions.

Yours sincerely,

Matthew Bate
Network Services Representative

Cameron Mars

From: Chorus Property Development Do Not Reply <npdnoreply@chorus.co.nz>
Sent: Tuesday, 10 October 2023 2:36 pm
To: npdnoreply@chorus.co.nz
Subject: Chorus 10610665 : We can service your development

Hi

Your reference: 15742
Development address: 25 Ashley Gorge Road, Oxford, Waimakariri District, 7495

This email is to confirm that Chorus can provide our fibre network to your development. An indicative cost for the work we would need to do (noting that this excludes costs for any work you may be required to do inside the site boundary) is presented in the below notes:

A high-level estimate to extend our fibre network to your development is $215,517.19 Incl. GST

If you would like this formalised into a quote, then please log in to your account and let us know. If you need to amend the connection numbers or provide updated plans, you can also do that via your account.

Chorus New Property Development Team

Please do not reply to this email as this inbox is not monitored. For any follow up queries please visit www.chorus.co.nz/develop-with-chorus or log in to your account. If you do not yet have an account with us, you will need to create an account to view your job progress and documentation.

Chorus New Zealand Limited

10 October 2023

Chorus reference: 10610614

Attention: Cameron Mars

Quote: New property development early design only

79 connections at 25 Ashley Gorge Road, Oxford, Waimakariri District, 7495

Your project reference: N/A

Thank you for your enquiry about having Chorus network designed for the above development. Chorus is pleased to advise that, as at the date of this letter, we are able to provide an early design for this property development based upon the information that has been provided.

The total contribution we would require from you is **$4,025.00 (including GST)**. This quote is valid for 90 days from 10 October 2023. This quote is conditional on you accepting a NPD Early Design Contract with us and making payment. We reserve the right to withdraw this quote and requote should we become aware of additional information that would impact the scope of this quotation.

This quote is only for the service of high-level design work and does not constitute any commitment by either party to reticulate fibre network to the site. When the development is ready for fibre network reticulation to every connection, a new request will be required, and standard pricing will apply at that time. For more information on what's involved in getting your development connected, visit our website www.chorus.co.nz/develop-with-chorus.

Kind Regards

Chorus New Property Development Team