

TO: The Hearing Administrator, Lynley Scott, DP.Hearings@qldc.govt.nz

**BEFORE AN INDEPENDENT HEARING PANEL
APPOINTED BY QUEENSTOWN LAKES DISTRICT COUNCIL**

UNDER THE Resource Management Act 1991 (“**Act**”)

IN THE MATTER OF a Variation to the proposed Queenstown Lakes District Plan (Te Pūtahi Ladies Mile) in accordance with Part 5 of Schedule 1 to the Resource Management Act 1991 (“**Variation**”)

BETWEEN **GLENPANEL DEVELOPMENT LIMITED (“GDL”)**
Submitter

AND **QUEENSTOWN LAKES DISTRICT COUNCIL (“QLDC”)**
Proponent of the Variation

**STATEMENT OF EVIDENCE OF CALLUM WOOD ON BEHALF OF GDL
DATED: 20 OCTOBER 2023**

Before a Hearing Panel: David Allen (Chair), & Commissioners Gillian Crowcroft, Hoani Langsbury, Judith Makinson and Ian Munro

Introduction, qualifications and experience

1. My name is Callum Wood.
2. I hold the following qualifications:
 - (a) **BE (Civil)**
 - (b) **MENZ CPEng**
 - (c) **CMInstD**
3. I am a member of the following professional bodies:
 - (a) Engineering New Zealand (ENZ)
 - (b) Institute of Directors – Chartered Member

4. I am a chartered professional engineer that specialises in the project management and delivery of large infrastructure projects with multi-discipline teams. I have over 25 years' experience in civil design and building services and have held various senior management and team leader positions with significant experience in the South Island.

Code of conduct

5. Although this is not an Environment Court hearing, I confirm that:
 - (a) I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023;
 - (b) I have complied with the Code in preparing this evidence.
 - (c) The issues addressed in this evidence are within my area of expertise, except where I have indicated that I am relying on others' opinions.
 - (d) I have not omitted material facts known to me that might alter or detract from my evidence.

Scope of evidence

6. The purpose of this evidence is to attach and confirm the servicing reports I have previously produced in respect of the "Flint's Park" Fast Track applications.
7. As "updated" and confirmed in my letter of 1 September 2023, the reports and calculations remain relevant, and provide assurance of the serviceability of the Flint's Park site in respect of the matters addressed.
8. The attachments are:
 - (a) Addendum letter of 1 September 2023;
 - (b) Proposed Infrastructure Report dated 28 October 2022; and
 - (c) Engineering Calculations dated 1 September 2023.

20 October 2023
Callum Wood

Ref: CQ21061
Date: 1st September 2023

Glenpanel
429 Ladies Mile,
Queenstown

Dear Sirs,

Re: Flints Park – Stage 1, Civil Engineering Addendum to application.

A new consent is being sought to develop Flints Park, Stage 1, at 429 Frankton-Ladies Mile Highway (Lot 2 DP 463532) for the same activities as the original application excluding a number of buildings (14) that were previously proposed on the ONF (with just the water tanks remaining on the ONF).

While the lot plans submitted with this Stage indicate a slightly smaller total from the previous reports, for simplicity the engineering calculations submitted here for water and sewer requirements are based on the slightly larger original application as it makes very little difference and provides for redundancy. The previous civil reports considered the creation of up to 384 residential dwelling units at the site and 840m² commercial activity. With the removal of the elements on the ONF, we understand there will be up to 370 residential dwellings now on site.

Potable water

As previously, 3 tanks of 1,000,000 litre capacity each are proposed on the northern hill. Since the original application QLDC has confirmed their preference for potable water to be serviced from the Western boundary sourced from the location of Stalkers roundabout with the appropriate engineering infrastructure via the SH (valves; pumps etc). This is as documented in the original application.

Sewer

As previously, the internal gravity sewer mains are to collect at the Eastern Road frontage to a specific lot proposed for a sewer pump station and tank to provide a minimum 108m³ emergency storage.

Since the original application QLDC has confirmed their preference for sewer to be pumped via a rising main on the northern side of SH1 to arrive at the location of Stalkers roundabout where an existing main is located with the appropriate engineering infrastructure. NZTA is also in agreement with this proposal and the intent is to create easements in the road frontage property of Glenpanel as there is no room in the road reserve. QLDC is in agreement to this in principle.

Work has been undertaken to coordinate how the proposed sewer gravity lines integrate with other services especially stormwater as provided by other reports.

Earthworks and roading

Roading is fundamentally same as previously, as are the earthworks. Refer to the landscape architecture layouts for roading.

Yours faithfully

A handwritten signature in black ink, appearing to read "Wood".

Callum Wood
Principal – Civil Engineering Manager
BE(Civil), CPEng, CMIInstD
Cosgroves Ltd

Attached: Engineering calculations for Potable water and Sewer

Flints Park Development

429 State Highway 6, Lake Hayes Proposed Infrastructure Report

Revision A.1:
28 October 2022
CQ21061

Flints Park Development , 429 State Highway 6, Lake Hayes

Document Control				
Document ID: Rev A.1				
Rev No	Date	Revision Details	Author	Approver
A	March 2022	Resource Consent	CW	CW
A.1	28 October 2022	General updates	CW	CW

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1. Introduction

This Civil infrastructure report is prepared in support of the proposal by Glenpanel LP Ltd (Glenpanel) for Flints Park at Ladies Mile (429 SH6, Lake Hayes, Queenstown) to develop and construct a new urban development.

The proposal includes altering the existing ground levels to achieve required minimum floor levels and appropriate fall for a stormwater network to discharge water from the various areas within the site. New sewer connections and water supply connections will be completed for the Lots as required for potable and firefighting supply. Electrical supply and other easements are required to accommodate the development needs.

Roading and pavements are discussed and the already consented access on to SH6.

Cosgroves has been engaged to also comment on the earthworks requirements for the land use consent application for earthworks activity. In conjunction with our report, investigation work completed by Geosolve Ltd is referenced where they have carried out geotechnical investigations.

The legal description of the site is; part of Lot 1 DP 22874, part of Lot 1 DP 463532, all of Lot 2 DP 463532, all of Lot 1 DP 20162, all of Section 1 SO 24954.

The proposed development is shown in Figure 1

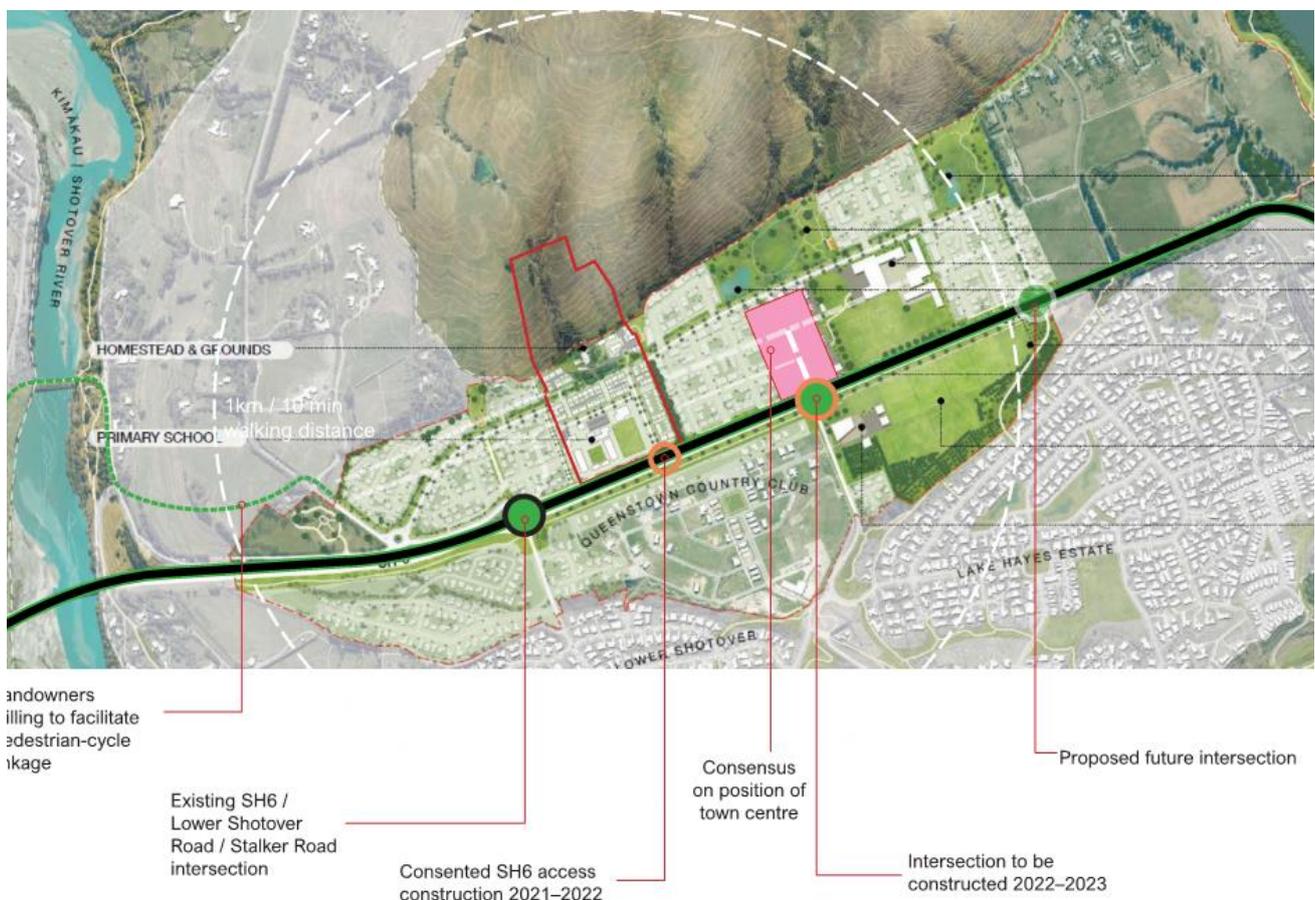


Figure 1: Proposed Concept Plan

2. Objectives

The objective of this report is to provide a detailed infrastructure assessment that address the capacity of the existing infrastructure (excluding stormwater)¹, and the extent of any upgrades required to service the development.

3. Assumptions

The analysis carried out as part of this report is based on the following key assumptions and design parameters:

3.1. General

- Contours provided by LINZ LiDAR as produced by Southern Horizons Surveying Ltd
- Lot configurations, roading layout and make up of development as provided in the spatial plan by Southern Horizons
- There are two case scenarios with different number of residential dwellings for the developable area within the site:
 - The first scenario includes a maximum of 384 residential dwellings (no school) and a commercial area of 0.084ha
 - The second scenario includes a maximum of 179 residential dwellings (with school) and a commercial area of 0.084ha

For the purpose of designing the wastewater and water supply networks, the first scenario with a maximum of 384 residential dwellings (no school) and a commercial area of 0.084ha has been used for calculations as this represents greater water supply and wastewater disposal demands of the two scenarios described.

- Geotechnical report by Geosolve
- Ladies Mile Te Putahi Masterplan (3 Waters Infrastructure report by Candor 3 (Draft dated April 2021)

In addition, there are a number of other historic reports produced by others on the Flints Park area and wider Ladies Mile and Shotover that are still relevant as they discuss condition of assets, constraints and options for development such as this. These include:

- Housing Infrastructure Fund: Review of 3 Waters Infrastructure Detailed Business Case (proposed by QLDC): Ladies Mile prepared for MBIE by Stantec 2018
- Ladies Mile HIF: Scoping and concept Design (Transportation and 3 Water) including Addendums prepared by WSP 28 June 2018

3.2. Wastewater

- Average dry weather flow (ADWF) from the development will be 250 l/h/d (Upper bounds of the design parameters given in NZS 4404:2010²)
- Dry weather peaking factor = 2.5 x ADWF - (Design parameter given in NZS 4404:2010).
- Wet weather peaking factor = 2 x PDWF - (Design parameter given in NZS 4404:2010).
- Fully developed, the residential area will have an average occupancy rate of 3 people per property
- Proposed wastewater pipes have a Manning's roughness coefficient (n) of 0.011.
- Commercial flow including peaking factors 1.3 l/s/ha (QLDC LDSC Table 5.1 - Heavy water usage)

¹ Refer to separate report by Warren Ladbrook for Stormwater

² And all flow parameters from the requirements of QLDC LDSC 2020 Section 5.3.5.1

3.3. Water supply

Average daily consumption of 1000 Litres/person / day³

3 people per dwelling

Commercial water usage = 1.3 l/s/ha (conservative)

Peak hour factor = 4

Firefighting requirements classified as commercial with two different scenarios compared for different categories of business for the maximum fire cell:

FW6 (for Fire Hazard Category 3)

Required flow: 6000 l/min (100 L/s) and 180 mins fire fighting

And

FW5 (for Fire Hazard Category 2)

Required flow: 4500 l/min (75 L/s) and 120 mins fire fighting

4. Wastewater

4.1. Existing situation and proposed works

QLDC has been carrying out a complete review of the wastewater network that services the entire area East of the Shotover river over a number of years. The Draft report Commissioned by QLDC discusses options for different pump solutions that have primarily common elements of requiring a falling gravity main falling East along the entire SH6 frontage of the Masterplan area to a pump station (or multiple stations). Then a pump solution and rising main back West to the ultimate discharge point for the entire network at the Shotover Treatment ponds.

The primary reason for the falling gravity main East is that the topography falls that way and this is no different for Flints Park. Falls across the site are generally in the order of 1-3m from the North-West to the South-East and hence a gravity solution results in a reticulation connection point in the vicinity of the consented access on SH6.

The demands from the overall development indicate 16.78l/s including peaking factors. Refer appendices for calculations.

Flints Park will carry out the gravity mains and pump station within the development and allow for a pressure main connection to the existing reticulation associated road opening and connection approvals. Should there be interim capacity issues in the existing rising main, Glenpanel will provide a level of storage in the pump wet well to allow timing of discharge at off peak load times with Scada control linking to QLDC requirements.

4.2. Option Discussion

Option 1: At the pump station across SH6.

At the proposed pump station site a pressure connection can be made to the existing rising main (300mm diameter) in SH6 that will serve for this development now. In the future, either of a new gravity main connection can be made from Flints Park to the proposed West – East Gravity main, or the pumped connection is maintained by connecting into an upgraded rising main pipe size where it is proposed as above. Either option would fit with the outlined strategy in the QLDC Ladies Mile Masterplan.

³ All parameters from QLDC LDSC 2020 Section 6.3.5 and discussion with QLDC

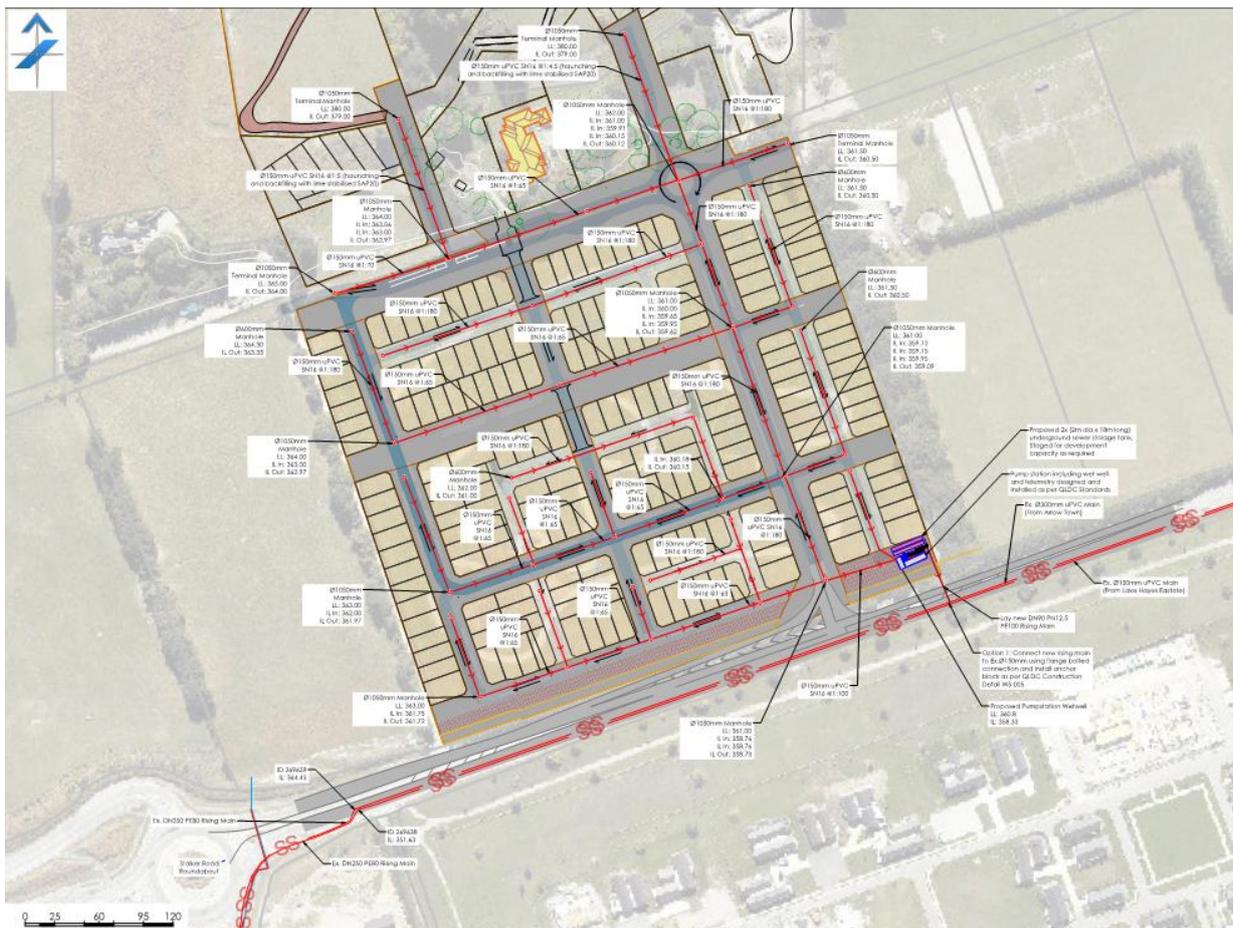


Figure 2: -Sewer Design (Option 1)

Option 2: New rising main to join existing gravity main West of Stalkers Rd

An existing gravity sewer line (150mm dia) crosses SH6 at the Stalker Road roundabout close to the development site on the West side. This is understood to not service any development but due to the topography of the land falling away from this pipe invert it is not possible to achieve a gravity solution to utilise it. In addition, the Stantec HIF review highlighted a risk that this line is not a gravity line and West of it is a rise. Therefore, this stub line has been discounted as an option.

Further West of Stalkers roundabout, with the exact location to be determined, (rising main connection to gravity) there is the option to connect to the existing 375mm dia wastewater line via a new rising main from the proposed Flints Park pumpstation across SH6 and traverse West along the South side of SH6. The reason for the South side is to avoid the new intersection works and services at Flints and the considerable earth bund on that side. Refer to the options in the following section.

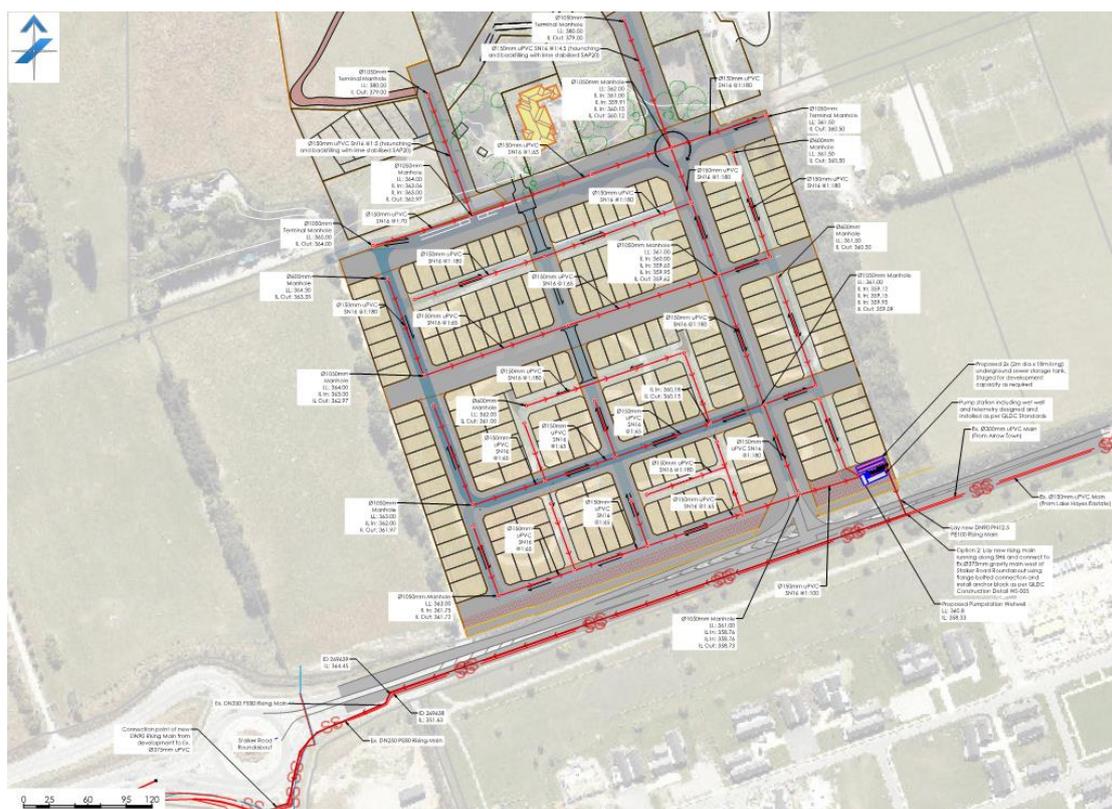


Figure 3: -Sewer Design (Option 2)

The capacity and condition of the current 300dia line along the SH6 frontage is unknown but given that there is to be a staged development and storage is available to offset any peak issues, this is the most desirable option for connection.

Ultimately there is the long-term intent by QLDC to install a new falling main East and an upgrade rising main West that this could connect into.

Therefore, Option 1, connect directly to SH6 existing is the preferred wastewater connection point for Flints Park with Option 2 being a viable alternative.

Other issues to note

The other reports commissioned in 2018 for the Housing Infrastructure Fund (HIF) that include the WSP concepts and the Stantec review of the same, both agree that:

- There are no capacity issues for pipe across the Shotover bridge ie can handle more loading
- There are no strength issues for the pipe across the Shotover bridge ie can handle more loading

5. Water Supply

5.1. Potable water; existing situation and proposed works

As for the wastewater requirements, QLDC is currently reviewing the long-term strategy to service and provide water supply to Shotover Country, Lake Hayes, Frankton, Quail Rise and all the area covered by the Flints Park development. This is driven by drinking water compliance and also to meet the growing capacity requirements in general requiring the review of how best to service the entire district.

The QLDC Masterplan nominates a new Ladies Mile reservoir on Slope Hill as part of mid-term infrastructure upgrades. This fits with the requirements of Flints Park and utilising a staged approach the rising mains and falling mains to the proposed reservoir site can be installed now as part of the Flints Park immediate

QLDC reservoir design parameters require the greater of;

- 6 hours average demand plus fire requirements
- 24 hours of average day demand or
- 12 hours of peak day demand

This results in a reservoir requirement of 2309m³ as a minimum⁵.

Original QLDC strategy discussed 2 of 5000m³ reservoirs being installed on Ladies Mile but we understand QLDC now favours tank farms of 3 smaller 1000m³ reservoirs to allow for better maintenance (working offline) activities and the ability to isolate one or more at a time. The smaller footprint of these farms also allows easier construction on the slopes and the ability to add to them as required.

This proposal is to install 3 of 1000m³ reservoirs (total 3000m³) that is in alignment with QLDC proposals.⁶ Staging any additional tanks when required for other local demands can be reviewed in detail design by allowing pipe and other infrastructure to be added in. This initial reservoir farm exceeds the minimum requirement and allows for redundancy in design depending on the final specifics of the commercial area buildings.

Both the WSP HIF study, and Stantec review of it, agree with the location. Volume can be added if future developments East and West of Flints Park require it. Allowance has been made in the design for gravity mains to feed East and West of Flints Park.

5.2. Fire fighting supply

The exact format of the commercial development is unknown and a maximum worst case example has been adopted with a Fire water classification of FW6. This covers a maximum fire cell size of 840m². If specific design is required for larger fire cells there is the ability to cover this by the redundancy built into the reservoir sizing and/or specific onsite tanks for the particular commercial activity. These would most likely have to be underground

6. Earthworks

A Preliminary Geotechnical Investigation Report has been prepared for the site by Geosolve Ltd. The site stratigraphy is expected to be topsoil over layers of loess (0-1m) over varying depths of alluvial silt (0-1m), that in turn overlie significant depths of sand and gravels

The expectation is that standard engineering solutions for pavements and structures will apply.

The development area is approx. 15.49Ha.

6.1. Bulk earthworks

Clearing activities will be required over the entire site for the removal of the existing topsoil to form roads and building platforms.

The majority of earthworks are cut to waste of topsoil with some re-use on site of existing materials.

The areas on the site development are summarised below in Table 1.

⁵ refer calculations in the appendices and commentary below on fire requirements.

⁶ For tank farm configuration

Total area of site earthworks	88,100 m ²
Strip Topsoil area – for roading (to waste off site and respread where possible on site)	39,200 m ²
Strip Topsoil area – for building platforms (to waste off site and respread where possible on site)	14,000 m ²
Minor shaping and filling area on flats	34,900 m ²

Table 1: Earthworks areas⁷

6.2. Sediment and erosion control

A specific erosion and sediment control plan will be required as part of the contractor's quality plan to cover how the contractor will mitigate dust, sediment, and debris and all construction activities and measures will be designed in accordance with the QLDC Code of Practice

Earthwork activities will not affect the safe operation of the local highway. There will be increased heavy traffic movements while material is being exported and imported and trucks will exit onto the roads via approved site entrances on to SH6 as required during construction.

The general nature of the soils will require the contractor to have a specific plan in place which will incorporate their methodology for dealing with construction earthworks and cover works associated with:

- Construction of a stabilised vehicle entrance at the entrance to any stage.
- Install clean water diversion drains to redirect upstream runoff where required.
- Construct Sediment Retention Pond(s) as required
- Construct silt fences and earth bunds around the perimeter directing water to sediment retention ponds.
- Carry out any clearing required
- Strip topsoil and stockpile on site.
- Carry out cut to fill earthworks.
- Complete civil works as appropriate with topsoil respread and grassing on completed areas as soon as possible after works are complete.
- Re-spread topsoil immediately after completion of earthworks on areas not subject to civil works.
- Seed area with grass seed and where necessary, straw mulch.
- Remove erosion and sediment control measures once site is stabilised.

7. Roads

7.1. Proposed

The proposed road layout in Figure 4 indicates the road hierarchy. The permanent access is already a consented commercial accessway. The existing homestead access adjacent is intended to provide the point of access for construction traffic to enable the area to be constructed efficiently.

The development of the site will require the construction of a split boulevard, local roads, including roads of varying width and function such as Collector/Connector Roads, Local Roads and private laneways/private Jointly Owned Access Lots (JOAL).

⁷ refer Southern Horizons Survey.

The roads will be designed in accordance with the QLDC Land Development Code of Practice. The legal width of the roads proposed will vary as shown on the Masterplan drawings set out in the application and as discussed below.



Figure 4: Road layout masterplan

Road A – East - West Collector Road

This road runs east west along the base of Slope Hill. The road is proposed to have an 26m road reserve with the following cross section:

- 0.6m Service strip from lot boundary to back of footpath
- 1.8m Min Footpath
- Grass berm and street trees with varied width
- 4.4m Carriageway
- 3m Planted Swale
- 4.4 m Carriageway
- 3m Bus stop
- 3m Min Shared path
- Grass berm with varied width from back of shared path to lot boundary
- Total = 26m

Road B – North - South Collector Road

This road will connect the development to the main access at SH 6 and will run north-south perpendicular-to SH6. The road is proposed to sit within a 20m road reserve with the following cross section:

- 0.6m Service strip from lot boundary to back of footpath
- 1.8m Footpath
- 2.1m Grass Berm

- 2.5m Parking Bay
- 6m Carriageway
- 3m Bus Bay
- 1.6m Bus Stop
- 1.8m Foot Path
- 0.6m Service strip from back of footpath to lot boundary
- Total = 20m

Road C – 15m Standard Local Road

- Service strip with varied width from lot boundary to back of footpath
- 1.8m Footpath
- 2.5m Parking Bay
- 5.5m Carriageway
- 2.5m Parking Bay
- 1.8m Footpath
- Service trip with varied width from back of footpath to lot boundary
- Total = 15m

Road D – 12m Local Road

- Service strip with varied width from lot boundary to back of footpath
- 1.8m Footpath
- 2.5m Parking Bay
- 5.5m Carriageway
- Grass berm with varied width from back of carriageway to lot boundary
- Total = 12m

Road E – 9m Lane

- Grass berm with varied width from lot boundary to carriageway
- 3m Carriageway
- 2.5m Passing/ Parking Lane
- 1.8m Footpath
- Total = 9m

All roads will be constructed in accordance with the QLDC Land Development Code of Practice standards with kerb and channel, footpaths and a hotmix surface. Parking and appropriate landscaping will be provided where required. The Transport Assessment Report details the proposed parking levels and locations.

The structural design of pavements will be carried out in accordance with the QLDC Land Development Code of Practice. Based on the findings of the Geotechnical Investigation Report there is no reason that the roads cannot be constructed to meet the required standards.

7.2. General roading / street furniture

Street lighting will be provided along all roading and street trees and landscaping will also be provided throughout the development, all in accordance with QLDC Land Development Code of Practice.

8. Power, Telecom and Gas Services

Aurora Energy and Powernet both have high voltage electrical networks adjoining the subject site and they have both confirmed that their networks can supply suitable underground electrical supply to the proposed development.

Fibre optic telecommunications cables exist along the north side of Frankton-Ladies Mile Hwy. These are owned by Chorus who have also confirmed that extensions to their network can be made to provide telecommunications services to the proposed development.

The Shotover Country subdivision has full gas reticulation with gas being provided by Contact/Rockgas who have a 50t buried gas tank located off Jones Ave. A 110mm main runs in Stalker Road past the property boundary and gas reticulation can be made available at the discretion of the developer.

All existing infrastructure is underground and all new reticulation required to service the proposed development will continue this model of service. Confirmation from the network owners has been obtained that they will be able to service the proposed development.

9. Conclusion

Based on the feedback from the Utility Service providers it is not anticipated that there will be any supply or capacity issues that will limit the provision of necessary services and connection can be made available from existing infrastructure at the time of development in accordance with the relevant service provider's specifications.

10. Information Supplied

Design calculations are supplied in the appendices.

Appendix A –Design information

Flints Park

Ladies Mile Development ENGINEERING CALCULATIONS

Prepared for:
Glenpanel LP

Ref# CQ21061

Rev: D
26 July 2022

Calc By: QT
Check By: JH/CW

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Client: Glenpanel LP
Project: Ladies Mile Development
Ref: CQ21061

Calc by: QT
Check by: JH/CW
Date: 26 July 2022

Reference : QLDC LDSC 2020

A) Wastewater Design

Residential Design Criteria From QLDC LDSC 2020 Section 5.3.5.1

ADWF	250	litres/person/day
PDFW peaking factor	2.5	
PWWF peaking factor	2	
People per Dwelling	3	

Wastewater Flow

Proposed Development

For 384 Dwellings

Dwellings	384
Population	1152
ADWF (l/s)	3.33
PDWF (l/s)	8.33
PWWF (l/s)	16.67
Total design flow	16.78 l/s
Emergency storage required (9hours ADWF): QLDC requirement	108 m ³

For commercial (0.084ha)

Design flow	1.3 (l/s/ha)
Area (hectare)	0.084
Industry type	Heavy (conservative)
Flow including peaking factors (l/s)	0.11 l/s

Pipe Capacity Check Downstream

Manhole Reach	Design Flow (l/s)	Pipe Diameter (mm)	Mannings 'n'	Pipe Gradient (%)	Flow Velocity (m/s)	Pipe Capacity (l/s)	Meet Design Flow?
Wastewater Network - Critical Section							
1.1	16.8	200	0.011	1.00%	1.23	38.8	Y

In Summary

	Design flow (l/s)	Emergency storage required (m ³)
384 Dwelling Units and 0.084ha commercial area	16.78	108

5.3.5.1 Design flow

The design flow comprises domestic wastewater, industrial wastewater, infiltration, and direct ingress of stormwater.

The design flow shall be calculated by the method nominated by the TA. In the absence of information from the TA the following design parameters are recommended:

(a) Residential flows

- (i) Average dry weather flow of 250 litres per day per person
- (ii) Dry weather diurnal PF of 2.5
- (iii) Dilution/infiltration factor of 2 for wet weather
- (iv) Number of people per dwelling 3;

Table 5.1 – Commercial and industrial flows

Industry type (Water usage)	Design flow (Litres/second/hectare)
Light	0.4
Medium	0.7
Heavy	1.3

Table 5.2 – Guide to roughness coefficients for gravity sewer lines

Material	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)
VC	1.0	0.012
PVC	0.6	0.011
PE	0.6	0.009 – 0.011
GRP	0.6	0.011
Concrete machine made to AS/NZS 4058	1.5	0.012
PE or epoxy lining	0.6	0.011
PP	0.6	0.009 – 0.011

NOTE –

- (1) These values take into account possible effects of rubber ring joints, slime, and debris.
- (2) The n and k values apply for pipes up to DN 300.
- (3) For further guidance refer to WSA 02:1999 table 2.4; AS 2200 table 2; *Plastics pipes for water supply and sewage disposal* (Janson), *Metrication: Hydraulic data and formulae* (Lamont), or the *Handbook of PVC pipe* (Uni-Bell).



Client: Glenpanel LP
 Project: Ladies Mile Development
 Ref: CQ21061

Calc by: QT
 Check by: JH/CW
 Date: 26 July 2022

Reference : QLDC LDSC 2020

B) Water Supply Demand

Residential Design Criteria		From QLDC LDSC 2020 Section 6.3.5	
Daily Consumption	1000	litres/person/day	Following discussion with council Daily consumption will be 1000l/p/s
Hourly Peaking Factor	4		
People per Dwelling	3		

Proposed Development

For 384 Dwellings		For commercial (0.084ha)	
Dwellings	384	Design flow	1.3 (l/s/ha)
Population	1152	Area (hectare)	0.084
Avg Daily Demand	1152000 l/d	Industry type	Heavy (conservative)
Peak Demand	53 l/s	Flow including peaking factors (l/s)	0.11 l/s

Total design flow **53.44**

Reservoir
 Potable requirements 6 hours of Avg daily demand **288** m3

Fire requirements

	flow rate (l/min)	duration (mins)	subtotal (litres)	subtotal (m3)
commercial (FW6)	6000	180	1080000	1080
max fire cell without specific design of 840m2 with FHC category 3 business				
residential : does not govern				
Total required				1368

Or minimising commercial to max fire cell 840m2 and FHC category 2 businesses

commercial (FW5)	4500	120	540000	540
				288
Total required				828

Following receipt of validated modelling data, the daily consumption has been amended to

- Daily consumption of 700 L/person/day (occupancy per residence = 3 people);
- Peak hour factor of up to 4.0 (Queenstown), 6.6 (Rest of District);
- Firefighting demands as specified in SNZ PAS 4509;
- The network should be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peak hour factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1 table 3.3.

When supported by alternative modelling/metering data that has been approved by Council the following minimum water demand figures may be used at the sole discretion of the Council.

- Daily consumption of 250 L/p/day;
- Peak hour factor of up to 4.0 (Queenstown), 6.6 (Rest of District);
- Firefighting demands as specified in SNZ PAS 4509;
- The network should be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peak hour factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1

Sprinklered structures	
Category	Water supply classification (see table 2)
Single family homes with a sprinkler system installed to an approved Standard	FW1
All other structures (apart from single family homes) with a sprinkler system installed to an approved Standard	FW2
Non-sprinklered structures	
Category	Water supply classification (see table 2)
Housing; includes single family dwellings, multi-unit dwellings, but excludes multi-storey apartment blocks	FW2
All other structures (characterised by fire hazard category ⁽¹⁾), examples of which are given below	
	Floor area of largest firecell of the building (m ²)
	0-199 ⁽¹⁰⁾ 200-399 400-599 600-799 800-999 1000-1199 1200-1399 1400-1599 1600-1799 1800-1999 2000-2199 2200-2399 2400-2599 2600-2799 >2800
FHC 1⁽²⁾	FW3 FW3 FW3 FW4 FW4 FW4 FW5 FW5 FW5 FW5 FW5 FW5 FW5 FW5 FW6
FHC 2⁽³⁾	FW3 FW3 FW4 FW5 FW5 FW5 FW6 FW6 FW6 FW7 FW7 FW7 FW7 FW7 FW7
FHC 3⁽⁴⁾	FW3 FW4 FW5 FW5 FW6 FW6 FW7 FW7 FW7 FW7 FW7 FW7 FW7 FW7 FW7
FHC 4⁽⁵⁾	FW4 FW6 FW6 FW6 FW6 FW7
For special or isolated hazards not covered in above categories⁽⁶⁾	FW7
NOTE –	
(1) Fire hazard category as defined in the compliance documents for the New Zealand Building Code, Acceptable Solution C/AS1.	
(2) FHC 1 is sleeping activities including care facilities, motels, hotels, hostels; crowd activities of <100 people including cinemas, art galleries, community halls, lecture halls, churches; working/business/storage activities processing non-combustible materials such as wineries, cattle yards, horticultural products; multistorey apartment blocks.	
(3) FHC 2 is crowd activities of >100 people, libraries, book storage, night clubs, restaurants; working/business/storage activities with low fire load such as hairdressers, banks, medical consulting rooms, offices.	
(4) FHC 3 is working/business/storage activities with medium fire load such as manufacturing, processing, bulk storage up to 3 metres.	
(5) FHC 4 is working/business/storage activities with high fire load such as chemical manufacturing, feed mills, plastics manufacturing, supermarkets or other stores with bulk display over 3 metres.	
(6) For special or isolated fire hazards in an area with a lower water supply classification, an assessment should be carried out to determine measures to mitigate the hazard or increase the water supply (see 4.4).	
(7) The values in the table were determined by heat release rate modelling for fully developed fires.	
(8) All non-sprinkler protected structures, except houses, have an entry level of FW3.	
(9) Examples of special or isolated hazards may include bulk fuel installations, timber yards, tyre dumps, wood chip stock piles, recycle depots, and marinas.	
(10) For non-sprinkler protected fire hazard category 1 structures less than 50 m ² in floor area, the FW3 requirement may be reduced by up to 50% with the agreement of the Fire Region Manager. Examples of the sorts of structures intended to be covered by this comment are predominantly garages, sheds, and outbuildings.	



In summary

Min Gross storage to be greater of Case A , B or C

	Design flow (l/s)	A			B	C
		Water storage requirement (m3)	Fire Fighting Requirement (m3)	Total storage required (m3)	24 hours of average daily demand (m3)	12 hours of peak daily demand (m3)
		Potable requirements 6 hours of Avg daily demand	Max fire cell of 840m2 with FHC category 3 business* (FW6)			
384 Dwelling Units and 0.084ha commercial area	53.44	288	1080	1368	1152	2309

*FHC 3 is working/business/storage activities with medium fire load such as manufacturing, processing, bulk storage up to 3 metres

	Design flow (l/s)	Water storage requirement (m3)	Fire Fighting Requirement (m3)	Total water storage (m3)	24 hours of average daily demand (m3)	12 hours of peak daily demand (m3)
		Potable requirements 6 hours of Avg daily demand	Max fire cell of 840m2 with FHC category 2 business* (FW5)			
384 Dwelling Units and 0.084ha commercial area	53.44	288	540	828	1152	2309

*FHC 2 is a crowd activities of >100 people, libraries, book storage, night clubs, restaurants, working/bussiness, storage activities with low fire load such as hairdressers, banks, medical consulting rooms, offices

Based on the summary, it can be seen that the difference in proposed dwellings from two case scenarios does not have a significant impact on the required storage volume. However, change in intended use for the building for example from HFC category from 3 to 2 significantly reduced the volume of water storage requirement for the proposed development.

SNZ PAS 4509:2008

Table 2 – Method for determining firefighting water supply

Fire water classification	Reticulated water supply			Non-reticulated water supply	
	Required water flow within a distance of 135 m	Additional water flow within a distance of 270 m	Maximum number of fire hydrants to provide flow	Minimum water storage within a distance of 90 m (see Note 8)	
				Time (firefighting) (min)	Volume (m ³)
FW1	450 L/min (7.5 L/s) (See Note 3)	–	1	15	7
FW2	750 L/min (12.5 L/s)	750 L/min (12.5 L/s)	2	30	45
FW3	1500 L/min (25 L/s)	1500 L/min (25 L/s)	3	60	180
FW4	3000 L/min (50 L/s)	3000 L/min (50 L/s)	4	90	540
FW5	4500 L/min (75 L/s)	4500 L/min (75 L/s)	6	120	1080
FW6	6000 L/min (100 L/s)	6000 L/min (100 L/s)	8	180	2160
FW7	As calculated (see Note 7)				

NOTE –

- (1) Table 1 lists the minimum requirements for firefighting water supplies. In developing towns' main reticulation systems, a water supply authority needs to cater for domestic/industrial water usage in addition to the above. This procedure is outlined in Appendix K.
- (2) Special or isolated fire hazards which have higher requirements in an area of lower water supply classification must determine measures to mitigate the hazard or increase the water supply (see 4.4).
- (3) Where houses have a sprinkler system installed to an approved Standard, the distance to a fire hydrant or alternative water supply may be negotiated by agreement with the Fire Region Manager.
- (4) The water requirements for fire protection systems must be considered in addition to the firefighting water supplies, as detailed in table 1 (FW2), the fire protection system demand plus 1500 L/min (25 L/s) at 1 bar residual pressure.
- (5) The minimum flow from a single hydrant must exceed 750 L/min (12.5 L/s), except for those cases where a home sprinkler is installed, in which case the minimum is 450 L/min (7.5 L/s) while the maximum design flow, for safety reasons, is limited to 2100 L/min (35 L/s).
- (6) If the minimum water storage requirement as listed in the above table is not available from the reticulated system (reservoir), water can be sourced from an 'alternative supply' as approved by the Fire Region Manager. This water supply must always be within 90 m of the fire risk.
- (7) FW7 is for either special or isolated hazards or where the fire hazard due to the size of the largest firecell and its fire hazard category make specific fire engineering assessment necessary. Appendix H and J must be used as the basis for calculating this required firefighting water supply.
- (8) See Appendix B.

Table 6.2 – Empirical guide for principal main sizing

Nominal diameter of main DN	Capacity of main (single direction feed only)			
	Residential (lots)	Rural Residential (lots)	General/light Industrial (ha)	High usage Industrial (ha)
100	40	10	–	–
150	160	125	23	–
200	400	290	52	10
225	550	370	66	18
250	650	470	84	24
300	1000	670	120	35
375	1600	1070	195	55



Client: Glenpanel LP
 Project: Ladies Mile Development
 Ref: CQ21061

Calc by: QT
 Check by: JH/CW
 Date: 26 July 2022

A) Wastewater Design

	Design flow (l/s)	Emergency storage required (m3)
384 Dwelling Units and 0.084ha commercial area)	16.78	108

	Tank size (diameter x length)	Volume provide (m3)	Volume required (m3)	Area required to fit in m2
Option 1	2m dia x 36m long	113	108	72
Option 2	2 x 2m dia x 18m long	113	108	72
Option 3	2.5m dia x 24m long	118	108	60
Option 4	2 x 2.5m dia x 12m long	118	108	60
Option 5	3m dia x 16m long	113	108	48
Option 6	2 x 3m dia x 8m long	113	108	48

B) Water Supply Demand

In summary

		Min Gross storage to be greater of Case A , B or C				
		A			B	C
	Design flow (l/s)	Water storage requirement (m3)	Fire Fighting Requirement (m3)	Total storage required (m3)	24 hours of average daily demand (m3)	12 hours of peak daily demand (m3)
		Potable requirements 6 hours of Avg daily demand	Max fire cell of 840m2 with FHC category 3 business* (FW6)			
384 Dwelling Units and 0.084ha commercial area (FHC category 3 bussiness)	53.44	288	1080	1421.44	1152	2309
384 Dwelling Units and 0.084ha commercial area (FHC category 2 bussiness)	53.44	288	540	881.44	1152	2309

Water storage tank:			
Volume required (litres)	Tank Size (litres)	Number of tank required	Area required to fit in m2
2309000	1000000	2.31	TBC at detailed design stage

Based on the summary, it can be seen that the intended use for the building for example from HFC category from 3 to 2 significantly reduced the volume of water storage requirement for the proposed development.



Flints Park Scheme Plan
 Lots 400 to 421, & 900 to 908
 Being Subdivision of
 Lots 1 & 2 DP 463532,
 Lot 1 DP 20162 & Sec 1 SO 24954

Scale: 1:1500 @ A3
 Project # - 20045
 Client - Glenpanel LP

Rev.	Date	Revision Details
6	4-03-22	Split super Lot 411
7	15-03-22	Alter Rd parcels & hill blocks
8	23-03-22	Change Area of Lots 421 & 903

Surveyed
 Drawn
 HRW
 Designed

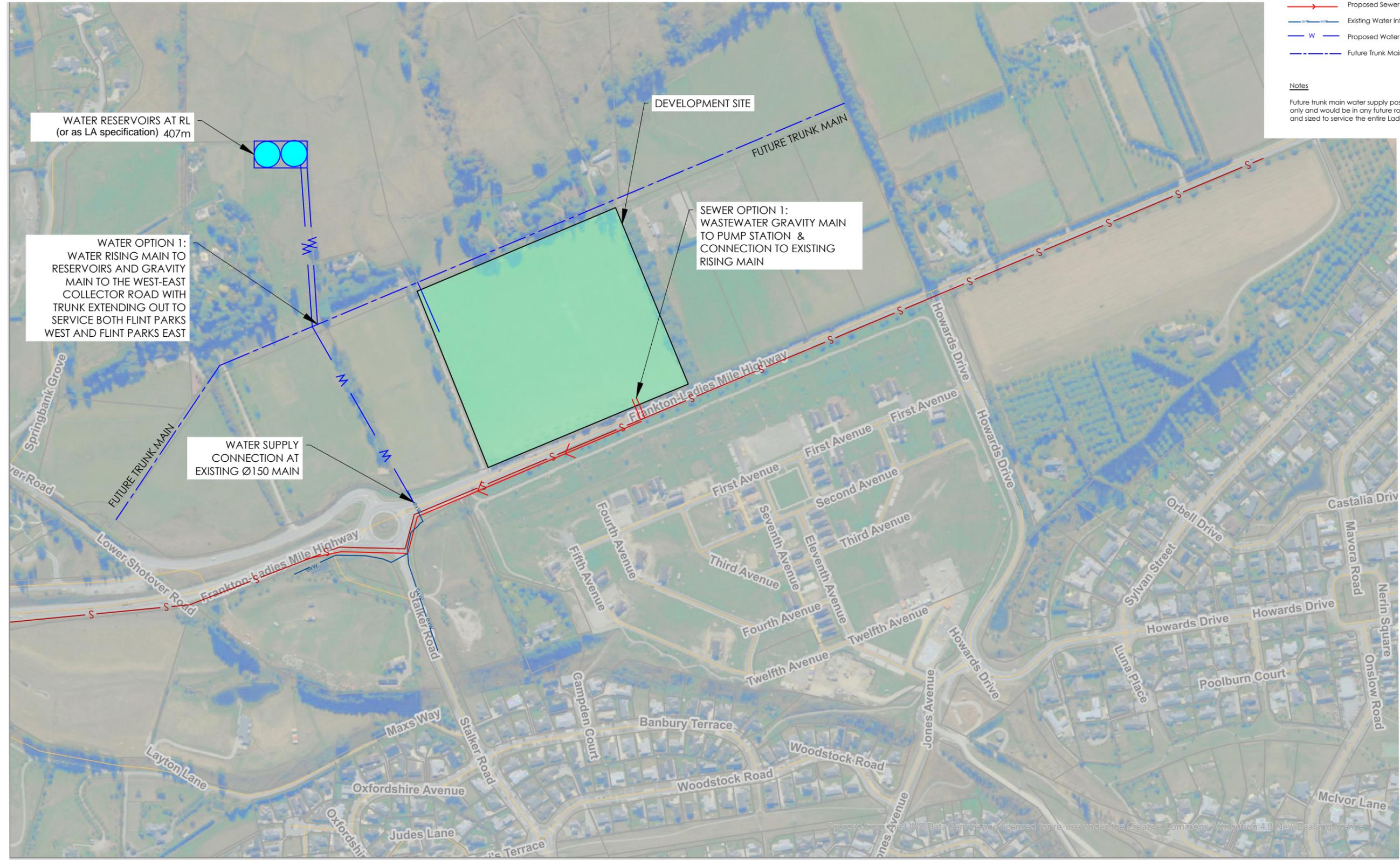
SOUTHERN HORIZONS
 SURVEYING & RESOURCE MANAGEMENT
 Gore • Ph: 027 468 2596 • hamish@southernhorizons.co.nz

NOTE:
 - All dimensions shown are in metres unless otherwise shown
 - If this plan is being used as part of sale and purchase agreement then it is done so on the basis that it is preliminary only, final dimensions and areas may vary on final survey
 - Any aerial images shown are sourced from LINZ Data Service unless otherwise stated

Plan # 05
 Datum NZGD 2000, Mt Nicholas NZVD2016



- Legend**
- Existing Sewer Infrastructure
 - Proposed Sewer Pipe
 - Existing Water Infrastructure
 - W Proposed Water Supply
 - Future Trunk Main
- Notes**
- Future trunk main water supply position is indicative only and would be in any future road easements and sized to service the entire Ladies Mile Area.



SAFETY IN DESIGN			
All reasonably practicable steps have been taken to ensure safety in design has been considered within Cosgroves scope of work for this design in accordance with IPENZ practice note 07 "design for safety in buildings and other structures (July 2006)". It remains the responsibility of the owner and/or operator to ensure appropriate practices are in place to protect the safety of the workers and the public in the operation of the facility.			
B	AMENDED DRAFT	05 Apr 22	QT
A	DRAFT	24 Mar 22	QT
REV	REASON FOR ISSUE	DATE	BY

The Contractor is to be aware of all inspections to be made by the Engineer as a requirement of the Producer Statement PS4 construction review documentation. The Engineer will require 24 hours prior notification for any inspection it is to be made.

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 Email: admin@cosgroves.com

CLIENT: **GLENPANEL LP**

PROJECT: **Ladies Mile Flints Park
Ladies Mile
Queenstown**

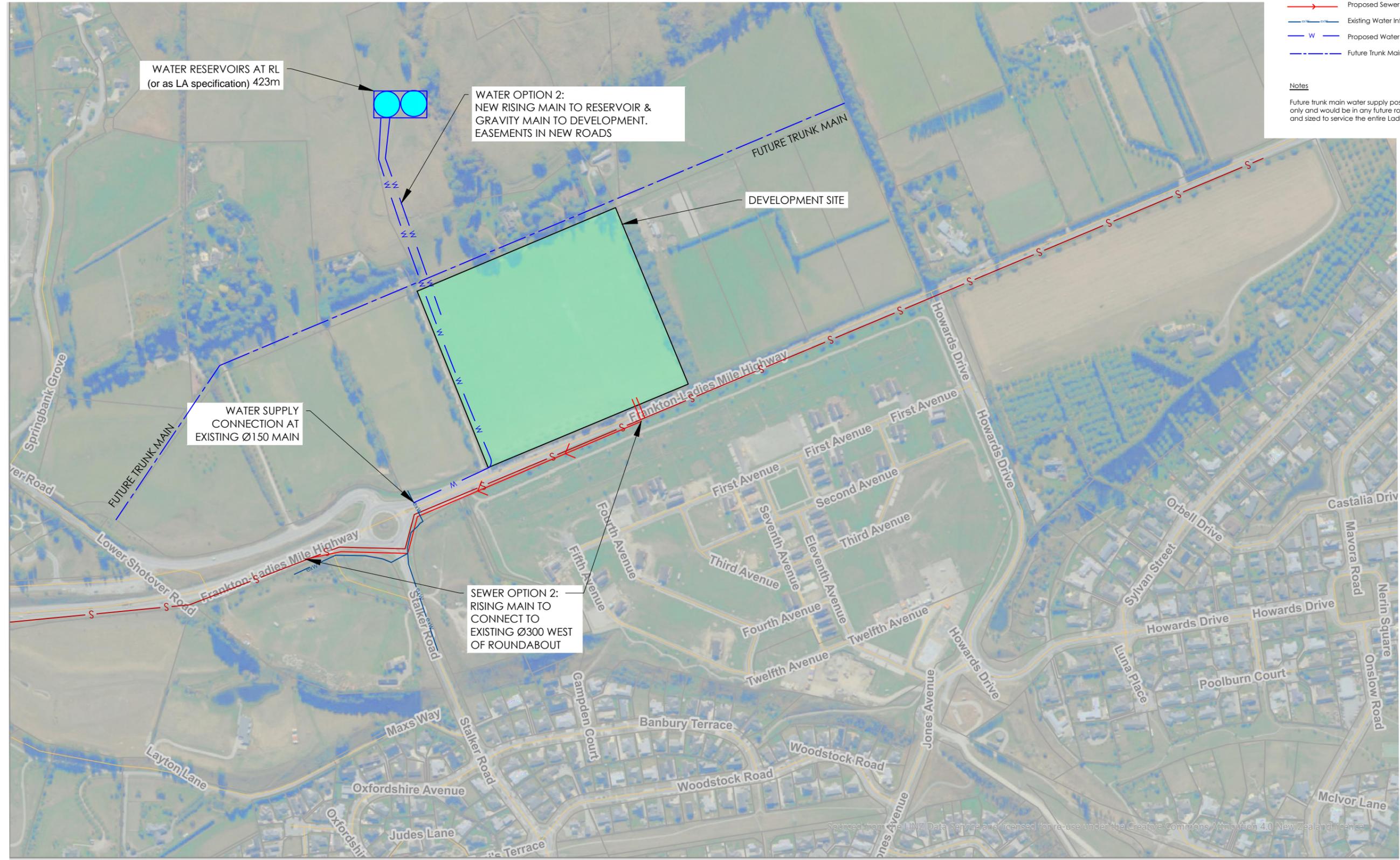
TITLE: **Water and Wastewater
Concept (Option 1)**

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Drawn	QT	1:2500
Checked	CW	A3 Scale
Date	5 April 2022	1:5000
Project No.	CQ21061	Sheet 100 Revision B
Draft		



- Legend**
- Existing Sewer Infrastructure
 - Proposed Sewer Pipe
 - Existing Water Infrastructure
 - W Proposed Water Supply
 - Future Trunk Main
- Notes**
- Future trunk main water supply position is indicative only and would be in any future road easements and sized to service the entire Ladies Mile Area.



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A	DRAFT	24 Mar 22	QT
REV	REASON FOR ISSUE	DATE	BY

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PROJECT: **Ladies Mile Flints Park**
Ladies Mile
Queenstown

TITLE: **Water and Wastewater**
Concept Plan

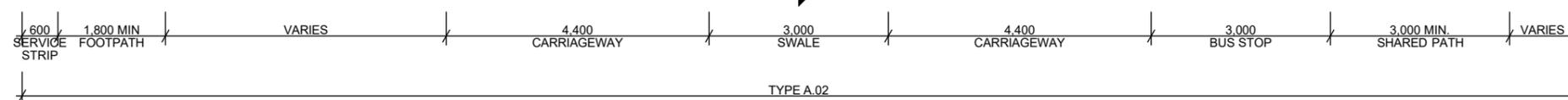
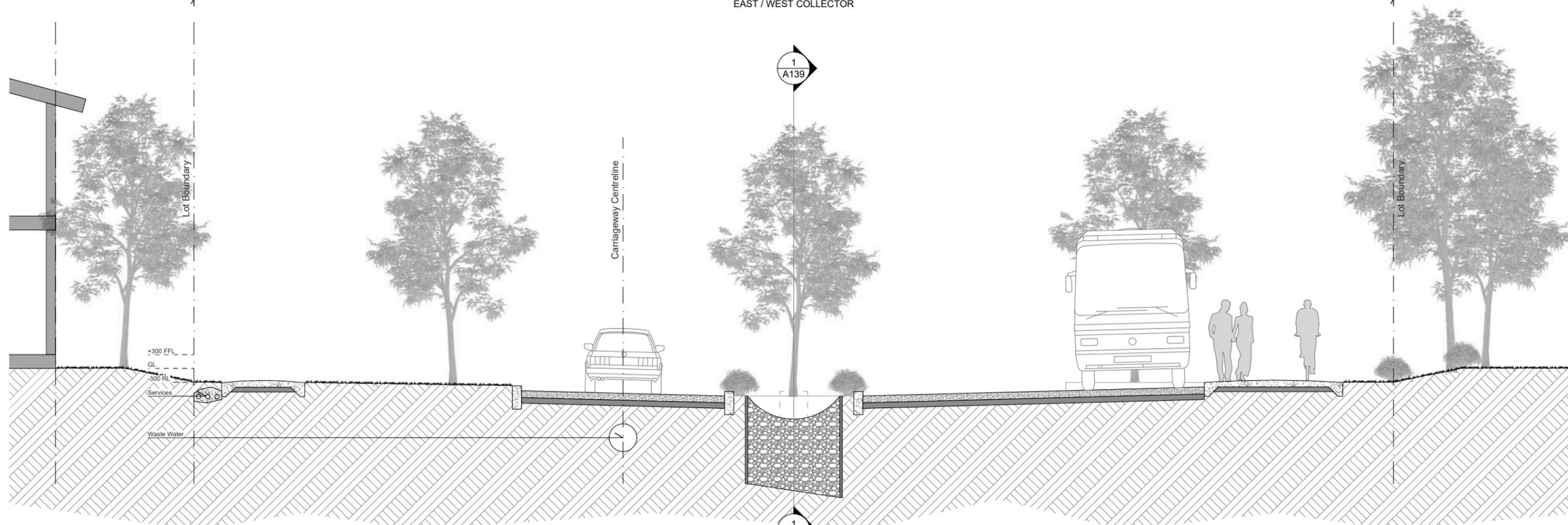
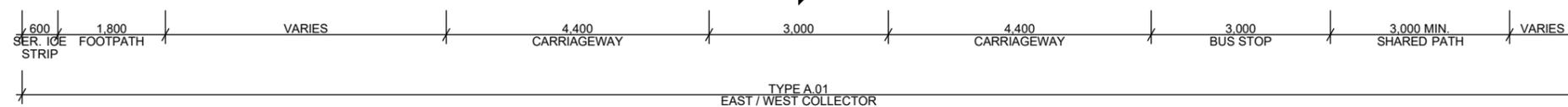
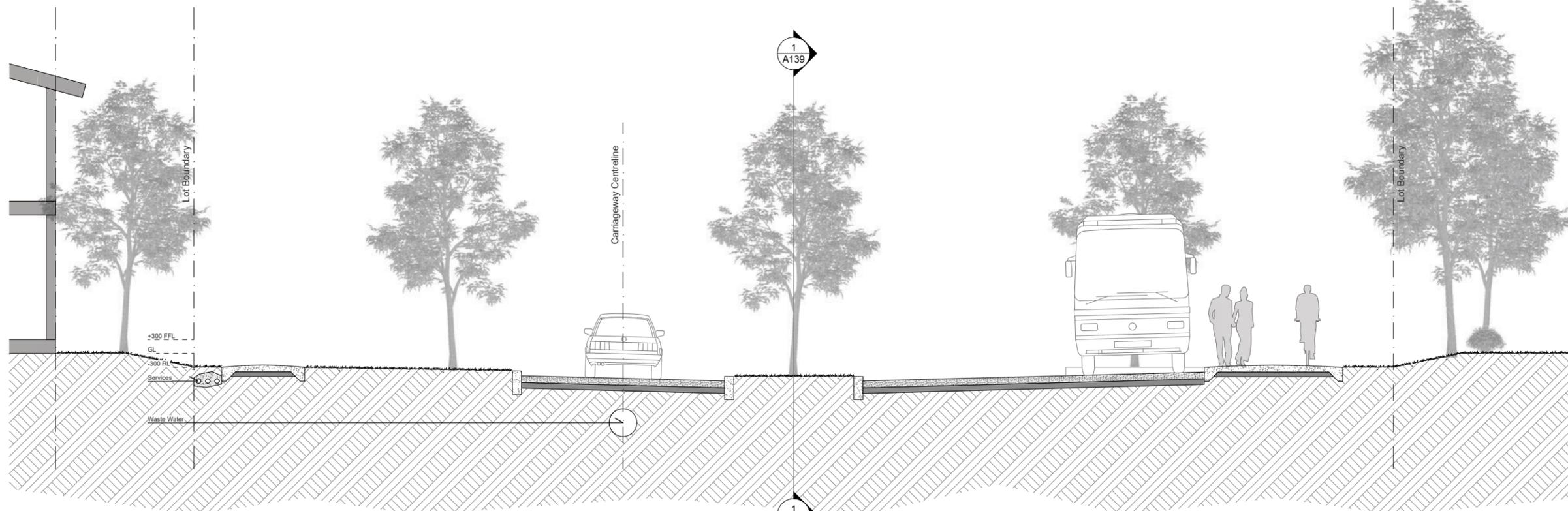
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Checked	CW	A3 Scale
Date	5 April 2022	1:5000
Project No.	CQ21061	Sheet 101
		Revision B
Draft		

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 004-GLP DATE
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 A137 REVISION
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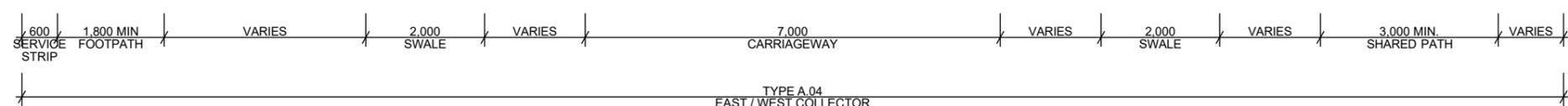
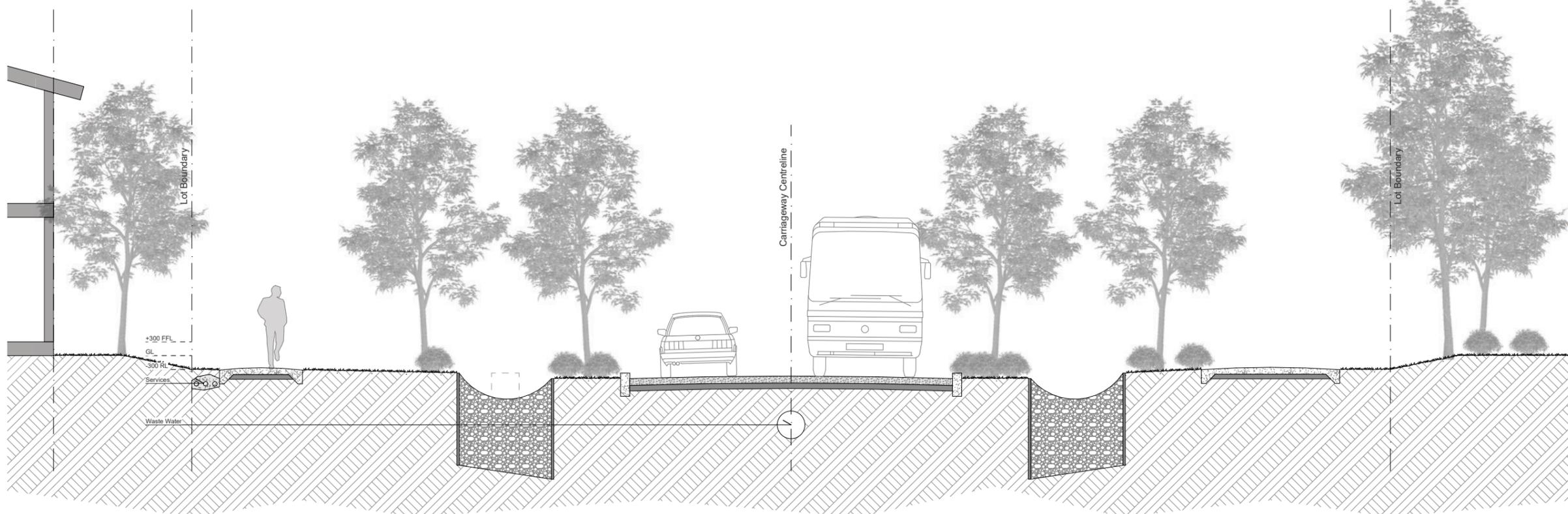
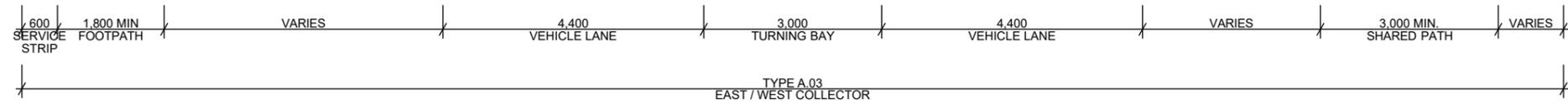
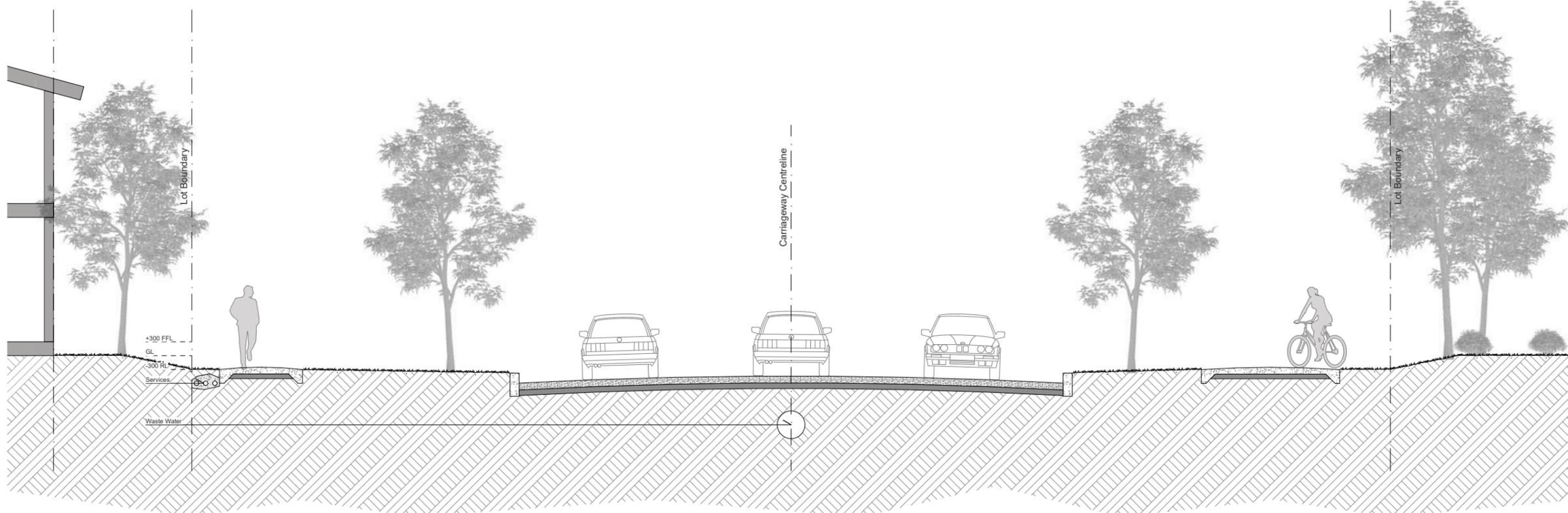
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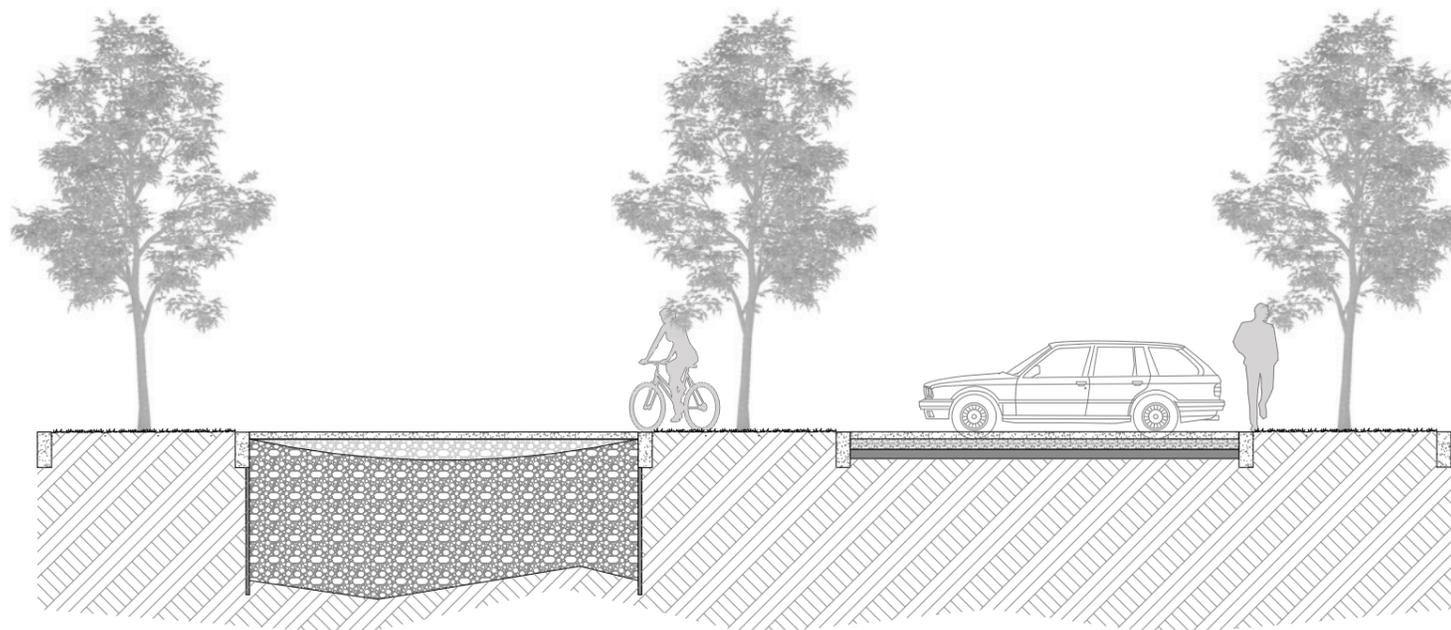
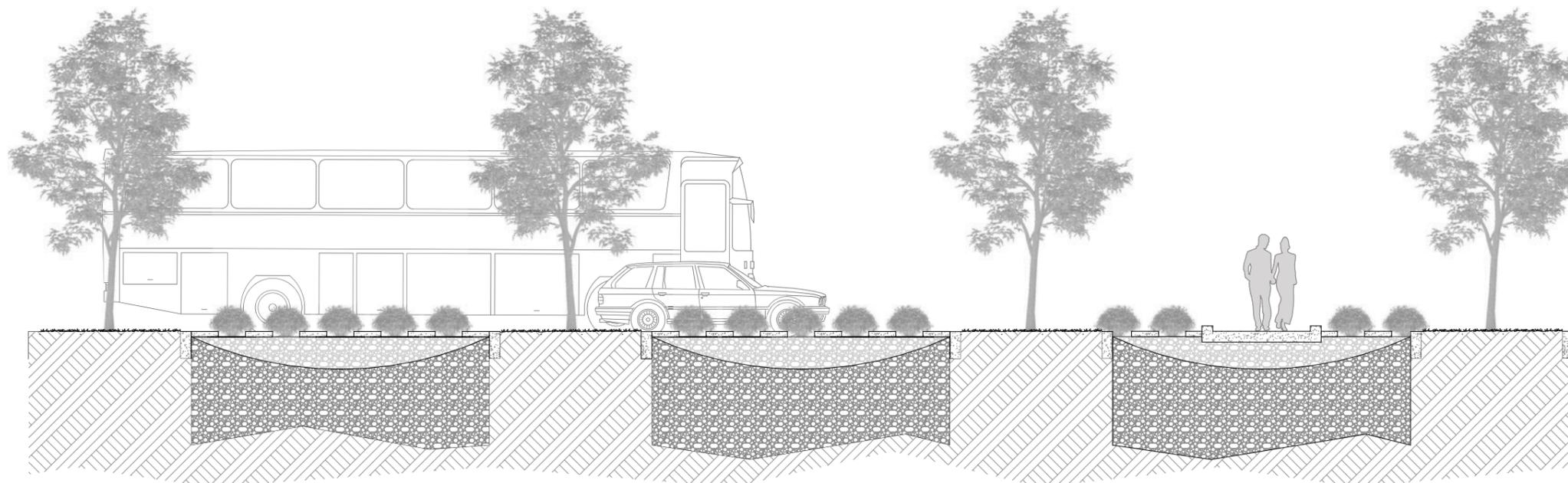
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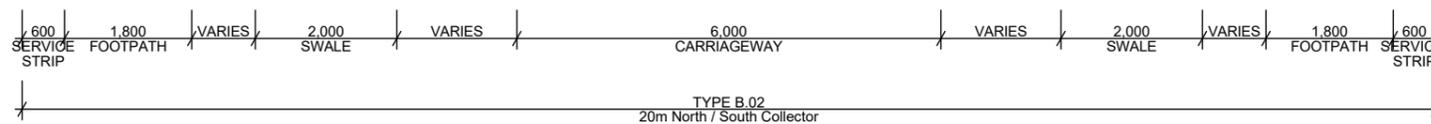
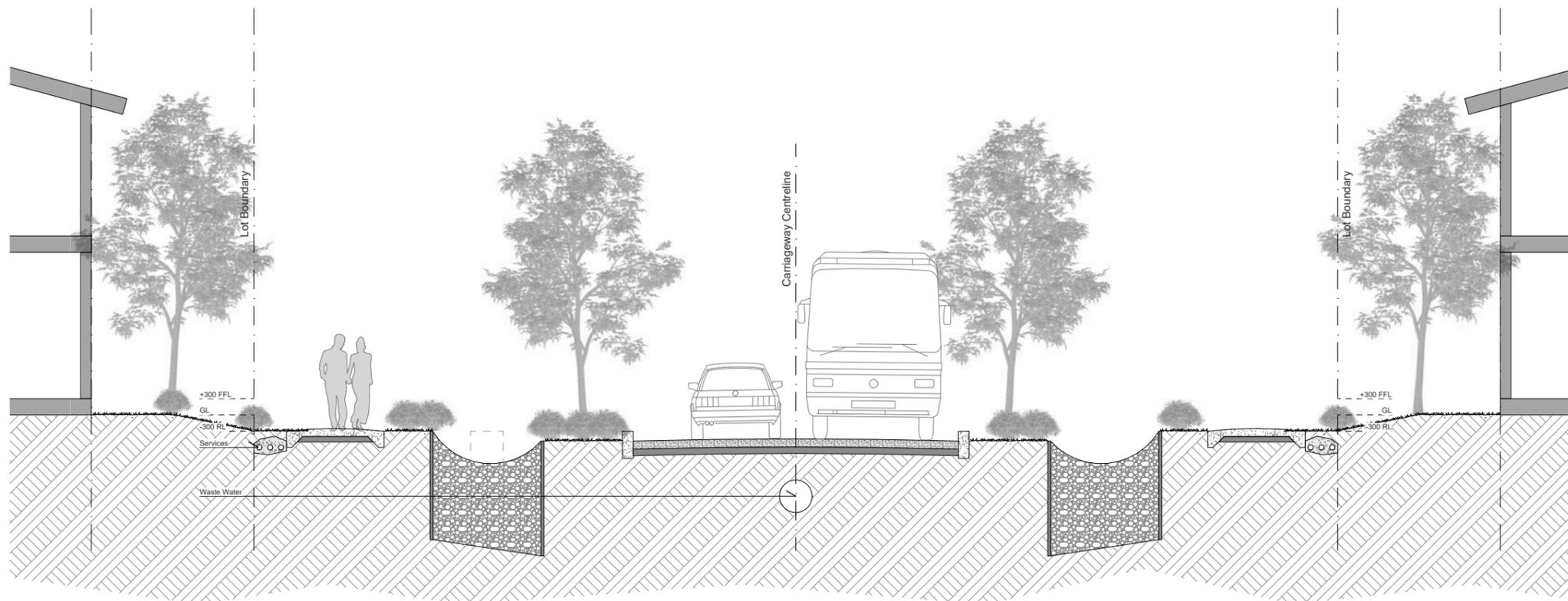
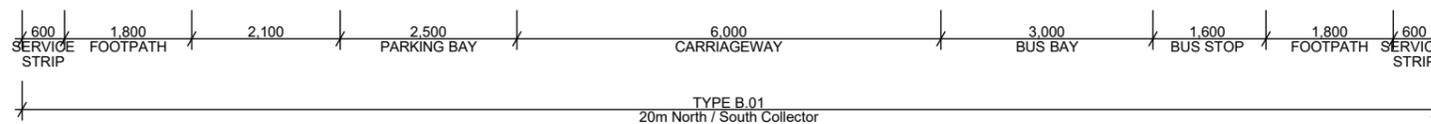
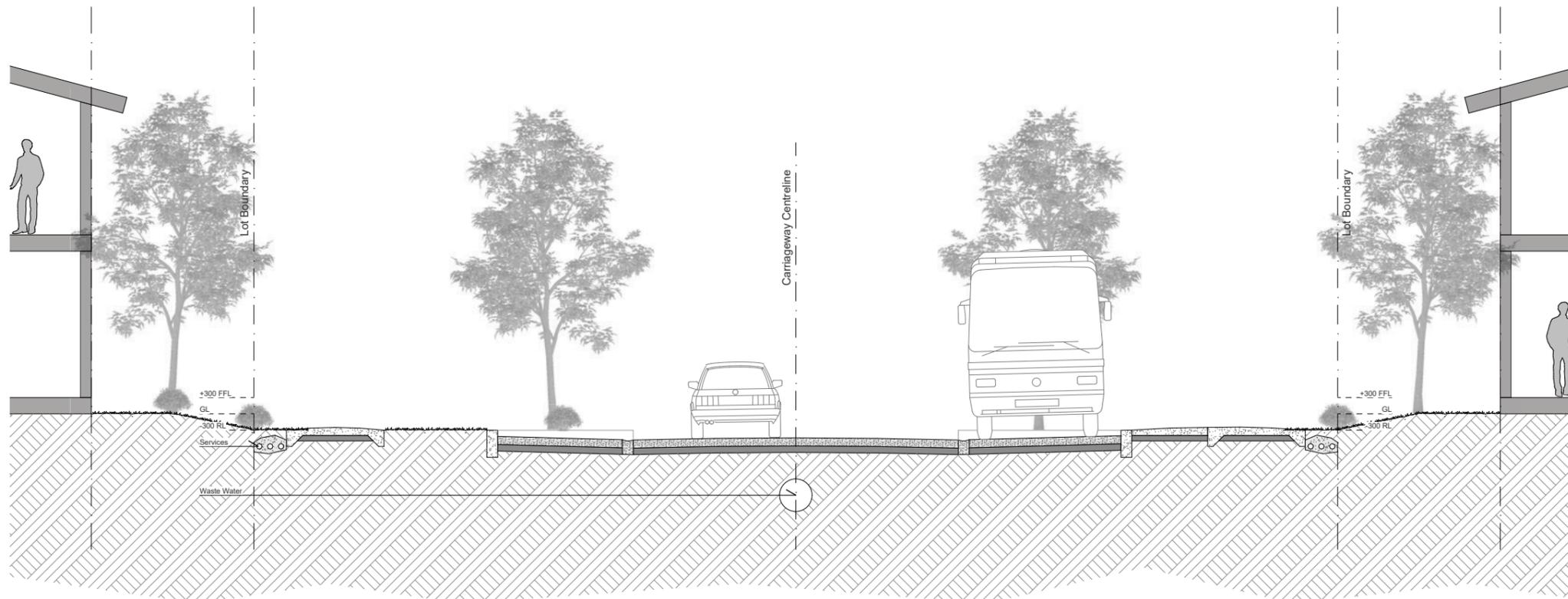
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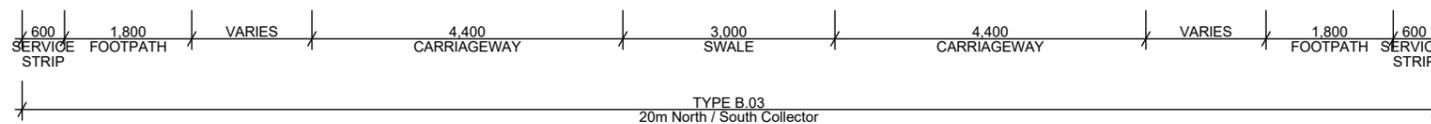
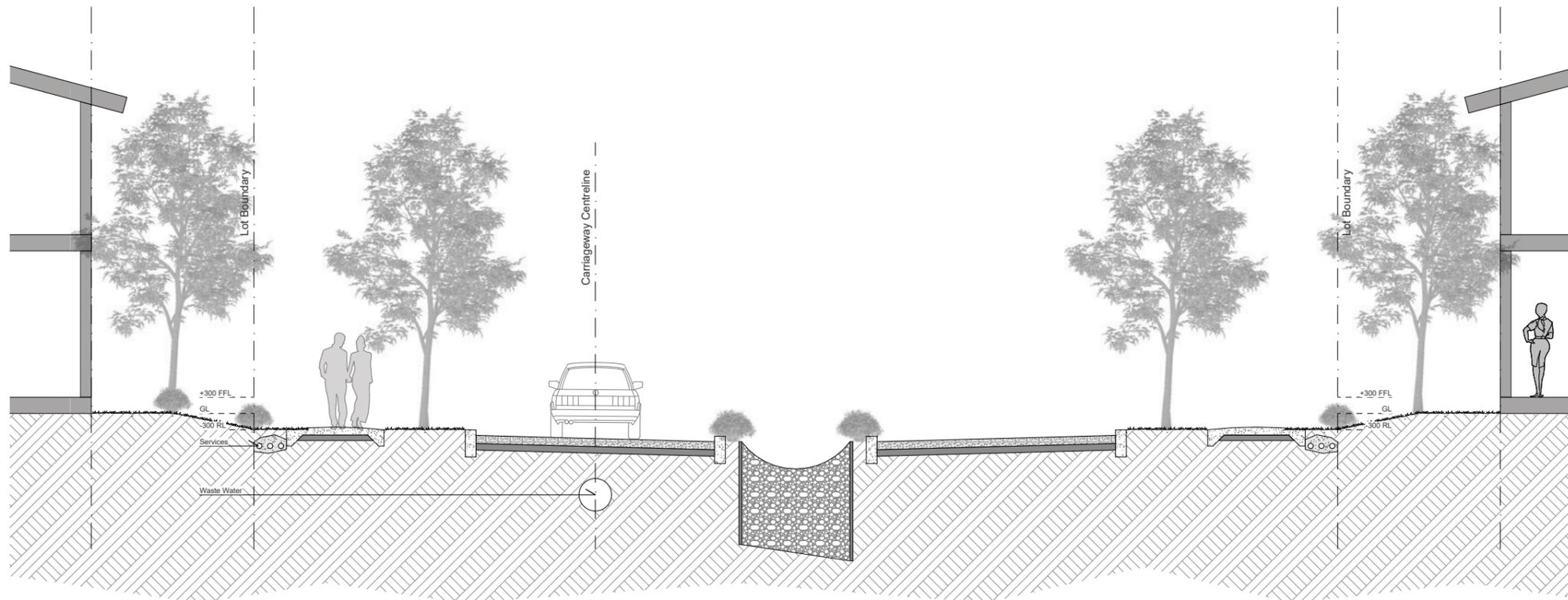
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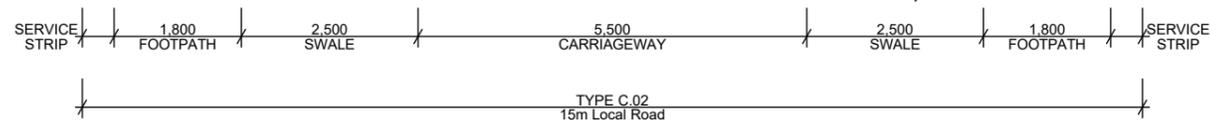
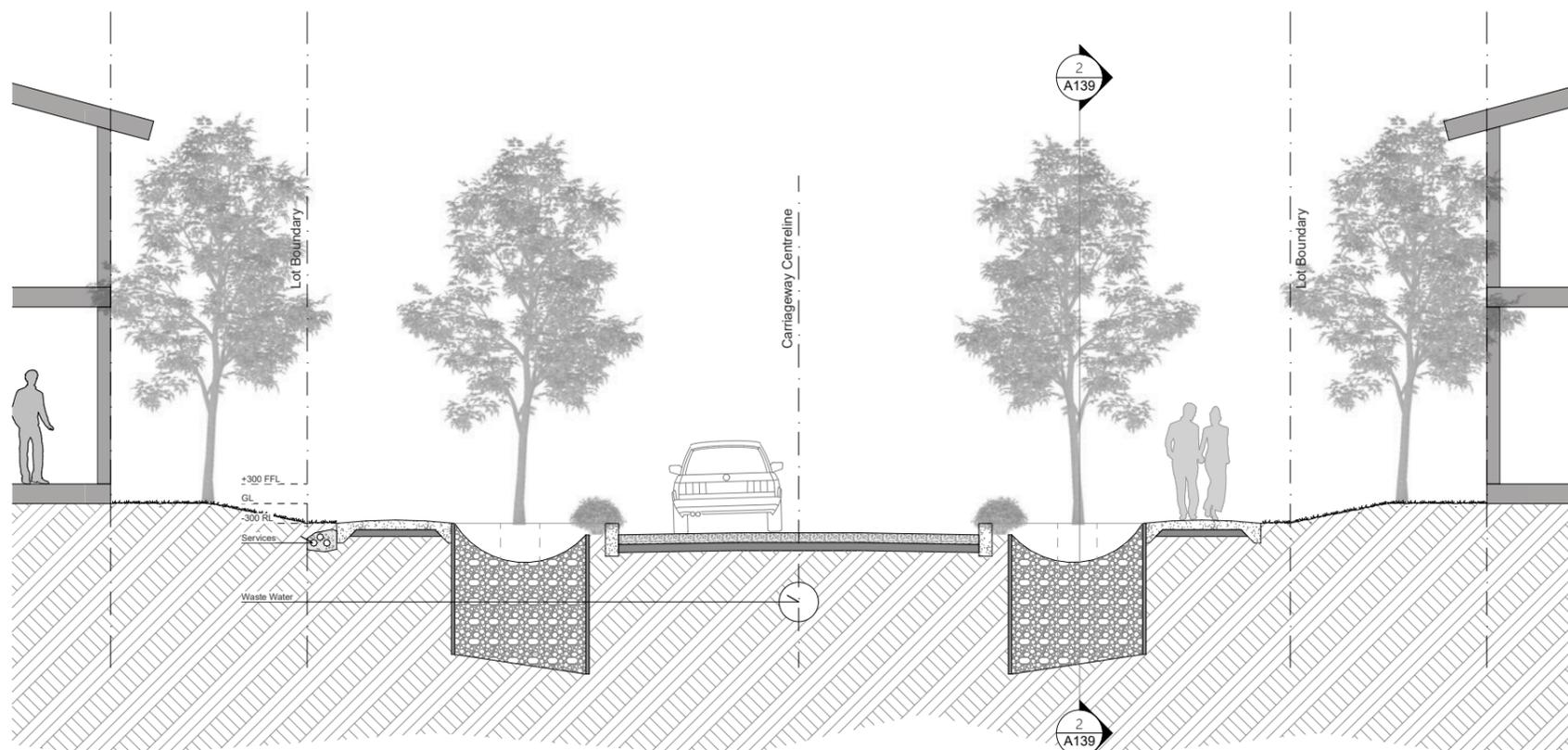
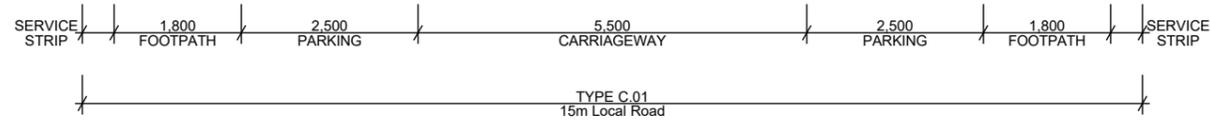
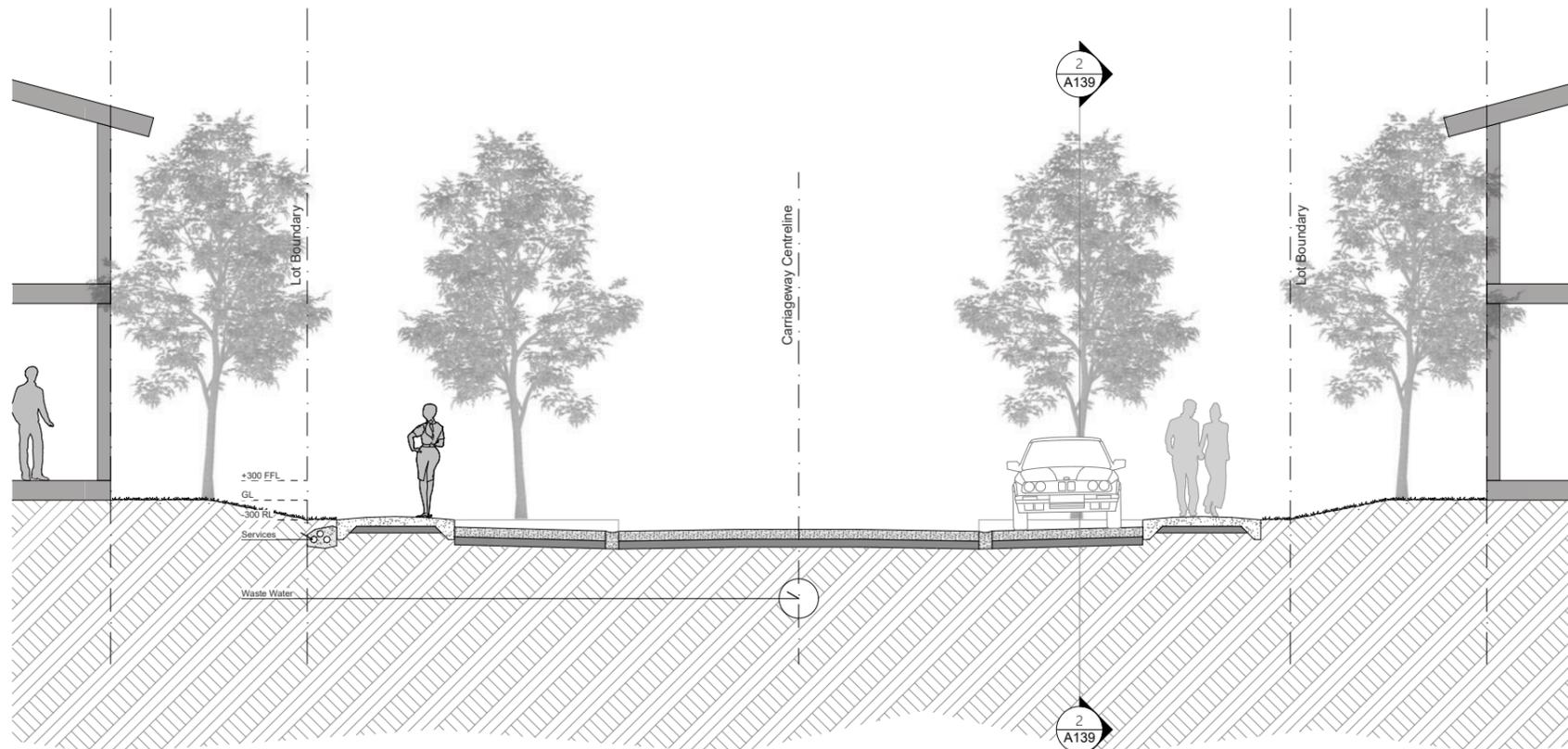
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TITLE
**ROAD SECTIONS
 15M LOCAL ROAD**

SCALE (A3) 0 1 2
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JOB NO. DATE
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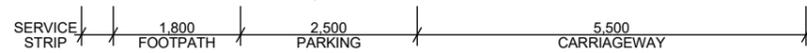
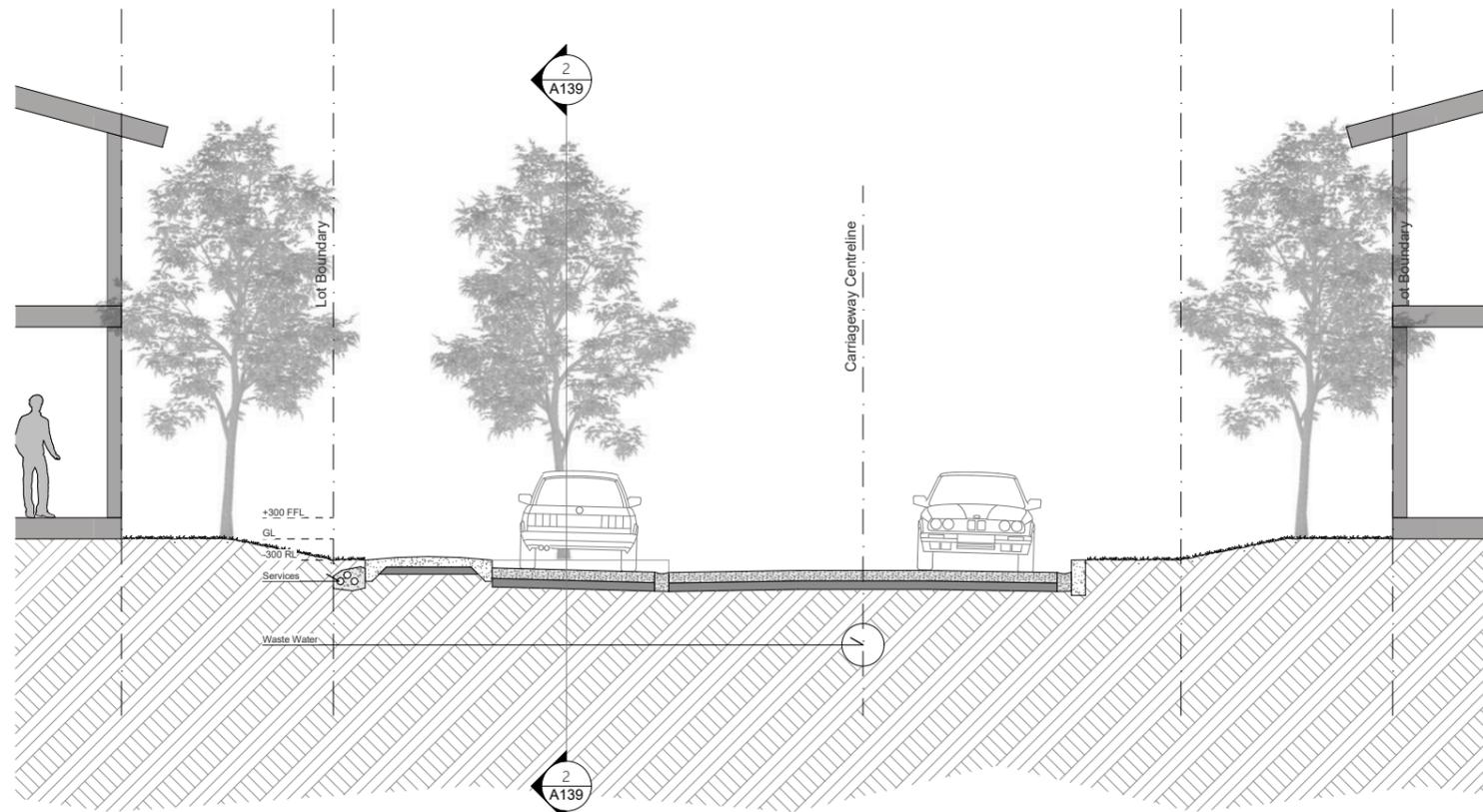
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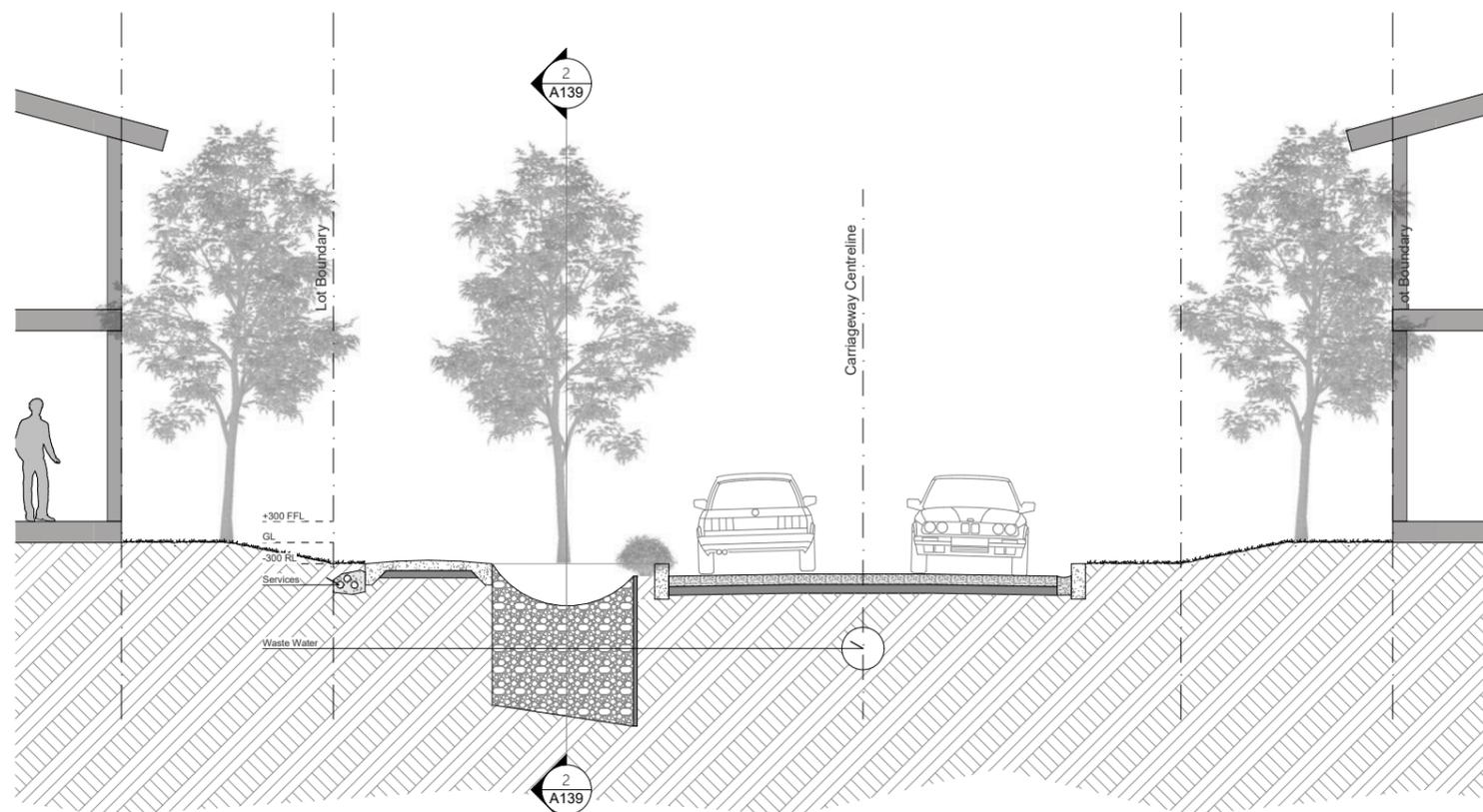
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TYPE D.01
12m Local Road



TYPE D.02
12m Local Road

TITLE
**ROAD SECTIONS
 12M LOCAL ROAD**

SCALE (A3) 0 1 2
 1:100

STATUS
 CONSULTANT CO-ORDINATION

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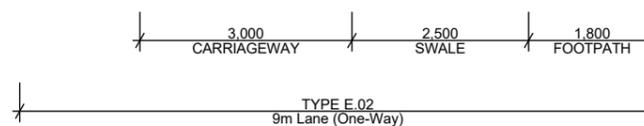
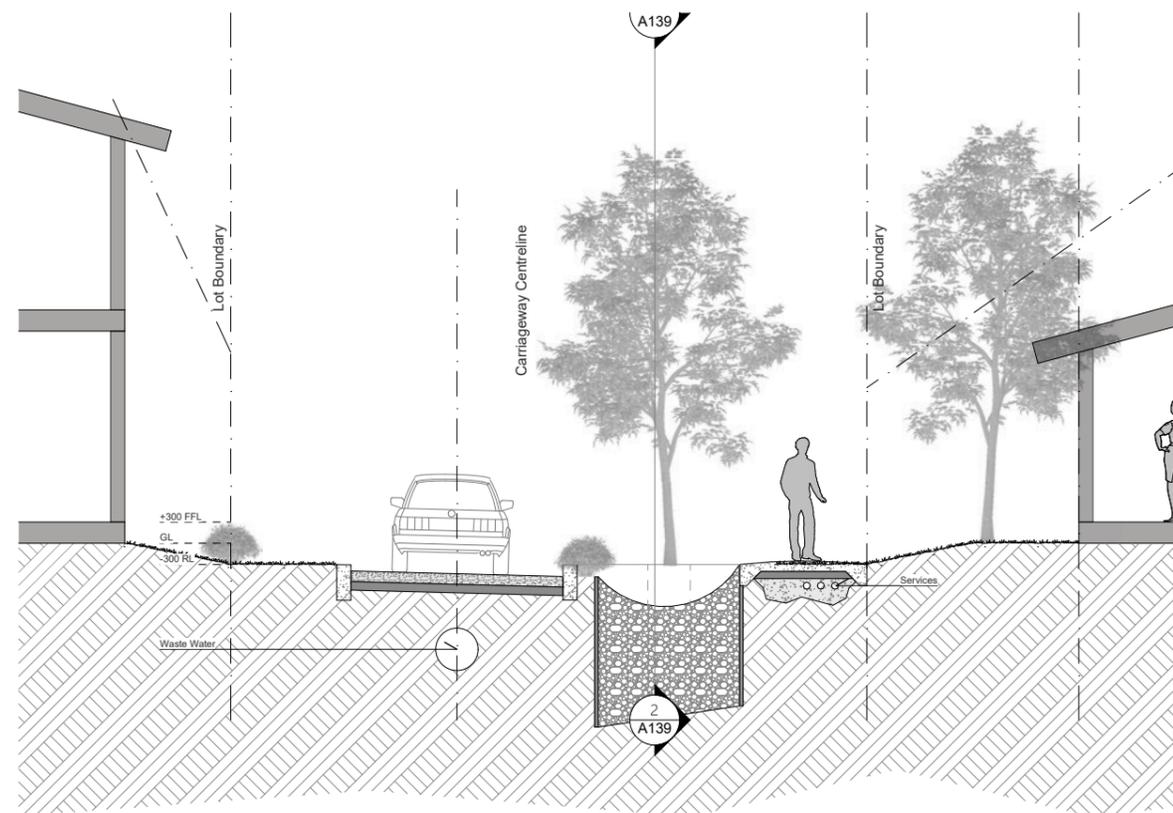
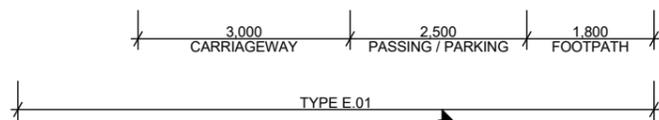
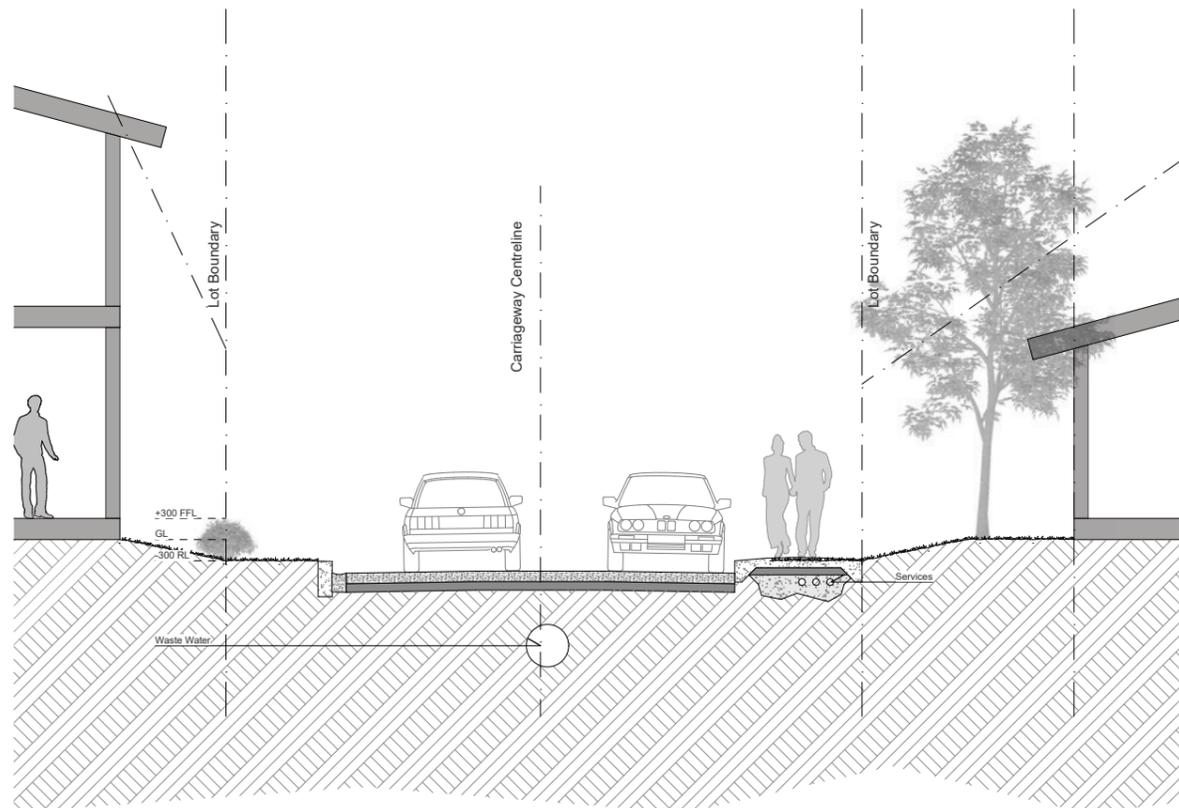
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REV 01 ISSUE CONSULTANT CO-ORDINATION DATE 18 FEB 2022

NOTES



TITLE
**ROAD SECTIONS
 9M LANES**

SCALE (A3)
 1:100

STATUS
 CONSULTANT CO-ORDINATION

PROJECT
 FLINTS PARK, LADIES MILE

CLIENT
 GLENPANEL LP

JOB NO
 004-GLP DATE
 11/03/2022

DRAWING NO
 A144 REVISION
 01

DEFINE

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Flints Park Stage 1

Ladies Mile Development ENGINEERING CALCULATIONS

Prepared for:
Glenpanel LP

Ref# CQ21061

Rev: A
01 September 2023

Calc By: CW
Check By: JA/CW

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Client: Glenpanel LP
Project: Ladies Mile Development
Ref: CQ21061

Calc by: CW
Check by: JA/CW
Date: 01 September 2023

Reference : QLDC LDSC 2020

A) Wastewater Design

Residential Design Criteria From QLDC LDSC 2020 Section 5.3.5.1

ADWF	250	litres/person/day
PDFW peaking factor	2.5	
PWWF peaking factor	2	
People per Dwelling	3	

Wastewater Flow

Proposed Development

For 384 Dwellings

Dwellings	384
Population	1152
ADWF (l/s)	3.33
PDWF (l/s)	8.33
PWWF (l/s)	16.67
Total design flow	16.78 l/s
Emergency storage required (9hours ADWF): QLDC requirement	108 m3

For commercial (0.084ha)

Design flow	1.3 (l/s/ha)
Area (hectare)	0.084
Industry type	Heavy (conservative)
Flow including peaking factors (l/s)	0.11 l/s

Pipe Capacity Check Downstream

Manhole Reach	Design Flow (l/s)	Pipe Diameter (mm)	Mannings 'n'	Pipe Gradient (%)	Flow Velocity (m/s)	Pipe Capacity (l/s)	Meet Design Flow?
Wastewater Network - Critical Section							
1.1	16.8	200	0.011	1.00%	1.23	38.8	Y

In Summary

	Design flow (l/s)	Emergency storage required (m3)
384 Dwelling Units and 0.084ha commercial area	16.78	108

5.3.5.1 Design flow
 The design flow comprises domestic wastewater, industrial wastewater, infiltration, and direct ingress of stormwater.
 The design flow shall be calculated by the method nominated by the TA. In the absence of information from the TA the following design parameters are recommended:

(a) Residential flows

- (i) Average dry weather flow of 250 litres per day per person
- (ii) Dry weather diurnal PF of 2.5
- (iii) Dilution/infiltration factor of 2 for wet weather
- (iv) Number of people per dwelling 3;

Table 5.1 – Commercial and industrial flows

Industry type (Water usage)	Design flow (Litre/second/hectare)
Light	0.4
Medium	0.7
Heavy	1.3

Table 5.2 – Guide to roughness coefficients for gravity sewer lines

Material	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)
VC	1.0	0.012
PVC	0.6	0.011
PE	0.6	0.009 – 0.011
GRP	0.6	0.011
Concrete machine made to AS/NZS 4058	1.5	0.012
PE or epoxy lining	0.6	0.011
PP	0.6	0.009 – 0.011

NOTE –

- (1) These values take into account possible effects of rubber ring joints, slime, and debris.
- (2) The n and k values apply for pipes up to DN 300.
- (3) For further guidance refer to WSA 02:1999 table 2.4; AS 2200 table 2; *Plastics pipes for water supply and sewage disposal* (Janson), *Metrication: Hydraulic data and formulae* (Lamont), or the *Handbook of PVC pipe* (Uni-Bell).



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B) Water Supply Demand

Residential Design Criteria From QLDC LDSC 2020 Section 6.3.5

Daily Consumption	1000	litres/person/day	Following discussion with council Daily consumption will be 1000l/p/s
Hourly Peaking Factor	4		
People per Dwelling	3		

Proposed Development

For 384 Dwellings		For commercial (0.084ha)	
Dwellings	384	Design flow	1.3 (l/s/ha)
Population	1152	Area (hectare)	0.084
Avg Daily Demand	1152000 l/d	Industry type	Heavy (conservative)
Peak Demand	53 l/s	Flow including peaking factors (l/s)	0.11 l/s

Total design flow **53.44**

Reservoir
 Potable requirements 6 hours of Avg daily demand **288** m3

Fire requirements

	flow rate (l/min)	duration (mins)	subtotal (litres)	subtotal (m3)
commercial (FW6)	6000	180	1080000	1080
max fire cell without specific design of 840m2 with FHC category 3 business				
residential : does not govern				
Total required				1368

Or minimising commercial to max fire cell 840m2 and FHC category 2 businesses

commercial (FW5)	4500	120	540000	540
				288
Total required				828

Following receipt of validated modelling data, the daily consumption has been amended to

- (a) Daily consumption of 700 L/person/day (occupancy per residence = 3 people);
- (b) Peak hour factor of up to 4.0 (Queenstown), 6.6 (Rest of District);
- (c) Firefighting demands as specified in SNZ PAS 4509;
- (d) The network should be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peak hour factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1 table 3.3.

When supported by alternative modelling/metering data that has been approved by Council the following minimum water demand figures may be used at the sole discretion of the Council.

- (a) Daily consumption of 250 L/p/day;
- (b) Peak hour factor of up to 4.0 (Queenstown), 6.6 (Rest of District);
- (c) Firefighting demands as specified in SNZ PAS 4509;
- (d) The network should be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peak hour factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1

Table 1 – Method for determining required water supply classification

Sprinklered structures		Water supply classification (see table 2)														
Category																
Single family homes with a sprinkler system installed to an approved Standard		FW1														
All other structures (apart from single family homes) with a sprinkler system installed to an approved Standard		FW2														
Non-sprinklered structures		Water supply classification (see table 2)														
Category																
Housing; includes single family dwellings, multi-unit dwellings, but excludes multi-storey apartment blocks		FW2														
All other structures (characterised by fire hazard category ⁽¹⁾), examples of which are given below		Water supply classification (see table 2)														
		Floor area of largest firecell of the building (m ²)														
		0-199 ⁽¹⁰⁾	200-399	400-599	600-799	800-999	1000-1199	1200-1399	1400-1599	1600-1799	1800-1999	2000-2199	2200-2399	2400-2599	2600-2799	> 2800
FHC 1 ⁽²⁾		FW3	FW3	FW3	FW4	FW4	FW4	FW5	FW6							
FHC 2 ⁽³⁾		FW3	FW3	FW4	FW5	FW5	FW5	FW6	FW6	FW6	FW7	FW7	FW7	FW7	FW7	FW7
FHC 3 ⁽⁴⁾		FW3	FW4	FW5	FW5	FW6	FW6	FW7	FW7							
FHC 4 ⁽⁵⁾		FW4	FW6	FW6	FW6	FW6	FW7	FW7								
For special or isolated hazards not covered in above categories ⁽⁶⁾		FW7														
NOTE –																
(1) Fire hazard category as defined in the compliance documents for the New Zealand Building Code, Acceptable Solution C/AS1.																
(2) FHC 1 is sleeping activities including care facilities, motels, hotels, hostels; crowd activities of <100 people including cinemas, art galleries, community halls, lecture halls, churches; working/business/storage activities processing non-combustible materials such as wineries, cattle yards, horticultural products; multistorey apartment blocks.																
(3) FHC 2 is crowd activities of >100 people, libraries, book storage, night clubs, restaurants; working/business/storage activities with low fire load such as hairdressers, banks, medical consulting rooms, offices.																
(4) FHC 3 is working/business/storage activities with medium fire load such as manufacturing, processing, bulk storage up to 3 metres.																
(5) FHC 4 is working/business/storage activities with high fire load such as chemical manufacturing, feed mills, plastics manufacturing, supermarkets or other stores with bulk display over 3 metres.																
(6) For special or isolated fire hazards in an area with a lower water supply classification, an assessment should be carried out to determine measures to mitigate the hazard or increase the water supply (see 4.4).																
(7) The values in the table were determined by heat release rate modelling for fully developed fires.																
(8) All non-sprinkler protected structures, except houses, have an entry level of FW3.																
(9) Examples of special or isolated hazards may include bulk fuel installations, timber yards, tyre dumps, wood chip stock piles, recycle depots, and marinas.																
(10) For non-sprinkler protected fire hazard category 1 structures less than 50 m ² in floor area, the FW3 requirement may be reduced by up to 50% with the agreement of the Fire Region Manager. Examples of the sorts of structures intended to be covered by this comment are predominantly garages, sheds, and outbuildings.																



In summary

Min Gross storage to be greater of Case A , B or C

	Design flow (l/s)	A		Total storage required (m3)	B 24 hours of average daily demand (m3)	C 12 hours of peak daily demand (m3)
		Water storage requirement (m3)	Fire Fighting Requirement (m3)			
		Potable requirements 6 hours of Avg daily demand	Max fire cell of 840m2 with FHC category 3 business* (FW6)			
384 Dwelling Units and 0.084ha commercial area	53.44	288	1080	1368	1152	2309

*FHC 3 is working/business/storage activities with medium fire load such as manufacturing, processing, bulk storage up to 3 metres

	Design flow (l/s)	Water storage requirement (m3)	Fire Fighting Requirement (m3)	Total water storage (m3)	24 hours of average daily demand (m3)	12 hours of peak daily demand (m3)
		Potable requirements 6 hours of Avg daily demand	Max fire cell of 840m2 with FHC category 2 business* (FW5)			
384 Dwelling Units and 0.084ha commercial area	53.44	288	540	828	1152	2309

*FHC 2 is a crowd activities of >100 people, libraries, book storage, night clubs, restaurants, working/business, storage activities with low fire load such as hairdressers, banks, medical consulting rooms, offices

Based on the summary, it can be seen that the difference in proposed dwellings from two case scenarios does not have a significant impact on the required storage volume. However, change in intended use for the building for example from HFC category from 3 to 2 significantly reduced the volume of water storage requirement for the proposed development.

SNZ PAS 4509:2008

Table 2 – Method for determining firefighting water supply

Fire water classification	Reticulated water supply			Non-reticulated water supply	
	Required water flow within a distance of 135 m	Additional water flow within a distance of 270 m	Maximum number of fire hydrants to provide flow	Minimum water storage within a distance of 90 m (see Note 8)	
				Time (firefighting) (min)	Volume (m³)
FW1	450 L/min (7.5 L/s) (See Note 3)	–	1	15	7
FW2	750 L/min (12.5 L/s)	750 L/min (12.5 L/s)	2	30	45
FW3	1500 L/min (25 L/s)	1500 L/min (25 L/s)	3	60	180
FW4	3000 L/min (50 L/s)	3000 L/min (50 L/s)	4	90	540
FW5	4500 L/min (75 L/s)	4500 L/min (75 L/s)	6	120	1080
FW6	6000 L/min (100 L/s)	6000 L/min (100 L/s)	8	180	2160
FW7	As calculated (see Note 7)				

NOTE –

- Table 1 lists the minimum requirements for firefighting water supplies. In developing towns' main reticulation systems, a water supply authority needs to cater for domestic/industrial water usage in addition to the above. This procedure is outlined in Appendix K.
- Special or isolated fire hazards which have higher requirements in an area of lower water supply classification must determine measures to mitigate the hazard or increase the water supply (see 4.4).
- Where houses have a sprinkler system installed to an approved Standard, the distance to a fire hydrant or alternative water supply may be negotiated by agreement with the Fire Region Manager.
- The water requirements for fire protection systems must be considered in addition to the firefighting water supplies, as detailed in table 1 (FW2), the fire protection system demand plus 1500 L/min (25 L/s) at 1 bar residual pressure.
- The minimum flow from a single hydrant must exceed 750 L/min (12.5 L/s), except for those cases where a home sprinkler is installed, in which case the minimum is 450 L/min (7.5 L/s) while the maximum design flow, for safety reasons, is limited to 2100 L/min (35 L/s).
- If the minimum water storage requirement as listed in the above table is not available from the reticulated system (reservoir), water can be sourced from an 'alternative supply' as approved by the Fire Region Manager. This water supply must always be within 90 m of the fire risk.
- FW7 is for either special or isolated hazards or where the fire hazard due to the size of the largest firecell and its fire hazard category make specific fire engineering assessment necessary. Appendix H and J must be used as the basis for calculating this required firefighting water supply.
- See Appendix B.

Table 6.2 – Empirical guide for principal main sizing

Nominal diameter of main DN	Capacity of main (single direction feed only)			
	Residential (lots)	Rural Residential (lots)	General/light Industrial (ha)	High usage Industrial (ha)
100	40	10	–	–
150	160	125	23	–
200	400	290	52	10
225	550	370	66	18
250	650	470	84	24
300	1000	670	120	35
375	1600	1070	195	55



Client: Glenpanel LP
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A) Wastewater Design

	Design flow (l/s)	Emergency storage required (m3)
384 Dwelling Units and 0.084ha commercial area)	16.78	108

	Tank size (diameter x length)	Volume provide (m3)	Volume required (m3)	Area required to fit in m2
Option 1	2m dia x 36m long	113	108	72
Option 2	2 x 2m dia x 18m long	113	108	72
Option 3	2.5m dia x 24m long	118	108	60
Option 4	2 x 2.5m dia x 12m long	118	108	60
Option 5	3m dia x 16m long	113	108	48
Option 6	2 x 3m dia x 8m long	113	108	48

B) Water Supply Demand

In summary

		Min Gross storage to be greater of Case A , B or C				
	Design flow (l/s)	A		B	C	
		Water storage requirement (m3)	Fire Fighting Requirement (m3)	Total storage required (m3)	24 hours of average daily demand (m3)	
		Potable requirements 6 hours of Avg daily demand	Max fire cell of 840m2 with FHC category 3 business* (FW6)			12 hours of peak daily demand (m3)
384 Dwelling Units and 0.084ha commercial area (FHC category 3 business)	53.44	288	1080	1421.44	1152	2309
384 Dwelling Units and 0.084ha commercial area (FHC category 2 business)	53.44	288	540	881.44	1152	2309

Water storage tank:			
Volume required (litres)	Tank Size (litres)	Number of tank required	Area required to fit in m2
2310000	1000000	2.31	TBC at detailed design stage

the above summary compares different intended building use and corresponding HFC category which reduces fire requirements for commercial but shows 12 hours peak daily always governs regardless.