CKL

Planning | Surveying | Engineering | Environmental

Water & Wastewater Assessment

Waterfall Park Developments LTD

Ayrburn Screen Hub

Substantive Design

Document Information

Client	**Waterfall Park Developments LTD**
Site Location	1 Ayr Avenue, Arrowtown
Legal Description	Lot 4 DP 540788
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01	Approved	30/6/2025	KG	JS	JS

The contributing authors, in their capacity as authors of this report, have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023. Where this report relies on information provided by other experts, this is outlined within the report. The qualifications and experience of the contributing authors are provided in Appendix 7 of this document.

Contents

Figures

Tables

Appendices

1 Executive Summary

This report provides an updated assessment of the water supply and wastewater infrastructure required to support the proposed Ayrburn Screen Hub development within the broader Waterfall Park development, near Arrowtown. The purpose of this assessment is to confirm that the proposed development can be adequately serviced in accordance with Queenstown Lakes District Council (QLDC) standards and without requiring additional upstream infrastructure upgrades or network re-modelling.

Water and wastewater demands have been updated to reflect minor revisions to the site layout and building programme, including the addition of a proposed 3-Lot Subdivision on the broader development site and changes in accommodation numbers and facilities within the proposed Screen Hub itself. These revised demands have been incorporated into CKL's updated hydraulic modelling, which builds upon earlier modelling by Mott MacDonald (2018), HAL, and Beca, as well as additional testing and analysis carried out by CKL through to 2025.

Key findings include:

Water Supply:

The development remains within the previously modelled 45 L/s water allocation for the wider Waterfall Park area. Pressure and flow testing in 2023 recorded static pressures of approximately 94 m, confirming ample head to service the development. While available pressures are currently high, PRVs will be installed to manage residual pressures and protect infrastructure. The internal water network, including firefighting provisions, complies with SNZ PAS 4509:2008 and QLDC design requirements.

Wastewater:

The development also remains within the previously modelled wastewater discharge limit of 23.4 L/s and 416.2 m^3/day for the Waterfall Park development. Wastewater from the Screen Hub will gravitate to the consented Waterfall Park Wastewater Pump Station (WPWWPS), which has been designed to accommodate the full discharge limit. Synchronisation and telemetry will ensure that all connected pump stations operate within the cumulative discharge cap.

Modelling Justification:

The QLDC commissioned 2018 modelling for both water and wastewater established network adequacy up to 2058, and all subsequent consents, including this one, have remained within the modelled capacity. Pressure testing of the water network within the development in 2023 confirmed actual conditions remain well within service thresholds. Additional modelling by Council may support future planning for Council, but it is not deemed necessary to confirm the viability of the Screen Hub within the Waterfall Park development as a whole.

Overall, the proposed development can be adequately serviced by the existing and consented infrastructure, and no upgrades or further modelling should be required to support its approval.

2 Introduction

This report has been prepared by CKL to assess the adequacy of the existing water supply and wastewater infrastructure to service the proposed Screen Hub development within the broader Waterfall Park development area in Arrowtown, within the Queenstown Lakes District.

The Waterfall Park development is currently serviced by a consented 315 mm OD PE water main, installed along Arrowtown-Lake Hayes Road and Ayr Avenue. This bulk water main was designed to meet the demands modelled in the 2018 Mott MacDonald water supply assessment, which established a potable water allocation of 45 L/s and a wastewater discharge limit of 23.4 L/s for the broader Waterfall Park development area (which included the Screen Hub area). These limits have formed the basis for all subsequent consenting, infrastructure design, and capacity planning within the development.

This report builds upon a suite of technical assessments and design memos prepared by CKL and others, including:

- CKL internal hydraulic modelling (2023–2025);
- Pressure and flow testing (April 2023);
- Previous reports supporting fast-track referral applications;
- Wastewater network assessments, including peer-reviewed pump station design.

The current update responds to recent design refinements—particularly revised water and wastewater demands for the Screen Hub and the inclusion of a proposed 3-lot subdivision on other land within the Waterfall Park development area. The updated report also addresses further queries raised by Queenstown Lakes District Council (QLDC) around the capacity of existing infrastructure and the need for broader network re-modelling.

The primary objectives of this report are to:

- Outline the design and demands of the water and wastewater internal networks for the proposed Screen Hub;
- Confirm that updated water and wastewater demands remain within the modelled limits;
- Demonstrate that the existing infrastructure, including proposed pressure management measures, can meet Level of Service (LOS) requirements under both normal and firefighting scenarios;
- Confirm that firefighting design is compliant with SNZ PAS 4509:2008;

All findings in this report are consistent with prior approvals and the established design framework accepted by QLDC. This report reaffirms that no new infrastructure upgrades or broader network modelling should be required to support the proposed development.

3 Background

It is proposed to create a Screen Hub development to the southwest of Ayr Avenue, located as indicated in **Figure 1** and **Figure 2** below. The site is located on Lot 4 DP 540788.

Figure 1: Location of project.

The proposed development includes a comprehensive range of facilities and infrastructure to support film production, visitor accommodation, and associated services. Key components of the development are as follows:

- **Screen Production Hub**
  Comprising a sound stage, flexible workshop and workroom spaces (for construction, fabrication, wardrobe, rigging, etc.), associated administration offices, and designated exterior areas for filming and set construction.
- **Visitor and Worker Accommodation**

  Includes multiple two-storey accommodation blocks interspersed with landscaping and parking. Offices, private actor spaces, and dressing rooms will also be available for conversion into single or double visitor accommodation suites when not in production use.
- **Wellness Facilities**

  A gym/wellness building provided to support both workers and visitors.
- **Reception and Administration Buildings**

  Office and reception buildings to service accommodation and the wider site functions.
- **Ayrburn Depot**

  A dedicated facility for deliveries and operational support to the wider Ayrburn precinct. This will house storage areas, back-of-house functions, and staff amenities, with allocated parking for Ayrburn personnel.

The general layout of the proposed development is as indicated in **Figure 2** below. Estimated occupancies for design are given in **Section 4.1**.

Figure 2: Masterplan of Screen Hub – Winton June 2025

3.1 Scope

This report has been prepared to support a substantive design application. It provides an assessment of the water and wastewater flows anticipated from the proposed development and outlines the developed design for the associated water and wastewater reticulation systems required to service the site.

This report builds upon CKL's earlier document titled "Water & Wastewater Assessment – Ayrburn Screen Hub", *Revision 02, dated 03 February 2025*. It incorporates key updates, including modifications to the masterplan—specifically, the replacement of the previously proposed Events Space with an additional accommodation block.

The scope also includes a revised analysis of sprinkler system demands, detailing their operation and assessing the impact on the wider existing water network.

3.2 Reference Documents

This report refers to the following documents and information (Copies of all the documents below can be found in **Appendix 4**):

- "Water & Wastewater Infrastructure Assessment", dated 27th February 2023, by CKL, lodged under RM220926.
- Memorandum: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL.
- Memorandum: "Backflow Prevention Design", dated the 3rd March 2025, by CKL.

- "Ayrburn Masterplan – Building Plans", dated 27 June 2025, by S A Studio.
- "Fire Fighting Water Supplies – Design Advice 02", dated the 14th of November 2024, by Holmes, reference 146046.03.
- "Water & Wastewater Assessment – Ayrburn Screen Hub", Revision 02, dated 03 February 2025
- "Ayrburn Farm 3 Lot Subdivision – Water & Wastewater Assessment Waterfall Park, Queenstown", dated 20 March 2025
- Water Supply and Wastewater Disposal Screen Hub – Response to QLDC Queries dated 10th June 2025

4 Water Supply

The proposed Screen Hub will be serviced by an extension of the existing water supply network currently serving the Ayrburn Domain development and consented retirement village. This new network will source potable and firefighting water from an existing 315mm OD PN12.5 PE100 HDPE water main connected to the Lake Hayes-Arrowtown 225DN PVC bulk main.

4.1 Assessment of Water Demand

The assessment of water demand for the proposed Screen Hub development has been undertaken in accordance with the Queenstown Lakes District Council (QLDC) Code of Practice (2025), NZS 4404:2010, and NZS 1547:2012, along with other recognised industry references such as BRANZ SR159. The key assumptions are as follows:

1. **Occupancy Rates**
   - All accommodation units are assumed to accommodate 2 persons per room, based on their typical layout and size.
   - It is also assumed, as a worst case scenario, that all accommodation occupants are employed on-site as part of a film production. The worst-case scenario assumes that all accommodation units are occupied by staff working on-site at the Screen Hub. In this case, occupants would be showering and using full amenities in the accommodation blocks (e.g. morning and evening), and only using toilets during the day while working at the film facility. This results in higher water demand per person, as both residential and workplace usage patterns overlap. Under normal operating conditions, the facility would have a mix of short-stay visitors and a smaller number of permanent staff. As such, the actual demand during regular operations would be lower than this peak scenario, which we've used to ensure the system is conservatively designed.
2. **Daily Water Consumption**
   - Accommodation Guests and Resident Staff: 250 L/person/day, based on NZS 4404:2010 and NZS 1547 Table H4.
   - Non-Resident Staff (e.g. film, spa, depot, admin staff): 30 L/person/day, reflecting limited occupancy duration and non-residential usage.
   - Spa/Gym/Pool Users: 50 L/person/day for each facility, based on BRANZ SR159 values for single showers or top-ups.

- Depot Visitors: 30 L/person/day, assuming short stays.
- Reception/Dining Guests: 30 L/person/day, based on expected seating capacity and turnover rates.
- Irrigation: 4 mm/day applied to 10,000 m² of planting and lawn areas. Irrigation is assumed to run overnight for 4 hours and cease after 2 years of establishment.

3. **Peak Hour Peaking Factor**
   - A peaking factor of 6.6 has been applied to all domestic and staff-related demand categories in accordance with QLDC guidelines.
   - This accounts for short-duration spikes in water use (e.g. morning or evening peaks).
   - No higher peaking factor (e.g. 10) has been applied to individual facilities such as the spa, as the existing factor was deemed sufficient given the scale and usage frequency.
4. **Design Flow Rate Calculation**
   - Water demands have been calculated for both average daily flow and peak hour flow.
   - The total daily demand is estimated at 171.3 m³/day, with a peak demand of 12.8 L/s, which includes irrigation.
5. **Contingency Allowance**
   - An additional 20% of staff numbers has been included to account for off-site visitors or contractors who may attend the film facility during peak operations.

Please refer to **Table 1** below for the water demand calculations.

Table 1: Water Demand Calculations.

Unit Type	No. of Facilities	Max No. of People Facility / Day	Daily Water Demand (L/p/d)	Daily Water Demand (m³/d)	Daily ave. Water Demand (L/s)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)	Comments/Assumptions
Screen Hub - 202 Accommodation units								
FILM FACILITY								
Staff	1	400	30	12	0.14	6.6	0.92	Water Demand - (NZS 1547 Table H4 - Non-resident Staff) Facility. Assumed all accommodation occupants will be working at the Film Facility. This is just staff. Outside visitors allowed for below
Visitors	1	80	30	2.4	0.03	6.6	0.18	Allowed 20% of staff numbers to allow for outside visitors
E1 - LOUNGE, GYM & ACCOMMODATION								
- Accommodation	4	2	250	2	0.02	6.6	0.15	Water Demand - QLDC COP
- Gym	1	35	50	1.8	0.02	6.6	0.13	BRANZ SR159 - Table 7 - Assume 50 l/p/d for one shower
- Spa	1	25	50	1.25	0.01	6.6	0.10	BRANZ SR159 - Table 7 - Assume 50 l/p/d for one shower/top up
- Pool	1	25	50	1.25	0.01	6.6	0.10	BRANZ SR159 - Table 7 - Assume 50 l/p/d for one shower/top up

Unit Type	No. of Facilities	Max No. of People Facility / Day	Daily Water Demand (L/p/d)	Daily Water Demand (m³/d)	Daily ave. Water Demand (L/s)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)	Comments/Assumptions
- Staff	1	8	30	0.2	0.00	6.6	0.02	Water Demand - (NZS 1547 Table H4 - Non-resident Staff)
B.1 FILM OFFICES or ACCOMMODATION	20	2	250	10	0.12	6.6	0.76	Assumed highest demand would be when facilities are used as accommodation. Water Demand - NZS 4404:2010 - 6.3.5.6 - Assume average of 2 people per room
C1 - ACCOMMODATION. TYPE 1	16	2	250	8	0.09	6.6	0.61	Water Demand - QLDC COP - Assume average of 2 people per room
C2 ACCOMMODATION TYPE 1	16	2	250	8	0.09	6.6	0.61	Water Demand - QLDC COP - Assume average of 2 people per room
C3 - ACCOMMODATION TYPE 1	16	2	250	8	0.09	6.6	0.61	Water Demand - QLDC COP - Assume average of 2 people per room
C4 - ACCOMMODATION TYPE 1	16	2	250	8	0.09	6.6	0.61	Water Demand - QLDC COP - Assume average of 2 people per room
C5 - ACCOMMODATION TYPE 1	16	2	250	8	0.09	6.6	0.61	Water Demand - QLDC COP - Assume average of 2 people per room
C6 - ACCOMMODATION TYPE 1	12	2	250	6	0.07	6.6	0.46	Water Demand - QLDC COP - Assume average of 2 people per room
C7 - ACCOMMODATION TYPE 3	30	2	250	15	0.17	6.6	1.15	Water Demand - QLDC COP - Assume average of 2 people per room
F - ACCOMMODATION TYPE 4	15	2	250	7.5	0.09	6.6	0.57	Water Demand - QLDC COP - Assume average of 2 people per room
B2 - FILM OFFICES or ACCOMMODATION	32	2	250	16	0.19	6.6	1.22	Assumed highest demand would be when facilities are used as accommodation. Water Demand - NZS 4404:2010 - 6.3.5.6 - Assume average of 2 people per room
C8 - ACCOMMODATION VIP	9	2	250	4.5	0.05	6.6	0.34	Water Demand - QLDC COP - Assume average of 2 people per room
ACCOMODATION STAFF	1	40	30	1.2	0.01	6.6	0.09	Assume 1 Staff per 5 rooms (Full Service). Total 202 rooms. This covers Housekeeping, Reception, Room service (if applicable, Maintenance, Night staff, Shared admin/HR/laundry support. Water Demand - (NZS 1547 Table H4 - Non-resident Staff)
E - RECEPTION & OFFICE								
Guests	1	300	30	9	0.10	6.6	0.69	Assume 200 Guests (96 seats @ 2 turnover per day) for the main dining area and 50 guests (40 seats @ 2 turnover per day) for the lounge area - Figure rounded up to nearest 100 - Water Demand - (NZS 1547 Table H4 - Reception Rooms)
Staff	1	8	30	0.2	0.00	6.6	0.02	Kitchen/Bar/Front of House/Cleaning/Utility/Admin/Reception - Water Demand - (NZS 1547 Table H4 - Non-resident Staff)
Total Screen Hub and Accommodation		**1241**		**130.3**	**1.51**	**6.6**	**9.96**	
D - DEPOT								
Depot staff	1	3	30	0.09	0.00	6.6	0.01	L/d from ASNZ1547:2012 Table H4.
Depot visitors	1	30	30	0.9	0.01	6.6	0.07	
Sub Total (Domestic)		**1274**		**131.3**	**1.5**		**10.0**	
Irrigation								
Irrigation for planting (9000m²)				36				Based on 4mm / day. Irrigation can stop after 2 years.
Irrigation for lawns (1000m²)				4				
Sub Total (Irrigation, overnight for 4 hours)				**40.0**			**2.8**	
TOTALS								

Unit Type	No. of Facilities	Max No. of People Facility / Day	Daily Water Demand (L/p/d)	Daily Water Demand (m³/d)	Daily ave. Water Demand (L/s)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)	Comments/Assumptions
Excluding Irrigation from Peak							**10.0**	Irrigate after hours - excl. irrigation from peak
Irrigating during 50% peak demand							**7.8**	Irrigate during 50% peak demand
Total (Domestic + Irrigation)				**171.3**			**12.8**	Irrigate during peak demand. Average demand per day irrespective of irrigation timing.

4.1.1 Analysis and Observations

- **Daily Water Demand**: The total daily water is estimated to be 171.3 m³/d for the development. This will decrease to 131.3 m³/d after 2 years once irrigation is no longer required.
- **Peak Water Demand**: Applying a peak factor of 6.6, the peak water demand reaches 12.8 L/s. This assumes that all irrigation will occur overnight during off peak hours.
- **Design Considerations**: The approach taken aligns with the QLDC Code of Practice and forms the foundation for designing the water supply system. These demand calculations help determine the right pipe sizes, manage pressure effectively, and build resilience into the network.

4.1.2 Effect on Overall Water Demand

The revised water demand analysis shows a peak demand for the Screen Hub is 10 L/s (excluding irrigation). The combined peak daily demand for the overall Waterfall Park development area (including Waterfall Park/Northbrook, Ayrburn Domain, 3 -Lot Subdivision and Screen Hub) is 28 L/s (excluding irrigation) - **Table 2.**

As a result, the remaining available capacity is 11.5 L/s, after accounting for the increased demand (refer to Table 2).

4.1.3 Firewater Demand

Holmes have provided design advice for firewater supply at the proposed Screen Hub (refer to **Appendix 3**) in accordance with SNZ PAS 4509:2008:

- All buildings within the Screen Hub development will be fitted with sprinkler systems.
  - The most onerous sprinkler demand for each building has been advised by Holmes and is summarised in **Table 2.**
  - For accommodation units and offices, sprinkler systems will be supplied directly by the public water reticulation network.
  - For the Depot, Screen Hub, and Spa/Reception buildings, sprinkler systems will be supplied via on-site storage tanks and booster pumps. Additional detail is provided in **Appendix 3.**
  - These tank systems will also include a bypass line connected to the public network to serve as a backup supply if tanks or pumps are unavailable.

- While the bypass line provides a contingency during system failure, the infill of sprinkler tanks during a fire event has been considered the worst-case scenario for modelling purposes. A continuous draw of 16.6 L/s from the network is assumed to replenish tank volumes during an active fire, representing the highest sustained load on the system during such an event. This value has been included in the fire flow modelling and is reflected in **Table 2** (Refer to **Appendix 3** – Advice note from Holmes). This represents an amendment to the sprinkler demand assumption outlined in CKL's previous memo titled *'Water & Wastewater Assessment – Ayrburn Screen Hub,' Revision 02, dated 03 February 2025*
- With sprinklers installed throughout, all buildings have been classified with a fire rating of FW2, which requires two hydrants within 135 m and 270 m delivering 12.5 L/s each concurrently.
- The total maximum fire demand on the public water network during a fire event in the Screen hub Facility is therefore 41.6 L/s, comprising two hydrants discharging at 12.5 L/s each and 16.6 L/s for sprinkler tank infill.

Table 2 below provides a summary of the water demand requirements across the broader Waterfall Park development site, including the additional peak flow associated with the Screen Hub. The table includes both domestic usage and firefighting demands, serving as a key reference for assessing the capacity and suitability of the proposed water supply system.

Note: It should be noted that the maximum combined fire flow demand on the public water network of 77 L/s occurs during a fire event scenario in the Ayrburn Domain, which includes existing, occupied buildings and represents the highest hydrant flow within the Waterfall Park development. This scenario comprises three hydrants discharging at 50 L/s, along with 60% of the previously modelled 45 L/s allocation. Importantly, this demand does not relate to the proposed film studio, and has already been modelled, with results provided in **Appendix 2**.

Table 2: Combined Domestic + Fire Flows[1].

Structure	Domestic Peak Flow (l/s)	60% Peak Flow (l/s)	FW	Fire Hydrant Flow (l/s)	Sprinkler Discharge (l/s)	60% Peak Flow+Fire Flow + Sprinkler Flow (l/s)
Ayrburn Domain						
Dairy (Ice cream parlour)	0.06	0.04	FW3	50	N/A	50.04
Bakehouse	0.43	0.26	FW2	25	13.3	38.56
Annex Building/Stable	1.43	0.86	FW2	25	20	45.86
Cart Shed (Deli)	0.15	0.09	FW2	25	25	50.09
Burr Barr	0.08	0.05	FW3	50	N/A	50.05
Barrel Room	0.22	0.13	FW3	50	N/A	50.13

[1] *Source: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL*

Structure	Domestic Peak Flow (l/s)	60% Peak Flow (l/s)	FW	Fire Hydrant Flow (l/s)	Sprinkler Discharge (l/s)	60% Peak Flow+Fire Flow + Sprinkler Flow (l/s)
Display Suite	0.02	0.01	FW3	50	N/A	50.01
Homestead Building	1.16	0.70	FW2	25	13.3	39.00
Haybarn	1.19	0.71	FW3	50	N/A	50.71
Future Domain Demand	4.66	2.80	FW3	50	N/A	52.80
Irrigation	1.60	0.96	NA			
Ayrburn Domain Sub-Total	**11.00**	**6.60**	NA			
Waterfall Park / Northbrook Retirement						
Building A - Arrivals & Amenities	2.46	1.48	FW2	25	16.60	43.08
Building B - Care & Offices	0.98	0.59	FW2	25	16.60	42.19
Building C - Residential	1.16	0.70	FW2	25	16.60	42.30
Building D - Residential	1.46	0.88	FW2	25	16.60	42.48
Building E - Residential	1.04	0.62	FW2	25	16.60	42.22
Building F - Boutique Hotel Including Function Venue	0.91	0.55	FW2	25	16.6	42.15
Miscellaneous	0.05	0.03	FW2	25	16.60	41.63
Irrigation	1.10	0.66	NA			
Waterfall Park Sub-Total (Current)	**9.16**	**5.50**				
Film Facility						
Film Facility	1.10	0.66	FW2	25	16.6	42.3
E1 - Lounge, Gym & Accommodation	0.50	0.30	FW2	25	16.6	41.9
B.1 FILM OFFICES Or ACCOMMODATION	0.76	0.46	FW2	25	16.6	42.1
C1 - Accommodation. Type 1	0.61	0.37	FW2	25	10.8	36.2

Structure	Domestic Peak Flow (l/s)	60% Peak Flow (l/s)	FW	Fire Hydrant Flow (l/s)	Sprinkler Discharge (l/s)	60% Peak Flow+Fire Flow + Sprinkler Flow (l/s)
C2 - Accommodation Type 1	0.61	0.37	FW2	25	10.8	36.2
C3 - Accommodation Type 1	0.61	0.37	FW2	25	10.8	36.2
C4 - Accommodation Type 1	0.61	0.37	FW2	25	10.8	36.2
C5 - Accommodation Type 1	0.61	0.37	FW2	25	10.8	36.2
C6 - Accommodation Type 1	0.46	0.28	FW2	25	10.8	36.1
C7 - Accommodation Type 3	1.15	0.69	FW2	25	10.8	36.5
F - Accommodation Type 4	0.57	0.34	FW2	25	10.8	36.2
B2 - FILM OFFICES Or ACCOMMODATION	1.22	0.73	FW2	25	10.8	36.6
C8 - Accommodation Vip	0.34	0.21	FW2	25	10.8	36.0
Accommodation Staff	0.09	0.06	FW2	25	10.8	35.9
E - Reception & Office	0.71	0.42	FW2	25	10.8	36.3
D - Depot	0.08	0.05	FW2	25	16.6	41.6
Screen Hub Domestic total	**10.0**	6.02				
Total (irrigation + domestic)	**12.8**	**7.69**				
3 Lot - Subdivision						
Lots 6-7-8	**0.48**	**0.29**	FW2	25	N/A	25.29
Future Capacity / Totals						
Total (excl. irrigation)	**28.0**	**16.8**				
Total (incl. irrigation)	**33.5**	**20.1**				
Future Capacity	**11.5**	**NA**	Allowance for additional flows based on total potential			
TOTAL POTENTIAL (CONSENTED)	**45**	**27.0**				

4.1.4 Fire Flow and Peak Demands – Screen hub

These scenarios have been modelled in EPANET, with results summarised in Section 4.4. During peak domestic demand with no firefighting draw-off, the network shows an available spare capacity of approximately 11.5 L/s, indicating sufficient headroom within the system.

Current Fire Flow Scenario (Based on Consented Development to Date)

The critical fire flow scenario associated with the currently consented development (i.e., all buildings approved under existing consents based on the 2018 modelling) includes:

- Sprinkler tank infill during fire event = 16.6 L/s
- Two hydrants operating at FW2 (12.5 L/s each) = 25 L/s
- 60% of peak domestic demand for the entire development (including irrigation) = 20.1 L/s

Total instantaneous fire flow demand (Current Consents) = 61.7 L/s

Theoretical Maximum Fire Flow (Based on Full Future Usage from 2018 Modelling)

The 2018 modelling established a peak daily demand allocation of 45 L/s for the full build-out of the Waterfall Park development. Based on this, the maximum theoretical combined fire flow demand for a future fire event at the Screen Hub facility would be:

- Sprinkler tank infill = 16.6 L/s
- Two hydrants at 12.5 L/s each = 25 L/s
- 60% of modelled peak daily demand (45 L/s) = 27.0 L/s

Total maximum fire flow demand (Modelled Future Capacity from 2018 Model) = 68.6 L/s

4.1.5 Fire Flow and Peak Demands – Waterfall Park Development

The maximum combined fire flow demand on the public water network during a fire event in the Ayrburn Domain, representing the highest hydrant flow scenario within the Waterfall Park development is 77 L/s. This comprises flow from three hydrants discharging at 50 L/s, combined with 60% of the previously modelled 45 L/s allocation. This scenario has also been modelled and results included in **Appendix 2**.

This scenario reflects the most critical demand on the system under both current and consented future usage, and has been tested in the hydraulic model to confirm network performance.

4.2 Proposed Water Supply Connection

The proposed development will be serviced by an extension of the existing water supply network currently serving the Ayrburn Domain development and retirement village. This new network will source potable and firefighting water from an existing 315mm OD PN12.5 PE100 HDPE water main connected to the Lake Hayes-Arrowtown bulk main.

The existing internal water network predominantly comprises high-density polyethylene (HDPE) pipes with diameters ranging from 180mm to 315mm **OD PN 12.5 PE100 HDPE**.

The existing water distribution network was modelled based on reticulation designs provided by PPG, as detailed in Annexure A. Initial pipe sizes and lengths from these designs were used as input parameters, and their suitability was assessed using hydraulic modelling principles. The previously constructed model[2] was then expanded, including the above additional water demands as well as fire demands, as described in Section 4.1.4.

The existing network connects to a DN 225 PVC QLDC water main at the intersection of Speargrass Flat Road and Arrowtown-Lake Hayes Road, as illustrated in **Figure 3**. Residual pressures at the point of connection were obtained from the Mott MacDonald Water Modelling Memo (2018)(**Appendix 6**), which identified peak day pressures of 82.2 m for 2028 and 80.2 m for 2058. Both scenarios have been modelled, and the results are discussed in Section 4.4 of this report.

Figures 3 and **4** illustrate the existing water network layouts, respectively.

[2] *Source: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL*

Figure 3: Existing Network Connection.

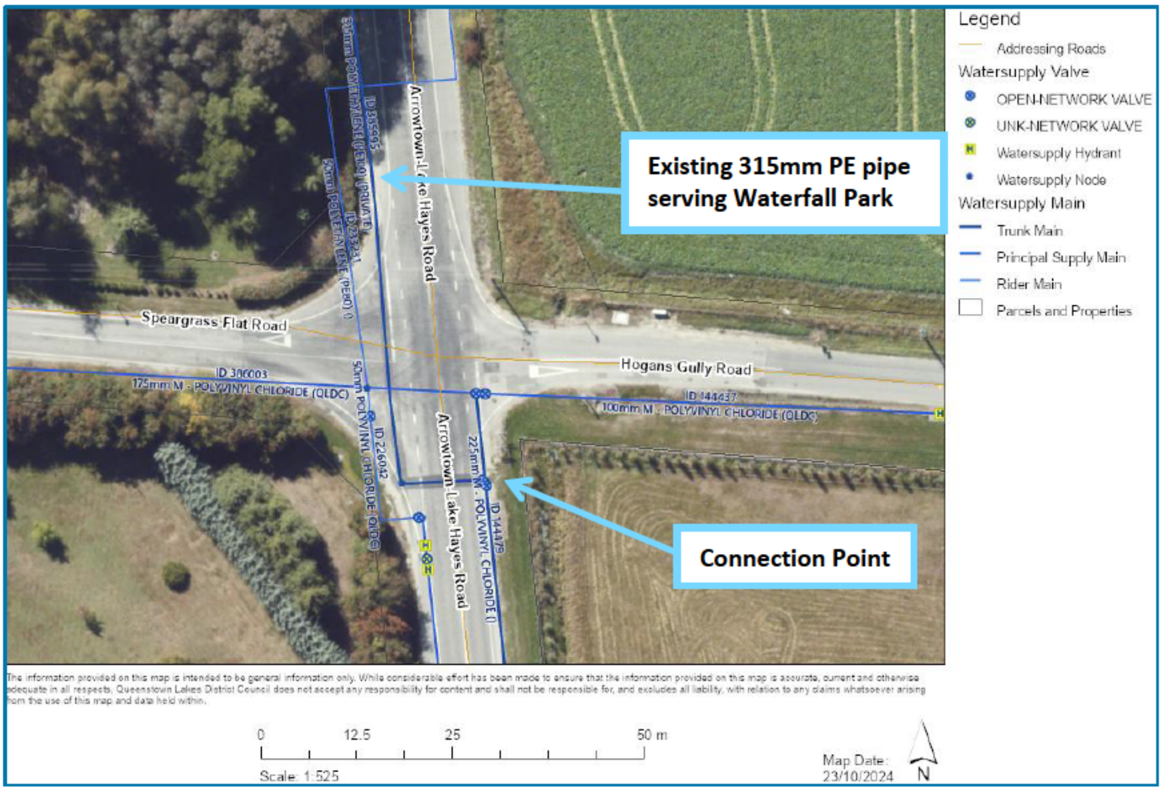
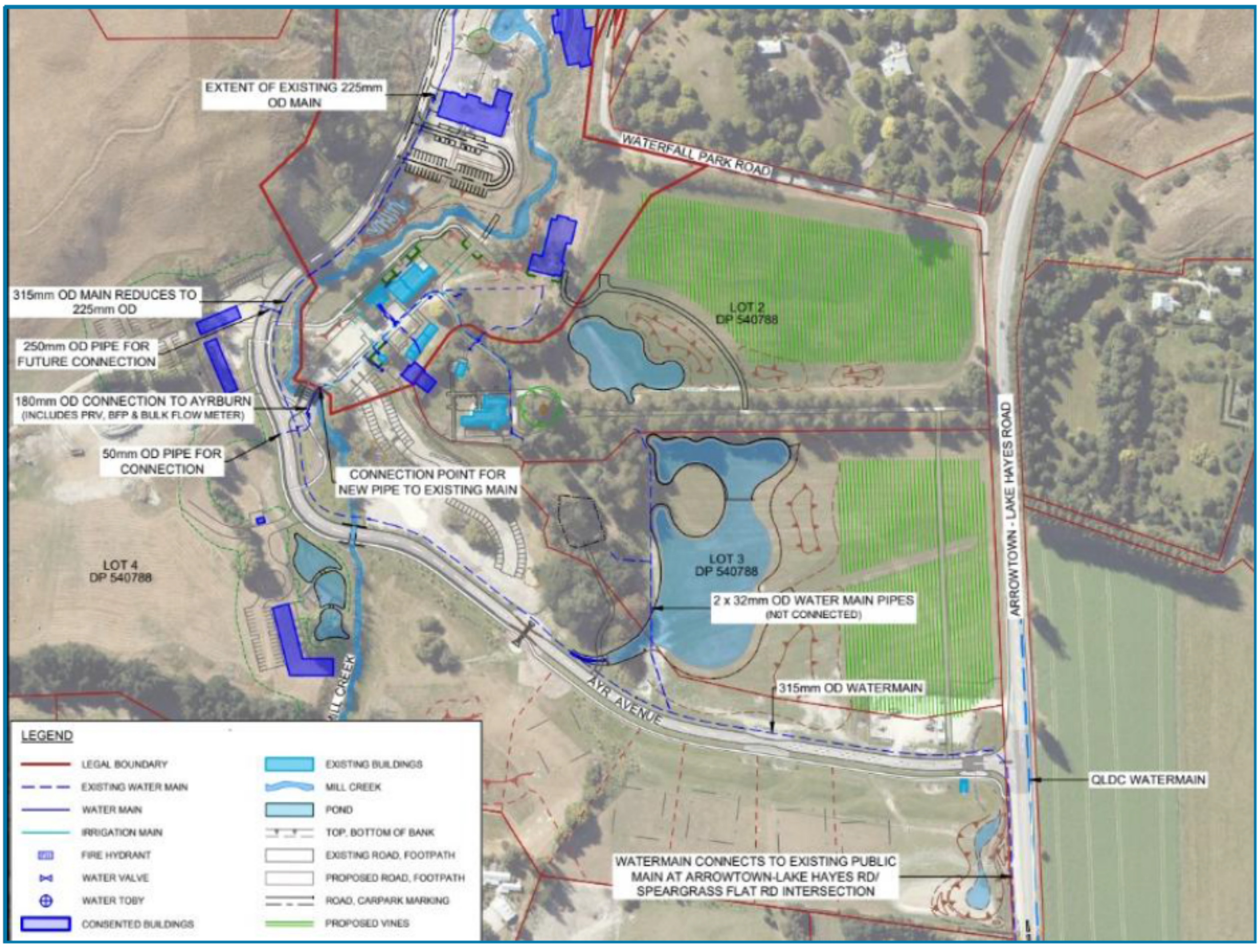


Figure 4: Existing Water Reticulation Network within the Waterfall Park Development.



4.3 Proposed Water Reticulation Layout

The water reticulation for the Screen Hub is illustrated in **Figure 5**. These lots will be supplied from a tee-off on the incoming 315 OD PE main. To manage residual pressures which exceed 90m during peak daily flows, pressure reducing valve(s) will be installed. This portion of the development will be isolated by means of isolation valves upstream of the pressure reducing.

4.3.1 Pipe Sizing in Screen hub

The water supply reticulation network within the Screen Hub facility has been sized to accommodate projected demands through to the year 2058, based on the Waterfall Park master planning and staged growth assumptions.

Hydraulic modelling was undertaken in EPANET using a combined peak flow scenario comprising:

- 60% of Peak Daily Demand, representing concurrent domestic use across the site during daytime activity;
- FW2 Fire Demand, requiring a minimum instantaneous flow of 12.5 L/s each for two hydrants;
- Sprinkler Tank Infill, requiring a maximum flow of 16.6 L/s, regulated as per fire protection engineering design.

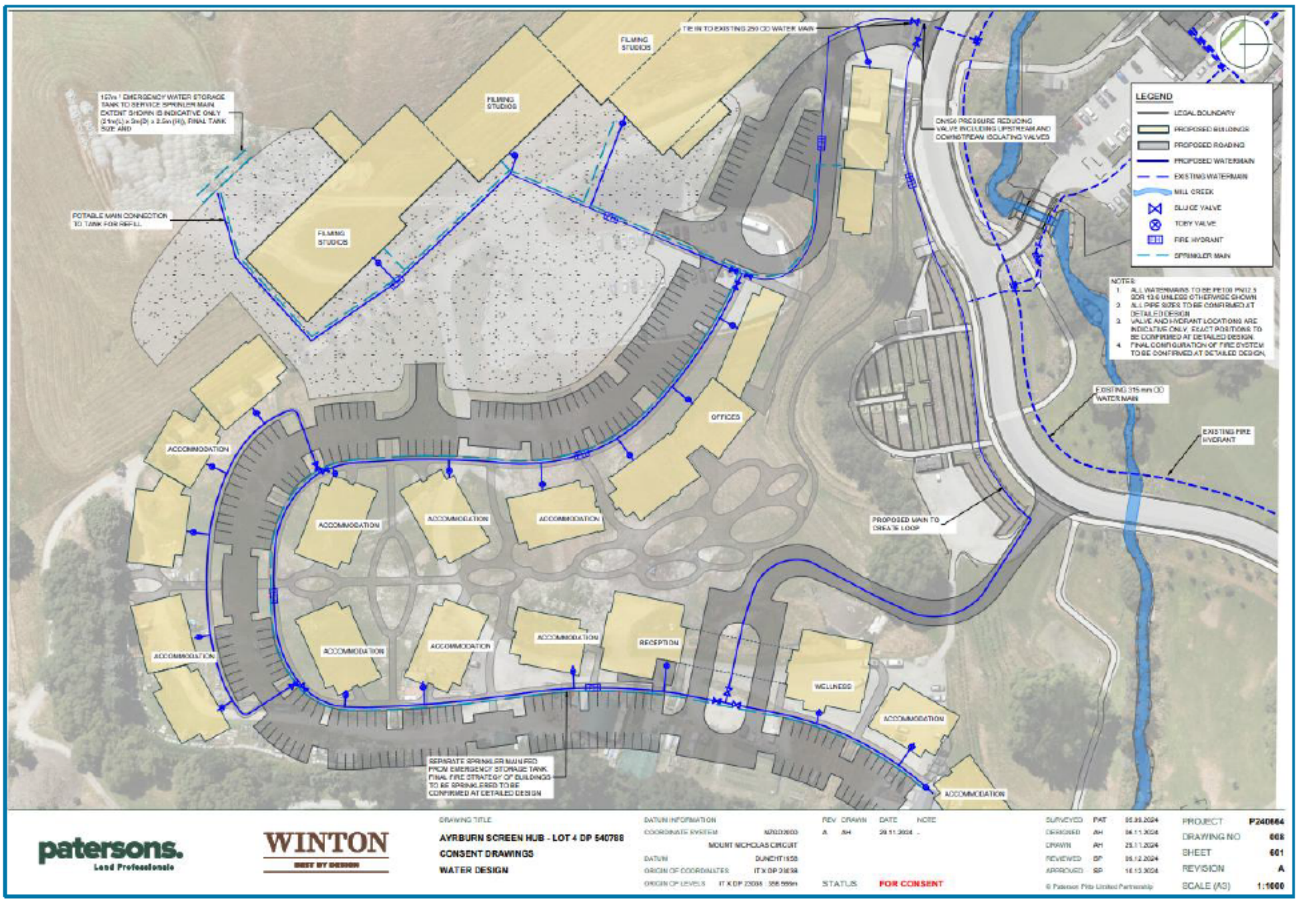
This combined flow scenario ensures sufficient capacity under the most critical simultaneous demand conditions, while also providing contingency for operational resilience and firefighting compliance.

The final pipe network within the Screen Hub Facilities consists of the following PE pressure-rated pipelines, installed in accordance with AS/NZS 4130 and CKL's detailed design:

- **DN32 PE16 SDR11:** 14.38 m
- **DN75 PE SDR13.6 PN12.5:** 273 m
- **DN110 PE SDR13.6 PN12.5:** 219 m
- **DN180 PE SDR13.6 PN12.5:** 822 m

These sizes maintain acceptable flow velocities and residual pressures throughout the network, including at critical nodes such as the PRV chamber and fire connection points.

Figure 5: Proposed Water Reticulation Layout for Screen Hub Facilities – source PPG



4.3.2 Sprinkler Infill Tank

Three dedicated sprinkler infill tanks are proposed to service the fire protection systems across the Screen Hub development. These tanks support the site's FW2 firefighting provision in accordance with PAS 4509, and their sizing and operation have been developed in collaboration with Holmes Fire.

Tank Summary:

- Film Studio: 135 m³
- Depot: 154 m³
- Spa / Reception / Function Hall: 50 m³

Each tank is to be filled from the potable water network at a flow-restricted rate of 16.6 L/s. This rate:

- Has been explicitly modelled as the draw-off from the network during a fire scenario;
- Ensures that sprinkler infill demands do not exceed the site's overall consented water take;
- Minimises impacts on pressure and flow availability for other users;
- Allows for accurate monitoring and operational control.

Flow restriction will be implemented via calibrated control valves or orifice plates, with final details confirmed at the detailed design stage.

Importantly, the tanks will continue to re-fill until sprinklers stop which provides system resilience while ensuring sustained compliance with firefighting and water demand requirements.

4.3.3 Velocities and Headlosses

The water supply network within the Screen Hub development has been hydraulically assessed for velocity and headloss performance under the 2058 design scenario, which includes peak daily demand and concurrent firefighting requirements. The system was modelled using the Darcy-Weisbach equation with a friction factor (f) of 0.015, consistent with PE pipe under clean conditions.

Flow Velocities

- Flow velocities throughout the system fall within the acceptable engineering range of 0.5 m/s to 2.5 m/s.
- Peak velocities occur during the combined fire flow scenario (60% peak daily demand + 25 L/s hydrant flow + 16.6 L/s sprinkler infill), but remain below 2.5 m/s, ensuring safe and efficient operation.

Headlosses

- Headlosses were calculated using the Darcy-Weisbach method, which offers accurate friction loss predictions based on pipe material, flow rate, and internal roughness.
- The maximum unit headloss observed within the network is 57.52 m/km, which occurs in smaller-diameter pipe sections operating under high flow conditions.
- Despite these peak losses, the network retains adequate pressure at all design nodes, including those critical for firefighting operations.

Conclusion

The analysis confirms that:

- Flow velocities are within acceptable limits for PE pipe systems;
- Headlosses are well-characterised and do not compromise pressure performance; and
- The network is appropriately sized and aligned to meet 2058 demand and fire protection scenarios with confidence.

4.3.4 Backflow Prevention & Hazard Assessment

Backflow protection across the Ayrburn Screen Hub has been addressed by implementing individual backflow preventers at each building connection. This decentralised approach allows each building's specific hazard level to be managed independently and aligns with the requirements of AS/NZS 2845.1 and local authority expectations.

Each building within the development has been assessed for backflow hazard risk:

- The Depot building, which includes light commercial and maintenance activities, is considered a medium hazard due to potential exposure to cleaning chemicals, workshop runoff, and external hose taps.
- The Film Studio is also assessed as a medium hazard. While it is primarily a production facility, the inclusion of kitchenettes, toilets, and storage for set materials presents a potential for moderate contamination risks.
- The Gym and Wellness building, is classified as a high hazard due to the use of chemicals and personal care products with potential to enter the water supply.
- The Reception building is assessed as medium hazard, primarily due to kitchen and bathroom facilities.
- The Accommodation units, consisting of standard guest suites, are considered low to medium hazard, with typical residential-style water usage.
- The Restaurant is considered a medium hazard due to food preparation and cleaning areas.
- Any building with plant rooms or external hose taps has been conservatively classified as medium hazard.

To manage these risks, Reduced Pressure Zone (RPZ) devices will be installed at each building's potable water connection. These will typically be sized at DN32 or DN50, depending on flow demands. RPZ devices are selected for their proven ability to protect against both backpressure and back-siphonage in medium to high hazard situations and will be installed in accessible, drained, above-ground locations in accordance with manufacturer and council guidelines.

This approach ensures each building is appropriately protected based on its use and risk profile, without introducing unnecessary pressure loss or maintenance burden across the wider network.

4.3.5 Pressure Loss Assessment for Boundary BFP (DN250)

A comprehensive pressure loss assessment was undertaken to determine the total head loss across the proposed DN250 inline valve assembly, which includes a backflow preventer (RPZ), strainer, flow meter, gate valves, reducers, and bends. The evaluation is based on hydraulic principles and available manufacturer data.

4.3.5.1 Components Assessed

- DN250 Zurn-Wilkins RPZ (Model 375) – headloss interpolated from manufacturer's pressure loss curve.
- DN250 Hydroflow bucket strainer with stainless steel insert – headloss interpolated from a representative pressure loss chart based on typical industry performance.
- DN200 Krohne Optiflux 2300 magnetic flow meter – headloss considered negligible due to streamlined design and minimal internal obstruction.
- AVK resilient seated gate valves – two DN250 and one DN200 valve.
- Flanged reducers – two DN250 to DN200 concentric reducers.
- Bends – four 90° bends and two 45° bends, all DN250.

4.3.5.2 Methodology

1. **Minor Losses Calculation**
   Each fitting was assigned a loss coefficient (K) based on manufacturer specifications or standard engineering references (e.g. CRANE TP-410). The total K = 5.5 accounts for valves, reducers, and bends.
2. **Headloss for RPZ and Strainer**
   Headloss for the RPZ and strainer was interpolated from manufacturer and industry-standard pressure loss curves, respectively, across a range of flow rates.
3. **Flow Meter**
   The DN200 Krohne Optiflux 2300 mag flow meter headloss was assumed negligible and conservatively set to zero.
4. **Calculation Approach**
   Pipe internal diameter was assumed to be 250 mm, giving a pipe cross-sectional area of 0.0491 m^2. Velocity and minor losses were calculated using the standard equation:

   $$h\_L = K * v^2 / 2g$$

   Where:
   - h_L = headloss in metres
   - K = minor loss coefficient
   - v = velocity in m/s
   - g = 9.81 m/s^2

5. **Total Head Loss Curve**
   A full headloss vs. flow rate curve (0–130 L/s) was developed and formatted for use in EPANET as a General Purpose Valve (GPV) curve.

4.3.5.3 Key Design Flow Scenarios

The table below summarises the key design flow scenarios modelled to assess network performance under both typical peak demand and critical fire flow conditions.

Table 3: Key Design Flow Scenarios

Flow Scenario	Flow Rate (L/s)	Total Headloss (m)
Previously Modelled Max Daily Flow	45	6.27
Peak Fire Flow (FW3 + 60% PDF)	77	7.47

4.3.5.4 Headlosses vs Flow

The following table outlines calculated headlosses across key boundary fittings under varying flow conditions. Total headloss has been calculated based on combined losses from all components at each flow rate.

Table 4: Headloss vs Flow For Backflow at Boundary

	Fittings			DN250 Zurn-Wilkins RPZ (Model 375)	DN250 Hydroflow bucket strainer with stainless steel insert	DN200 Krohne Optiflux 2300 mag flow meter	
Flow Rate (L/s)	**Velocity (m/s)**	**Headloss (m)**	**K Factor (Total)**	**Headloss (m)**	**Headloss (m)**	**Headloss (m)**	**Total Headloss (m)**
0	0.00	0.00	5.5	0.0	0.00	0.00	0.00
10	0.20	0.01	5.5	6.8	0.01	0.00	6.79
20	0.41	0.05	5.5	6.6	0.06	0.00	6.74
30	0.61	0.10	5.5	6.5	0.12	0.00	6.75
40	0.81	0.19	5.5	6.5	0.17	0.00	6.81
50	1.02	0.29	5.5	6.4	0.23	0.00	6.93
60	1.22	0.42	5.5	6.4	0.27	0.00	7.10
70	1.43	0.57	5.5	6.5	0.31	0.00	7.34
80	1.63	0.74	5.5	6.6	0.34	0.00	7.64
90	1.83	0.94	5.5	6.7	0.40	0.00	8.04
100	2.04	1.16	5.5	6.9	0.49	0.00	8.56
110	2.24	1.41	5.5	7.2	0.60	0.00	9.18
120	2.44	1.68	5.5	7.5	0.71	0.00	9.89
130	2.65	1.97	5.5	7.9	0.82	0.00	10.69

4.4 Network Pressures and Modelling

4.4.1.1 EPANET Modelling Outcomes

Hydraulic modelling was undertaken by CKL to assess whether the proposed Screen Hub development could be adequately serviced under future (year 2058) water demand conditions. This modelling utilised the accepted residual pressure at the development boundary of 80.2 m, as established by Mott MacDonald in 2018 (**Appendix 6**) and referenced in all subsequent consents across the Waterfall Park development.

The EPANET model accounted for:

- 60% of peak daily water demand, consistent with anticipated operational loads (Consented Flows to Date - 33.5 l/s x 60% - Table 2),
- A firefighting demand of 25 L/s, and
- A sprinkler tank infill draw-off of 16.6 L/s, which is flow restricted and drawn directly from the network.

- We have also modelled a Fire Flow Scenario with 60% of peak daily water demand, (Previously Modelled Flows (Mott MacDonald 2018 – 45l/s x 60% - Table 2)

The modelling results confirm that (Year 2058 Consented Flows to Date – 33.5 l/s x 60% + FW2 + Sprinkler 16.6 l/s) (Fire Event in the Screen Hub Facility):

- The minimum residual pressure within the Screen Hub facility is 42.50 m, and
- A broader minimum of 50.61 m occurs at Building F (Highest Point in internal network) in the Northbrook Arrowtown precinct.

The modelling results confirm that (Year 2058 Maximum Modelled Flows – 45 l/s x 60% + FW2 + Sprinkler 16.6 l/s) (Fire Event in the Screen Hub Facility):

- The minimum residual pressure within the Screen Hub facility is 41.66 m, and
- A broader minimum of 49.77 m occurs at Building F (Highest Point in internal network) in the Northbrook Arrowtown precinct.

The modelling results confirm that (Year 2058 Maximum Modelled Flows – 45 l/s x 60% + FW3 50 l/s) (Fire Event in the Ayrburn Domain):

- The minimum residual pressure within the Screen Hub facility is 58.05 m, and
- A broader minimum of 48.97 m occurs at Building F (Highest Point in internal network) in the Northbrook Arrowtown precinct.

The development's Level of Service (LOS) requirement during a fire flow scenario is a minimum of 10 m head at building outlets. To maintain this, a minimum residual pressure of 36 m is required at the connection point to the existing 225 mm network main — ensuring adequate supply to elevated or distant structures during peak demand events.

See **Appendix 2** for results from EPANET Model and **Figure 7** for a snapshot of residual pressures and network velocities within the Screen Hub Facilities.

Figure 6: Screen Hub Proposed Water Reticulation Network (Refer to Appendix 1).

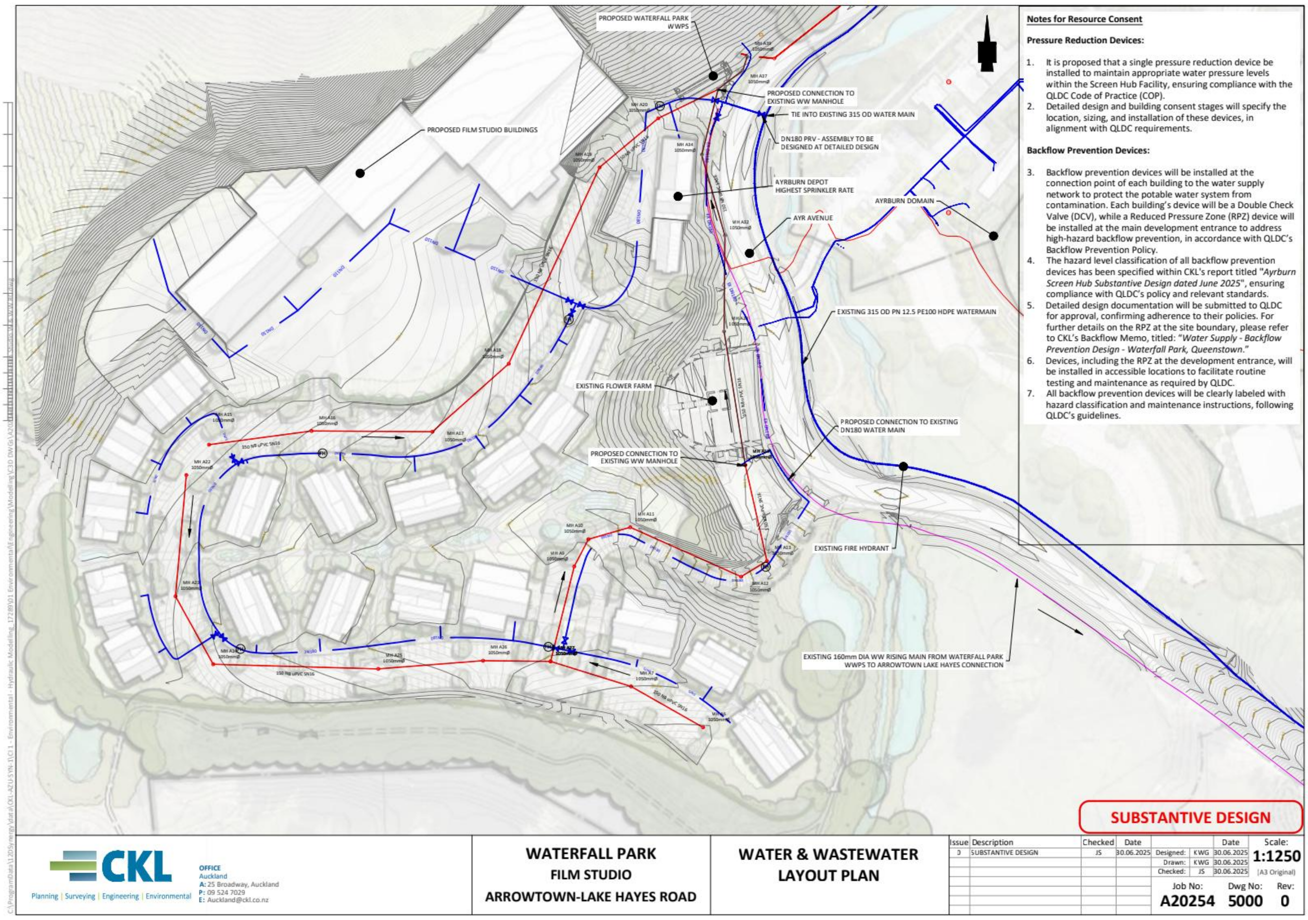
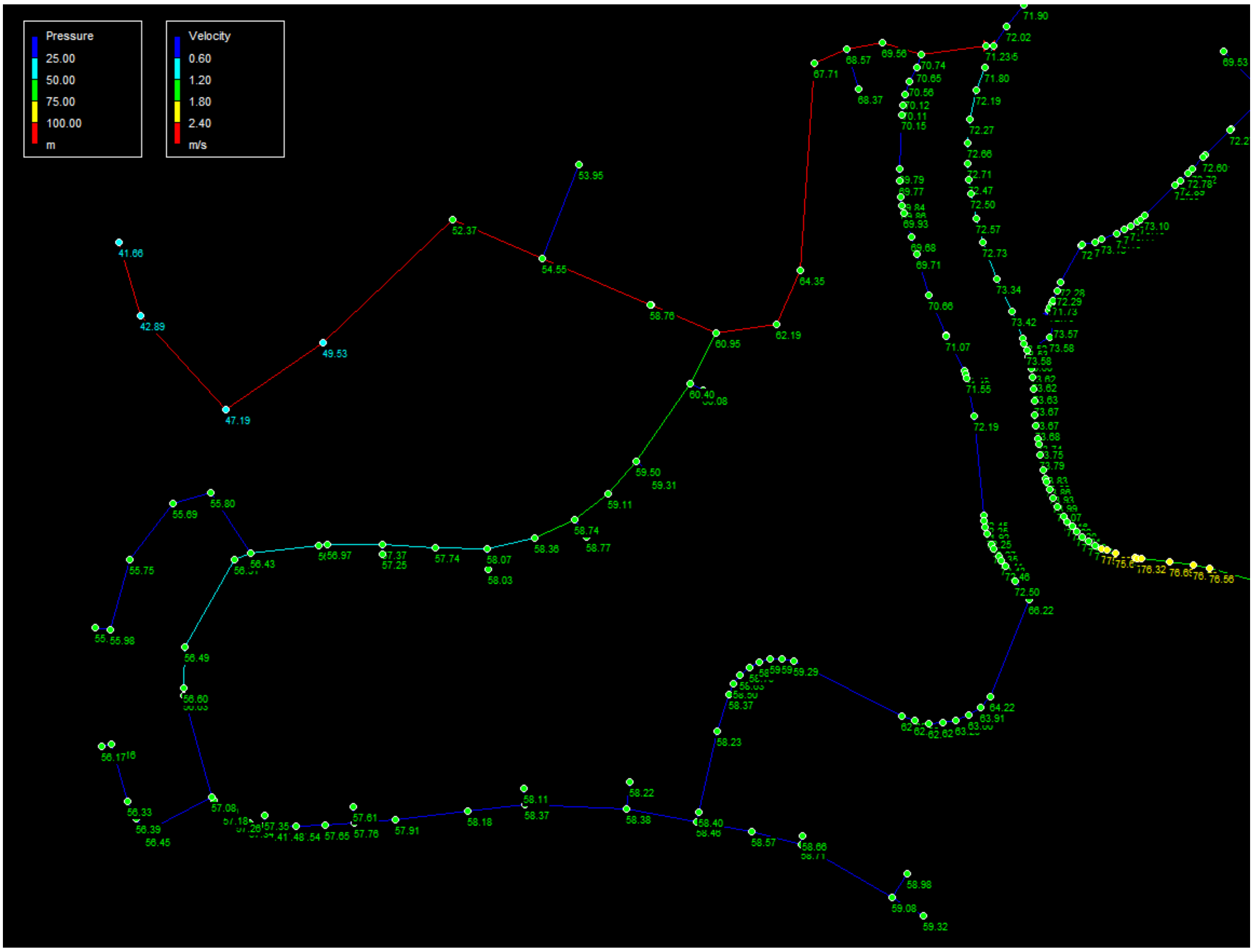


Figure 7: Screen Hub Steady State Hydraulic Analysis with Pipe Velocities And Residual Pressures- 60% Peak Flow (Modelled Flows Mott Mac - 2018) + FW2 + Sprinkler- Year 2058



4.5 Discussion on Pressure Trends and Modelling Validity

Pressure testing conducted in 2023 confirms that the current residual pressure at the development boundary is approximately 94 m head, which is significantly above the minimum requirement. While this surplus allows for healthy operational margins, it also necessitates pressure reduction within the internal network to protect downstream components, maintain safe working pressures, and minimise water losses. Pressure-reducing valves (PRVs) have been incorporated into the design accordingly.

It is acknowledged that network pressure will gradually decline over time as new developments connect within the broader network. However, for the residual pressure at the Arrowtown-Lake Hayes/Speargrass Flat Road connection point (Indicated in Figure 3) to fall below 36 m, a drop of nearly 60 m from current measured levels would be required — an unrealistic decline without substantial unplanned growth or systemic degradation.

The accepted residual pressure of 80.2 m (based on Mott Macdonald modelling based on the 2058 projections) has formed the basis for all Waterfall Park consents to date. The total development demand has remained capped at 45 L/s excluding emergency fire flow, and all modelling to date, including for the Screen Hub, has adhered to this constraint.

The modelling and pressure testing undertaken to date confirm that the proposed development can be reliably serviced by the existing network, with significant pressure headroom remaining. Refer to **Appendix 5** for extract on pressure testing undertaken in 2023.

4.6 Pressure Reduction Requirements

4.6.1 Existing Pressures

Static head pressures in the vicinity of the Waterfall Park development are elevated due to the site's topography and network elevation. Pressure testing conducted in 2023 recorded static pressures of approximately 94 m head at the development connection point. These pressures are significantly above the Queenstown Lakes District Council’s (QLDC) maximum recommended limit of 90 m, beyond which network and plumbing systems may be at risk of damage.

A pressure reducing valve (PRV) has previously been installed at the entrance to the Ayrburn Domain to manage elevated pressures under a separate, earlier consent. This establishes a precedent for localised pressure control to comply with QLDC’s pressure management requirements.

4.6.2 Proposed Pressure Management for Waterfall Park Developments

As part of the Waterfall Park development, including the proposed 3-Lot subdivision and the proposed Screen Hub facility, further pressure reduction will be required to protect the internal network and connected buildings.

Given the current static pressures exceeding 90 m head, pressure reducing measures will be necessary at multiple points:

- For the Screen Hub facility, a PRV will be installed at the connection point to the development’s internal 315 mm OD supply line located at the entrance to the Screen Hub. This will regulate pressure for the entire facility and prevent excessive pressures and minimise water losses under both daily and fire flow conditions. Additional PRVs may also be required within the facility to manage pressure zones, depending on final building layouts and fixture ratings.

These PRVs will be modelled to limit residual pressures to approximately 750 kPa (~75 m head), in line with QLDC expectations. This staged pressure control approach ensures:

- Compliance with the QLDC Land Development and Subdivision Code of Practice;
- Protection of internal pipework, fittings, and fixtures;
- Flexibility to accommodate future internal changes during detailed design.

The precise placement and pressure settings of all PRVs will be finalised at the detailed design stage.

5 Wastewater

5.1 General Description

The wastewater solution for the proposed development will be directed to the Waterfall Park Wastewater Pump Station, which will then pump to the existing wastewater main in Arrowtown-Lake Hayes Road.

5.1.1 Existing Wastewater Network (Overall Strategy)

Figure 7 illustrates the general location of key components of the existing wastewater reticulation system.

Summary of Key Components:

- **Waterfall Park Wastewater Pump Station (WPWWPS):** Once commissioned, this pump station will accommodate wastewater from the broader Waterfall Park development site, including proposed Film Hub, via a 160 OD PE rising main to the Lake Hayes–Arrowtown gravity main.
- **Ayrburn Wastewater:** Currently conveyed through a 63 OD PE pipe, this flow connects to the existing 160 OD PE rising main. In the future, Ayrburn's wastewater will be redirected directly to the WPWWPS (once built and commissioned). Once this occurs, the existing 63 OD rising main will be repurposed to convey wastewater from the proposed Haybarn pump station.
- **Haybarn Wastewater:** The proposed Haybarn pump station will pump wastewater from the consented Haybarn Venue once constructed. As described above, once the Ayrburn flow is redirected, the 63 OD rising main will be available to serve the Haybarn pump station and discharge into the same 160 OD PE rising main.
- **3 lot sub**-division at the entrance to the development – these lots will be served by grinder pumps (with emergency storage) to convey wastewater directly to a new 63OD rising main.

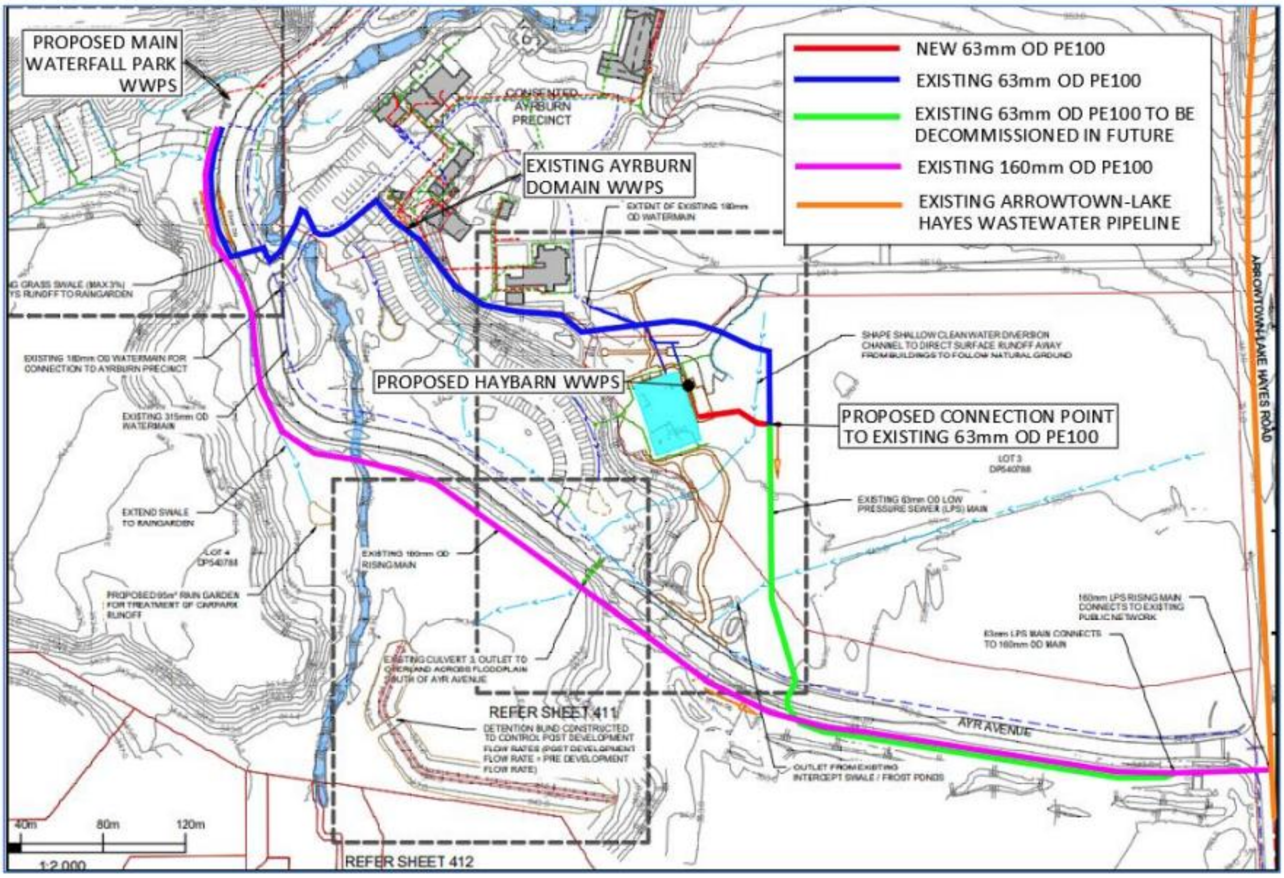
Note - The total **consented discharge limit from the entire Waterfall Park development site is 23.4 L/s**. This includes all pump stations operating within the development. As such, the pump stations will be synchronised and managed to ensure that this cumulative discharge limit is not exceeded at any time.

5.1.2 Proposed Wastewater Infrastructure

The wastewater network for the proposed Screen Hub Facilities will consist of a gravity system designed to collect and convey flows through a 150 NB uPVC SN16 gravity network. This network will discharge into an existing gravity main located near the Flower Farm, as shown in **Figure 6**.

To ensure the overall discharge from the development does not exceed the modelled 23.4 L/s limit, all pump stations will be configured to operate in coordination with the WPWWPS. This will be facilitated by a telemetry or control system, provided by the pump supplier, allowing pump operation to occur only when the WPWWPS is inactive or operating below threshold.

Figure 7: Existing Wastewater Network.



5.2 Assessment of Wastewater Flows

The wastewater flows for the proposed Screen Hub have been assessed using a combination of QLDC standards, NZS 4404:2010, NZS 1547:2012, and BRANZ guidelines. The assessment accounts for residential accommodation, film facilities, public amenities, and operational staff. Key assumptions and results are summarised below.

4.2.1 Design Assumptions

1. **Occupancy**
   Each accommodation unit is assumed to house two people per room. Additional staffing requirements are included based on facility functions (e.g., housekeeping, spa, offices, etc.).

2. **Wastewater Generation Rates**
   Wastewater generation per capita was estimated based on activity type:
   - Accommodation/Residential Guests: 250 L/p/d (QLDC CoP)
   - Non-resident Staff (studio, admin, depot, etc.): 30 L/p/d (NZS 1547 Table H4)
   - Spa/Gym/Pool Users: 50 L/p/d (BRANZ SR159, Table 7)
   - Depot Visitors: 20–30 L/p/d depending on use (NZS 1547 Table H4)

3. **Operational Strategy**

   It is assumed that all accommodation occupants will also be working at the film facility, and therefore, not generating duplicated flows across use categories. To account for any additional outside visitors or external workers, a 20% contingency has been applied across the total wastewater demand.

4. **Peak Flow Factors**
    - Peak Dry Weather Flow (PDWF): Based on a factor of ~2 × ADWF
    - Peak Wet Weather Flow (PWWF): Set at 5 × ADWF in accordance with QLDC standards and conservative industry practice
5. **Infrastructure Integration**
    - The development will discharge to the Waterfall Park Wastewater Pump Station (WPWWPS).
    - Wastewater from the 3-lot subdivision will be managed using grinder pumps with a controlled discharge strategy to ensure the combined flow remains within consented limits.

Table 5: Assessment of Wastewater Flows from The Screen Hub.

Unit Type	No. of Facilities	Max No. of People Facility / Day	Daily WW Demand (L/p/d)	Daily WW Demand (m^3/d)	Daily ave. WW Demand (L/s)	Peak Dry weather Flow (l/s)	Peak wet weather flow (l/s)	Comments/Assumptions
Screen Hub - 202 Accommodation units								
FILM FACILITY								
Staff	1	400	30	12.00	0.14	0.28	0.69	Wastewater Demand - (NZS 1547 Table H4 - Non-resident Staff) Facility. Assumed all accommodation occupants will be working at the Film Facility. This is just staff. Outside visitors allowed for below
Visitors	1	80	30	2.40	0.03	0.06	0.14	Allowed 20% of staff numbers to allow for outside visitors
E1 - LOUNGE, GYM & ACCOMMODATION								
- Accommodation	4	2	250	2.00	0.02	0.05	0.12	Wastewater Demand - QLDC COP
- Gym	1	35	50	1.75	0.02	0.04	0.10	BRANZ SR159 - Table 7 - Assume 50 l/p/d for one shower
- Spa	1	25	50	1.25	0.01	0.03	0.07	BRANZ SR159 - Table 7 - Assume 50 l/p/d for one shower/top up
- Pool	1	25	50	1.25	0.01	0.03	0.07	BRANZ SR159 - Table 7 - Assume 50 l/p/d for one shower/top up
- Staff	1	8	30	0.24	0.00	0.01	0.01	Wastewater Demand - (NZS 1547 Table H4 - Non-resident Staff)

Unit Type	No. of Facilities	Max No. of People Facility / Day	Daily WW Demand (L/p/d)	Daily WW Demand (m^3/d)	Daily ave. WW Demand (L/s)	Peak Dry weather Flow (l/s)	Peak wet weather flow (l/s)	Comments/Assumptions
B.1 FILM OFFICES or ACCOMMODATION	20	2	250	10.00	0.12	0.23	0.58	Assumed highest demand would be when facilities are used as accommodation. Water Demand - NZS 4404:2010 - 6.3.5.6 - Assume average of 2 people per room
C1 - ACCOMMODATION. TYPE 1	16	2	250	8.00	0.09	0.19	0.46	Wastewater Demand - QLDC COP - Assume average of 2 people per room
C2 - ACCOMMODATION TYPE 1	16	2	250	8.00	0.09	0.19	0.46	Wastewater Demand - QLDC COP - Assume average of 2 people per room
C3 - ACCOMMODATION TYPE 1	16	2	250	8.00	0.09	0.19	0.46	Wastewater Demand - QLDC COP - Assume average of 2 people per room
C4 - ACCOMMODATION TYPE 1	16	2	250	8.00	0.09	0.19	0.46	Wastewater Demand - QLDC COP - Assume average of 2 people per room
C5 - ACCOMMODATION TYPE 1	16	2	250	8.00	0.09	0.19	0.46	Wastewater Demand - QLDC COP - Assume average of 2 people per room
C6 - ACCOMMODATION TYPE 1	12	2	250	6.00	0.07	0.14	0.35	Wastewater Demand - QLDC COP - Assume average of 2 people per room
C7 - ACCOMMODATION TYPE 3	30	2	250	15.00	0.17	0.35	0.87	Wastewater Demand - QLDC COP - Assume average of 2 people per room
F - ACCOMMODATION TYPE 4	15	2	250	7.50	0.09	0.17	0.43	Wastewater Demand - QLDC COP - Assume average of 2 people per room
B2 - FILM OFFICES or ACCOMMODATION	32	2	250	16.00	0.19	0.37	0.93	Assumed highest demand would be when facilities are used as accommodation. Wastewater Demand - NZS 4404:2010 - 6.3.5.6 - Assume average of 2 people per room
C8 - ACCOMMODATION VIP	9	2	250	4.50	0.05	0.10	0.26	Wastewater Demand - QLDC COP - Assume average of 2 people per room
ACCOMODATION STAFF	1	40	30	1.21	0.01	0.03	0.07	Assume 1 Staff per 5 rooms (Full Service). Total 202 rooms. This covers Housekeeping, Reception, Room service (if applicable, Maintenance, Night staff, Shared admin/HR/laundry support. Wastewater Demand - (NZS 1547 Table H4 - Non-resident Staff)

Unit Type	No. of Facilities	Max No. of People Facility / Day	Daily WW Demand (L/p/d)	Daily WW Demand (m³/d)	Daily ave. WW Demand (L/s)	Peak Dry weather Flow (l/s)	Peak wet weather flow (l/s)	Comments/Assumptions
E - RECEPTION & OFFICE								
Guests	1	300	30	9.00	0.10	0.21	0.52	L/d from ASNZ1547:2012 Table H4.
Staff	1	8	30	0.24	0.00	0.01	0.01	
Total Screen Hub and Accommodation		**1274**		**130.34**	**1.51**	**3.02**	**7.54**	**Sum of all hotels + 20% for outside workers.**
D - DEPOT	0	0	0	0	0	0	0.00	
Depot staff	1	3	30	0.09	0.00	0.00	0.01	L/d from ASNZ1547:2012 Table H4.
Depot visitors	1	30	20	0.60	0.01	0.01	0.03	
TOTALS								
Total				**131.03**	**1.52**	**3.03**	**7.58**	

5.2.1 Impact on Overall Flows

The effect of the proposed Screen Hub yields an increase in the peak wet weather flow of 6.5 L/s from 11.3 L/s to 17.8 L/s.

The Waterfall Park development area is modelled for a Peak Wet Weather Flow (PWFW) of 23.4 l/s as per **Table 6** below. Even after the proposed Screen Hub and 3 lot proposed subdivision, there is still future (spare) system capacity remaining of 5.56 l/s. Further wastewater modelling of the development is therefore not considered necessary and the conclusion that the existing infrastructure has available capacity for the current, 2028 and 2058 design horizons remain unchanged.

Table 6: Updated Waterfall Park Development Wastewater Flows[3].

Development Area	Modelled (HAL January 2019)		Proposed Development	
	Peak Daily Volume (m³)	PWWF (l/s)	Peak Daily Volume (m³)	PWWF (l/s)
Waterfall Park & Ayrburn Domain				
Waterfall Park Hotel	247.4	14.3	-	-
Northbrook Arrowtown	-	-	98.15	5.68
Ayrburn Domain (Consented as part of RM 180584)	-	-	18.8	1.1
Ayrburn Domain change of use buildings	-	-	2.6	0.2
Ayrburn Domain Extension (RM211193)			32.5	1.9
Ayrburn Farm - No longer proposed Residential Development	150	9	-	-
Barrel Room (RM220829)**			3.3	0.19
Bakehouse (RM220874)**			4.2	0.24

[3] *Source: "Water Modelling – Waterfall Park", dated 7th July 2023, by CKL*

Development Area	Modelled (HAL January 2019)		Proposed Development	
	Peak Daily Volume (m^3)	PWWF (l/s)	Peak Daily Volume (m^3)	PWWF (l/s)
Haybarn (RM230425)			14.23	0.82
Sub-total (Ayrburn Domain + Waterfall Park)			**173.8**	**10.13**
Screen Hub				
Screen Hub sub-total			**131.03**	**7.58**
3-Lot Subdivision				
3-Lot Subdivision sub-total			**2.25**	**0.13**
TOTALS				
Total: Screen Hub, 3-Lot Subdivision, Ayrburn Domain, Waterfall park	247.4	14.3	307.08	17.8
Future Capacity (Subject to Future RC applications)	-	-	109.14	5.56
Total	**416.2**	**23.4**	**416.2**	**23.4**

5.2.2 Proposed Wastewater Reticulation

Figure 6 depicts the wastewater reticulation for the proposed Screen Hub.

Proposed Solution: installation of gravity reticulation, directing wastewater towards the WPWWPS. Gravity reticulation will generally consist of 150mm DN uPVC SN16 piping laid at grades between 0.58% and a maximum of approximately 9.4%.

5.2.3 Waterfall Park Wastewater Pump Station

The available capacity in the main Waterfall Park Wastewater Pump Station (WPWWPS) has been evaluated based on current and future flow calculations. CKL's calculations indicate a Peak Wet Weather Flow (PWWF) of 17.67 l/s (Excluding the 3-lot subdivision as the grinder pumps will not convey flow to the WPWWPS) and a future spare capacity of 5.73 l/s for the WPWWPS. The WWPS itself has been designed to accommodate a PWWF of 23.4 l/s, which is the maximum consented value. Both the current and future flow assessments demonstrate that the WWPS will operate well within its design limits, confirming that there is sufficient available capacity in the system to accommodate the Screen Hub.

5.2.4 Position on Further Wastewater Modelling

Council has indicated an interest in undertaking additional wastewater network modelling to confirm system capacity. While we understand the value of ongoing assessment of the broader network, we maintain that such modelling should not impact the approval of the Screen Hub development, for the following reasons:

1. **Capacity Already Established in 2018 Modelling**

   Comprehensive wastewater modelling undertaken by Beca in 2018 (and supported by subsequent HAL reporting)(**Appendix 6**) assessed the performance of the downstream network — specifically the 300 mm uPVC trunk main along Lake Hayes–Arrowtown Road — under both current and future growth scenarios up to 2058. This modelling confirmed that the system could accommodate up to 23.4 L/s peak flow and 416.2 m^3/day from the Waterfall Park development area, including future intensification.

2. **Screen Hub Operates Within Modelled Constraints**

   The proposed wastewater flows from the Screen Hub, including recent design updates, remain well within the discharge limits established in the 2018 modelling. No changes are proposed to the discharge location, network route, or peak demand that would trigger a need for further modelling.

3. **Pump Station Design Aligned with Model Outcomes**

   The Waterfall Park Wastewater Pump Station (WPWWPS), which will receive wastewater from the Screen Hub and surrounding developments, was **designed in accordance with the 2018 model outcomes**. It has been consented and approved (RM180584.EA08) for the full 23.4 L/s peak flow and includes 9 hours of emergency storage. The Screen Hub connects directly into this approved infrastructure.

4. **Broader Network Modelling Is Separate and Non-Critical to This Decision**

   While Council may choose to update its broader network model to reflect wider growth or cumulative effects, this exercise is independent of the current development proposal, which remains consistent with earlier modelling parameters and network approvals. The need to update Council's network model should not form a prerequisite for approving this application, especially given the established design envelope is not being exceeded.

5. **Precedent of Prior Consents**

   Multiple consents in the Waterfall Park and Ayrburn domains have proceeded on the basis of the 2018 modelling. Requiring additional modelling at this stage — without a change in discharge volumes or system configuration — would introduce inconsistency into Council's consent framework and undermine confidence in the modelling-led approach that has guided development in the area to date.

6 Conclusion

This report has demonstrated that the proposed Screen Hub development can be adequately serviced by the existing and consented water supply and wastewater infrastructure within the Waterfall Park development.

The available residual head in the current system has been validated through both modelling and field testing, with static pressures exceeding 90m. Pressure reduction measures, including PRVs at key connection points, have been incorporated to mitigate elevated pressures and protect internal infrastructure. Hydraulic modelling undertaken using EPANET confirms that pressures across the network remain within acceptable operational and firefighting thresholds, both now and under future 2058 design scenarios. This therefore confirms that the development can be reliably serviced with an acceptable level of service.

For wastewater, the total discharge volumes and peak flows from the development remain well within the modelled maximum limits of 23.4 L/s and 416.2 m^3/day, as established through the 2018 Beca modelling and incorporated into the consented design of the Waterfall Park Wastewater Pump Station. All wastewater flows from the Screen Hub will be directed to this pump station. Pumped flows from the Haybarn and 3-lot subdivision will be synchronised with the WFPWWPS to ensure that the overall discharge is in compliance with these limits.

While we acknowledge QLDC's desire to update its broader infrastructure modelling, this report reaffirms that the proposed development operates fully within the previously established and previously modelled infrastructure parameters. As such, we maintain that further modelling of the broader network should not be a prerequisite to approval of this application.

The infrastructure design and modelling outputs presented herein provide Council with the necessary assurance that the Screen Hub development will not compromise network performance and can be accommodated within the existing, approved water and wastewater servicing strategy.

7 Recommendations

7.1 Water

Pressure Reduction Measures:

Due to elevated residual pressures exceeding 90 m during low-demand periods, it is recommended that Pressure Reducing Valves (PRVs) be installed at key connection points and/or points of use within the Screen Hub. This is necessary to protect internal pipework, ensure user safety, and preserve long-term asset integrity. Final PRV sizing and placement will be confirmed during detailed design.

Fire Water Compliance:

Fire hydrant locations and configurations must meet the requirements of SNZ PAS 4509:2008. Flow testing and hydrant placement should be confirmed at the detailed design stage to ensure adequate firefighting coverage and compliance with FW2 standards.

Sprinkler Infill Management:

The sprinkler system infill demand for all facilities must be flow-restricted to a maximum of **16.6 L/s**, consistent with hydraulic modelling assumptions. Flow-limiting devices or control valves should be incorporated at the tank inlet to ensure this limit is not exceeded during a fire event.

Backflow Prevention:

To prevent cross-contamination of the potable supply network:

- **At the boundary to the broader Waterfall Park Development site:** A Reduced Pressure Zone (RPZ) assembly at the primary point of connection to the existing council main is currently underway under a separate consent process. Refer to CKL's backflow design. This device has been sized and located to accommodate the total development demand while maintaining sufficient downstream pressure.
- **Within the Screen Hub:** Individual RPZ devices or suitable alternatives should be installed at each building with a high or medium hazard rating (e.g., accommodation, spa facilities, depot). Final device type and placement should be confirmed at detailed design stage in accordance with G12/G13 and QLDC requirements.

7.2 Wastewater

Gravity Reticulation Network:

Construct a gravity wastewater network using DN 150 mm uPVC SN16 pipes laid on grades ranging from 0.58% to a maximum of 9.4%, in accordance with QLDC and NZS standards.

Connection to Existing Infrastructure:

The wastewater reticulation is discharge into the existing gravity main near the proposed flower farm building, ultimately conveying flows to the Waterfall Park Wastewater Pump Station (WPWWPS).

Manhole Design:

The location and requirement for drop manholes or other vertical transitions will be evaluated and confirmed during the detailed design phase to ensure proper hydraulic performance and access for maintenance.

Appendix 1 Drawings

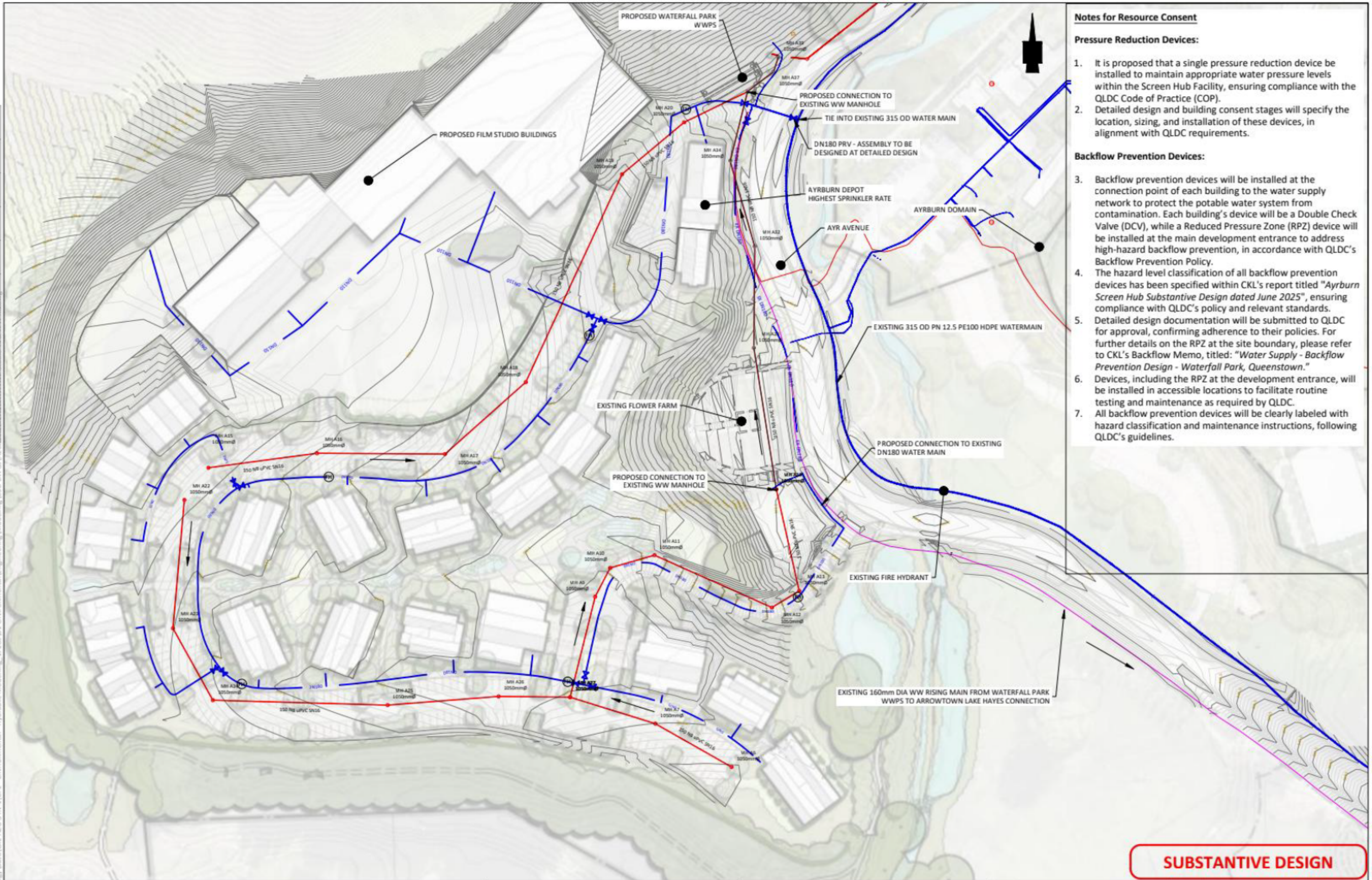
Ayrburn Screen Hub Drawings

- Ayrburn Screen Hub – Masterplan. Dated the June 2025

Proposed Water and Wastewater Reticulation Plans

- Proposed Water & Wastewater Layout Plan – Sheet 5000 & 5001

- **A** — **Filming studios**
  14m external height clear span building for set construction and filming.
- **B** — **Workshop and workroom spaces**
  Flexible spaces for construction, fabrication, wardrobe, paint and tech departments such as Grip, Lighting, Rigging and Camera etc.
- **C** — **'Backlot'**
  Flexible hardstand area for tech trucks, catering, outdoor sets, storage and carparking as required.
- **D** — **Controlled entries**
  two entries so that the facility can be used for two smaller productions working at the same time.
- **E** — **Offices and private actor spaces and dressing rooms**
  To be used as production and department offices. When not in use for a production, these will be able to convert to double and single visitor accommodation suites for the open market.
- **F** — **Crew or visitor accommodation**
  to be used for accommodating crew. When not in use for a production these will be used for visitor accommodation.
- **G** — **Christine's Hill**
  Retained as open pasture browntop grass and grazed by sheep and kept free of invasive weeds. Riparian planting areas to be fenced.
- **H** — **Existing Countryside Trail**
  Public trail largely via easement over the applicant's land on Christines Hill and in road reserve on the flat land.
- **I** — **Extension of existing spur**
  To mitigate landscape effects from the trail up Christines Hill and screen larger studio buildings from view.
- **J** — **Existing conifer shelter belt**
  To be retained as required by the Ayrburn Structure Plan.
- **K** — **Existing mature vegetation.**
  To be retained.
- **L** — **Native riparian planting**
  To the ephemeral watercourse.
- **M** — **Grapevines**
  To bookend the site and provide an open space buffer as per that between Arrowtown - Lake Hayes Road and the site.
- **N** — **Ayrburn Depot**
  Deliveries and ancillary function to the Ayrburn hospitality precinct. This will replace / formalise all the temporary storage containers, portacom staff rooms and offices scattered around the site.
- **O** — **Engineered Wetlands / detention ponds**
  To ensure water entering Mill Creek is sufficiently treated.
- **P** — **Ayrburn Hospitality Precinct (existing)**
  5 Restaurants, 7 bars, butcher, retail, bakery, music events area ice creamery, children's playgrounds, wedding venue and botanic garden including a flower farm.
- **Q** — **Northbrook Retirement and Hotel**
  170 retirement units including 23 hospital grade care suites, clubhouse, gym pool and spa. An 18 room boutique Hotel with a 120 pax event space.
- **R** — **Reception & Breakfast area**
  For crew/ visitor accommodation
- **S** — **Gym / wellness / Screening & VIP lounge**
  For crew / visitor accommodation
- **U** — **Productive Garden**
- **V** — **Mill Creek**
- **W** — **Proposed Mill Creek Sediment Trap**
  50x12m serviceable in line sediment trap.
- **X** — **2.5m high Hedge**
  and solid timber fence
- **Y** — **Proposed public trails**
  Refer public trails plan



Notes for Resource Consent

Pressure Reduction Devices:

1. It is proposed that a single pressure reduction device be installed to maintain appropriate water pressure levels within the Screen Hub Facility, ensuring compliance with the QLDC Code of Practice (COP).
2. Detailed design and building consent stages will specify the location, sizing, and installation of these devices, in alignment with QLDC requirements.

Backflow Prevention Devices:

3. Backflow prevention devices will be installed at the connection point of each building to the water supply network to protect the potable water system from contamination. Each building's device will be a Double Check Valve (DCV), while a Reduced Pressure Zone (RPZ) device will be installed at the main development entrance to address high-hazard backflow prevention, in accordance with QLDC's Backflow Prevention Policy.
4. The hazard level classification of all backflow prevention devices has been specified within CKL's report titled "*Ayrburn Screen Hub Substantive Design dated June 2025*", ensuring compliance with QLDC's policy and relevant standards.
5. Detailed design documentation will be submitted to QLDC for approval, confirming adherence to their policies. For further details on the RPZ at the site boundary, please refer to CKL's Backflow Memo, titled: "*Water Supply - Backflow Prevention Design - Waterfall Park, Queenstown.*"
6. Devices, including the RPZ at the development entrance, will be installed in accessible locations to facilitate routine testing and maintenance as required by QLDC.
7. All backflow prevention devices will be clearly labeled with hazard classification and maintenance instructions, following QLDC's guidelines.

SUBSTANTIVE DESIGN

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WATERFALL PARK
FILM STUDIO
ARROWTOWN-LAKE HAYES ROAD

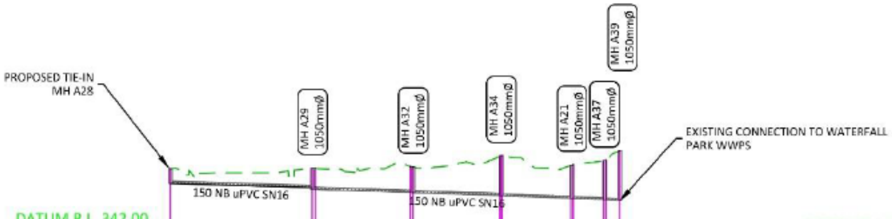
WATER & WASTEWATER LAYOUT PLAN

Issue	Description	Checked	Date
0	SUBSTANTIVE DESIGN	JS	30.06.2025

		Date
Designed:	KWG	30.06.2025
Drawn:	KWG	30.06.2025
Checked:	JS	30.06.2025

Scale: 1:1250 (A3 Original)

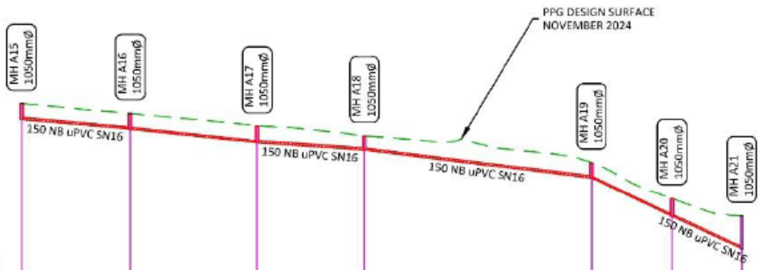
Job No: A20254 | Dwg No: 5000 | Rev: 0



DATUM R.L. 342.00

DEPTH TO INVERT	1.11		1.58		1.94		3.01				2.97		3.72
LID LEVEL	346.55		346.58		346.69		347.52				347.17		347.87
INVERT LEVEL	345.44		345.12 345.00		344.78 344.74		344.55 344.51		344.34 344.31		344.23 [illegible]		[illegible]
PIPE GRADE		0.600% 1:166.6		0.581% 1:172.2		0.589% 1:169.7		0.638% 1:156.7		0.59[illegible] 1:168.[illegible]		[illegible]06% [illegible]10.4	
CHAINAGE	0.00	Pipe=53.18	53.18	Pipe=37.72	90.90	Pipe=33.08	123.99	Pipe=26.40		[illegible]	16[illegible].57	[illegible].68	16[illegible]29

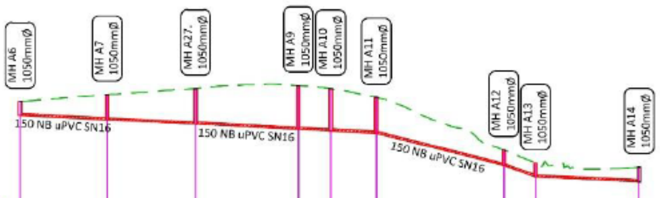
LONGITUDINAL SECTION FOR Alignment - Flower Farm Ex WW Line



DATUM R.L. 342.00

DEPTH TO INVERT	1.20		1.18		1.24		1.07		1.17		1.32		2.52
LID LEVEL	355.21		354.48		353.51		352.79		350.79		348.10		346.82
INVERT LEVEL	354.01		353.30 353.30		352.28 352.28		351.72 351.72		349.61 349.61		346.78 346.78		344.34
PIPE GRADE		1.755% 1:57.0		2.142% 1:46.7		1.387% 1:72.1		2.480% 1:40.3		9.417% 1:10.6		9.343% 1:10.7	
CHAINAGE	0.00	Pipe=40.65	40.65	Pipe=47.49	88.14	Pipe=40.17	128.31	Pipe=85.04	213.35	Pipe=30.09	243.43	Pipe=26.14	269.57

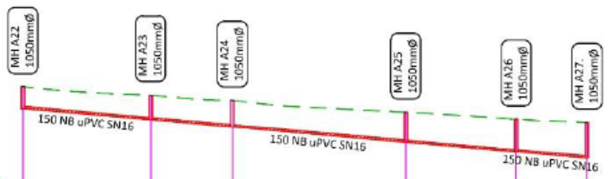
LONGITUDINAL SECTION FOR Alignment - WW Line B



DATUM R.L. 343.00

DEPTH TO INVERT	1.02		1.89		2.67		3.30		3.18		2.69		1.17		1.04		1.11
LID LEVEL	351.47		352.00		352.45		352.68		352.45		351.78		347.83		346.85		346.55
INVERT LEVEL	350.45		350.10 350.10		349.78 349.78		349.38 349.38		349.27 349.27		349.09 349.09		346.67 346.67		345.81 345.81		345.44
PIPE GRADE		1.050% 1:95.3		0.980% 1:102.0		1.045% 1:95.7		0.925% 1:108.1		1.006% 1:99.4		5.084% 1:19.7		7.270% 1:13.8		0.945% 1:105.8	
CHAINAGE	0.00	Pipe=32.56	32.56	Pipe=33.10	65.66	Pipe=38.46	10[illegible]	Pipe=1[illegible]	11[illegible].16	Pipe=17.09	13[illegible].25	Pipe=47.71	18[illegible]	Pipe=1[illegible].86	19[illegible].82	Pipe=38.69	231.51

LONGITUDINAL SECTION FOR Alignment - WW A Line



DATUM R.L. 347.00

DEPTH TO INVERT	1.64		1.86		2.00		2.25		2.44		2.67
LID LEVEL	355.14		354.51		354.12		353.22		352.69		352.45
INVERT LEVEL	353.49		352.65 352.65		352.12 352.12		350.97 350.97		350.25 350.25		349.78
PIPE GRADE		1.753% 1:57.0		1.761% 1:56.8		1.765% 1:56.6		1.753% 1:57.0		1.761% 1:56.8	
CHAINAGE	0.00	Pipe=47.86	47.86	Pipe=30.54	78.40	Pipe=64.89	143.29	Pipe=41.32	184.61	Pipe=26.5[illegible]	211.14

LONGITUDINAL SECTION FOR Alignment - WW Line C

SUBSTANTIVE DESIGN

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WATERFALL PARK
FILM STUDIO
ARROWTOWN-LAKE HAYES ROAD

WASTEWATER LONG SECTIONS

Issue	Description	Checked	Date
0	RESOURCE CONSENT	JS	30.06.2025

		Date
Designed:	KWG	30.06.2025
Drawn:	KWG	30.06.2025
Checked:	JS	30.06.2025

Scale: 1:1250 (A3 Original)

Job No: A20254 Dwg No: 5100 Rev: 0

Appendix 2 EPANET Model Output

NODES

	Year 2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s 25 l/s FW2 16.6 l/s Sprinkler			Year 2058_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s 25 l/s FW2 16.6 l/s Sprinkler		Year 2028_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s 25 l/s FW2 16.6 l/s Sprinkler		Year 2028_Fire Flow Analysis_Steady State_Full 60% x 45 l/s 25 l/s FW2 16.6 l/s Sprinkler			Year 2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s 50 l/s Ayrburn Domain	
	Elevation	Demand	Pressure	Demand	Pressure	Demand	Pressure		Demand	Pressure	Demand	Pressure
Node ID	m	LPS	m	LPS	m	LPS	m	Node ID	LPS	m	LPS	m
Junc n2	349.4636536	0.00	67.6	0.00	68.44	0.00	70.44	Junc n2	0.00	69.6	0.00	66.8
Junc n3	349.4885559	0.00	67.58	0.00	68.42	0.00	70.42	Junc n3	0.00	69.58	0.00	66.77
Junc n4	349.4424744	0.00	67.62	0.00	68.46	0.00	70.46	Junc n4	0.00	69.63	0.00	66.82
Junc n5	349.4387512	0.00	67.63	0.00	68.47	0.00	70.47	Junc n5	0.00	69.63	0.00	66.83
Junc FH(CH805)	349.1653137	0.00	67.91	0.00	68.75	0.00	70.75	Junc FH(CH805)	0.00	69.91	0.00	67.1
Junc n8	348.8339844	0.00	68.24	0.00	69.08	0.00	71.08	Junc n8	0.00	70.24	0.00	67.44
Junc n9	348.4049988	0.00	68.67	0.00	69.51	0.00	71.51	Junc n9	0.00	70.67	0.00	67.87
Junc n10	347.9075317	0.00	69.17	0.00	70.01	0.00	72.01	Junc n10	0.00	71.17	0.00	68.37
Junc n11	347.2978821	0.00	69.78	0.00	70.62	0.00	72.62	Junc n11	0.00	71.78	0.00	68.98
Junc n12	346.5548401	0.00	70.53	0.00	71.37	0.00	73.37	Junc n12	0.00	72.53	0.00	69.72
Junc n13	346.2035828	0.00	70.88	0.00	71.72	0.00	73.72	Junc n13	0.00	72.88	0.00	70.08
Junc n14	345.7581177	0.00	71.33	0.00	72.17	0.00	74.17	Junc n14	0.00	73.33	0.00	70.52
Junc n15	345.8704529	0.00	71.22	0.00	72.06	0.00	74.06	Junc n15	0.00	73.22	0.00	70.41
Junc n16	345.7558899	0.00	71.33	0.00	72.17	0.00	74.17	Junc n16	0.00	73.33	0.00	70.53
Junc n17	345.7662964	0.00	71.32	0.00	72.16	0.00	74.16	Junc n17	0.00	73.32	0.00	70.52
Junc n18	345.376648	0.00	71.71	0.00	72.55	0.00	74.55	Junc n18	0.00	73.71	0.00	70.91
Junc n19	345.2644959	0.00	71.83	0.00	72.67	0.00	74.67	Junc n19	0.00	73.83	0.00	71.02
Junc n20	345.3989563	0.00	71.69	0.00	72.53	0.00	74.53	Junc n20	0.00	73.69	0.00	70.89
Junc n21	345.2784729	0.00	71.82	0.00	72.65	0.00	74.65	Junc n21	0.00	73.82	0.00	71.01
Junc n22	345.269104	0.00	71.83	0.00	72.67	0.00	74.67	Junc n22	0.00	73.83	0.00	71.02
Junc n23	345.3000488	0.00	71.8	0.00	72.64	0.00	74.64	Junc n23	0.00	73.8	0.00	70.99
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Junc n25	345.0832825	0.00	72.02	0.00	72.86	0.00	74.86	Junc n25	0.00	74.02	0.00	71.22
Junc n26	345.0570679	0.00	72.05	0.00	72.88	0.00	74.88	Junc n26	0.00	74.05	0.00	71.24
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Junc n47	344.9047854	0.00	72.27	0.00	73.1	0.00	75.1	Junc n47	0.00	74.27	0.00	71.4
Junc n48	344.5330738	0.00	72.66	0.00	73.49	0.00	75.49	Junc n48	0.00	74.66	0.00	71.78
Junc n49	344.5094103	0.00	72.71	0.00	73.53	0.00	75.53	Junc n49	0.00	74.71	0.00	71.8
Junc n50	344.7590466	0.00	72.47	0.00	73.29	0.00	75.29	Junc n50	0.00	74.47	0.00	71.55
Junc n51	344.7461486	0.00	72.5	0.00	73.31	0.00	75.31	Junc n51	0.00	74.5	0.00	71.57
Junc n52	344.6956549	0.00	72.57	0.00	73.38	0.00	75.38	Junc n52	0.00	74.57	0.00	71.62
Junc n53	344.5596759	0.00	72.73	0.00	73.54	0.00	75.54	Junc n53	0.00	74.73	0.00	71.76
Junc n54	343.9910484	0.00	73.34	0.00	74.14	0.00	76.14	Junc n54	0.00	75.34	0.00	72.33
Junc n55	343.9456251	0.00	73.42	0.00	74.21	0.00	76.21	Junc n55	0.00	75.42	0.00	72.38
Junc n56	343.8707395	0.00	73.52	0.00	74.31	0.00	76.31	Junc n56	0.00	75.52	0.00	72.46
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Junc n62	343.8196843	0.00	73.63	0.00	74.4	0.00	76.4	Junc n62	0.00	75.63	0.00	72.57
Junc n63	343.7966203	0.00	73.67	0.00	74.44	0.00	76.44	Junc n63	0.00	75.67	0.00	72.61
Junc n64	343.8061764	0.00	73.67	0.00	74.44	0.00	76.44	Junc n64	0.00	75.67	0.00	72.62
Junc n65	343.8167842	0.00	73.68	0.00	74.44	0.00	76.44	Junc n65	0.00	75.68	0.00	72.62
Junc n66	343.7702245	0.00	73.74	0.00	74.5	0.00	76.5	Junc n66	0.00	75.74	0.00	72.69
Junc n67	343.7597078	0.00	73.75	0.00	74.52	0.00	76.52	Junc n67	0.00	75.76	0.00	72.71
Junc n68	343.7405037	0.00	73.79	0.00	74.55	0.00	76.55	Junc n68	0.00	75.79	0.00	72.74
Junc n69	343.7101652	0.00	73.83	0.00	74.59	0.00	76.59	Junc n69	0.00	75.83	0.00	72.79
Junc n70	343.7064754	0.00	73.85	0.00	74.6	0.00	76.6	Junc n70	0.00	75.85	0.00	72.81
Junc n71	343.698229	0.00	73.86	0.00	74.62	0.00	76.62	Junc n71	0.00	75.86	0.00	72.82
Junc n72	343.6421118	0.00	73.93	0.00	74.68	0.00	76.68	Junc n72	0.00	75.93	0.00	72.89
Junc n73	343.5844162	0.00	73.99	0.00	74.75	0.00	76.75	Junc n73	0.00	76	0.00	72.96
Junc n74	343.5209003	0.00	74.07	0.00	74.82	0.00	76.82	Junc n74	0.00	76.07	0.00	73.04
Junc n75	343.4461917	0.00	74.16	0.00	74.9	0.00	76.9	Junc n75	0.00	76.16	0.00	73.13
Junc n76	343.386385	0.00	74.22	0.00	74.97	0.00	76.97	Junc n76	0.00	76.22	0.00	73.2
Junc n77	343.342193	0.00	74.28	0.00	75.02	0.00	77.02	Junc n77	0.00	76.28	0.00	73.26
Junc n78	343.3196458	0.00	74.31	0.00	75.05	0.00	77.05	Junc n78	0.00	76.31	0.00	73.29
Junc n79	343.2550023	0.00	74.38	0.00	75.12	0.00	77.12	Junc n79	0.00	76.38	0.00	73.36
Junc n80	343.0853681	0.00	74.56	0.00	75.3	0.00	77.3	Junc n80	0.00	76.56	0.00	73.54
Junc n81	342.8514169	0.00	74.8	0.00	75.54	0.00	77.54	Junc n81	0.00	76.8	0.00	73.79
Junc n82	342.589308	0.00	75.07	0.00	75.81	0.00	77.81	Junc n82	0.00	77.07	0.00	74.06
Junc n83	342.3805574	0.00	75.29	0.00	76.02	0.00	78.02	Junc n83	0.00	77.29	0.00	74.28
Junc n84	342.0187171	0.00	75.66	0.00	76.39	0.00	78.39	Junc n84	0.00	77.66	0.00	74.65
Junc n85	341.4419309	0.00	76.26	0.00	76.99	0.00	78.99	Junc n85	0.00	78.26	0.00	75.26
Junc n86	341.4360133	0.00	76.27	0.00	77	0.00	79	Junc n86	0.00	78.27	0.00	75.27
Junc n87	341.3916507	0.00	76.32	0.00	77.05	0.00	79.05	Junc n87	0.00	78.32	0.00	75.32
Junc FH(CH460)	341.0472093	0.00	76.69	0.00	77.42	0.00	79.42	Junc FH(CH460)	0.00	78.69	0.00	75.7
Junc n89	341.0356783	0.00	76.73	0.00	77.45	0.00	79.45	Junc n89	0.00	78.73	0.00	75.75
Junc n90	341.2326448	0.00	76.56	0.00	77.27	0.00	79.27	Junc n90	0.00	78.56	0.00	75.58
Junc n91	341.9984001	0.00	75.86	0.00	76.56	0.00	78.56	Junc n91	0.00	77.86	0.00	74.89
Junc n92	342.8782349	0.00	75.01	0.00	75.71	0.00	77.71	Junc n92	0.00	77.01	0.00	74.05
Junc n93	342.1875305	0.00	75.75	0.00	76.44	0.00	78.44	Junc n93	0.00	77.75	0.00	74.81
Junc n94	342.291687	0.00	75.69	0.00	76.37	0.00	78.37	Junc n94	0.00	77.69	0.00	74.75
Junc n95	342.3529663	0.00	75.68	0.00	76.35	0.00	78.35	Junc n95	0.00	77.69	0.00	74.76
Junc n96	342.5151957	0.00	75.56	0.00	76.22	0.00	78.22	Junc n96	0.00	77.56	0.00	74.65
Junc n97	342.5857447	0.00	75.53	0.00	76.19	0.00	78.19	Junc n97	0.00	77.53	0.00	74.63
Junc n98	342.5872231	0.00	75.58	0.00	76.22	0.00	78.22	Junc n98	0.00	77.58	0.00	74.69
Junc n99	342.7431033	0.00	75.47	0.00	76.11	0.00	78.11	Junc n99	0.00	77.47	0.00	74.59
Junc n100	342.7613557	0.00	75.5	0.00	76.13	0.00	78.13	Junc n100	0.00	77.5	0.00	74.63
Junc n101	342.9268199	0.00	75.38	0.00	76	0.00	78	Junc n101	0.00	77.38	0.00	74.52
Junc n102	343.0575547	0.00	75.27	0.00	75.89	0.00	77.89	Junc n102	0.00	77.28	0.00	74.42
Junc n103	343.9247404	0.00	74.44	0.00	75.05	0.00	77.05	Junc n103	0.00	76.44	0.00	73.6
Junc n104	344.834565	0.00	73.57	0.00	74.17	0.00	76.17	Junc n104	0.00	75.57	0.00	72.74
Junc n105	345.910065	0.00	72.54	0.00	73.13	0.00	75.13	Junc n105	0.00	74.54	0.00	71.71
Junc n106	346.39253	0.00	72.09	0.00	72.68	0.00	74.68	Junc n106	0.00	74.09	0.00	71.27
Junc n107	347.1281896	0.00	71.39	0.00	71.98	0.00	73.98	Junc n107	0.00	73.4	0.00	70.59
Junc n108	348.146584	0.00	70.43	0.00	71	0.00	73	Junc n108	0.00	72.43	0.00	69.64
Junc n109	348.9293719	0.00	69.71	0.00	70.27	0.00	72.27	Junc n109	0.00	71.71	0.00	68.93
Junc n110	349.0533877	0.00	69.63	0.00	70.18	0.00	72.18	Junc n110	0.00	71.63	0.00	68.86
Junc n111	349.0021364	0.00	69.76	0.00	70.3	0.00	72.3	Junc n111	0.00	71.76	0.00	69.01
Junc n112	348.9179857	0.00	69.93	0.00	70.46	0.00	72.46	Junc n112	0.00	71.93	0.00	69.21
Junc n113	348.9334706	0.00	69.98	0.00	70.49	0.00	72.49	Junc n113	0.00	71.98	0.00	69.27
Junc n114	348.7982607	0.00	70.18	0.00	70.69	0.00	72.69	Junc n114	0.00	72.18	0.00	69.49
Junc n115	348.7007731	0.00	70.34	0.00	70.83	0.00	72.83	Junc n115	0.00	72.34	0.00	69.66
Junc n116	348.6299825	0.00	70.46	0.00	70.94	0.00	72.94	Junc n116	0.00	72.46	0.00	69.79
Junc n117	348.5789867	0.00	70.55	0.00	71.03	0.00	73.03	Junc n117	0.00	72.55	0.00	69.9
Junc n118	348.5078482	0.00	70.67	0.00	71.14	0.00	73.14	Junc n118	0.00	72.68	0.00	70.03
Junc n119	348.3784849	0.00	70.86	0.00	71.31	0.00	73.31	Junc n119	0.00	72.86	0.00	70.22
Junc n120	348.3791044	0.00	70.9	0.00	71.35	0.00	73.35	Junc n120	0.00	72.9	0.00	70.28
Junc n121	348.3184603	0.00	71.01	0.00	71.45	0.00	73.45	Junc n121	0.00	73.01	0.00	70.4
Junc n122	348.2467263	0.00	71.13	0.00	71.56	0.00	73.56	Junc n122	0.00	73.13	0.00	70.52
Junc n123	348.19241	0.00	71.22	0.00	71.64	0.00	73.64	Junc n123	0.00	73.22	0.00	70.63
Junc n124	348.139152	0.00	71.32	0.00	71.73	0.00	73.73	Junc n124	0.00	73.32	0.00	70.73
Junc n125	348.141122	0.00	71.35	0.00	71.76	0.00	73.76	Junc n125	0.00	73.35	0.00	70.78
Junc n127	348.0386658	0.00	71.49	0.00	71.9	0.00	73.9	Junc n127	0.00	73.49	0.00	70.93
Junc n128	348.0920105	0.00	71.49	0.00	71.89	0.00	73.89	Junc n128	0.00	73.49	0.00	70.94
Junc n129	348.118988	0.00	71.52	0.00	71.9	0.00	73.9	Junc n129	0.00	73.52	0.00	70.98
Junc n130	348.1980591	0.00	78.75	0.00	78.97	0.00	80.97	Junc n130	0.00	80.75	0.00	78.45
Junc n131	348.3204651	0.00	78.64	0.00	78.85	0.00	80.85	Junc n131	0.00	80.64	0.00	78.35
Junc n132	348.5073242	0.00	78.49	0.00	78.7	0.00	80.7	Junc n132	0.00	80.5	0.00	78.21
Junc n133	348.5058899	0.00	78.5	0.00	78.71	0.00	80.71	Junc n133	0.00	80.5	0.00	78.22
Junc n134	348.5324402	0.00	78.53	0.00	78.73	0.00	80.73	Junc n134	0.00	80.53	0.00	78.26
Junc n135	348.3099976	0.00	78.8	0.00	78.99	0.00	80.99	Junc n135	0.00	80.8	0.00	78.54
Junc n136	348.1951599	0.00	78.98	0.00	79.16	0.00	81.16	Junc n136	0.00	80.98	0.00	78.74
Junc n137	348.1723328	0.00	79.06	0.00	79.23	0.00	81.23	Junc n137	0.00	81.06	0.00	78.84
Junc n138	348.1526184	0.00	79.15	0.00	79.31	0.00	81.31	Junc n138	0.00	81.15	0.00	78.94
Junc n139	347.9946899	0.00	79.39	0.00	79.53	0.00	81.53	Junc n139	0.00	81.39	0.00	79.2
Junc n140	347.9443054	0.00	79.53	0.00	79.65	0.00	81.65	Junc n140	0.00	81.53	0.00	79.36
Junc n141	347.7932129	0.00	79.75	0.00	79.87	0.00	81.87	Junc n141	0.00	81.75	0.00	79.6
Junc n142	347.8450317	0.00	79.76	0.00	79.86	0.00	81.86	Junc n142	0.00	81.76	0.00	79.62
Junc n143	347.6789856	0.00	79.96	0.00	80.06	0.00	82.06	Junc n143	0.00	81.96	0.00	79.84
Junc n144	347.803894	0.00	80.01	0.00	80.08	0.00	82.08	Junc n144	0.00	82.01	0.00	79.93
Junc n145	348.1260071	0.00	79.73	0.00	79.79	0.00	81.79	Junc n145	0.00	81.73	0.00	79.65
Junc n146	348.169281	0.00	79.77	0.00	79.81	0.00	81.81	Junc n146	0.00	81.77	0.00	79.71
Junc n147	348.0718994	0.00	79.89	0.00	79.93	0.00	81.93	Junc n147	0.00	81.89	0.00	79.84
Junc n148	347.9364014	0.00	80.09	0.00	80.12	0.00	82.12	Junc n148	0.00	82.09	0.00	80.05
Junc n149	347.7740173	0.00	80.3	0.00	80.32	0.00	82.32	Junc n149	0.00	82.3	0.00	80.27
Junc n150	347.9187622	0.00	80.19	0.00	80.21	0.00	82.21	Junc n150	0.00	82.19	0.00	80.18
Junc n151	347.9094238	0.00	80.21	0.00	80.22	0.00	82.22	Junc n151	0.00	82.21	0.00	80.19
Junc n152	347.8964844	0.00	80.22	0.00	80.23	0.00	82.23	Junc n152	0.00	82.22	0.00	80.21
Junc n153	348.2701111	0.00	79.85	0.00	79.86	0.00	81.86	Junc n153	0.00	81.85	0.00	79.84
Junc n154	347.9817505	0.00	80.18	0.00	80.18	0.00	82.18	Junc n154	0.00	82.18	0.00	80.17
Junc n155	347.98	0.00	80.18	0.00	80.18	0.00	82.18	Junc n155	0.00	82.18	0.00	80.18
Junc DAIRY	344.7944	0.04	72.54	0.04	73.32	0.04	73.97	Junc DAIRY	0.04	73.97	0.04	67.85
Junc n163	345.1033	0.00	72.28	0.00	73.07	0.00	73.71	Junc n163	0.00	73.71	0.00	70.26
Junc n164	344.6085789	0.00	72.77	0.00	73.55	0.00	74.19	Junc n164	0.00	74.19	0.00	70.18
Junc n165	344.5592999	0.00	72.82	0.00	73.6	0.00	74.24	Junc n165	0.00	74.24	0.00	70.2
Junc n166	344.3920162	0.00	72.98	0.00	73.76	0.00	74.41	Junc n166	0.00	74.41	0.00	70.2
Junc n167	344.192697	0.00	73.18	0.00	73.96	0.00	74.6	Junc n167	0.00	74.6	0.00	70.29
Junc n168	344.1869527	0.00	73.18	0.00	73.96	0.00	74.61	Junc n168	0.00	74.61	0.00	70.07
Junc n169	344.2607741	0.00	73.1	0.00	73.89	0.00	74.53	Junc n169	0.00	74.53	0.00	69.88
Junc n170	344.2478111	0.00	73.11	0.00	73.9	0.00	74.54	Junc n170	0.00	74.54	0.00	69.91
Junc n171	344.2496374	0.00	73.11	0.00	73.89	0.00	74.54	Junc n171	0.00	74.54	0.00	69.7
Junc n172	344.2603962	0.00	73.1	0.00	73.88	0.00	74.53	Junc n172	0.00	74.53	0.00	69.63
Junc n173	344.2570392	0.00	73.1	0.00	73.88	0.00	74.53	Junc n173	0.00	74.53	0.00	69.55
Junc n174	344.4594311	0.00	72.89	0.00	73.67	0.00	74.31	Junc n174	0.00	74.31	0.00	68.76
Junc n175	344.4582707	0.00	72.89	0.00	73.67	0.00	74.31	Junc n175	0.00	74.31	0.00	68.68
Junc n176	344.6167084	0.00	72.72	0.00	73.51	0.00	74.15	Junc n176	0.00	74.15	0.00	68.29
Junc n177	344.7340057	0.00	72.6	0.00	73.39	0.00	74.03	Junc n177	0.00	74.03	0.00	67.95
Junc n178	345.0364755	0.00	72.29	0.00	73.07	0.00	73.72	Junc n178	0.00	73.72	0.00	67.1
Junc FH2	345.3397346	0.00	71.98	0.00	72.76	0.00	73.41	Junc FH2	0.00	73.41	16.66	66.31
Junc n180	345.3507536	0.00	71.97	0.00	72.75	0.00	73.39	Junc n180	0.00	73.39	0.00	66.24
Junc n181	345.4423584	0.00	71.87	0.00	72.66	0.00	73.3	Junc n181	0.00	73.3	0.00	66.08
Junc n182	345.4877352	0.00	71.83	0.00	72.61	0.00	73.25	Junc n182	0.00	73.25	0.00	66.01
Junc n183	345.8566708	0.00	71.45	0.00	72.24	0.00	72.88	Junc n183	0.00	72.88	0.00	65.43
Junc n184	345.9172675	0.00	71.39	0.00	72.17	0.00	72.82	Junc n184	0.00	72.82	0.00	65.32
Junc n185	346.4713556	0.00	70.83	0.00	71.61	0.00	72.25	Junc n185	0.00	72.25	0.00	64.46
Junc FH1	346.5444435	0.00	70.75	0.00	71.54	0.00	72.18	Junc FH1	0.00	72.18	16.66	64.31
Junc n187	346.5238356	0.00	70.77	0.00	71.56	0.00	72.2	Junc n187	0.00	72.2	0.00	64.33
Junc n188	346.5822979	0.00	70.71	0.00	71.5	0.00	72.14	Junc n188	0.00	72.14	0.00	64.26
Junc n189	346.684609	0.00	70.61	0.00	71.39	0.00	72.04	Junc n189	0.00	72.04	0.00	64.13
Junc Haybarn FutureDemand Irrigati	346.8322529	4.47	70.46	4.47	71.24	4.47	71.89	Junc Haybarn FutureDemand Irrigati	4.47	71.89	6.17	63.96
Junc n191	346.9090361	0.00	70.36	0.00	71.15	0.00	71.79	Junc n191	0.00	71.79	0.00	63.86
Junc n192	347.238304	0.00	70.05	0.00	70.84	0.00	71.48	Junc n192	0.00	71.48	0.00	63.51
Junc n193	347.3960486	0.00	69.89	0.00	70.68	0.00	71.32	Junc n193	0.00	71.32	0.00	63.33
Junc n194	347.5194673	0.00	69.77	0.00	70.56	0.00	71.2	Junc n194	0.00	71.2	0.00	63.2
Junc n195	347.7191933	0.00	69.57	0.00	70.36	0.00	71	Junc n195	0.00	71	0.00	62.98
Junc n196	347.8057154	0.00	69.39	0.00	70.17	0.00	70.81	Junc n196	0.00	70.81	0.00	62.78
Junc n197	348.0869531	0.00	69.2	0.00	69.99	0.00	70.63	Junc n197	0.00	70.63	0.00	62.58
Junc n198	348.170605	0.00	69.12	0.00	69.9	0.00	70.55	Junc n198	0.00	70.55	0.00	62.49
Junc n199	348.1743826	0.00	69.12	0.00	69.9	0.00	70.54	Junc n199	0.00	70.54	0.00	62.48
Junc n200	348.2868997	0.00	69	0.00	69.79	0.00	70.43	Junc n200	0.00	70.43	0.00	62.35
Junc n201	348.4395134	0.00	68.85	0.00	69.64	0.00	70.28	Junc n201	0.00	70.28	0.00	62.18
Junc n202	348.5419144	0.00	68.75	0.00	69.53	0.00	70.18	Junc n202	0.00	70.18	0.00	62.07
Junc n203	348.6719091	0.00	68.62	0.00	69.4	0.00	70.05	Junc n203	0.00	70.05	0.00	61.92
Junc n204	348.734205	0.00	68.56	0.00	69.34	0.00	69.98	Junc n204	0.00	69.98	0.00	61.86
Junc n205	348.9194845	0.00	68.37	0.00	69.15	0.00	69.8	Junc n205	0.00	69.8	0.00	61.64
Junc n206	349.0556585	0.00	68.24	0.00	69.02	0.00	69.66	Junc n206	0.00	69.66	0.00	61.5
Junc n207	349.3161221	0.00	67.97	0.00	68.76	0.00	69.4	Junc n207	0.00	69.4	0.00	61.21
Junc n208	349.3432186	0.00	67.95	0.00	68.73	0.00	69.37	Junc n208	0.00	69.37	0.00	61.18
Junc n209	349.6586801	0.00	67.63	0.00	68.42	0.00	69.06	Junc n209	0.00	69.06	0.00	60.84
Junc n210	349.6994502	0.00	67.59	0.00	68.37	0.00	69.02	Junc n210	0.00	69.02	0.00	60.78
Junc n211	349.4653109	0.00	67.81	0.00	68.59	0.00	69.23	Junc n211	0.00	69.23	0.00	60.96
Junc FH3	349.4367636	0.00	67.85	0.00	68.64	0.00	69.28	Junc FH3	0.00	69.28	16.66	60.99
Junc n213	349.5713326	0.00	67.72	0.00	68.5	0.00	69.15	Junc n213	0.00	69.15	0.00	60.85
Junc Homestead	349.6676422	0.70	67.62	0.70	68.41	0.70	69.05	Junc Homestead	0.70	69.05	0.70	60.76
Junc n215	349.427	0.00	67.64	0.00	68.48	0.00	70.48	Junc n215	0.00	69.64	0.00	60.83
Junc n216	350.9107	0.00	66.15	0.00	66.99	0.00	68.98	Junc n216	0.00	68.15	0.00	59.32
Junc n217	351.1553	0.00	65.9	0.00	66.74	0.00	68.74	Junc n217	0.00	67.91	0.00	65.1
Junc n218	351.1919	0.00	65.86	0.00	66.7	0.00	68.7	Junc n218	0.00	67.86	0.00	65.06
Junc n219	351.1413	0.00	65.91	0.00	66.75	0.00	68.75	Junc n219	0.00	67.91	0.00	65.11
Junc n220	351.026	0.00	66.01	0.00	66.85	0.00	68.85	Junc n220	0.00	68.02	0.00	65.21
Junc n221	351.1979	0.00	65.85	0.00	66.69	0.00	68.69	Junc n221	0.00	67.85	0.00	65.05
Junc n222	351.4619	0.00	65.58	0.00	66.42	0.00	68.42	Junc n222	0.00	67.59	0.00	64.78
Junc n223	352.0499	0.00	64.99	0.00	65.83	0.00	67.83	Junc n223	0.00	67	0.00	64.19
Junc n224	352.6379	0.00	64.41	0.00	65.24	0.00	67.24	Junc n224	0.00	66.41	0.00	63.6
Junc n225	353.4253	0.00	63.62	0.00	64.45	0.00	66.45	Junc n225	0.00	65.62	0.00	62.81
Junc n226	354.1219	0.00	62.92	0.00	63.76	0.00	65.76	Junc n226	0.00	64.92	0.00	62.11
Junc n227	355.1739	0.00	61.86	0.00	62.7	0.00	64.7	Junc n227	0.00	63.86	0.00	61.06
Junc n228	356.0989	0.00	60.94	0.00	61.78	0.00	63.78	Junc n228	0.00	62.94	0.00	60.13
Junc n229	356.3199	0.00	60.72	0.00	61.55	0.00	63.55	Junc n229	0.00	62.72	0.00	59.91
Junc n231	357.1933	0.00	59.84	0.00	60.68	0.00	62.68	Junc n231	0.00	61.84	0.00	59.04
Junc n232	357.4671	0.00	59.57	0.00	60.41	0.00	62.41	Junc n232	0.00	61.57	0.00	58.76
Junc FH C New	357.7691	0.00	59.26	0.00	60.1	0.00	62.1	Junc FH C New	0.00	61.27	0.00	58.46
Junc n234	359.1186	0.00	57.91	0.00	58.75	0.00	60.75	Junc n234	0.00	59.92	0.00	57.11
Junc n235	360.1566	0.00	56.87	0.00	57.71	0.00	59.71	Junc n235	0.00	58.88	0.00	56.07
Junc n236	362.2356	0.00	54.8	0.00	55.64	0.00	57.64	Junc n236	0.00	56.8	0.00	53.99
Junc n237	363.0163	0.00	54.02	0.00	54.85	0.00	56.85	Junc n237	0.00	56.02	0.00	53.21
Junc n238	363.4402	0.00	53.59	0.00	54.43	0.00	56.43	Junc n238	0.00	55.59	0.00	52.79
Junc Irrigation WPARK	364.0054	0.66	53.03	0.66	53.87	0.66	55.87	Junc Irrigation WPARK	0.66	55.03	0.66	52.22
Junc n240	367.2608	0.00	49.77	0.00	50.61	0.00	52.61	Junc n240	0.00	51.77	0.00	48.97
Junc n1111	349.05	0.00	69.67	0.00	70.22	0.00	72.22	Junc n1111	0.00	71.67	0.00	66.81
Junc Building A Sprinkler	349.477	0.00	67.64	0.00	68.48	0.00	70.48	Junc Building A Sprinkler	0.00	69.64	0.00	60.83
Junc n249	351.4604	0.00	65.6	0.00	66.43	0.00	68.43	Junc n249	0.00	67.6	0.00	64.79
Junc n250	351.4604	0.00	65.6	0.00	66.43	0.00	68.43	Junc n250	0.00	67.6	0.00	64.79
Junc n251	351.4604	0.00	65.6	0.00	66.43	0.00	68.43	Junc n251	0.00	67.6	0.00	64.79
Junc n252	351.4604	0.00	65.6	0.00	66.43	0.00	68.43	Junc n252	0.00	67.6	0.00	64.79
Junc n253	351.4604	0.00	65.6	0.00	66.43	0.00	68.43	Junc n253	0.00	67.6	0.00	64.79
Junc n254	351.4604	0.00	65.6	0.00	66.43	0.00	68.43	Junc n254	0.00	67.6	0.00	64.79
Junc Building B Sprinkler	351.5319	0.00	65.51	0.00	66.35	0.00	68.35	Junc Building B Sprinkler	0.00	67.52	0.00	64.71
Junc n257	353.0579	0.00	63.98	0.00	64.82	0.00	66.82	Junc n257	0.00	65.98	0.00	63.18
Junc Building C Sprinkler	353.0579	0.00	63.98	0.00	64.82	0.00	66.82	Junc Building C Sprinkler	0.00	65.98	0.00	63.18
Junc n259	354.6181	0.00	62.42	0.00	63.26	0.00	65.26	Junc n259	0.00	64.42	0.00	61.62
Junc Building D Sprinkler	353.0579	0.00	63.98	0.00	64.82	0.00	66.82	Junc Building D Sprinkler	0.00	65.98	0.00	63.18
Junc n261	356.8505	0.00	60.18	0.00	61.02	0.00	63.02	Junc n261	0.00	62.19	0.00	59.38
Junc Building E Sprinkler	356.8505	0.00	60.18	0.00	61.02	0.00	63.02	Junc Building E Sprinkler	0.00	62.19	0.00	59.38
Junc Building F Domestic	368.659	0.55	48.37	0.55	49.21	0.55	50	Junc Building F Domestic	0.55	50	0.55	47.57
Junc Annex Building CartShed	347.763	0.95	69.53	0.95	70.32	0.95	70.96	Junc Annex Building CartShed	0.95	70.96	0.95	63.78
Junc n265	344.9587	0.00	72.36	0.00	73.14	0.00	73.78	Junc n265	0.00	73.78	0.00	68.6
Junc n274	349.3057	0.00	67.76	0.00	68.6	0.00	70.6	Junc n274	0.00	69.77	0.00	66.96
Junc DiningSuite	349.3057	0.04	67.76	0.04	68.6	0.04	70.6	Junc DiningSuite	0.04	69.77	0.04	66.96
Junc n277	343.8207	0.00	73.58	0.00	74.36	0.00	76.36	Junc n277	0.00	75.58	0.00	72.14
Junc n278	343.8207	0.00	73.57	0.00	74.36	0.00	76.36	Junc n278	0.00	75.57	0.00	71.95
Junc n279	343.8207	0.00	73.57	0.00	74.36	0.00	75	Junc n279	0.00	75	0.00	71.95
Junc n280	344.5618	0.00	72.78	0.00	73.56	0.00	74.21	Junc n280	0.00	74.21	0.00	68.42
Junc BARREL ROOM	345.0572	0.13	72.27	0.13	73.05	0.13	73.7	Junc BARREL ROOM	0.13	73.7	0.13	67.11
Junc 3	345.1764	0.00	72.12	0.00	72.91	0.00	73.55	Junc 3	0.00	73.55	0.00	65.74
Junc 4	345.1764	0.00	72.12	0.00	72.91	0.00	73.55	Junc 4	0.00	73.55	0.00	65.89
Junc 5	343.8207	0.00	73.58	0.00	74.37	0.00	76.37	Junc 5	0.00	75.58	0.00	72.51
Junc 6	349.3057	0.00	67.77	0.00	68.6	0.00	70.6	Junc 6	0.00	69.77	0.00	66.96
Junc Burr Bar	349.107	0.05	68.18	0.05	68.97	0.05	69.61	Junc Burr Bar	0.05	69.61	0.05	61.45
Junc Bakehouse	347.8785	0.26	69.41	0.26	70.2	0.26	70.84	Junc Bakehouse	0.26	70.84	0.26	62.68

NODES

Year2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s 25 l/s FW2 16.6 l/s Sprinkler				Year2058_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s 25 l/s FW2 16.6 l/s Sprinkler		Year2028_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s 25 l/s FW2 16.6 l/s Sprinkler		Year2028_Fire Flow Analysis_Steady State_Full 60% x 45 l/s 25 l/s FW2 16.6 l/s Sprinkler			Year2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s 50 l/s Ayrburn Domain	
Junc 12	347.8789	0.00	69.41	0.00	70.2	0.00	70.84	Junc 12	0.00	70.84	0.00	62.68
Junc 13	347.719	0.00	69.57	0.00	70.36	0.00	71	Junc 13	0.00	71	0.00	62.84
Junc 14	347.863	0.00	69.43	0.00	70.21	0.00	70.85	Junc 14	0.00	70.85	0.00	62.7
Junc 2	347.684	0.00	69.61	0.00	70.39	0.00	71.03	Junc 2	0.00	71.03	0.00	62.88
Junc 8	344.6041	0.00	72.79	0.00	73.57	0.00	74.22	Junc 8	0.00	74.22	0.00	71.13
Junc 10	345.6406	0.00	71.75	0.00	72.53	0.00	73.18	Junc 10	0.00	73.18	0.00	70.02
Junc 16	345.6567	0.00	71.73	0.00	72.52	0.00	73.16	Junc 16	0.00	73.16	0.00	69.97
Junc 18	345.1033	0.00	72.29	0.00	73.07	0.00	73.71	Junc 18	0.00	73.71	0.00	70.37
Junc WP FutureCap	345.3244934	6.90	71.8	0.00	72.64	0.00	74.64	Junc WP FutureCap	6.89	73.8	6.89	70.98
Junc FH4	347	0.00	70.29	0.00	71.07	0.00	71.72	Junc FH4	0.00	71.72	0.00	63.42
Junc 0	349.427	0.00	67.64	0.00	68.48	0.00	70.48	Junc 0	0.00	69.64	0.00	66.83
Junc Building A Domestic	349.427	1.48	50	1.48	50	1.48	50	Junc Building A Domestic	1.48	50	1.48	50
Junc 1	351.4619	0.00	65.58	0.00	66.42	0.00	68.42	Junc 1	0.00	67.59	0.00	64.78
Junc Building B Domestic	351.5319	0.59	50	0.59	50	0.59	50	Junc Building B Domestic	0.59	50	0.59	50
Junc 7	353.0579	0.00	63.98	0.00	64.82	0.00	66.82	Junc 7	0.00	65.98	0.00	63.18
Junc Building C Domestic	353.0579	0.70	50	0.70	50	0.70	50	Junc Building C Domestic	0.70	50	0.70	50
Junc Building D Domestic	353.0579	0.88	50	0.88	50	0.88	50	Junc Building D Domestic	0.88	50	0.88	50
Junc 11	354.6181	0.00	62.42	0.00	63.26	0.00	65.26	Junc 11	0.00	64.42	0.00	61.62
Junc 15	356.8505	0.00	60.18	0.00	61.02	0.00	63.02	Junc 15	0.00	62.19	0.00	59.38
Junc Building E Domestic	356.8505	0.62	50	0.62	50	0.62	50	Junc Building E Domestic	0.62	50	0.62	50
Junc Building F Sprinkler	368.659	0.00	48.37	0.00	49.21	0.00	51.21	Junc Building F Sprinkler	0.00	50.37	0.00	47.57
Junc 19	367.2608	0.00	49.77	0.00	50.61	0.00	52.61	Junc 19	0.00	51.77	0.00	48.97
Junc 9	345.876	0.00	71.23	0.00	72.07	0.00	74.07	Junc 9	0.00	73.23	0.00	70.42
Junc D n3	354.45	0.00	54.55	0.00	55.39	0.00	57.39	Junc D n3	0.00	56.56	0.00	61.73
Junc D n4	355.06	0.00	52.37	0.00	53.2	0.00	55.2	Junc D n4	0.00	54.37	0.00	61.12
Junc D n5	346.43	0.00	69.56	0.00	70.4	0.00	72.4	Junc D n5	0.00	71.57	0.00	69.85
Junc D n6	347.07	0.00	68.57	0.00	69.4	0.00	71.4	Junc D n6	0.00	70.57	0.00	69.2
Junc D n7	347.58	0.00	67.71	0.00	68.54	0.00	70.54	Junc D n7	0.00	69.71	0.00	68.68
Junc D n8	348.87	0.00	64.35	0.00	65.19	0.00	67.19	Junc D n8	0.00	66.35	0.00	67.35
Junc D n9	350.44	0.00	62.19	0.00	63.03	0.00	65.03	Junc D n9	0.00	64.2	0.00	65.77
Junc D n10	351.07	0.00	60.95	0.00	61.79	0.00	63.79	Junc D n10	0.00	62.95	0.00	65.12
Junc D n11	355.04	0.66	49.53	0.66	50.36	0.66	52.36	Junc D n11	0.66	51.53	0.66	61.13
Junc D n12	355.62	0.00	47.19	0.00	48.03	0.00	50.03	Junc D n12	0.00	49.2	0.00	60.55
Junc D n13	358.03	0.00	42.89	0.00	43.73	0.00	45.73	Junc D n13	0.00	44.89	0.00	58.14
Junc Infill Tank-Sprinklers	358.12	16.60	41.66	16.60	42.5	16.60	44.5	Junc Infill Tank-Sprinklers	16.60	43.66	0.00	58.05
Junc D n15	350.81	0.38	59.32	0.38	60.16	0.38	62.16	Junc D n15	0.38	61.32	0.38	65.18
Junc D n16	351.06	0.00	59.08	0.00	59.91	0.00	61.91	Junc D n16	0.00	61.08	0.00	64.93
Junc D n17	351.46	0.00	58.71	0.00	59.55	0.00	61.55	Junc D n17	0.00	60.71	0.00	64.57
Junc D n18	351.64	0.00	58.57	0.00	59.41	0.00	61.41	Junc D n18	0.00	60.57	0.00	64.43
Junc D n19	351.79	0.00	58.46	0.00	59.3	0.00	61.3	Junc D n19	0.00	60.46	0.00	64.32
Junc D n20	355.05	0.00	53.95	0.00	54.79	0.00	56.79	Junc D n20	0.00	55.96	0.00	61.13
Junc D n21	351.85	0.00	58.4	0.00	59.24	0.00	61.24	Junc D n21	0.00	60.4	0.00	64.26
Junc D n22	352.02	0.00	58.23	0.00	59.07	0.00	61.07	Junc D n22	0.00	60.23	0.00	64.09
Junc D n23	351.88	0.00	58.37	0.00	59.21	0.00	61.21	Junc D n23	0.00	60.37	0.00	64.23
Junc D n24	351.75	0.00	58.5	0.00	59.34	0.00	61.34	Junc D n24	0.00	60.5	0.00	64.36
Junc D n25	351.62	0.00	58.63	0.00	59.47	0.00	61.47	Junc D n25	0.00	60.63	0.00	64.49
Junc D n26	351.49	0.00	58.76	0.00	59.6	0.00	61.6	Junc D n26	0.00	60.76	0.00	64.62
Junc D n27	351.35	0.00	58.9	0.00	59.74	0.00	61.74	Junc D n27	0.00	60.9	0.00	64.76
Junc D n28	351.22	0.00	59.03	0.00	59.87	0.00	61.87	Junc D n28	0.00	61.03	0.00	64.89
Junc D n29	351.09	0.00	59.16	0.00	60	0.00	62	Junc D n29	0.00	61.16	0.00	65.02
Junc D n30	350.96	0.00	59.29	0.00	60.13	0.00	62.13	Junc D n30	0.00	61.29	0.00	65.15
Junc D n31	348.2	0.00	62.05	0.00	62.89	0.00	64.89	Junc D n31	0.00	64.05	0.00	67.91
Junc D n32	347.89	0.00	62.36	0.00	63.2	0.00	65.2	Junc D n32	0.00	64.36	0.00	68.22
Junc D n33	347.58	0.00	62.67	0.00	63.51	0.00	65.51	Junc D n33	0.00	64.67	0.00	68.53
Junc D n34	347.27	0.00	62.98	0.00	63.82	0.00	65.82	Junc D n34	0.00	64.98	0.00	68.84
Junc D n35	346.96	0.00	63.29	0.00	64.13	0.00	66.13	Junc D n35	0.00	65.29	0.00	69.15
Junc D n36	346.65	0.00	63.6	0.00	64.44	0.00	66.44	Junc D n36	0.00	65.6	0.00	69.46
Junc D n37	346.34	0.00	63.91	0.00	64.75	0.00	66.75	Junc D n37	0.00	65.91	0.00	69.77
Junc D n38	346.03	0.00	64.22	0.00	65.06	0.00	67.06	Junc D n38	0.00	66.22	0.00	70.08
Junc D n39	344.03	0.00	66.22	0.00	67.06	0.00	69.06	Junc D n39	0.00	68.22	0.00	72.08
Junc D n40	343.9	0.00	66.35	0.00	67.19	0.00	69.19	Junc D n40	0.00	68.35	0.00	72.21
Junc D n41	351.87	0.00	58.38	0.00	59.22	0.00	61.22	Junc D n41	0.00	60.38	0.00	64.24
Junc D n42	351.88	0.00	58.37	0.00	59.21	0.00	61.21	Junc D n42	0.00	60.37	0.00	64.23
Junc D n43	352.08	0.00	58.18	0.00	59.01	0.00	61.01	Junc D n43	0.00	60.18	0.00	64.03
Junc D n44	352.35	0.00	57.91	0.00	58.75	0.00	60.75	Junc D n44	0.00	59.91	0.00	63.76
Junc D n45	352.5	0.00	57.76	0.00	58.6	0.00	60.6	Junc D n45	0.00	59.76	0.00	63.62
Junc D n46	352.61	0.00	57.65	0.00	58.49	0.00	60.49	Junc D n46	0.00	59.65	0.00	63.51
Junc D n47	352.72	0.00	57.54	0.00	58.38	0.00	60.38	Junc D n47	0.00	59.54	0.00	63.4
Junc D n48	352.78	0.00	57.48	0.00	58.32	0.00	60.32	Junc D n48	0.00	59.48	0.00	63.34
Junc D n49	352.85	0.00	57.41	0.00	58.25	0.00	60.25	Junc D n49	0.00	59.41	0.00	63.27
Junc D n50	352.92	0.00	57.34	0.00	58.18	0.00	60.18	Junc D n50	0.00	59.34	0.00	63.2
Junc D n51	353	0.00	57.26	0.00	58.1	0.00	60.1	Junc D n51	0.00	59.26	0.00	63.12
Junc D n52	353.08	0.00	57.18	0.00	58.02	0.00	60.02	Junc D n52	0.00	59.18	0.00	63.04
Junc D n53	353.16	0.00	57.1	0.00	57.94	0.00	59.94	Junc D n53	0.00	59.11	0.00	62.96
Junc D n54	353.18	0.00	57.08	0.00	57.92	0.00	59.92	Junc D n54	0.00	59.09	0.00	62.94
Junc D n55	353.81	0.00	56.45	0.00	57.29	0.00	59.29	Junc D n55	0.00	58.45	0.00	62.3
Junc D n56	353.86	0.00	56.39	0.00	57.23	0.00	59.23	Junc D n56	0.00	58.4	0.00	62.25
Junc D n57	353.92	0.00	56.33	0.00	57.17	0.00	59.17	Junc D n57	0.00	58.33	0.00	62.19
Junc D n58	354.09	0.00	56.16	0.00	56.99	0.00	58.99	Junc D n58	0.00	58.16	0.00	62.01
Junc D n59	347.26	0.05	68.37	0.05	69.21	0.05	71.21	Junc D n59	0.05	70.37	0.05	69
Junc D n60	351.69	0.38	60.08	0.38	60.92	0.38	62.92	Junc D n60	0.38	62.08	0.38	64.49
Junc D n61	351.37	0.30	60.4	0.30	61.24	0.30	63.24	Junc D n61	0.30	62.4	0.30	64.81
Junc D n62	352.05	0.38	59.31	0.38	60.15	0.38	62.15	Junc D n62	0.38	61.31	0.38	64.12
Junc D n63	351.86	0.00	59.5	0.00	60.34	0.00	62.34	Junc D n63	0.00	61.51	0.00	64.31
Junc D n64	352.24	0.38	58.77	0.38	59.6	0.38	61.6	Junc D n64	0.38	60.77	0.38	63.92
Junc D n65	352.27	0.00	58.74	0.00	59.58	0.00	61.58	Junc D n65	0.00	60.74	0.00	63.89
Junc D n66	352.73	0.38	58.03	0.38	58.86	0.38	60.86	Junc D n66	0.38	60.03	0.38	63.42
Junc D n67	352.69	0.00	58.07	0.00	58.91	0.00	60.91	Junc D n67	0.00	60.07	0.00	63.46
Junc D n68	354.13	0.00	56.31	0.00	57.15	0.00	59.15	Junc D n68	0.00	58.31	0.00	62
Junc D n69	354.03	0.00	56.43	0.00	57.27	0.00	59.27	Junc D n69	0.00	58.43	0.00	62.11
Junc D n71	354.76	0.00	55.69	0.00	56.52	0.00	58.52	Junc D n71	0.00	57.69	0.00	61.36
Junc D n73	354.69	0.38	55.75	0.38	56.59	0.38	58.59	Junc D n73	0.38	57.75	0.38	61.43
Junc Infill Tank	354.59	0.00	55.85	0.00	56.69	0.00	58.69	Junc Infill Tank	0.00	57.85	0.00	61.53
Junc D n75	354.46	0.00	55.98	0.00	56.82	0.00	58.82	Junc D n75	0.00	57.98	0.00	61.66
Junc D n76	354.08	0.38	56.17	0.38	57	0.38	59	Junc D n76	0.38	58.17	0.38	62.02
Junc D n78	351.15	0.38	58.98	0.38	59.82	0.38	61.82	Junc D n78	0.38	60.98	0.38	64.84
Junc D n79	351.51	0.38	58.66	0.38	59.5	0.38	61.5	Junc D n79	0.38	60.66	0.38	64.52
Junc D n80	352.91	0.00	57.35	0.00	58.19	0.00	60.19	Junc D n80	0.00	59.35	0.00	63.21
Junc D n81	352.65	0.38	57.61	0.38	58.45	0.38	60.45	Junc D n81	0.38	59.61	0.38	63.46
Junc D n82	352.03	0.43	58.22	0.43	59.06	0.43	61.06	Junc D n82	0.43	60.22	0.43	64.07
Junc D n83	352.14	0.38	58.11	0.38	58.95	0.38	60.95	Junc D n83	0.38	60.11	0.38	63.97
Junc FH Screen#2	353.64	12.50	56.63	12.50	57.47	12.50	59.47	Junc FH Screen#2	12.50	58.63	0.00	62.49
Junc D n85	353.68	0.00	56.6	0.00	57.44	0.00	59.44	Junc D n85	0.00	58.6	0.00	62.45
Junc D n86	353.84	0.00	56.49	0.00	57.32	0.00	59.32	Junc D n86	0.00	58.49	0.00	62.29
Junc D n87	354.65	0.00	55.8	0.00	56.64	0.00	58.64	Junc D n87	0.00	57.8	0.00	61.48
Junc D n88	353.63	0.00	56.91	0.00	57.75	0.00	59.75	Junc D n88	0.00	58.91	0.00	62.51
Junc D n89	353.58	0.00	56.97	0.00	57.81	0.00	59.81	Junc D n89	0.00	58.97	0.00	62.56
Junc D n90	353.25	0.00	57.37	0.00	58.2	0.00	60.2	Junc D n90	0.00	59.37	0.00	62.89
Junc D n91	352.94	1.68	57.74	1.68	58.58	1.68	60.58	Junc D n91	1.68	59.74	0.00	63.21
Junc FH Screen	352.47	12.50	58.36	12.50	59.2	12.50	61.2	Junc FH Screen	12.50	60.36	0.00	63.69
Junc D n93	352.08	0.00	59.11	0.00	59.95	0.00	61.95	Junc D n93	0.00	61.11	0.00	64.09
Junc D n94	352.1	0.00	58.8	0.00	59.64	0.00	61.64	Junc D n94	0.00	60.8	0.00	64.09
Junc D n95	352.12	0.00	58.76	0.00	59.6	0.00	61.6	Junc D n95	0.00	60.76	0.00	64.07
Junc D n96	353.36	0.38	57.25	0.38	58.09	0.38	60.09	Junc D n96	0.38	59.26	0.38	62.78
Junc E n1	345.66	0.00	70.74	0.00	71.57	0.00	73.57	Junc E n1	0.00	72.74	0.00	70.62
Junc E n2	345.75	0.00	70.65	0.00	71.48	0.00	73.48	Junc E n2	0.00	72.65	0.00	70.53
Junc E n3	345.84	0.00	70.56	0.00	71.39	0.00	73.39	Junc E n3	0.00	72.56	0.00	70.44
Junc E n4	346.28	0.00	70.12	0.00	70.95	0.00	72.95	Junc E n4	0.00	72.12	0.00	70
Junc E n5	346.29	0.00	70.11	0.00	70.94	0.00	72.94	Junc E n5	0.00	72.11	0.00	69.99
Junc E n6	346.25	0.00	70.15	0.00	70.98	0.00	72.98	Junc E n6	0.00	72.15	0.00	70.03
Junc E n7	346.61	0.00	69.79	0.00	70.62	0.00	72.62	Junc E n7	0.00	71.79	0.00	69.67
Junc E n8	346.63	0.00	69.77	0.00	70.6	0.00	72.6	Junc E n8	0.00	71.77	0.00	69.65
Junc E n9	346.56	0.00	69.84	0.00	70.67	0.00	72.67	Junc E n9	0.00	71.84	0.00	69.72
Junc E n10	346.54	0.00	69.86	0.00	70.69	0.00	72.69	Junc E n10	0.00	71.86	0.00	69.74
Junc E n11	346.47	0.00	69.93	0.00	70.76	0.00	72.76	Junc E n11	0.00	71.93	0.00	69.81
Junc E n12	346.72	0.00	69.68	0.00	70.51	0.00	72.51	Junc E n12	0.00	71.68	0.00	69.56
Junc E n13	346.69	0.00	69.71	0.00	70.54	0.00	72.54	Junc E n13	0.00	71.71	0.00	69.59
Junc E n14	345.74	0.00	70.66	0.00	71.49	0.00	73.49	Junc E n14	0.00	72.66	0.00	70.54
Junc E n15	345.32	0.00	71.08	0.00	71.91	0.00	73.91	Junc E n15	0.00	73.08	0.00	70.96
Junc E n16	345.33	0.00	71.07	0.00	71.9	0.00	73.9	Junc E n16	0.00	73.07	0.00	70.95
Junc E n17	344.95	0.00	71.45	0.00	72.28	0.00	74.28	Junc E n17	0.00	73.45	0.00	71.33
Junc E n18	344.91	0.00	71.49	0.00	72.32	0.00	74.32	Junc E n18	0.00	73.49	0.00	71.37
Junc E n19	344.85	0.00	71.55	0.00	72.38	0.00	74.38	Junc E n19	0.00	73.55	0.00	71.43
Junc E n20	344.21	0.00	72.19	0.00	73.02	0.00	75.02	Junc E n20	0.00	74.19	0.00	72.07
Junc E n21	343.95	0.00	72.45	0.00	73.28	0.00	75.28	Junc E n21	0.00	74.45	0.00	72.33
Junc E n22	344.15	0.00	72.25	0.00	73.08	0.00	75.08	Junc E n22	0.00	74.25	0.00	72.13
Junc E n23	344.48	0.00	71.92	0.00	72.75	0.00	74.75	Junc E n23	0.00	73.92	0.00	71.8
Junc E n24	344.15	0.00	72.25	0.00	73.08	0.00	75.08	Junc E n24	0.00	74.25	0.00	72.13
Junc E n25	344.13	0.00	72.27	0.00	73.1	0.00	75.1	Junc E n25	0.00	74.27	0.00	72.15
Junc E n26	344.05	0.00	72.35	0.00	73.18	0.00	75.18	Junc E n26	0.00	74.35	0.00	72.23
Junc E n27	343.99	0.00	72.41	0.00	73.24	0.00	75.24	Junc E n27	0.00	74.41	0.00	72.29
Junc E n28	343.97	0.00	72.43	0.00	73.26	0.00	75.26	Junc E n28	0.00	74.43	0.00	72.31
Junc E n29	343.94	0.00	72.46	0.00	73.29	0.00	75.29	Junc E n29	0.00	74.46	0.00	72.34
Junc E n30	343.9	0.00	72.5	0.00	73.33	0.00	75.33	Junc E n30	0.00	74.5	0.00	72.38
Junc F n1	348.71	0.00	70.76	0.00	71.18	0.00	73.18	Junc F n1	0.00	72.76	0.00	70.18
Junc F n2	348.64	0.10	70.83	0.10	71.25	0.10	73.25	Junc F n2	0.10	72.83	0.10	70.25
Junc F n3	348.58	0.00	70.89	0.00	71.3	0.00	73.3	Junc F n3	0.00	72.89	0.00	70.31
Junc F n4	349.0114369	0.00	70.46	0.00	70.87	0.00	72.87	Junc F n4	0.00	72.46	0.00	69.88
Junc F n8	348.91	0.00	70.56	0.00	70.98	0.00	72.98	Junc F n8	0.00	72.56	0.00	69.98
Junc F n9	348.9	0.10	70.57	0.10	70.99	0.10	72.99	Junc F n9	0.10	72.57	0.10	69.99
Junc F n10	349.47	0.10	70	0.10	70.42	0.10	72.42	Junc F n10	0.10	72	0.10	69.42
Junc FH Lot8	349.44	0.00	70.03	0.00	70.45	0.00	72.45	Junc FH Lot8	0.00	72.03	0.00	69.45
Junc F n12	349.35	0.00	70.12	0.00	70.54	0.00	72.54	Junc F n12	0.00	72.12	0.00	69.54
Junc F n13	349.26	0.00	70.21	0.00	70.63	0.00	72.63	Junc F n13	0.00	72.21	0.00	69.63
Junc FH Lot7	348.95	0.00	70.52	0.00	70.94	0.00	72.94	Junc FH Lot7	0.00	72.52	0.00	69.94
Resvr Ex Cnct	428.18	-68.59	0	-61.70	0	-61.70	0	Resvr Ex Cnct	-68.59	0	-77.00	0

PIPES - WATERFALL PARK HYDRAULIC MODELING

Year 2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler

Link ID	Length m	Diameter mm	Roughness mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe p2	5.34	250	0.015	-5.48	0.11	0.06
Pipe p3	6.49	191.1	0.015	-5.48	0.19	0.22
Pipe p4	11.33	191.1	0.015	-5.48	0.19	0.22
Pipe p7	9.66	191.1	0.015	-5.52	0.19	0.22
Pipe p8	9.546	191.1	0.015	-5.52	0.19	0.23
Pipe p9	6.139	191.1	0.015	-5.52	0.19	0.22
Pipe p10	7.89	191.1	0.015	-5.52	0.19	0.22
Pipe p11	9.403	191.1	0.015	-5.52	0.19	0.22
Pipe p12	7.836	191.1	0.015	-5.52	0.19	0.22
Pipe p13	8.28	191.1	0.015	-5.52	0.19	0.22
Pipe p14	9.601	191.1	0.015	-5.52	0.19	0.22
Pipe p15	2.229	191.1	0.015	-5.52	0.19	0.22
Pipe p16	1.931	191.1	0.015	-5.52	0.19	0.23
Pipe p17	5.747	191.1	0.015	-5.52	0.19	0.22
Pipe p18	5.108	191.1	0.015	-5.52	0.19	0.23
Pipe p19	5.41	191.1	0.015	-5.52	0.19	0.22
Pipe p20	6.379	191.1	0.015	-5.52	0.19	0.23
Pipe p21	11.26	191.1	0.015	-5.52	0.19	0.22
Pipe p22	7.271	191.1	0.015	-5.52	0.19	0.23
Pipe p23	7.711	191.1	0.015	-5.52	0.19	0.22
Pipe p24	7.904	191.1	0.015	-5.52	0.19	0.23
Pipe p25	6.305	191.1	0.015	-5.52	0.19	0.22
Pipe p44	8.292	267.9	0.015	-61.69	1.09	3.44
Pipe p45	6.583	267.9	0.015	-61.69	1.09	3.44
Pipe p46	5.604	267.9	0.015	-61.69	1.09	3.44
Pipe p47	4.655	267.9	0.015	-61.69	1.09	3.44
Pipe p48	4.025	267.9	0.015	-61.69	1.09	3.45
Pipe p49	7.081	267.9	0.015	-61.69	1.09	3.44
Pipe p50	6.744	267.9	0.015	-61.69	1.09	3.44
Pipe p51	11.08	267.9	0.015	-61.69	1.09	3.44
Pipe p52	9.948	267.9	0.015	-61.69	1.09	3.44
Pipe p53	8.031	267.9	0.015	-61.69	1.09	3.44
Pipe p54	1.465	267.9	0.015	-61.69	1.09	3.45
Pipe p57	3.238	267.9	0.015	-68.29	1.21	4.15
Pipe p58	2.385	267.9	0.015	-68.29	1.21	4.15
Pipe p59	3.284	267.9	0.015	-68.29	1.21	4.15
Pipe p60	3.527	267.9	0.015	-68.29	1.21	4.16
Pipe p61	3.862	267.9	0.015	-68.29	1.21	4.15
Pipe p62	2.909	267.9	0.015	-68.29	1.21	4.14
Pipe p63	3.592	267.9	0.015	-68.29	1.21	4.15
Pipe p64	1.629	267.9	0.015	-68.29	1.21	4.13
Pipe p65	3.068	267.9	0.015	-68.29	1.21	4.15
Pipe p66	4.092	267.9	0.015	-68.29	1.21	4.16
Pipe p67	2.589	267.9	0.015	-68.29	1.21	4.15
Pipe p68	0.9354	267.9	0.015	-68.29	1.21	4.14
Pipe p69	2.425	267.9	0.015	-68.29	1.21	4.14
Pipe p70	2.539	267.9	0.015	-68.29	1.21	4.16
Pipe p71	2.715	267.9	0.015	-68.29	1.21	4.14
Pipe p72	3.221	267.9	0.015	-68.29	1.21	4.16
Pipe p73	1.66	267.9	0.015	-68.29	1.21	4.15
Pipe p74	1.891	267.9	0.015	-68.29	1.21	4.15
Pipe p75	2.039	267.9	0.015	-68.29	1.21	4.14
Pipe p76	2.005	267.9	0.015	-68.29	1.21	4.16
Pipe p77	2.097	267.9	0.015	-68.29	1.21	4.15
Pipe p78	2.21	267.9	0.015	-68.29	1.21	4.14
Pipe p79	2.024	267.9	0.015	-68.29	1.21	4.15
Pipe p80	1.496	267.9	0.015	-68.29	1.21	4.15
Pipe p81	2.63	267.9	0.015	-68.29	1.21	4.15
Pipe p82	5.603	267.9	0.015	-68.29	1.21	4.15
Pipe p83	0.5437	267.9	0.015	-68.29	1.21	4.11
Pipe p84	1.383	267.9	0.015	-68.29	1.21	4.17
Pipe p85	7.65	267.9	0.015	-68.29	1.21	4.15
Pipe p86	6.75	267.9	0.015	-68.29	1.21	4.15
Pipe p87	4.593	267.9	0.015	-68.29	1.21	4.15
Pipe p88	15.91	267.9	0.015	-68.29	1.21	4.15
Pipe p89	8.338	267.9	0.015	-68.29	1.21	4.15
Pipe p90	12.34	267.9	0.015	-68.29	1.21	4.15
Pipe p91	8.813	267.9	0.015	-68.29	1.21	4.15
Pipe p92	14.55	267.9	0.015	-68.29	1.21	4.15
Pipe p93	8.813	267.9	0.015	-68.29	1.21	4.15
Pipe p94	10.88	267.9	0.015	-68.29	1.21	4.15
Pipe p95	10.94	267.9	0.015	-68.29	1.21	4.15
Pipe p96	11.96	267.9	0.015	-68.29	1.21	4.15
Pipe p97	10.3	267.9	0.015	-68.29	1.21	4.15
Pipe p98	11.05	267.9	0.015	-68.29	1.21	4.15
Pipe p99	7.116	267.9	0.015	-68.29	1.21	4.15
Pipe p100	8.402	267.9	0.015	-68.29	1.21	4.15
Pipe p101	8.682	267.9	0.015	-68.29	1.21	4.15
Pipe p102	10.23	267.9	0.015	-68.29	1.21	4.15
Pipe p103	8.116	267.9	0.015	-68.29	1.21	4.15
Pipe p104	10.62	267.9	0.015	-68.29	1.21	4.15
Pipe p105	12.89	267.9	0.015	-68.29	1.21	4.15
Pipe p106	13.96	267.9	0.015	-68.29	1.21	4.15
Pipe p107	10.96	267.9	0.015	-68.29	1.21	4.15
Pipe p109	22.34	267.9	0.015	-68.29	1.21	4.15
Pipe p110	14.24	267.9	0.015	-68.29	1.21	4.15
Pipe p111	17.16	267.9	0.015	-68.29	1.21	4.15
Pipe p112	14.81	267.9	0.015	-68.29	1.21	4.15
Pipe p113	11.77	267.9	0.015	-68.29	1.21	4.15
Pipe p114	9.714	267.9	0.015	-68.29	1.21	4.15
Pipe p115	11.92	267.9	0.015	-68.29	1.21	4.15
Pipe p116	12.59	267.9	0.015	-68.29	1.21	4.15
Pipe p117	11.71	267.9	0.015	-68.29	1.21	4.15
Pipe p118	10.68	267.9	0.015	-68.29	1.21	4.15
Pipe p119	10.63	267.9	0.015	-68.29	1.21	4.15
Pipe p120	9.509	267.9	0.015	-68.29	1.21	4.15
Pipe p121	10.42	267.9	0.015	-68.29	1.21	4.15
Pipe p126	12.84	267.9	0.015	-68.59	1.22	4.18
Pipe p128	3.013	267.9	0.015	-68.59	1.22	4.19
Pipe p129	10.55	267.9	0.015	-68.59	1.22	4.18
Pipe p130	0.6196	267.9	0.015	-68.59	1.22	4.2
Pipe p131	12.88	267.9	0.015	-68.59	1.22	4.18
Pipe p132	11.59	267.9	0.015	-68.59	1.22	4.18
Pipe p133	15.55	267.9	0.015	-68.59	1.22	4.18
Pipe p134	15.31	267.9	0.015	-68.59	1.22	4.18
Pipe p135	16.21	267.9	0.015	-68.59	1.22	4.18
Pipe p136	19.02	267.9	0.015	-68.59	1.22	4.18
Pipe p137	21.23	267.9	0.015	-68.59	1.22	4.18
Pipe p138	17.61	267.9	0.015	-68.59	1.22	4.18
Pipe p139	14.37	267.9	0.015	-68.59	1.22	4.18
Pipe p140	8.812	267.9	0.015	-68.59	1.22	4.18
Pipe p141	41.94	267.9	0.015	-68.59	1.22	4.18
Pipe p142	8.97	267.9	0.015	-68.59	1.22	4.18
Pipe p143	18.95	267.9	0.015	-68.59	1.22	4.18
Pipe p144	6.481	267.9	0.015	-68.59	1.22	4.19
Pipe p145	15.52	267.9	0.015	-68.59	1.22	4.18
Pipe p146	10.12	267.9	0.015	-68.59	1.22	4.18
Pipe p147	10.38	267.9	0.015	-68.59	1.22	4.18
Pipe p148	0.5885	267.9	0.015	-68.59	1.22	4.17
Pipe p149	0.773	267.9	0.015	-68.59	1.22	4.19
Pipe p150	0.6848	267.9	0.015	-68.59	1.22	4.18
Pipe p151	8.767	267.9	0.015	-68.59	1.22	4.18
Pipe p152	0.71	267.9	0.015	-68.59	1.22	4.14
Pipe p164	11.7	152.8	0.015	6.6	0.36	0.9
Pipe p165	0.5398	152.8	0.015	6.6	0.36	0.9
Pipe p166	3.468	152.8	0.015	6.6	0.36	0.9
Pipe p167	2.283	152.8	0.015	6.6	0.36	0.9
Pipe p168	4.447	152.8	0.015	6.6	0.36	0.9
Pipe p169	2.382	152.8	0.015	6.6	0.36	0.89
Pipe p170	1.871	152.8	0.015	6.6	0.36	0.91
Pipe p171	2.163	152.8	0.015	6.6	0.36	0.89
Pipe p172	1.203	152.8	0.015	6.6	0.36	0.9
Pipe p173	1.667	152.8	0.015	6.6	0.36	0.89
Pipe p174	11.98	152.8	0.015	6.6	0.36	0.9
Pipe p175	1.77	152.8	0.015	6.6	0.36	0.9
Pipe p177	4.49	152.8	0.015	6.6	0.36	0.9
Pipe p179	9.99	152.8	0.015	6.43	0.35	0.86
Pipe p180	2.39	152.8	0.015	6.43	0.35	0.86
Pipe p182	0.6818	152.8	0.015	5.48	0.3	0.65
Pipe p183	7.777	152.8	0.015	5.48	0.3	0.64
Pipe p184	3.03	152.8	0.015	5.48	0.3	0.65
Pipe p187	0.3482	152.8	0.015	5.48	0.3	0.64
Pipe p188	1.11	152.8	0.015	5.48	0.3	0.67
Pipe p189	3.19	152.8	0.015	5.48	0.3	0.64
Pipe p190	2.524	152.8	0.015	5.48	0.3	0.65
Pipe p191	1.086	152.8	0.015	1.01	0.06	0.03
Pipe p192	6.131	152.8	0.015	1.01	0.06	0.03
Pipe p193	3.395	152.8	0.015	1.01	0.06	0.03
Pipe p194	2.253	152.8	0.015	1.01	0.06	0.03
Pipe p195	3.623	152.8	0.015	1.01	0.06	0.04
Pipe p196	2.802	152.8	0.015	1.01	0.06	0.03
Pipe p197	3.727	152.8	0.015	1.01	0.06	0.03
Pipe p198	1.92	152.8	0.015	1.01	0.06	0.04
Pipe p199	0.2	152.8	0.015	1.01	0.06	0
Pipe p200	2.639	152.8	0.015	1.01	0.06	0.04
Pipe p201	3.272	152.8	0.015	1.01	0.06	0.03
Pipe p202	2.85	152.8	0.015	1.01	0.06	0.03
Pipe p203	2.263	152.8	0.015	1.01	0.06	0.03
Pipe p204	0.9576	152.8	0.015	1.01	0.06	0.04
Pipe p205	5.81	152.8	0.015	1.01	0.06	0.03
Pipe p206	1.49	152.8	0.015	0.7	0.04	0.02
Pipe p207	4.718	152.8	0.015	0.7	0.04	0.02
Pipe p208	0.4516	152.8	0.015	0.7	0.04	0
Pipe p209	5.289	152.8	0.015	0.7	0.04	0.02
Pipe p210	4.083	152.8	0.015	0.7	0.04	0.02
Pipe p211	5.57	152.8	0.015	0.7	0.04	0.01
Pipe p212	4.591	152.8	0.015	0.7	0.04	0.02
Pipe p213	6.928	152.8	0.015	0.7	0.04	0.02
Pipe p214	5.059	152.8	0.015	0.7	0.04	0.01
Pipe p216	12	191.1	0.015	4	0.14	0.13
Pipe p218	6.997	191.1	0.015	4	0.14	0.12
Pipe p219	18.47	191.1	0.015	4	0.14	0.13
Pipe p220	19.5	191.1	0.015	4	0.14	0.13
Pipe p221	10.5	191.1	0.015	4	0.14	0.13
Pipe p223	17.15	191.1	0.015	3.41	0.12	0.1
Pipe p225	23.77	191.1	0.015	2.71	0.09	0.06
Pipe p227	28.37	191.1	0.015	1.83	0.06	0.03
Pipe p228	9.98	191.1	0.015	1.83	0.06	0.03
Pipe p231	24.84	191.1	0.015	1.21	0.04	0.01
Pipe p232	9.42	191.1	0.015	1.21	0.04	0.02
Pipe p233	20.56	191.1	0.015	1.21	0.04	0.02
Pipe p234	12.96	191.1	0.015	1.21	0.04	0.02
Pipe p235	27.26	191.1	0.015	1.21	0.04	0.02
Pipe p236	16.47	191.1	0.015	1.21	0.04	0.02
Pipe p237	8.993	191.1	0.015	1.21	0.04	0.02
Pipe p238	11.94	191.1	0.015	1.21	0.04	0.02
Pipe p245	6.01	152.8	0.015	0	0	0
Pipe p246	12.7	50	0.015	0	0	0
Pipe p247	23.04	50	0.015	0	0	0
Pipe p249	8.821	50	0.015	0	0	0
Pipe p251	12.59	152.8	0.015	0	0	0
Pipe p252	11.5	152.8	0.015	0	0	0
Pipe p253	8.14	152.8	0.015	0	0	0
Pipe p255	17.05	152.8	0.015	-0.95	0.05	0.03
Pipe p261	8.59	50	0.015	0.04	0.02	0.03
Pipe p263	3.85	152.8	0.015	6.6	0.36	0.9
Pipe 19	27.43	191.1	0.015	-1.83	0.06	0.03
Pipe 22	17.8	191.1	0.015	-2.71	0.09	0.06
Pipe 24	16.9	191.1	0.015	-3.41	0.12	0.1
Pipe 25	13.62	152.8	0.015	0	0	0
Pipe 45	7.1	50	0.015	0	0	0
Pipe 46	9.5	50	0.015	0	0	0
Pipe 47	20.32	191.1	0.015	-4	0.14	0.13
Pipe 48	29.77	191.1	0.015	-4	0.14	0.13
Pipe 49	8	191.1	0.015	-5.48	0.19	0.22

Year 2058_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler

Link ID	Length m	Diameter mm	Roughnes mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe p2	5.34	250	0.015	-5.48	0.11	0.06
Pipe p3	6.49	191.1	0.015	-5.48	0.19	0.22
Pipe p4	11.33	191.1	0.015	-5.48	0.19	0.22
Pipe p7	9.66	191.1	0.015	-5.52	0.19	0.22
Pipe p8	9.546	191.1	0.015	-5.52	0.19	0.22
Pipe p9	6.139	191.1	0.015	-5.52	0.19	0.22
Pipe p10	7.89	191.1	0.015	-5.52	0.19	0.22
Pipe p11	9.403	191.1	0.015	-5.52	0.19	0.23
Pipe p12	7.836	191.1	0.015	-5.52	0.19	0.22
Pipe p13	8.28	191.1	0.015	-5.52	0.19	0.22
Pipe p14	9.601	191.1	0.015	-5.52	0.19	0.22
Pipe p15	2.229	191.1	0.015	-5.52	0.19	0.22
Pipe p16	1.931	191.1	0.015	-5.52	0.19	0.23
Pipe p17	5.747	191.1	0.015	-5.52	0.19	0.23
Pipe p18	5.108	191.1	0.015	-5.52	0.19	0.22
Pipe p19	5.41	191.1	0.015	-5.52	0.19	0.23
Pipe p20	6.379	191.1	0.015	-5.52	0.19	0.22
Pipe p21	11.26	191.1	0.015	-5.52	0.19	0.22
Pipe p22	7.271	191.1	0.015	-5.52	0.19	0.22
Pipe p23	7.711	191.1	0.015	-5.52	0.19	0.23
Pipe p24	7.904	191.1	0.015	-5.52	0.19	0.22
Pipe p25	6.305	191.1	0.015	-5.52	0.19	0.22
Pipe p44	8.292	267.9	0.015	-54.8	0.97	2.77
Pipe p45	6.583	267.9	0.015	-54.8	0.97	2.76
Pipe p46	5.604	267.9	0.015	-54.8	0.97	2.77
Pipe p47	4.655	267.9	0.015	-54.8	0.97	2.77
Pipe p48	4.025	267.9	0.015	-54.8	0.97	2.76
Pipe p49	7.081	267.9	0.015	-54.8	0.97	2.77
Pipe p50	6.744	267.9	0.015	-54.8	0.97	2.76
Pipe p51	11.08	267.9	0.015	-54.8	0.97	2.77
Pipe p52	9.948	267.9	0.015	-54.8	0.97	2.76
Pipe p53	8.031	267.9	0.015	-54.8	0.97	2.77
Pipe p54	1.465	267.9	0.015	-54.8	0.97	2.77
Pipe p57	3.238	267.9	0.015	-61.4	1.09	3.41
Pipe p58	2.385	267.9	0.015	-61.4	1.09	3.42
Pipe p59	3.284	267.9	0.015	-61.4	1.09	3.41
Pipe p60	3.527	267.9	0.015	-61.4	1.09	3.41
Pipe p61	3.862	267.9	0.015	-61.4	1.09	3.41
Pipe p62	2.909	267.9	0.015	-61.4	1.09	3.4
Pipe p63	3.592	267.9	0.015	-61.4	1.09	3.42
Pipe p64	1.629	267.9	0.015	-61.4	1.09	3.4
Pipe p65	3.068	267.9	0.015	-61.4	1.09	3.41
Pipe p66	4.092	267.9	0.015	-61.4	1.09	3.41
Pipe p67	2.589	267.9	0.015	-61.4	1.09	3.41
Pipe p68	0.9354	267.9	0.015	-61.4	1.09	3.42
Pipe p69	2.425	267.9	0.015	-61.4	1.09	3.41
Pipe p70	2.539	267.9	0.015	-61.4	1.09	3.41
Pipe p71	2.715	267.9	0.015	-61.4	1.09	3.41
Pipe p72	3.221	267.9	0.015	-61.4	1.09	3.41
Pipe p73	1.66	267.9	0.015	-61.4	1.09	3.41
Pipe p74	1.891	267.9	0.015	-61.4	1.09	3.42
Pipe p75	2.039	267.9	0.015	-61.4	1.09	3.39
Pipe p76	2.005	267.9	0.015	-61.4	1.09	3.41
Pipe p77	2.097	267.9	0.015	-61.4	1.09	3.41
Pipe p78	2.21	267.9	0.015	-61.4	1.09	3.42
Pipe p79	2.024	267.9	0.015	-61.4	1.09	3.4
Pipe p80	1.496	267.9	0.015	-61.4	1.09	3.43
Pipe p81	2.63	267.9	0.015	-61.4	1.09	3.41
Pipe p82	5.603	267.9	0.015	-61.4	1.09	3.41
Pipe p83	0.5437	267.9	0.015	-61.4	1.09	3.42
Pipe p84	1.383	267.9	0.015	-61.4	1.09	3.42
Pipe p85	7.65	267.9	0.015	-61.4	1.09	3.41
Pipe p86	6.75	267.9	0.015	-61.4	1.09	3.41
Pipe p87	4.593	267.9	0.015	-61.4	1.09	3.41
Pipe p88	15.91	267.9	0.015	-61.4	1.09	3.41
Pipe p89	8.338	267.9	0.015	-61.4	1.09	3.41
Pipe p90	12.34	267.9	0.015	-61.4	1.09	3.41
Pipe p91	8.813	267.9	0.015	-61.4	1.09	3.41
Pipe p92	14.55	267.9	0.015	-61.4	1.09	3.41
Pipe p93	8.813	267.9	0.015	-61.4	1.09	3.41
Pipe p94	10.88	267.9	0.015	-61.4	1.09	3.41
Pipe p95	10.94	267.9	0.015	-61.4	1.09	3.41
Pipe p96	11.96	267.9	0.015	-61.4	1.09	3.41
Pipe p97	10.3	267.9	0.015	-61.4	1.09	3.41
Pipe p98	11.05	267.9	0.015	-61.4	1.09	3.41
Pipe p99	7.116	267.9	0.015	-61.4	1.09	3.41
Pipe p100	8.402	267.9	0.015	-61.4	1.09	3.41
Pipe p101	8.682	267.9	0.015	-61.4	1.09	3.41
Pipe p102	10.23	267.9	0.015	-61.4	1.09	3.41
Pipe p103	8.116	267.9	0.015	-61.4	1.09	3.41
Pipe p104	10.62	267.9	0.015	-61.4	1.09	3.41
Pipe p105	12.89	267.9	0.015	-61.4	1.09	3.41
Pipe p106	13.96	267.9	0.015	-61.4	1.09	3.41
Pipe p107	10.96	267.9	0.015	-61.4	1.09	3.41
Pipe p109	22.34	267.9	0.015	-61.4	1.09	3.41
Pipe p110	14.24	267.9	0.015	-61.4	1.09	3.41
Pipe p111	17.16	267.9	0.015	-61.4	1.09	3.41
Pipe p112	14.81	267.9	0.015	-61.4	1.09	3.41
Pipe p113	11.77	267.9	0.015	-61.4	1.09	3.41
Pipe p114	9.714	267.9	0.015	-61.4	1.09	3.41
Pipe p115	11.92	267.9	0.015	-61.4	1.09	3.41
Pipe p116	12.59	267.9	0.015	-61.4	1.09	3.41
Pipe p117	11.71	267.9	0.015	-61.4	1.09	3.41
Pipe p118	10.68	267.9	0.015	-61.4	1.09	3.41
Pipe p119	10.63	267.9	0.015	-61.4	1.09	3.41
Pipe p120	9.509	267.9	0.015	-61.4	1.09	3.41
Pipe p121	10.42	267.9	0.015	-61.4	1.09	3.41
Pipe p126	12.84	267.9	0.015	-61.7	1.09	3.44
Pipe p128	3.013	267.9	0.015	-61.7	1.09	3.45
Pipe p129	10.55	267.9	0.015	-61.7	1.09	3.44
Pipe p130	0.6196	267.9	0.015	-61.7	1.09	3.42
Pipe p131	12.88	267.9	0.015	-61.7	1.09	3.44
Pipe p132	11.59	267.9	0.015	-61.7	1.09	3.44
Pipe p133	15.55	267.9	0.015	-61.7	1.09	3.44
Pipe p134	15.31	267.9	0.015	-61.7	1.09	3.44
Pipe p135	16.21	267.9	0.015	-61.7	1.09	3.44
Pipe p136	19.02	267.9	0.015	-61.7	1.09	3.44
Pipe p137	21.23	267.9	0.015	-61.7	1.09	3.44
Pipe p138	17.61	267.9	0.015	-61.7	1.09	3.44
Pipe p139	14.37	267.9	0.015	-61.7	1.09	3.44
Pipe p140	8.812	267.9	0.015	-61.7	1.09	3.44
Pipe p141	41.94	267.9	0.015	-61.7	1.09	3.44
Pipe p142	8.97	267.9	0.015	-61.7	1.09	3.44
Pipe p143	18.95	267.9	0.015	-61.7	1.09	3.44
Pipe p144	6.481	267.9	0.015	-61.7	1.09	3.44
Pipe p145	15.52	267.9	0.015	-61.7	1.09	3.44
Pipe p146	10.12	267.9	0.015	-61.7	1.09	3.44
Pipe p147	10.38	267.9	0.015	-61.7	1.09	3.44
Pipe p148	0.5885	267.9	0.015	-61.7	1.09	3.41
Pipe p149	0.773	267.9	0.015	-61.7	1.09	3.47
Pipe p150	0.6848	267.9	0.015	-61.7	1.09	3.42
Pipe p151	8.767	267.9	0.015	-61.7	1.09	3.44
Pipe p152	0.71	267.9	0.015	-61.7	1.09	3.41
Pipe p164	11.7	152.8	0.015	6.6	0.36	0.9
Pipe p165	0.5398	152.8	0.015	6.6	0.36	0.9
Pipe p166	3.468	152.8	0.015	6.6	0.36	0.9
Pipe p167	2.283	152.8	0.015	6.6	0.36	0.9
Pipe p168	4.447	152.8	0.015	6.6	0.36	0.9
Pipe p169	2.382	152.8	0.015	6.6	0.36	0.89
Pipe p170	1.871	152.8	0.015	6.6	0.36	0.89
Pipe p171	2.163	152.8	0.015	6.6	0.36	0.91
Pipe p172	1.203	152.8	0.015	6.6	0.36	0.9
Pipe p173	1.667	152.8	0.015	6.6	0.36	0.89
Pipe p174	11.98	152.8	0.015	6.6	0.36	0.9
Pipe p175	1.77	152.8	0.015	6.6	0.36	0.9
Pipe p177	4.49	152.8	0.015	6.6	0.36	0.89
Pipe p179	9.99	152.8	0.015	6.43	0.35	0.86
Pipe p180	2.39	152.8	0.015	6.43	0.35	0.87
Pipe p182	0.6818	152.8	0.015	5.48	0.3	0.65
Pipe p183	7.777	152.8	0.015	5.48	0.3	0.65
Pipe p184	3.03	152.8	0.015	5.48	0.3	0.65
Pipe p187	0.3482	152.8	0.015	5.48	0.3	0.64
Pipe p188	1.11	152.8	0.015	5.48	0.3	0.64
Pipe p189	3.19	152.8	0.015	5.48	0.3	0.65
Pipe p190	2.524	152.8	0.015	5.48	0.3	0.65
Pipe p191	1.086	152.8	0.015	1.01	0.06	0.03
Pipe p192	6.131	152.8	0.015	1.01	0.06	0.03
Pipe p193	3.395	152.8	0.015	1.01	0.06	0.03
Pipe p194	2.253	152.8	0.015	1.01	0.06	0.03
Pipe p195	3.623	152.8	0.015	1.01	0.06	0.03
Pipe p196	2.802	152.8	0.015	1.01	0.06	0.04
Pipe p197	3.727	152.8	0.015	1.01	0.06	0.03
Pipe p198	1.92	152.8	0.015	1.01	0.06	0.04
Pipe p199	0.2	152.8	0.015	1.01	0.06	0
Pipe p200	2.639	152.8	0.015	1.01	0.06	0.03
Pipe p201	3.272	152.8	0.015	1.01	0.06	0.03
Pipe p202	2.85	152.8	0.015	1.01	0.06	0.04
Pipe p203	2.263	152.8	0.015	1.01	0.06	0.03
Pipe p204	0.9576	152.8	0.015	1.01	0.06	0.04
Pipe p205	5.81	152.8	0.015	1.01	0.06	0.03
Pipe p206	1.49	152.8	0.015	0.7	0.04	0.02
Pipe p207	4.718	152.8	0.015	0.7	0.04	0.02
Pipe p208	0.4516	152.8	0.015	0.7	0.04	0
Pipe p209	5.289	152.8	0.015	0.7	0.04	0.02
Pipe p210	4.083	152.8	0.015	0.7	0.04	0.02
Pipe p211	5.57	152.8	0.015	0.7	0.04	0.01
Pipe p212	4.591	152.8	0.015	0.7	0.04	0.02
Pipe p213	6.928	152.8	0.015	0.7	0.04	0.02
Pipe p214	5.059	152.8	0.015	0.7	0.04	0.01
Pipe p216	12	191.1	0.015	4	0.14	0.13
Pipe p218	6.997	191.1	0.015	4	0.14	0.13
Pipe p219	18.47	191.1	0.015	4	0.14	0.13
Pipe p220	19.5	191.1	0.015	4	0.14	0.13
Pipe p221	10.5	191.1	0.015	4	0.14	0.13
Pipe p223	17.15	191.1	0.015	3.41	0.12	0.1
Pipe p225	23.77	191.1	0.015	2.71	0.09	0.06
Pipe p227	28.37	191.1	0.015	1.83	0.06	0.03
Pipe p228	9.98	191.1	0.015	1.83	0.06	0.03
Pipe p231	24.84	191.1	0.015	1.21	0.04	0.01
Pipe p232	9.42	191.1	0.015	1.21	0.04	0.02
Pipe p233	20.56	191.1	0.015	1.21	0.04	0.02
Pipe p234	12.96	191.1	0.015	1.21	0.04	0.01
Pipe p235	27.26	191.1	0.015	1.21	0.04	0.02
Pipe p236	16.47	191.1	0.015	1.21	0.04	0.02
Pipe p237	8.993	191.1	0.015	1.21	0.04	0.01
Pipe p238	11.94	191.1	0.015	1.21	0.04	0.02
Pipe p245	6.01	152.8	0.015	0	0	0
Pipe p246	12.7	50	0.015	0	0	0
Pipe p247	23.04	50	0.015	0	0	0
Pipe p249	8.821	50	0.015	0	0	0
Pipe p251	12.59	152.8	0.015	0	0	0
Pipe p252	11.5	152.8	0.015	0	0	0
Pipe p253	8.14	152.8	0.015	0	0	0
Pipe p255	17.05	152.8	0.015	-0.95	0.05	0.03
Pipe p261	8.59	50	0.015	0.04	0.02	0.03
Pipe p263	3.85	152.8	0.015	6.6	0.36	0.9
Pipe 19	27.43	191.1	0.015	-1.83	0.06	0.03
Pipe 22	17.8	191.1	0.015	-2.71	0.09	0.06
Pipe 24	16.9	191.1	0.015	-3.41	0.12	0.09
Pipe 25	13.62	152.8	0.015	0	0	0
Pipe 45	7.1	50	0.015	0	0	0
Pipe 46	9.5	50	0.015	0	0	0
Pipe 47	20.32	191.1	0.015	-4	0.14	0.13
Pipe 48	29.77	191.1	0.015	-4	0.14	0.13
Pipe 49	8	191.1	0.015	-5.48	0.19	0.22

Year 2028_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler

Link ID	Length m	Diameter mm	Roughnes mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe p2	5.34	250	0.015	-5.48	0.11	0.06
Pipe p3	6.49	191.1	0.015	-5.48	0.19	0.22
Pipe p4	11.33	191.1	0.015	-5.48	0.19	0.22
Pipe p7	9.66	191.1	0.015	-5.52	0.19	0.22
Pipe p8	9.546	191.1	0.015	-5.52	0.19	0.22
Pipe p9	6.139	191.1	0.015	-5.52	0.19	0.22
Pipe p10	7.89	191.1	0.015	-5.52	0.19	0.23
Pipe p11	9.403	191.1	0.015	-5.52	0.19	0.22
Pipe p12	7.836	191.1	0.015	-5.52	0.19	0.22
Pipe p13	8.28	191.1	0.015	-5.52	0.19	0.22
Pipe p14	9.601	191.1	0.015	-5.52	0.19	0.22
Pipe p15	2.229	191.1	0.015	-5.52	0.19	0.23
Pipe p16	1.931	191.1	0.015	-5.52	0.19	0.21
Pipe p17	5.747	191.1	0.015	-5.52	0.19	0.23
Pipe p18	5.108	191.1	0.015	-5.52	0.19	0.23
Pipe p19	5.41	191.1	0.015	-5.52	0.19	0.22
Pipe p20	6.379	191.1	0.015	-5.52	0.19	0.22
Pipe p21	11.26	191.1	0.015	-5.52	0.19	0.22
Pipe p22	7.271	191.1	0.015	-5.52	0.19	0.23
Pipe p23	7.711	191.1	0.015	-5.52	0.19	0.22
Pipe p24	7.904	191.1	0.015	-5.52	0.19	0.22
Pipe p25	6.305	191.1	0.015	-5.52	0.19	0.22
Pipe p44	8.292	267.9	0.015	-54.8	0.97	2.76
Pipe p45	6.583	267.9	0.015	-54.8	0.97	2.76
Pipe p46	5.604	267.9	0.015	-54.8	0.97	2.77
Pipe p47	4.655	267.9	0.015	-54.8	0.97	2.77
Pipe p48	4.025	267.9	0.015	-54.8	0.97	2.76
Pipe p49	7.081	267.9	0.015	-54.8	0.97	2.77
Pipe p50	6.744	267.9	0.015	-54.8	0.97	2.76
Pipe p51	11.08	267.9	0.015	-54.8	0.97	2.77
Pipe p52	9.948	267.9	0.015	-54.8	0.97	2.77
Pipe p53	8.031	267.9	0.015	-54.8	0.97	2.77
Pipe p54	1.465	267.9	0.015	-54.8	0.97	2.77
Pipe p57	3.238	267.9	0.015	-61.4	1.09	3.4
Pipe p58	2.385	267.9	0.015	-61.4	1.09	3.42
Pipe p59	3.284	267.9	0.015	-61.4	1.09	3.41
Pipe p60	3.527	267.9	0.015	-61.4	1.09	3.41
Pipe p61	3.862	267.9	0.015	-61.4	1.09	3.41
Pipe p62	2.909	267.9	0.015	-61.4	1.09	3.42
Pipe p63	3.592	267.9	0.015	-61.4	1.09	3.41
Pipe p64	1.629	267.9	0.015	-61.4	1.09	3.4
Pipe p65	3.068	267.9	0.015	-61.4	1.09	3.41
Pipe p66	4.092	267.9	0.015	-61.4	1.09	3.41
Pipe p67	2.589	267.9	0.015	-61.4	1.09	3.42
Pipe p68	0.9354	267.9	0.015	-61.4	1.09	3.38
Pipe p69	2.425	267.9	0.015	-61.4	1.09	3.42
Pipe p70	2.539	267.9	0.015	-61.4	1.09	3.4
Pipe p71	2.715	267.9	0.015	-61.4	1.09	3.41
Pipe p72	3.221	267.9	0.015	-61.4	1.09	3.41
Pipe p73	1.66	267.9	0.015	-61.4	1.09	3.43
Pipe p74	1.891	267.9	0.015	-61.4	1.09	3.4
Pipe p75	2.039	267.9	0.015	-61.4	1.09	3.41
Pipe p76	2.005	267.9	0.015	-61.4	1.09	3.41
Pipe p77	2.097	267.9	0.015	-61.4	1.09	3.41
Pipe p78	2.21	267.9	0.015	-61.4	1.09	3.4
Pipe p79	2.024	267.9	0.015	-61.4	1.09	3.42
Pipe p80	1.496	267.9	0.015	-61.4	1.09	3.41
Pipe p81	2.63	267.9	0.015	-61.4	1.09	3.41
Pipe p82	5.603	267.9	0.015	-61.4	1.09	3.41
Pipe p83	0.5437	267.9	0.015	-61.4	1.09	3.42
Pipe p84	1.383	267.9	0.015	-61.4	1.09	3.42
Pipe p85	7.65	267.9	0.015	-61.4	1.09	3.41
Pipe p86	6.75	267.9	0.015	-61.4	1.09	3.41
Pipe p87	4.593	267.9	0.015	-61.4	1.09	3.41
Pipe p88	15.91	267.9	0.015	-61.4	1.09	3.41
Pipe p89	8.338	267.9	0.015	-61.4	1.09	3.41
Pipe p90	12.34	267.9	0.015	-61.4	1.09	3.41
Pipe p91	8.813	267.9	0.015	-61.4	1.09	3.41
Pipe p92	14.55	267.9	0.015	-61.4	1.09	3.41
Pipe p93	8.813	267.9	0.015	-61.4	1.09	3.41
Pipe p94	10.88	267.9	0.015	-61.4	1.09	3.41
Pipe p95	10.94	267.9	0.015	-61.4	1.09	3.41
Pipe p96	11.96	267.9	0.015	-61.4	1.09	3.41
Pipe p97	10.3	267.9	0.015	-61.4	1.09	3.41
Pipe p98	11.05	267.9	0.015	-61.4	1.09	3.41
Pipe p99	7.116	267.9	0.015	-61.4	1.09	3.41
Pipe p100	8.402	267.9	0.015	-61.4	1.09	3.41
Pipe p101	8.682	267.9	0.015	-61.4	1.09	3.41
Pipe p102	10.23	267.9	0.015	-61.4	1.09	3.41
Pipe p103	8.116	267.9	0.015	-61.4	1.09	3.41
Pipe p104	10.62	267.9	0.015	-61.4	1.09	3.41
Pipe p105	12.89	267.9	0.015	-61.4	1.09	3.41
Pipe p106	13.96	267.9	0.015	-61.4	1.09	3.41
Pipe p107	10.96	267.9	0.015	-61.4	1.09	3.41
Pipe p109	22.34	267.9	0.015	-61.4	1.09	3.41
Pipe p110	14.24	267.9	0.015	-61.4	1.09	3.41
Pipe p111	17.16	267.9	0.015	-61.4	1.09	3.41
Pipe p112	14.81	267.9	0.015	-61.4	1.09	3.41
Pipe p113	11.77	267.9	0.015	-61.4	1.09	3.41
Pipe p114	9.714	267.9	0.015	-61.4	1.09	3.41
Pipe p115	11.92	267.9	0.015	-61.4	1.09	3.41
Pipe p116	12.59	267.9	0.015	-61.4	1.09	3.41
Pipe p117	11.71	267.9	0.015	-61.4	1.09	3.41
Pipe p118	10.68	267.9	0.015	-61.4	1.09	3.41
Pipe p119	10.63	267.9	0.015	-61.4	1.09	3.41
Pipe p120	9.509	267.9	0.015	-61.4	1.09	3.41
Pipe p121	10.42	267.9	0.015	-61.4	1.09	3.41
Pipe p126	12.84	267.9	0.015	-61.7	1.09	3.44
Pipe p128	3.013	267.9	0.015	-61.7	1.09	3.43
Pipe p129	10.55	267.9	0.015	-61.7	1.09	3.44
Pipe p130	0.6196	267.9	0.015	-61.7	1.09	3.42
Pipe p131	12.88	267.9	0.015	-61.7	1.09	3.44
Pipe p132	11.59	267.9	0.015	-61.7	1.09	3.44
Pipe p133	15.55	267.9	0.015	-61.7	1.09	3.44
Pipe p134	15.31	267.9	0.015	-61.7	1.09	3.44
Pipe p135	16.21	267.9	0.015	-61.7	1.09	3.44
Pipe p136	19.02	267.9	0.015	-61.7	1.09	3.44
Pipe p137	21.23	267.9	0.015	-61.7	1.09	3.44
Pipe p138	17.61	267.9	0.015	-61.7	1.09	3.44
Pipe p139	14.37	267.9	0.015	-61.7	1.09	3.44
Pipe p140	8.812	267.9	0.015	-61.7	1.09	3.44
Pipe p141	41.94	267.9	0.015	-61.7	1.09	3.44
Pipe p142	8.97	267.9	0.015	-61.7	1.09	3.44
Pipe p143	18.95	267.9	0.015	-61.7	1.09	3.44
Pipe p144	6.481	267.9	0.015	-61.7	1.09	3.44
Pipe p145	15.52	267.9	0.015	-61.7	1.09	3.44
Pipe p146	10.12	267.9	0.015	-61.7	1.09	3.44
Pipe p147	10.38	267.9	0.015	-61.7	1.09	3.44
Pipe p148	0.5885	267.9	0.015	-61.7	1.09	3.48
Pipe p149	0.773	267.9	0.015	-61.7	1.09	3.42
Pipe p150	0.6848	267.9	0.015	-61.7	1.09	3.42
Pipe p151	8.767	267.9	0.015	-61.7	1.09	3.44
Pipe p152	0.71	267.9	0.015	-61.7	1.09	3.46
Pipe p164	11.7	152.8	0.015	6.6	0.36	0.9
Pipe p165	0.5398	152.8	0.015	6.6	0.36	0.96
Pipe p166	3.468	152.8	0.015	6.6	0.36	0.89
Pipe p167	2.283	152.8	0.015	6.6	0.36	0.91
Pipe p168	4.447	152.8	0.015	6.6	0.36	0.9
Pipe p169	2.382	152.8	0.015	6.6	0.36	0.91
Pipe p170	1.871	152.8	0.015	6.6	0.36	0.89
Pipe p171	2.163	152.8	0.015	6.6	0.36	0.89
Pipe p172	1.203	152.8	0.015	6.6	0.36	0.9
Pipe p173	1.667	152.8	0.015	6.6	0.36	0.92
Pipe p174	11.98	152.8	0.015	6.6	0.36	0.9
Pipe p175	1.77	152.8	0.015	6.6	0.36	0.88
Pipe p177	4.49	152.8	0.015	6.6	0.36	0.9
Pipe p179	9.99	152.8	0.015	6.43	0.35	0.86
Pipe p180	2.39	152.8	0.015	6.43	0.35	0.86
Pipe p182	0.6818	152.8	0.015	5.48	0.3	0.65
Pipe p183	7.777	152.8	0.015	5.48	0.3	0.65
Pipe p184	3.03	152.8	0.015	5.48	0.3	0.64
Pipe p187	0.3482	152.8	0.015	5.48	0.3	0.64
Pipe p188	1.11	152.8	0.015	5.48	0.3	0.64
Pipe p189	3.19	152.8	0.015	5.48	0.3	0.64
Pipe p190	2.524	152.8	0.015	5.48	0.3	0.65
Pipe p191	1.086	152.8	0.015	1.01	0.06	0.03
Pipe p192	6.131	152.8	0.015	1.01	0.06	0.04
Pipe p193	3.395	152.8	0.015	1.01	0.06	0.03
Pipe p194	2.253	152.8	0.015	1.01	0.06	0.03
Pipe p195	3.623	152.8	0.015	1.01	0.06	0.03
Pipe p196	2.802	152.8	0.015	1.01	0.06	0.03
Pipe p197	3.727	152.8	0.015	1.01	0.06	0.04
Pipe p198	1.92	152.8	0.015	1.01	0.06	0.02
Pipe p199	0.2	152.8	0.015	1.01	0.06	0.19
Pipe p200	2.639	152.8	0.015	1.01	0.06	0.03
Pipe p201	3.272	152.8	0.015	1.01	0.06	0.03
Pipe p202	2.85	152.8	0.015	1.01	0.06	0.03
Pipe p203	2.263	152.8	0.015	1.01	0.06	0.03
Pipe p204	0.9576	152.8	0.015	1.01	0.06	0.04
Pipe p205	5.81	152.8	0.015	1.01	0.06	0.03
Pipe p206	1.49	152.8	0.015	0.7	0.04	0.02
Pipe p207	4.718	152.8	0.015	0.7	0.04	0.02
Pipe p208	0.4516	152.8	0.015	0.7	0.04	0.08
Pipe p209	5.289	152.8	0.015	0.7	0.04	0.01
Pipe p210	4.083	152.8	0.015	0.7	0.04	0.02
Pipe p211	5.57	152.8	0.015	0.7	0.04	0.02
Pipe p212	4.591	152.8	0.015	0.7	0.04	0.02
Pipe p213	6.928	152.8	0.015	0.7	0.04	0.02
Pipe p214	5.059	152.8	0.015	0.7	0.04	0.02
Pipe p216	12	191.1	0.015	4	0.14	0.13
Pipe p218	6.997	191.1	0.015	4	0.14	0.13
Pipe p219	18.47	191.1	0.015	4	0.14	0.12
Pipe p220	19.5	191.1	0.015	4	0.14	0.13
Pipe p221	10.5	191.1	0.015	4	0.14	0.12
Pipe p223	17.15	191.1	0.015	3.41	0.12	0.1
Pipe p225	23.77	191.1	0.015	2.71	0.09	0.06
Pipe p227	28.37	191.1	0.015	1.83	0.06	0.03
Pipe p228	9.98	191.1	0.015	1.83	0.06	0.03
Pipe p231	24.84	191.1	0.015	1.21	0.04	0.02
Pipe p232	9.42	191.1	0.015	1.21	0.04	0.02
Pipe p233	20.56	191.1	0.015	1.21	0.04	0.02
Pipe p234	12.96	191.1	0.015	1.21	0.04	0.01
Pipe p235	27.26	191.1	0.015	1.21	0.04	0.02
Pipe p236	16.47	191.1	0.015	1.21	0.04	0.02
Pipe p237	8.993	191.1	0.015	1.21	0.04	0.02
Pipe p238	11.94	191.1	0.015	1.21	0.04	0.02
Pipe p245	6.01	152.8	0.015	0	0	0
Pipe p246	12.7	50	0.015	0	0	0
Pipe p247	23.04	50	0.015	0	0	0
Pipe p249	8.821	50	0.015	0	0	0
Pipe p251	12.59	152.8	0.015	0	0	0
Pipe p252	11.5	152.8	0.015	0	0	0
Pipe p253	8.14	152.8	0.015	0	0	0
Pipe p255	17.05	152.8	0.015	-0.95	0.05	0.03
Pipe p261	8.59	50	0.015	0.04	0.02	0.03
Pipe p263	3.85	152.8	0.015	6.6	0.36	0.9
Pipe 19	27.43	191.1	0.015	-1.83	0.06	0.03
Pipe 22	17.8	191.1	0.015	-2.71	0.09	0.06
Pipe 24	16.9	191.1	0.015	-3.41	0.12	0.09
Pipe 25	13.62	152.8	0.015	0	0	0
Pipe 45	7.1	50	0.015	0	0	0
Pipe 46	9.5	50	0.015	0	0	0
Pipe 47	20.32	191.1	0.015	-4	0.14	0.13
Pipe 48	29.77	191.1	0.015	-4	0.14	0.13
Pipe 49	8	191.1	0.015	-5.48	0.19	0.22

Year 2028_Fire Flow Analysis_Steady State_Full 60% x 45 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler

Link ID	Length m	Diameter mm	Roughness mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe p2	5.34	250	0.015	-5.48	0.11	0.06
Pipe p3	6.49	191.1	0.015	-5.48	0.19	0.22
Pipe p4	11.33	191.1	0.015	-5.48	0.19	0.22
Pipe p7	9.66	191.1	0.015	-5.52	0.19	0.22
Pipe p8	9.546	191.1	0.015	-5.52	0.19	0.23
Pipe p9	6.139	191.1	0.015	-5.52	0.19	0.22
Pipe p10	7.89	191.1	0.015	-5.52	0.19	0.22
Pipe p11	9.403	191.1	0.015	-5.52	0.19	0.22
Pipe p12	7.836	191.1	0.015	-5.52	0.19	0.23
Pipe p13	8.28	191.1	0.015	-5.52	0.19	0.22
Pipe p14	9.601	191.1	0.015	-5.52	0.19	0.22
Pipe p15	2.229	191.1	0.015	-5.52	0.19	0.22
Pipe p16	1.931	191.1	0.015	-5.52	0.19	0.23
Pipe p17	5.747	191.1	0.015	-5.52	0.19	0.22
Pipe p18	5.108	191.1	0.015	-5.52	0.19	0.23
Pipe p19	5.41	191.1	0.015	-5.52	0.19	0.23
Pipe p20	6.379	191.1	0.015	-5.52	0.19	0.22
Pipe p21	11.26	191.1	0.015	-5.52	0.19	0.22
Pipe p22	7.271	191.1	0.015	-5.52	0.19	0.23
Pipe p23	7.711	191.1	0.015	-5.52	0.19	0.22
Pipe p24	7.904	191.1	0.015	-5.52	0.19	0.23
Pipe p25	6.305	191.1	0.015	-5.52	0.19	0.22
Pipe p44	8.292	267.9	0.015	-61.69	1.09	3.44
Pipe p45	6.583	267.9	0.015	-61.69	1.09	3.44
Pipe p46	5.604	267.9	0.015	-61.69	1.09	3.44
Pipe p47	4.655	267.9	0.015	-61.69	1.09	3.44
Pipe p48	4.025	267.9	0.015	-61.69	1.09	3.44
Pipe p49	7.081	267.9	0.015	-61.69	1.09	3.44
Pipe p50	6.744	267.9	0.015	-61.69	1.09	3.44
Pipe p51	11.08	267.9	0.015	-61.69	1.09	3.44
Pipe p52	9.948	267.9	0.015	-61.69	1.09	3.44
Pipe p53	8.031	267.9	0.015	-61.69	1.09	3.44
Pipe p54	1.465	267.9	0.015	-61.69	1.09	3.43
Pipe p57	3.238	267.9	0.015	-68.29	1.21	4.15
Pipe p58	2.385	267.9	0.015	-68.29	1.21	4.15
Pipe p59	3.284	267.9	0.015	-68.29	1.21	4.15
Pipe p60	3.527	267.9	0.015	-68.29	1.21	4.16
Pipe p61	3.862	267.9	0.015	-68.29	1.21	4.14
Pipe p62	2.909	267.9	0.015	-68.29	1.21	4.16
Pipe p63	3.592	267.9	0.015	-68.29	1.21	4.14
Pipe p64	1.629	267.9	0.015	-68.29	1.21	4.16
Pipe p65	3.068	267.9	0.015	-68.29	1.21	4.15
Pipe p66	4.092	267.9	0.015	-68.29	1.21	4.15
Pipe p67	2.589	267.9	0.015	-68.29	1.21	4.15
Pipe p68	0.9354	267.9	0.015	-68.29	1.21	4.14
Pipe p69	2.425	267.9	0.015	-68.29	1.21	4.16
Pipe p70	2.539	267.9	0.015	-68.29	1.21	4.15
Pipe p71	2.715	267.9	0.015	-68.29	1.21	4.15
Pipe p72	3.221	267.9	0.015	-68.29	1.21	4.15
Pipe p73	1.66	267.9	0.015	-68.29	1.21	4.15
Pipe p74	1.891	267.9	0.015	-68.29	1.21	4.15
Pipe p75	2.039	267.9	0.015	-68.29	1.21	4.14
Pipe p76	2.005	267.9	0.015	-68.29	1.21	4.16
Pipe p77	2.097	267.9	0.015	-68.29	1.21	4.13
Pipe p78	2.21	267.9	0.015	-68.29	1.21	4.16
Pipe p79	2.024	267.9	0.015	-68.29	1.21	4.15
Pipe p80	1.496	267.9	0.015	-68.29	1.21	4.13
Pipe p81	2.63	267.9	0.015	-68.29	1.21	4.16
Pipe p82	5.603	267.9	0.015	-68.29	1.21	4.14
Pipe p83	0.5437	267.9	0.015	-68.29	1.21	4.17
Pipe p84	1.383	267.9	0.015	-68.29	1.21	4.14
Pipe p85	7.65	267.9	0.015	-68.29	1.21	4.15
Pipe p86	6.75	267.9	0.015	-68.29	1.21	4.15
Pipe p87	4.593	267.9	0.015	-68.29	1.21	4.15
Pipe p88	15.91	267.9	0.015	-68.29	1.21	4.15
Pipe p89	8.338	267.9	0.015	-68.29	1.21	4.15
Pipe p90	12.34	267.9	0.015	-68.29	1.21	4.15
Pipe p91	8.813	267.9	0.015	-68.29	1.21	4.15
Pipe p92	14.55	267.9	0.015	-68.29	1.21	4.15
Pipe p93	8.813	267.9	0.015	-68.29	1.21	4.15
Pipe p94	10.88	267.9	0.015	-68.29	1.21	4.15
Pipe p95	10.94	267.9	0.015	-68.29	1.21	4.15
Pipe p96	11.96	267.9	0.015	-68.29	1.21	4.15
Pipe p97	10.3	267.9	0.015	-68.29	1.21	4.15
Pipe p98	11.05	267.9	0.015	-68.29	1.21	4.15
Pipe p99	7.116	267.9	0.015	-68.29	1.21	4.15
Pipe p100	8.402	267.9	0.015	-68.29	1.21	4.15
Pipe p101	8.682	267.9	0.015	-68.29	1.21	4.15
Pipe p102	10.23	267.9	0.015	-68.29	1.21	4.15
Pipe p103	8.116	267.9	0.015	-68.29	1.21	4.15
Pipe p104	10.62	267.9	0.015	-68.29	1.21	4.15
Pipe p105	12.89	267.9	0.015	-68.29	1.21	4.15
Pipe p106	13.96	267.9	0.015	-68.29	1.21	4.15
Pipe p107	10.96	267.9	0.015	-68.29	1.21	4.15
Pipe p109	22.34	267.9	0.015	-68.29	1.21	4.15
Pipe p110	14.24	267.9	0.015	-68.29	1.21	4.15
Pipe p111	17.16	267.9	0.015	-68.29	1.21	4.15
Pipe p112	14.81	267.9	0.015	-68.29	1.21	4.15
Pipe p113	11.77	267.9	0.015	-68.29	1.21	4.15
Pipe p114	9.714	267.9	0.015	-68.29	1.21	4.15
Pipe p115	11.92	267.9	0.015	-68.29	1.21	4.15
Pipe p116	12.59	267.9	0.015	-68.29	1.21	4.15
Pipe p117	11.71	267.9	0.015	-68.29	1.21	4.15
Pipe p118	10.68	267.9	0.015	-68.29	1.21	4.15
Pipe p119	10.63	267.9	0.015	-68.29	1.21	4.15
Pipe p120	9.509	267.9	0.015	-68.29	1.21	4.15
Pipe p121	10.42	267.9	0.015	-68.29	1.21	4.15
Pipe p126	12.84	267.9	0.015	-68.59	1.22	4.18
Pipe p128	3.013	267.9	0.015	-68.59	1.22	4.19
Pipe p129	10.55	267.9	0.015	-68.59	1.22	4.18
Pipe p130	0.6196	267.9	0.015	-68.59	1.22	4.2
Pipe p131	12.88	267.9	0.015	-68.59	1.22	4.18
Pipe p132	11.59	267.9	0.015	-68.59	1.22	4.18
Pipe p133	15.55	267.9	0.015	-68.59	1.22	4.18
Pipe p134	15.31	267.9	0.015	-68.59	1.22	4.18
Pipe p135	16.21	267.9	0.015	-68.59	1.22	4.18
Pipe p136	19.02	267.9	0.015	-68.59	1.22	4.18
Pipe p137	21.23	267.9	0.015	-68.59	1.22	4.18
Pipe p138	17.61	267.9	0.015	-68.59	1.22	4.18
Pipe p139	14.37	267.9	0.015	-68.59	1.22	4.18
Pipe p140	8.812	267.9	0.015	-68.59	1.22	4.18
Pipe p141	41.94	267.9	0.015	-68.59	1.22	4.18
Pipe p142	8.97	267.9	0.015	-68.59	1.22	4.19
Pipe p143	18.95	267.9	0.015	-68.59	1.22	4.18
Pipe p144	6.481	267.9	0.015	-68.59	1.22	4.18
Pipe p145	15.52	267.9	0.015	-68.59	1.22	4.18
Pipe p146	10.12	267.9	0.015	-68.59	1.22	4.18
Pipe p147	10.38	267.9	0.015	-68.59	1.22	4.18
Pipe p148	0.5885	267.9	0.015	-68.59	1.22	4.24
Pipe p149	0.773	267.9	0.015	-68.59	1.22	4.19
Pipe p150	0.6848	267.9	0.015	-68.59	1.22	4.13
Pipe p151	8.767	267.9	0.015	-68.59	1.22	4.18
Pipe p152	0.71	267.9	0.015	-68.59	1.22	4.19
Pipe p164	11.7	152.8	0.015	6.6	0.36	0.9
Pipe p165	0.5398	152.8	0.015	6.6	0.36	0.96
Pipe p166	3.468	152.8	0.015	6.6	0.36	0.89
Pipe p167	2.283	152.8	0.015	6.6	0.36	0.91
Pipe p168	4.447	152.8	0.015	6.6	0.36	0.9
Pipe p169	2.382	152.8	0.015	6.6	0.36	0.91
Pipe p170	1.871	152.8	0.015	6.6	0.36	0.89
Pipe p171	2.163	152.8	0.015	6.6	0.36	0.89
Pipe p172	1.203	152.8	0.015	6.6	0.36	0.9
Pipe p173	1.667	152.8	0.015	6.6	0.36	0.92
Pipe p174	11.98	152.8	0.015	6.6	0.36	0.9
Pipe p175	1.77	152.8	0.015	6.6	0.36	0.88
Pipe p177	4.49	152.8	0.015	6.6	0.36	0.9
Pipe p179	9.99	152.8	0.015	6.43	0.35	0.86
Pipe p180	2.39	152.8	0.015	6.43	0.35	0.86
Pipe p182	0.6818	152.8	0.015	5.48	0.3	0.65
Pipe p183	7.777	152.8	0.015	5.48	0.3	0.65
Pipe p184	3.03	152.8	0.015	5.48	0.3	0.64
Pipe p187	0.3482	152.8	0.015	5.48	0.3	0.64
Pipe p188	1.11	152.8	0.015	5.48	0.3	0.64
Pipe p189	3.19	152.8	0.015	5.48	0.3	0.64
Pipe p190	2.524	152.8	0.015	5.48	0.3	0.65
Pipe p191	1.086	152.8	0.015	1.01	0.06	0.03
Pipe p192	6.131	152.8	0.015	1.01	0.06	0.04
Pipe p193	3.395	152.8	0.015	1.01	0.06	0.03
Pipe p194	2.253	152.8	0.015	1.01	0.06	0.03
Pipe p195	3.623	152.8	0.015	1.01	0.06	0.03
Pipe p196	2.802	152.8	0.015	1.01	0.06	0.03
Pipe p197	3.727	152.8	0.015	1.01	0.06	0.04
Pipe p198	1.92	152.8	0.015	1.01	0.06	0.02
Pipe p199	0.2	152.8	0.015	1.01	0.06	0.19
Pipe p200	2.639	152.8	0.015	1.01	0.06	0.03
Pipe p201	3.272	152.8	0.015	1.01	0.06	0.03
Pipe p202	2.85	152.8	0.015	1.01	0.06	0.03
Pipe p203	2.263	152.8	0.015	1.01	0.06	0.03
Pipe p204	0.9576	152.8	0.015	1.01	0.06	0.04
Pipe p205	5.81	152.8	0.015	1.01	0.06	0.03
Pipe p206	1.49	152.8	0.015	0.7	0.04	0.02
Pipe p207	4.718	152.8	0.015	0.7	0.04	0.02
Pipe p208	0.4516	152.8	0.015	0.7	0.04	0.08
Pipe p209	5.289	152.8	0.015	0.7	0.04	0.01
Pipe p210	4.083	152.8	0.015	0.7	0.04	0.02
Pipe p211	5.57	152.8	0.015	0.7	0.04	0.02
Pipe p212	4.591	152.8	0.015	0.7	0.04	0.02
Pipe p213	6.928	152.8	0.015	0.7	0.04	0.02
Pipe p214	5.059	152.8	0.015	0.7	0.04	0.02
Pipe p216	12	191.1	0.015	4	0.14	0.12
Pipe p218	6.997	191.1	0.015	4	0.14	0.13
Pipe p219	18.47	191.1	0.015	4	0.14	0.13
Pipe p220	19.5	191.1	0.015	4	0.14	0.13
Pipe p221	10.5	191.1	0.015	4	0.14	0.13
Pipe p223	17.15	191.1	0.015	3.41	0.12	0.1
Pipe p225	23.77	191.1	0.015	2.71	0.09	0.06
Pipe p227	28.37	191.1	0.015	1.83	0.06	0.03
Pipe p228	9.98	191.1	0.015	1.83	0.06	0.03
Pipe p231	24.84	191.1	0.015	1.21	0.04	0.01
Pipe p232	9.42	191.1	0.015	1.21	0.04	0.02
Pipe p233	20.56	191.1	0.015	1.21	0.04	0.02
Pipe p234	12.96	191.1	0.015	1.21	0.04	0.01
Pipe p235	27.26	191.1	0.015	1.21	0.04	0.02
Pipe p236	16.47	191.1	0.015	1.21	0.04	0.02
Pipe p237	8.993	191.1	0.015	1.21	0.04	0.02
Pipe p238	11.94	191.1	0.015	1.21	0.04	0.02
Pipe p245	6.01	152.8	0.015	0	0	0
Pipe p246	12.7	50	0.015	0	0	0
Pipe p247	23.04	50	0.015	0	0	0
Pipe p249	8.821	50	0.015	0	0	0
Pipe p251	12.59	152.8	0.015	0	0	0
Pipe p252	11.5	152.8	0.015	0	0	0
Pipe p253	8.14	152.8	0.015	0	0	0
Pipe p255	17.05	152.8	0.015	-0.95	0.05	0.03
Pipe p261	8.59	50	0.015	0.04	0.02	0.03
Pipe p263	3.85	152.8	0.015	6.6	0.36	0.9
Pipe 19	27.43	191.1	0.015	-1.83	0.06	0.03
Pipe 22	17.8	191.1	0.015	-2.71	0.09	0.06
Pipe 24	16.9	191.1	0.015	-3.41	0.12	0.1
Pipe 25	13.62	152.8	0.015	0	0	0
Pipe 45	7.1	50	0.015	0	0	0
Pipe 46	9.5	50	0.015	0	0	0
Pipe 47	20.32	191.1	0.015	-4	0.14	0.13
Pipe 48	29.77	191.1	0.015	-4	0.14	0.13
Pipe 49	8	191.1	0.015	-5.48	0.19	0.22

Year 2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s + 50 l/s Ayrburn Domain

Link ID	Length m	Diameter mm	Roughnes mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe p2	5.34	250	0.015	-5.48	0.11	0.06
Pipe p3	6.49	191.1	0.015	-5.48	0.19	0.22
Pipe p4	11.33	191.1	0.015	-5.48	0.19	0.22
Pipe p7	9.66	191.1	0.015	-5.52	0.19	0.22
Pipe p8	9.546	191.1	0.015	-5.52	0.19	0.23
Pipe p9	6.139	191.1	0.015	-5.52	0.19	0.22
Pipe p10	7.89	191.1	0.015	-5.52	0.19	0.22
Pipe p11	9.403	191.1	0.015	-5.52	0.19	0.22
Pipe p12	7.836	191.1	0.015	-5.52	0.19	0.23
Pipe p13	8.28	191.1	0.015	-5.52	0.19	0.22
Pipe p14	9.601	191.1	0.015	-5.52	0.19	0.22
Pipe p15	2.229	191.1	0.015	-5.52	0.19	0.22
Pipe p16	1.931	191.1	0.015	-5.52	0.19	0.23
Pipe p17	5.747	191.1	0.015	-5.52	0.19	0.22
Pipe p18	5.108	191.1	0.015	-5.52	0.19	0.23
Pipe p19	5.41	191.1	0.015	-5.52	0.19	0.23
Pipe p20	6.379	191.1	0.015	-5.52	0.19	0.22
Pipe p21	11.26	191.1	0.015	-5.52	0.19	0.22
Pipe p22	7.271	191.1	0.015	-5.52	0.19	0.23
Pipe p23	7.711	191.1	0.015	-5.52	0.19	0.22
Pipe p24	7.904	191.1	0.015	-5.52	0.19	0.23
Pipe p25	6.305	191.1	0.015	-5.52	0.19	0.22
Pipe p44	8.292	267.9	0.015	-18.41	0.33	0.38
Pipe p45	6.583	267.9	0.015	-18.41	0.33	0.38
Pipe p46	5.604	267.9	0.015	-18.41	0.33	0.38
Pipe p47	4.655	267.9	0.015	-18.41	0.33	0.38
Pipe p48	4.025	267.9	0.015	-18.41	0.33	0.38
Pipe p49	7.081	267.9	0.015	-18.41	0.33	0.38
Pipe p50	6.744	267.9	0.015	-18.41	0.33	0.38
Pipe p51	11.08	267.9	0.015	-18.41	0.33	0.38
Pipe p52	9.948	267.9	0.015	-18.41	0.33	0.38
Pipe p53	8.031	267.9	0.015	-18.41	0.33	0.38
Pipe p54	1.465	267.9	0.015	-18.41	0.33	0.38
Pipe p57	3.238	267.9	0.015	-76.7	1.36	5.14
Pipe p58	2.385	267.9	0.015	-76.7	1.36	5.15
Pipe p59	3.284	267.9	0.015	-76.7	1.36	5.13
Pipe p60	3.527	267.9	0.015	-76.7	1.36	5.15
Pipe p61	3.862	267.9	0.015	-76.7	1.36	5.14
Pipe p62	2.909	267.9	0.015	-76.7	1.36	5.14
Pipe p63	3.592	267.9	0.015	-76.7	1.36	5.14
Pipe p64	1.629	267.9	0.015	-76.7	1.36	5.14
Pipe p65	3.068	267.9	0.015	-76.7	1.36	5.14
Pipe p66	4.092	267.9	0.015	-76.7	1.36	5.15
Pipe p67	2.589	267.9	0.015	-76.7	1.36	5.14
Pipe p68	0.9354	267.9	0.015	-76.7	1.36	5.13
Pipe p69	2.425	267.9	0.015	-76.7	1.36	5.14
Pipe p70	2.539	267.9	0.015	-76.7	1.36	5.14
Pipe p71	2.715	267.9	0.015	-76.7	1.36	5.14
Pipe p72	3.221	267.9	0.015	-76.7	1.36	5.14
Pipe p73	1.66	267.9	0.015	-76.7	1.36	5.16
Pipe p74	1.891	267.9	0.015	-76.7	1.36	5.14
Pipe p75	2.039	267.9	0.015	-76.7	1.36	5.15
Pipe p76	2.005	267.9	0.015	-76.7	1.36	5.14
Pipe p77	2.097	267.9	0.015	-76.7	1.36	5.15
Pipe p78	2.21	267.9	0.015	-76.7	1.36	5.13
Pipe p79	2.024	267.9	0.015	-76.7	1.36	5.15
Pipe p80	1.496	267.9	0.015	-76.7	1.36	5.15
Pipe p81	2.63	267.9	0.015	-76.7	1.36	5.14
Pipe p82	5.603	267.9	0.015	-76.7	1.36	5.15
Pipe p83	0.5437	267.9	0.015	-76.7	1.36	5.13
Pipe p84	1.383	267.9	0.015	-76.7	1.36	5.14
Pipe p85	7.65	267.9	0.015	-76.7	1.36	5.14
Pipe p86	6.75	267.9	0.015	-76.7	1.36	5.14
Pipe p87	4.593	267.9	0.015	-76.7	1.36	5.14
Pipe p88	15.91	267.9	0.015	-76.7	1.36	5.14
Pipe p89	8.338	267.9	0.015	-76.7	1.36	5.14
Pipe p90	12.34	267.9	0.015	-76.7	1.36	5.14
Pipe p91	8.813	267.9	0.015	-76.7	1.36	5.14
Pipe p92	14.55	267.9	0.015	-76.7	1.36	5.14
Pipe p93	8.813	267.9	0.015	-76.7	1.36	5.14
Pipe p94	10.88	267.9	0.015	-76.7	1.36	5.14
Pipe p95	10.94	267.9	0.015	-76.7	1.36	5.14
Pipe p96	11.96	267.9	0.015	-76.7	1.36	5.14
Pipe p97	10.3	267.9	0.015	-76.7	1.36	5.14
Pipe p98	11.05	267.9	0.015	-76.7	1.36	5.15
Pipe p99	7.116	267.9	0.015	-76.7	1.36	5.14
Pipe p100	8.402	267.9	0.015	-76.7	1.36	5.14
Pipe p101	8.682	267.9	0.015	-76.7	1.36	5.14
Pipe p102	10.23	267.9	0.015	-76.7	1.36	5.14
Pipe p103	8.116	267.9	0.015	-76.7	1.36	5.14
Pipe p104	10.62	267.9	0.015	-76.7	1.36	5.14
Pipe p105	12.89	267.9	0.015	-76.7	1.36	5.14
Pipe p106	13.96	267.9	0.015	-76.7	1.36	5.14
Pipe p107	10.96	267.9	0.015	-76.7	1.36	5.14
Pipe p109	22.34	267.9	0.015	-76.7	1.36	5.14
Pipe p110	14.24	267.9	0.015	-76.7	1.36	5.14
Pipe p111	17.16	267.9	0.015	-76.7	1.36	5.14
Pipe p112	14.81	267.9	0.015	-76.7	1.36	5.14
Pipe p113	11.77	267.9	0.015	-76.7	1.36	5.14
Pipe p114	9.714	267.9	0.015	-76.7	1.36	5.14
Pipe p115	11.92	267.9	0.015	-76.7	1.36	5.14
Pipe p116	12.59	267.9	0.015	-76.7	1.36	5.14
Pipe p117	11.71	267.9	0.015	-76.7	1.36	5.14
Pipe p118	10.68	267.9	0.015	-76.7	1.36	5.14
Pipe p119	10.63	267.9	0.015	-76.7	1.36	5.14
Pipe p120	9.509	267.9	0.015	-76.7	1.36	5.14
Pipe p121	10.42	267.9	0.015	-76.7	1.36	5.14
Pipe p126	12.84	267.9	0.015	-77	1.37	5.18
Pipe p128	3.013	267.9	0.015	-77	1.37	5.17
Pipe p129	10.55	267.9	0.015	-77	1.37	5.18
Pipe p130	0.6196	267.9	0.015	-77	1.37	5.16
Pipe p131	12.88	267.9	0.015	-77	1.37	5.18
Pipe p132	11.59	267.9	0.015	-77	1.37	5.18
Pipe p133	15.55	267.9	0.015	-77	1.37	5.18
Pipe p134	15.31	267.9	0.015	-77	1.37	5.18
Pipe p135	16.21	267.9	0.015	-77	1.37	5.18
Pipe p136	19.02	267.9	0.015	-77	1.37	5.18
Pipe p137	21.23	267.9	0.015	-77	1.37	5.18
Pipe p138	17.61	267.9	0.015	-77	1.37	5.18
Pipe p139	14.37	267.9	0.015	-77	1.37	5.18
Pipe p140	8.812	267.9	0.015	-77	1.37	5.18
Pipe p141	41.94	267.9	0.015	-77	1.37	5.18
Pipe p142	8.97	267.9	0.015	-77	1.37	5.18
Pipe p143	18.95	267.9	0.015	-77	1.37	5.18
Pipe p144	6.481	267.9	0.015	-77	1.37	5.18
Pipe p145	15.52	267.9	0.015	-77	1.37	5.18
Pipe p146	10.12	267.9	0.015	-77	1.37	5.18
Pipe p147	10.38	267.9	0.015	-77	1.37	5.18
Pipe p148	0.5885	267.9	0.015	-77	1.37	5.18
Pipe p149	0.773	267.9	0.015	-77	1.37	5.15
Pipe p150	0.6848	267.9	0.015	-77	1.37	5.22
Pipe p151	8.767	267.9	0.015	-77	1.37	5.18
Pipe p152	0.71	267.9	0.015	-77	1.37	5.19
Pipe p164	11.7	152.8	0.015	58.29	3.18	48.96
Pipe p165	0.5398	152.8	0.015	58.29	3.18	48.94
Pipe p166	3.468	152.8	0.015	58.29	3.18	48.95
Pipe p167	2.283	152.8	0.015	58.29	3.18	48.96
Pipe p168	4.447	152.8	0.015	58.29	3.18	48.95
Pipe p169	2.382	152.8	0.015	58.29	3.18	48.97
Pipe p170	1.871	152.8	0.015	58.29	3.18	48.96
Pipe p171	2.163	152.8	0.015	58.29	3.18	48.96
Pipe p172	1.203	152.8	0.015	58.29	3.18	48.93
Pipe p173	1.667	152.8	0.015	58.29	3.18	48.97
Pipe p174	11.98	152.8	0.015	58.29	3.18	48.96
Pipe p175	1.77	152.8	0.015	58.29	3.18	48.96
Pipe p177	4.49	152.8	0.015	58.29	3.18	48.96
Pipe p179	9.99	152.8	0.015	58.12	3.17	48.69
Pipe p180	2.39	152.8	0.015	41.46	2.26	25.84
Pipe p182	0.6818	152.8	0.015	40.51	2.21	24.78
Pipe p183	7.777	152.8	0.015	40.51	2.21	24.75
Pipe p184	3.03	152.8	0.015	40.51	2.21	24.77
Pipe p187	0.3482	152.8	0.015	23.84	1.3	9.19
Pipe p188	1.11	152.8	0.015	23.84	1.3	9.28
Pipe p189	3.19	152.8	0.015	23.84	1.3	9.27
Pipe p190	2.524	152.8	0.015	23.84	1.3	9.27
Pipe p191	1.086	152.8	0.015	17.67	0.96	5.34
Pipe p192	6.131	152.8	0.015	17.67	0.96	5.35
Pipe p193	3.395	152.8	0.015	17.67	0.96	5.35
Pipe p194	2.253	152.8	0.015	17.67	0.96	5.35
Pipe p195	3.623	152.8	0.015	17.67	0.96	5.36
Pipe p196	2.802	152.8	0.015	17.67	0.96	5.35
Pipe p197	3.727	152.8	0.015	17.67	0.96	5.35
Pipe p198	1.92	152.8	0.015	17.67	0.96	5.35
Pipe p199	0.2	152.8	0.015	17.67	0.96	5.4
Pipe p200	2.639	152.8	0.015	17.67	0.96	5.34
Pipe p201	3.272	152.8	0.015	17.67	0.96	5.36
Pipe p202	2.85	152.8	0.015	17.67	0.96	5.35
Pipe p203	2.263	152.8	0.015	17.67	0.96	5.34
Pipe p204	0.9576	152.8	0.015	17.67	0.96	5.36
Pipe p205	5.81	152.8	0.015	17.67	0.96	5.35
Pipe p206	1.49	152.8	0.015	17.36	0.95	5.17
Pipe p207	4.718	152.8	0.015	17.36	0.95	5.18
Pipe p208	0.4516	152.8	0.015	17.36	0.95	5.19
Pipe p209	5.289	152.8	0.015	17.36	0.95	5.18
Pipe p210	4.083	152.8	0.015	17.36	0.95	5.18
Pipe p211	5.57	152.8	0.015	17.36	0.95	5.18
Pipe p212	4.591	152.8	0.015	17.36	0.95	5.18
Pipe p213	6.928	152.8	0.015	0.7	0.04	0.02
Pipe p214	5.059	152.8	0.015	0.7	0.04	0.01
Pipe p216	12	191.1	0.015	4	0.14	0.12
Pipe p218	6.997	191.1	0.015	4	0.14	0.13
Pipe p219	18.47	191.1	0.015	4	0.14	0.13
Pipe p220	19.5	191.1	0.015	4	0.14	0.13
Pipe p221	10.5	191.1	0.015	4	0.14	0.13
Pipe p223	17.15	191.1	0.015	3.41	0.12	0.1
Pipe p225	23.77	191.1	0.015	2.71	0.09	0.06
Pipe p227	28.37	191.1	0.015	1.83	0.06	0.03
Pipe p228	9.98	191.1	0.015	1.83	0.06	0.03
Pipe p231	24.84	191.1	0.015	1.21	0.04	0.01
Pipe p232	9.42	191.1	0.015	1.21	0.04	0.02
Pipe p233	20.56	191.1	0.015	1.21	0.04	0.02
Pipe p234	12.96	191.1	0.015	1.21	0.04	0.01
Pipe p235	27.26	191.1	0.015	1.21	0.04	0.02
Pipe p236	16.47	191.1	0.015	1.21	0.04	0.02
Pipe p237	8.993	191.1	0.015	1.21	0.04	0.02
Pipe p238	11.94	191.1	0.015	1.21	0.04	0.02
Pipe p245	6.01	152.8	0.015	0	0	0
Pipe p246	12.7	50	0.015	0	0	0
Pipe p247	23.04	50	0.015	0	0	0
Pipe p249	8.821	50	0.015	0	0	0
Pipe p251	12.59	152.8	0.015	0	0	0
Pipe p252	11.5	152.8	0.015	0	0	0
Pipe p253	8.14	152.8	0.015	0	0	0
Pipe p255	17.05	152.8	0.015	-0.95	0.05	0.03
Pipe p261	8.59	50	0.015	0.04	0.02	0.03
Pipe p263	3.85	152.8	0.015	58.29	3.18	48.96
Pipe 19	27.43	191.1	0.015	-1.83	0.06	0.03
Pipe 22	17.8	191.1	0.015	-2.71	0.09	0.06
Pipe 24	16.9	191.1	0.015	-3.41	0.12	0.09
Pipe 25	13.62	152.8	0.015	0	0	0
Pipe 45	7.1	50	0.015	0	0	0
Pipe 46	9.5	50	0.015	0	0	0
Pipe 47	20.32	191.1	0.015	-4	0.14	0.13
Pipe 48	29.77	191.1	0.015	-4	0.14	0.13
Pipe 49	8	191.1	0.015	-5.48	0.19	0.22

PIPES - WATERFALL PARK HYDRAULIC MODELING

Year 2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler							Year 2058_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler							Year 2028_Fire Flow Analysis_Steady State_Consented 60% x 33.5 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler							Year 2028_Fire Flow Analysis_Steady State_Full 60% x 45 l/s + 25 l/s FW 2 + 16.6 l/s Sprinkler							Year 2058_Fire Flow Analysis_Steady State_Full 60% x 45 l/s + 50 l/s Ayrburn Domain						
	Length	Diameter	Roughness	Flow	Velocity	Unit Headloss		Length	Diameter	Roughness	Flow	Velocity	Unit Headloss		Length	Diameter	Roughness	Flow	Velocity	Unit Headloss		Length	Diameter	Roughness	Flow	Velocity	Unit Headloss		Length	Diameter	Roughness	Flow	Velocity	Unit Headloss
Pipe 50	6.57	191.1	0.015	-5.52	0.19	0.22	Pipe 50	6.57	191.1	0.015	-5.52	0.19	0.23	Pipe 50	6.57	191.1	0.015	-5.52	0.19	0.23	Pipe 50	6.57	191.1	0.015	-5.52	0.19	0.22	Pipe 50	6.57	191.1	0.015	-5.52	0.19	0.22
Pipe 51	43.44	50	0.015	0.04	0.02	0.03	Pipe 51	43.44	50	0.015	0.04	0.02	0.03	Pipe 51	43.44	50	0.015	0.04	0.02	0.03	Pipe 51	43.44	50	0.015	0.04	0.02	0.03	Pipe 51	43.44	50	0.015	0.04	0.02	0.03
Pipe 52	2.29	152.8	0.015	-5.48	0.3	0.63	Pipe 52	2.29	152.8	0.015	-5.48	0.3	0.65	Pipe 52	2.29	152.8	0.015	-5.48	0.3	0.65	Pipe 52	2.29	152.8	0.015	-5.48	0.3	0.65	Pipe 52	2.29	152.8	0.015	-40.51	2.21	24.76
Pipe 53	0.88	152.8	0.015	-5.48	0.3	0.68	Pipe 53	0.88	152.8	0.015	-5.48	0.3	0.63	Pipe 53	0.88	152.8	0.015	-5.48	0.3	0.63	Pipe 53	0.88	152.8	0.015	-5.48	0.3	0.63	Pipe 53	0.88	152.8	0.015	-40.51	2.21	24.78
Pipe 54	5.29	152.8	0.015	-5.48	0.3	0.64	Pipe 54	5.29	152.8	0.015	-5.48	0.3	0.65	Pipe 54	5.29	152.8	0.015	-5.48	0.3	0.65	Pipe 54	5.29	152.8	0.015	-5.48	0.3	0.65	Pipe 54	5.29	152.8	0.015	-40.51	2.21	24.75
Pipe 55	6.79	152.8	0.015	-5.48	0.3	0.65	Pipe 55	6.79	152.8	0.015	-5.48	0.3	0.64	Pipe 55	6.79	152.8	0.015	-5.48	0.3	0.65	Pipe 55	6.79	152.8	0.015	-5.48	0.3	0.65	Pipe 55	6.79	152.8	0.015	-40.51	2.21	24.76
Pipe 58	9.72	152.8	0.015	-6.56	0.36	0.89	Pipe 58	9.72	152.8	0.015	-6.56	0.36	0.89	Pipe 58	9.72	152.8	0.015	-6.56	0.36	0.89	Pipe 58	9.72	152.8	0.015	-6.56	0.36	0.89	Pipe 58	9.72	152.8	0.015	-58.25	3.18	48.89
Pipe 59	0.76	152.8	0.015	-6.6	0.36	0.88	Pipe 59	0.76	152.8	0.015	-6.6	0.36	0.93	Pipe 59	0.76	152.8	0.015	-6.6	0.36	0.88	Pipe 59	0.76	152.8	0.015	-6.6	0.36	0.88	Pipe 59	0.76	152.8	0.015	-58.29	3.18	48.96
Pipe 60	1.65	152.8	0.015	-6.6	0.36	0.9	Pipe 60	1.65	152.8	0.015	-6.6	0.36	0.9	Pipe 60	1.65	152.8	0.015	-6.6	0.36	0.88	Pipe 60	1.65	152.8	0.015	-6.6	0.36	0.88	Pipe 60	1.65	152.8	0.015	-58.29	3.18	48.96
Pipe 61	3.11	152.8	0.015	-6.6	0.36	0.9	Pipe 61	3.11	152.8	0.015	-6.6	0.36	0.9	Pipe 61	3.11	152.8	0.015	-6.6	0.36	0.91	Pipe 61	3.11	152.8	0.015	-6.6	0.36	0.91	Pipe 61	3.11	152.8	0.015	-58.29	3.18	48.96
Pipe 62	0.67	152.8	0.015	-6.43	0.35	0.83	Pipe 62	0.67	152.8	0.015	-6.43	0.35	0.89	Pipe 62	0.67	152.8	0.015	-6.43	0.35	0.83	Pipe 62	0.67	152.8	0.015	-6.43	0.35	0.83	Pipe 62	0.67	152.8	0.015	-58.12	3.17	48.7
Pipe 63	0.99	152.8	0.015	6.43	0.35	0.86	Pipe 63	0.99	152.8	0.015	6.43	0.35	0.83	Pipe 63	0.99	152.8	0.015	6.43	0.35	0.86	Pipe 63	0.99	152.8	0.015	6.43	0.35	0.86	Pipe 63	0.99	152.8	0.015	41.46	2.26	25.86
Pipe 64	1.79	152.8	0.015	5.48	0.3	0.64	Pipe 64	1.79	152.8	0.015	5.48	0.3	0.64	Pipe 64	1.79	152.8	0.015	5.48	0.3	0.64	Pipe 64	1.79	152.8	0.015	5.48	0.3	0.64	Pipe 64	1.79	152.8	0.015	40.51	2.21	24.76
Pipe 65	1.96	267.9	0.015	-61.69	1.09	3.44	Pipe 65	1.96	267.9	0.015	-54.8	0.97	2.77	Pipe 65	1.96	267.9	0.015	-54.8	0.97	2.75	Pipe 65	1.96	267.9	0.015	-61.69	1.09	3.44	Pipe 65	1.96	267.9	0.015	-18.41	0.33	0.38
Pipe 66	2.01	267.9	0.015	68.29	1.21	4.15	Pipe 66	2.01	267.9	0.015	61.4	1.09	3.41	Pipe 66	2.01	267.9	0.015	61.4	1.09	3.42	Pipe 66	2.01	267.9	0.015	68.29	1.21	4.15	Pipe 66	2.01	267.9	0.015	76.7	1.36	5.15
Pipe 67	7.57	152.8	0.015	6.6	0.36	0.9	Pipe 67	7.57	152.8	0.015	6.6	0.36	0.9	Pipe 67	7.57	152.8	0.015	6.6	0.36	0.9	Pipe 67	7.57	152.8	0.015	6.6	0.36	0.9	Pipe 67	7.57	152.8	0.015	58.29	3.18	48.96
Pipe 68	9.58	267.9	0.015	68.29	1.21	4.15	Pipe 68	9.58	267.9	0.015	61.4	1.09	3.41	Pipe 68	9.58	267.9	0.015	61.4	1.09	3.41	Pipe 68	9.58	267.9	0.015	68.29	1.21	4.15	Pipe 68	9.58	267.9	0.015	76.7	1.36	5.14
Pipe 69	9.58	267.9	0.015	68.29	1.21	4.15	Pipe 69	9.58	267.9	0.015	61.4	1.09	3.41	Pipe 69	9.58	267.9	0.015	61.4	1.09	3.41	Pipe 69	9.58	267.9	0.015	68.29	1.21	4.15	Pipe 69	9.58	267.9	0.015	76.7	1.36	5.14
Pipe 72	8.05	180	0.015	0.05	0	0	Pipe 72	8.05	180	0.015	0.05	0	0	Pipe 72	8.05	180	0.015	0.05	0	0	Pipe 72	8.05	180	0.015	0.05	0	0	Pipe 72	8.05	180	0.015	0.05	0	0
Pipe 73	16.17	180	0.015	0.26	0.01	0	Pipe 73	16.17	180	0.015	0.26	0.01	0	Pipe 73	16.17	180	0.015	0.26	0.01	0	Pipe 73	16.17	180	0.015	0.26	0.01	0	Pipe 73	16.17	180	0.015	0.26	0.01	0
Pipe 74	9.51	180	0.015	0.26	0.01	0	Pipe 74	9.51	180	0.015	0.26	0.01	0	Pipe 74	9.51	180	0.015	0.26	0.01	0	Pipe 74	9.51	180	0.015	0.26	0.01	0	Pipe 74	9.51	180	0.015	0.26	0.01	0
Pipe 75	6.68	180	0.015	0.26	0.01	0	Pipe 75	6.68	180	0.015	0.26	0.01	0	Pipe 75	6.68	180	0.015	0.26	0.01	0	Pipe 75	6.68	180	0.015	0.26	0.01	0	Pipe 75	6.68	180	0.015	0.26	0.01	0.01
Pipe 76	14.61	180	0.015	0.26	0.01	0	Pipe 76	14.61	180	0.015	0.26	0.01	0	Pipe 76	14.61	180	0.015	0.26	0.01	0	Pipe 76	14.61	180	0.015	0.26	0.01	0	Pipe 76	14.61	180	0.015	0.26	0.01	0
Pipe 77	13.8	180	0.015	0.26	0.01	0	Pipe 77	13.8	180	0.015	0.26	0.01	0	Pipe 77	13.8	180	0.015	0.26	0.01	0	Pipe 77	13.8	180	0.015	0.26	0.01	0	Pipe 77	13.8	180	0.015	0.26	0.01	0
Pipe 87	1.4	152.8	0.015	-6.6	0.36	0.88	Pipe 87	1.4	152.8	0.015	-6.6	0.36	0.9	Pipe 87	1.4	152.8	0.015	-6.6	0.36	0.9	Pipe 87	1.4	152.8	0.015	-6.6	0.36	0.9	Pipe 87	1.4	152.8	0.015	-58.29	3.18	48.95
Pipe 89	0.69	152.8	0.015	-6.6	0.36	0.92	Pipe 89	0.69	152.8	0.015	-6.6	0.36	0.92	Pipe 89	0.69	152.8	0.015	-6.6	0.36	0.86	Pipe 89	0.69	152.8	0.015	-6.6	0.36	0.86	Pipe 89	0.69	152.8	0.015	-58.29	3.18	48.96
Pipe 90	2.39	152.8	0.015	-6.6	0.36	0.9	Pipe 90	2.39	152.8	0.015	-6.6	0.36	0.9	Pipe 90	2.39	152.8	0.015	-6.6	0.36	0.9	Pipe 90	2.39	152.8	0.015	-6.6	0.36	0.9	Pipe 90	2.39	152.8	0.015	-58.29	3.18	48.96
Pipe 91	3.07	152.8	0.015	-6.6	0.36	0.9	Pipe 91	3.07	152.8	0.015	-6.6	0.36	0.9	Pipe 91	3.07	152.8	0.015	-6.6	0.36	0.91	Pipe 91	3.07	152.8	0.015	-6.6	0.36	0.91	Pipe 91	3.07	152.8	0.015	-58.29	3.18	48.95
Pipe 92	2.42	225	0.015	-5.48	0.14	0.11	Pipe 92	2.42	225	0.015	-5.48	0.14	0.09	Pipe 92	2.42	225	0.015	-5.48	0.14	0.11	Pipe 92	2.42	225	0.015	-5.48	0.14	0.09	Pipe 92	2.42	225	0.015	-5.48	0.14	0.09
Pipe 2	0.88	152.8	0.015	-6.6	0.36	0.93	Pipe 2	0.88	152.8	0.015	-6.6	0.36	0.89	Pipe 2	0.88	152.8	0.015	-6.6	0.36	0.89	Pipe 2	0.88	152.8	0.015	-6.6	0.36	0.89	Pipe 2	0.88	152.8	0.015	-58.29	3.18	48.96
Pipe 3	4.46	267.9	0.015	68.59	1.22	4.19	Pipe 3	4.46	267.9	0.015	61.7	1.09	3.45	Pipe 3	4.46	267.9	0.015	61.7	1.09	3.44	Pipe 3	4.46	267.9	0.015	68.59	1.22	4.18	Pipe 3	4.46	267.9	0.015	77	1.37	5.18
Pipe 4	6.75	267.9	0.015	61.69	1.09	3.44	Pipe 4	6.75	267.9	0.015	54.8	0.97	2.77	Pipe 4	6.75	267.9	0.015	54.8	0.97	2.77	Pipe 4	6.75	267.9	0.015	61.69	1.09	3.44	Pipe 4	6.75	267.9	0.015	18.41	0.33	0.38
Pipe 5	6.61	267.9	0.015	-54.8	0.97	2.76	Pipe 5	6.61	267.9	0.015	-54.8	0.97	2.76	Pipe 5	6.61	267.9	0.015	-54.8	0.97	2.77	Pipe 5	6.61	267.9	0.015	-54.8	0.97	2.76	Pipe 5	6.61	267.9	0.015	-11.52	0.2	0.16
Pipe 1	41	152.8	0.015	0	0	0	Pipe 1	41	152.8	0.015	0	0	0	Pipe 1	41	152.8	0.015	0	0	0	Pipe 1	41	152.8	0.015	0	0	0	Pipe 1	41	152.8	0.015	0	0	0
Pipe 9	1.4	191.1	0.015	5.48	0.19	0.21	Pipe 9	1.4	191.1	0.015	5.48	0.19	0.21	Pipe 9	1.4	191.1	0.015	5.48	0.19	0.21	Pipe 9	1.4	191.1	0.015	5.48	0.19	0.24	Pipe 9	1.4	191.1	0.015	5.48	0.19	0.24
Pipe 10	24.46	191.1	0.015	-4	0.14	0.13	Pipe 10	24.46	191.1	0.015	-4	0.14	0.13	Pipe 10	24.46	191.1	0.015	-4	0.14	0.13	Pipe 10	24.46	191.1	0.015	-4	0.14	0.13	Pipe 10	24.46	191.1	0.015	-4	0.14	0.13
Pipe 11	17.96	191.1	0.015	-3.41	0.12	0.1	Pipe 11	17.96	191.1	0.015	-3.41	0.12	0.1	Pipe 11	17.96	191.1	0.015	-3.41	0.12	0.1	Pipe 11	17.96	191.1	0.015	-3.41	0.12	0.1	Pipe 11	17.96	191.1	0.015	-3.41	0.12	0.1
Pipe 12	2.51	191.1	0.015	-4	0.14	0.12	Pipe 12	2.51	191.1	0.015	-4	0.14	0.12	Pipe 12	2.51	191.1	0.015	-4	0.14	0.13	Pipe 12	2.51	191.1	0.015	-4	0.14	0.12	Pipe 12	2.51	191.1	0.015	-4	0.14	0.12
Pipe 8	4.55	191.1	0.015	3.41	0.12	0.09	Pipe 8	4.55	191.1	0.015	3.41	0.12	0.1	Pipe 8	4.55	191.1	0.015	3.41	0.12	0.1	Pipe 8	4.55	191.1	0.015	3.41	0.12	0.09	Pipe 8	4.55	191.1	0.015	3.41	0.12	0.1
Pipe 13	9.45	191.1	0.015	2.71	0.09	0.06	Pipe 13	9.45	191.1	0.015	2.71	0.09	0.06	Pipe 13	9.45	191.1	0.015	2.71	0.09	0.06	Pipe 13	9.45	191.1	0.015	2.71	0.09	0.06	Pipe 13	9.45	191.1	0.015	2.71	0.09	0.06
Pipe 15	22.02	191.1	0.015	-1.83	0.06	0.03	Pipe 15	22.02	191.1	0.015	-1.83	0.06	0.03	Pipe 15	22.02	191.1	0.015	-1.83	0.06	0.03	Pipe 15	22.02	191.1	0.015	-1.83	0.06	0.03	Pipe 15	22.02	191.1	0.015	-1.83	0.06	0.03
Pipe 16	3.18	191.1	0.015	-2.71	0.09	0.06	Pipe 16	3.18	191.1	0.015	-2.71	0.09	0.07	Pipe 16	3.18	191.1	0.015	-2.71	0.09	0.06	Pipe 16	3.18	191.1	0.015	-2.71	0.09	0.07	Pipe 16	3.18	191.1	0.015	-2.71	0.09	0.07
Pipe 18	28.46	191.1	0.015	-1.21	0.04	0.02	Pipe 18	28.46	191.1	0.015	-1.21	0.04	0.02	Pipe 18	28.46	191.1	0.015	-1.21	0.04	0.02	Pipe 18	28.46	191.1	0.015	-1.21	0.04	0.02	Pipe 18	28.46	191.1	0.015	-1.21	0.04	0.02
Pipe 20	1.54	191.1	0.015	-1.83	0.06	0.02	Pipe 20	1.54	191.1	0.015	-1.83	0.06	0.05	Pipe 20	1.54	191.1	0.015	-1.83	0.06	0.02	Pipe 20	1.54	191.1	0.015	-1.83	0.06	0.02	Pipe 20	1.54	191.1	0.015	-1.83	0.06	0.02
Pipe 23	36.24	191.1	0.015	0.55	0.02	0	Pipe 23	36.24	191.1	0.015	0.55	0.02	0	Pipe 23	36.24	191.1	0.015	0.55	0.02	0	Pipe 23	36.24	191.1	0.015	0.55	0.02	0	Pipe 23	36.24	191.1	0.015	0.55	0.02	0
Pipe 26	0.86	191.1	0.015	-0.55	0.02	0.04	Pipe 26	0.86	191.1	0.015	-0.55	0.02	0	Pipe 26	0.86	191.1	0.015	-0.55	0.02	0	Pipe 26	0.86	191.1	0.015	-0.55	0.02	0	Pipe 26	0.86	191.1	0.015	-0.55	0.02	0
Pipe 27	6.4	152.8	0.015	0	0	0	Pipe 27	6.4	152.8	0.015	0	0	0	Pipe 27	6.4	152.8	0.015	0	0	0	Pipe 27	6.4	152.8	0.015	0	0	0	Pipe 27	6.4	152.8	0.015	0	0	0
Pipe 86	13.25	269.7	0.015	68.59	1.2	4.05	Pipe 86	13.25	269.7	0.015	61.7	1.08	3.33	Pipe 86	13.25	269.7	0.015	61.7	1.08	3.33	Pipe 86	13.25	269.7	0.015	68.59	1.2	4.05	Pipe 86	13.25	269.7	0.015	77	1.35	5.01
Pipe 88	10.26	269.7	0.015	68.59	1.2	4.05	Pipe 88	10.26	269.7	0.015	61.7	1.08	3.33	Pipe 88	10.26	269.7	0.015	61.7	1.08	3.33	Pipe 88	10.26	269.7	0.015	68.59	1.2	4.05	Pipe 88	10.26	269.7	0.015	77	1.35	5.01
Pipe D_p3	27.45	93.3	0.015	17.26	2.52	57.52	Pipe D_p3	27.45	93.3	0.015	17.26	2.52	57.52	Pipe D_p3	27.45	93.3	0.015	17.26	2.52	57.52	Pipe D_p3	27.45	93.3	0.015	17.26	2.52	57.52	Pipe D_p3	27.45	93.3	0.015	0.66	0.1	0.17
Pipe D_p4	10.03	152.8	0.015	49.28	2.69	35.72	Pipe D_p4	10.03	152.8	0.015	49.28	2.69	35.72	Pipe D_p4	10.03	152.8	0.015	49.28	2.69	35.72	Pipe D_p4	10.03	152.8	0.015	49.28	2.69	35.72	Pipe D_p4	10.03	152.8	0.015	6	0.33	0.76
Pipe D_p5	9.815	152.8	0.015	49.23	2.68	35.65	Pipe D_p5	9.815	152.8	0.015	49.23	2.68	35.65	Pipe D_p5	9.815	152.8	0.015	49.23	2.68	35.65	Pipe D_p5	9.815	152.8	0.015	49.23	2.68	35.65	Pipe D_p5	9.815	152.8	0.015	5.95	0.32	0.75
Pipe D_p6	57.91	152.8	0.015	49.23	2.68	35.65	Pipe D_p6	57.91	152.8	0.015	49.23	2.68	35.65	Pipe D_p6	57.91	152.8	0.015	49.23	2.68	35.65	Pipe D_p6	57.91	152.8	0.015	49.23	2.68	35.65	Pipe D_p6	57.91	152.8	0.015	5.95	0.32	0.75
Pipe D_p7	16.48	152.8	0.015	49.23	2.68	35.65	Pipe D_p7	16.48	152.8	0.015	49.23	2.68	35.65	Pipe D_p7	16.48	152.8	0.015	49.23	2.68	35.65	Pipe D_p7	16.48	152.8	0.015	49.23	2.68	35.65	Pipe D_p7	16.48	152.8	0.015	5.95	0.32	0.75
Pipe D_p8	17.17	152.8	0.015	49.23	2.68	35.65	Pipe D_p8	17.17	152.8	0.015	49.23	2.68	35.65	Pipe D_p8	17.17	152.8	0.015	49.23	2.68	35.65	Pipe D_p8	17.17	152.8	0.015	49.23	2.68	35.65	Pipe D_p8	17.17	152.8	0.015	5.95	0.32	0.75
Pipe D_p9	32.74	93.3	0.015	16.6	2.43	53.48	Pipe D_p9	32.74	93.3	0.015	16.6	2.43	53.48	Pipe D_p9	32.74	93.3	0.015	16.6	2.43	53.48	Pipe D_p9	32.74	93.3	0.015	16.6	2.43	53.48	Pipe D_p9	32.74	93.3	0.015	0	0	0
Pipe D_p1	35.45	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	35.45	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	35.45	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	35.45	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	35.45	93.3	0.015	0	0	0
Pipe D_p1	21.26	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	21.26	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	21.26	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	21.26	93.3	0.015	16.6	2.43	53.48	Pipe D_p1	21.26	93.3	0.015	0	0	0
Pipe D_p1	10.05	63.7	0.015	-0.38	0.12	0.39	Pipe D_p1	10.05	63.7	0.015	-0.38	0.12	0.39	Pipe D_p1	10.05	63.7	0.015	-0.38	0.12	0.39	Pipe D_p1	10.05	63.7	0.015	-0.38	0.12	0.39	Pipe D_p1	10.05	63.7	0.015	-0.38	0.12	0.39
Pipe D_p1	29.28	63.7	0.015	-0.76	0.24	1.29	Pipe D_p1	29.28	63.7	0.015	-0.76	0.24	1.29	Pipe D_p1	29.28	63.7	0.015	-0.76	0.24	1.29	Pipe D_p1	29.28	63.7	0.015	-0.76	0.24	1.29	Pipe D_p1	29.28	63.7	0.015	-0.76	0.24	1.29
Pipe D_p1	14.14	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	14.14	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	14.14	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	14.14	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	14.14	63.7	0.015	-1.14	0.36	2.63
Pipe D_p1	15.5	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	15.5	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	15.5	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	15.5	63.7	0.015	-1.14	0.36	2.63	Pipe D_p1	15.5	63.7	0.015	-1.14	0.36	2.63
Pipe D_p1	28.06	63.7	0.015	0	0	0	Pipe D_p1	28.06	63.7	0.015	0	0	0	Pipe D_p1	28.06	63.7	0.015	0	0	0	Pipe D_p1	28.06	63.7	0.015	0	0	0	Pipe D_p1	28.06	63.7	0.015	0	0	0
Pipe D_p1	23.29	152.8	0.015	0	0	0	Pipe D_p1	23.29	152.8	0.015	0	0	0	Pipe D_p1	23.29	152.8	0.015	0	0	0	Pipe D_p1	23.29	152.8	0.015	0	0	0	Pipe D_p1	23.29	152.8	0.015	0	0	0
Pipe D_p1	10.6	152.8	0.015	0	0	0	Pipe D_p1	10.6	152.8	0.015	0	0	0	Pipe D_p1	10.6	152.8	0.015	0	0	0	Pipe D_p1	10.6	152.8	0.015	0	0	0	Pipe D_p1	10.6	152.8	0.015	0	0	0
Pipe D_p1	3.218	152.8	0.015	0	0	0	Pipe D_p1	3.218	152.8	0.015	0	0	0	Pipe D_p1	3.218	152.8	0.015	0	0	0	Pipe D_p1	3.218	152.8	0.015	0	0	0	Pipe D_p1	3.218	152.8	0.015	0	0	0
Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0
Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0
Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0
Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0
Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0
Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0	Pipe D_p2	3.218	152.8	0.015	0	0	0
Pipe D_p2	34	152.8	0.015	0	0	0	Pipe D_p2	34	152.8	0.015	0	0	0	Pipe D_p2	34	152.8	0.015	0	0	0	Pipe D_p2	34	152.8	0.015	0	0	0	Pipe D_p2	34	152.8	0.015	0	0	0
Pipe D_p2	3.866	152.8	0.015	0	0	0	Pipe D_p2	3.866	152.8	0.015	0	0	0	Pipe D_p2	3.866	152.8	0.015	0	0	0	Pipe D_p2	3.866	152.8	0.015	0	0	0	Pipe D_p2	3.866	152.8	0.015	0	0	0
Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0
Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0
Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0
Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0
Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0
Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0	Pipe D_p3	3.866	152.8	0.015	0	0	0
Pipe D_p3	29.48	152.8	0.015	0	0	0	Pipe D_p3	29.48	152.8	0.015	0	0	0	Pipe D_p3	29.48	152.8	0.015	0	0	0	Pipe D_p3	29.48	152.8	0.015	0	0	0	Pipe D_p3	29.48	152.8	0.015	0	0	0
Pipe D_p3	6.494	152.8	0.015	0	0	0	Pipe D_p3	6.494	152.8	0.015	0	0	0	Pipe D_p3	6.494	152.8	0.015	0	0	0	Pipe D_p3	6.494	152.8	0.015	0	0	0	Pipe D_p3	6.494	152.8	0.015	0	0	0
Pipe D_p4	19.89	152.8	0.015	-1.14	0.06	0.04	Pipe D_p4	19.89	152.8	0.015	-1.14	0.06	0.04	Pipe D_p4	19.89	152.8	0.015	-1.14	0.06	0.04	Pipe D_p4	19.89	152.8	0.015	-1.14	0.06	0.04	Pipe D_p4	19.89	152.8	0.015	-1.14	0.06	0.04
Pipe D_p4	28.39	152.8	0.015	-1.57	0.09	0.07	Pipe D_p4	28.39	152.8	0.015	-1.57	0.09	0.07	Pipe D_p4	28.39	152.8	0.015	-1.57	0.09	0.07	Pipe D_p4	28.39	152.8	0.015	-1.57	0.09	0.07	Pipe D_p4	28.39	152.8	0.015	-1.57	0.09	0.07
Pipe D_p4	16.08	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	16.08	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	16.08	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	16.08	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	16.08	152.8	0.015	-1.95	0.11	0.1
Pipe D_p4	20.11	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	20.11	152.8	0.015	-1.95	0.11	0.11	Pipe D_p4	20.11	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	20.11	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	20.11	152.8	0.015	-1.95	0.11	0.11
Pipe D_p4	11.44	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	11.44	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	11.44	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	11.44	152.8	0.015	-1.95	0.11	0.1	Pipe D_p4	11.44	152.8	0.015	-1.95	0.11	0.1
Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14
Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14	Pipe D_p4	8.234	152.8	0.015	-2.33	0.13	0.14
Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14
Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.387	152.8	0.015	-2.33	0.13	0.14
Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14
Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15
Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14
Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	4.031	152.8	0.015	-2.33	0.13	0.15
Pipe D_p5	1.063	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	1.063	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	1.063	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	1.063	152.8	0.015	-2.33	0.13	0.14	Pipe D_p5	1.063	152.8	0.015	-2.33	0.13	0.14
Pipe D_p5	20.74	63.7	0.015	0.38	0.12	0.39	Pipe D_p5	20.74	63.7	0.015	0.38	0.12	0.39	Pipe D_p5	20.74	63.7	0.015	0.38	0.12	0.39	Pipe D_p5	20.74	63.7	0.015	0.38	0.12	0.39	Pipe D_p5	20.74	63.7	0.015	0.38	0.12	0.39
Pipe D_p6	4.23	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	4.23	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	4.23	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	4.23	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	4.23	63.7	0.015	0.38	0.12	0.39
Pipe D_p6	5.449	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	5.449	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	5.449	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	5.449	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	5.449	63.7	0.015	0.38	0.12	0.39
Pipe D_p6	16.65	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	16.65	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	16.65	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	16.65	63.7	0.015	0.38	0.12	0.39	Pipe D_p6	16.65	63.7	0.015	0.38	0.12	0.39
Pipe D_p6	11.48	25.9	0.015	-0.05	0.09	0.51	Pipe D_p6	11.48	25.9	0.015	-0.05	0.09	0.52	Pipe D_p6	11.48	25.9	0.015	-0.05	0.09	0.52	Pipe D_p6	11.48	25.9	0.015	-0.05	0.09	0.52	Pipe D_p6	11.48	25.9	0.015	-0.05	0.09	0.51
Pipe D_p6	3.84	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	3.84	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	3.84	63.7	0.015	-0.38	0.12	0.38	Pipe D_p6	3.84	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	3.84	63.7	0.015	-0.38	0.12	0.38
Pipe D_p6	5.704	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.704	63.7	0.015	-0.38	0.12	0.38	Pipe D_p6	5.704	63.7	0.015	-0.38	0.12	0.38	Pipe D_p6	5.704	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.704	63.7	0.015	-0.38	0.12	0.38
Pipe D_p6	5.812	63.7	0.015	-0.38	0.12	0.38	Pipe D_p6	5.812	63.7	0.015	-0.38	0.12	0.38	Pipe D_p6	5.812	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.812	63.7	0.015	-0.38	0.12	0.38	Pipe D_p6	5.812	63.7	0.015	-0.38	0.12	0.38
Pipe D_p6	5.883	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.883	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.883	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.883	63.7	0.015	-0.38	0.12	0.39	Pipe D_p6	5.883	63.7	0.015	-0.38	0.12	0.39
Pipe D_p6	4.673	152.8	0.015	-15.21	0.83	4.07	Pipe D_p6	4.673	152.8	0.015	-15.21	0.83	4.07	Pipe D_p6	4.673	152.8	0.015	-15.21	0.83	4.07	Pipe D_p6	4.673	152.8	0.015	-15.21	0.83	4.07	Pipe D_p6	4.673	152.8	0.015	-2.71	0.15	0.19
Pipe D_p7	4.336	63.7	0.015	0	0	0	Pipe D_p7	4.336	63.7	0.015	0	0	0	Pipe D_p7	4.336	63.7	0.015	0	0	0	Pipe D_p7	4.336	63.7	0.015	0	0	0	Pipe D_p7	4.336	63.7	0.015	0	0	0
Pipe D_p7	2.852	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	2.852	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	2.852	63.7	0.015	-0.38	0.12	0.38	Pipe D_p7	2.852	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	2.852	63.7	0.015	-0.38	0.12	0.38
Pipe D_p7	7.787	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	7.787	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	7.787	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	7.787	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	7.787	63.7	0.015	-0.38	0.12	0.39
Pipe D_p7	2.539	63.7	0.015	-0.38	0.12	0.4	Pipe D_p7	2.539	63.7	0.015	-0.38	0.12	0.38	Pipe D_p7	2.539	63.7	0.015	-0.38	0.12	0.38	Pipe D_p7	2.539	63.7	0.015	-0.38	0.12	0.4	Pipe D_p7	2.539	63.7	0.015	-0.38	0.12	0.38
Pipe D_p7	2.907	25.9	0.015	0	0	0	Pipe D_p7	2.907	25.9	0.015	0	0	0	Pipe D_p7	2.907	25.9	0.015	0	0	0	Pipe D_p7	2.907	25.9	0.015	0	0	0	Pipe D_p7	2.907	25.9	0.015	0	0	0
Pipe D_p7	4.655	63.7	0.015	-0.38	0.12	0.38	Pipe D_p7	4.655	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	4.655	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	4.655	63.7	0.015	-0.38	0.12	0.38	Pipe D_p7	4.655	63.7	0.015	-0.38	0.12	0.39
Pipe D_p7	7.445	63.7	0.015	-0.43	0.13	0.48	Pipe D_p7	7.445	63.7	0.015	-0.43	0.13	0.48	Pipe D_p7	7.445	63.7	0.015	-0.43	0.13	0.48	Pipe D_p7	7.445	63.7	0.015	-0.43	0.13	0.48	Pipe D_p7	7.445	63.7	0.015	-0.43	0.13	0.48
Pipe D_p7	4.542	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	4.542	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	4.542	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	4.542	63.7	0.015	-0.38	0.12	0.39	Pipe D_p7	4.542	63.7	0.015	-0.38	0.12	0.39
Pipe D_p8	49.72	93.3	0.015	17.26	2.52	57.52	Pipe D_p8	49.72	93.3	0.015	17.26	2.52	57.52	Pipe D_p8	49.72	93.3	0.015	17.26	2.52	57.52	Pipe D_p8	49.72	93.3	0.015	17.26	2.52	57.52	Pipe D_p8	49.72	93.3	0.015	0.66	0.1	0.16
Pipe D_p8	2.528	152.8	0.015	0	0	0	Pipe D_p8	2.528	152.8	0.015	0	0	0	Pipe D_p8	2.528	152.8	0.015	0	0	0	Pipe D_p8	2.528	152.8	0.015	0	0	0	Pipe D_p8	2.528	152.8	0.015	0	0	0
Pipe D_p8	29.3	152.8	0.015	-2.71	0.15	0.19	Pipe D_p8	29.3	152.8	0.015	-2.71	0.15	0.19	Pipe D_p8	29.3	152.8	0.015	-2.71	0.15	0.19	Pipe D_p8	29.3	152.8	0.015	-2.71	0.15	0.19	Pipe D_p8	29.3	152.8	0.015	-2.71	0.15	0.19
Pipe D_p8	2.185	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	2.185	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	2.185	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	2.185	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	2.185	152.8	0.015	-2.71	0.15	0.17
Pipe D_p8	11.46	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	11.46	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	11.46	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	11.46	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	11.46	152.8	0.015	-2.71	0.15	0.19
Pipe D_p8	27.93	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	27.93	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	27.93	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	27.93	152.8	0.015	-15.21	0.83	4.07	Pipe D_p8	27.93	152.8	0.015	-2.71	0.15	0.19
Pipe D_p8	20.15	63.7	0.015	0	0	0	Pipe D_p8	20.15	63.7	0.015	0	0	0	Pipe D_p8	20.15	63.7	0.015	0	0	0	Pipe D_p8	20.15	63.7	0.015	0	0	0	Pipe D_p8	20.15	63.7	0.015	0	0	0
Pipe D_p8	19.72	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	19.72	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	19.72	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	19.72	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	19.72	63.7	0.015	-0.38	0.12	0.39
Pipe D_p8	10.95	63.7	0.015	-0.38	0.12	0.38	Pipe D_p8	10.95	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	10.95	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	10.95	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	10.95	63.7	0.015	-0.38	0.12	0.39
Pipe D_p8	20.17	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	20.17	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	20.17	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	20.17	63.7	0.015	-0.38	0.12	0.39	Pipe D_p8	20.17	63.7	0.015	-0.38	0.12	0.39
Pipe D_p9	19.24	152.8	0.015	-15.59	0.85	4.26	Pipe D_p9	19.24	152.8	0.015	-15.59	0.85	4.25	Pipe D_p9	19.24	152.8	0.015	-15.59	0.85	4.25	Pipe D_p9	19.24	152.8	0.015	-15.59	0.85	4.26	Pipe D_p9	19.24	152.8	0.015	-3.09	0.17	0.23
Pipe D_p9	2.267	152.8	0.015	-15.59	0.85	4.25	Pipe D_p9	2.267	152.8	0.015	-15.59	0.85	4.27	Pipe D_p9	2.267	152.8	0.015	-15.59	0.85	4.27	Pipe D_p9	2.267	152.8	0.015	-15.59	0.85	4.25	Pipe D_p9	2.267	152.8	0.015	-3.09	0.17	0.25
Pipe D_p9	15.46	152.8	0.015	-15.59	0.85	4.26	Pipe D_p9	15.46	152.8	0.015	-15.59	0.85	4.25	Pipe D_p9	15.46	152.8	0.015	-15.59	0.85	4.25	Pipe D_p9	15.46	152.8	0.015	-15.59	0.85	4.26	Pipe D_p9	15.46	152.8	0.015	-3.09	0.17	0.23
Pipe D_p9	14.79	152.8	0.015	-15.97	0.87	4.45	Pipe D_p9	14.79	152.8	0.015	-15.97	0.87	4.45	Pipe D_p9	14.79	152.8	0.015	-15.97	0.87	4.45	Pipe D_p9	14.79	152.8	0.015	-15.97	0.87	4.45	Pipe D_p9	14.79	152.8	0.015	-3.47	0.19	0.29
Pipe D_p9	14.34	152.8	0.015	-17.65	0.96	5.34	Pipe D_p9	14.34	152.8	0.015	-17.65	0.96	5.34	Pipe D_p9	14.34	152.8	0.015	-17.65	0.96	5.34	Pipe D_p9	14.34	152.8	0.015	-17.65	0.96	5.34	Pipe D_p9	14.34	152.8	0.015	-3.47	0.19	0.29
Pipe D_p9	13.65	152.8	0.015	-18.03	0.98	5.55	Pipe D_p9	13.65	152.8	0.015	-18.03	0.98	5.55	Pipe D_p9	13.65	152.8	0.015	-18.03	0.98	5.55	Pipe D_p9	13.65	152.8	0.015	-18.03	0.98	5.55	Pipe D_p9	13.65	152.8	0.015	-3.85	0.21	0.34
Pipe D_p9	11.96	152.8	0.015	-30.53	1.66	14.64	Pipe D_p9	11.96	152.8	0.015	-30.53	1.66	14.63	Pipe D_p9	11.96	152.8	0.015	-30.53	1.66	14.64	Pipe D_p9	11.96	152.8	0.015	-30.53	1.66	14.64	Pipe D_p9	11.96	152.8	0.015	-3.85	0.21	0.35
Pipe D_p9	11.91	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.91	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.91	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.91	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.91	152.8	0.015	-4.23	0.23	0.41
Pipe D_p9	11.87	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.87	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.87	152.8	0.015	-30.91	1.69	14.97	Pipe D_p9	11.87	152.8	0.015	-30.91	1.69	14.98	Pipe D_p9	11.87	152.8	0.015	-4.23	0.23	0.41
Pipe D_p1	26.55	152.8	0.015	-31.29	1.71	15.32	Pipe D_p1	26.55	152.8	0.015	-31.29	1.71	15.32	Pipe D_p1	26.55	152.8	0.015	-31.29	1.71	15.32	Pipe D_p1	26.55	152.8	0.015	-31.29	1.71	15.32	Pipe D_p1	26.55	152.8	0.015	-4.61	0.25	0.47
Pipe D_p1	15.75	152.8	0.015	-31.97	1.74	15.94	Pipe D_p1	15.75	152.8	0.015	-31.97	1.74	15.94	Pipe D_p1	15.75	152.8	0.015	-31.97	1.74	15.94	Pipe D_p1	15.75	152.8	0.015	-31.97	1.74	15.94	Pipe D_p1	15.75	152.8	0.015	-5.29	0.29	0.61
Pipe D_p1	19.48	93.3	0.015	17.26	2.52	57.52	Pipe D_p1	19.48	93.3	0.015	17.26	2.52	57.52	Pipe D_p1	19.48	93.3	0.015	17.26	2.52	57.52	Pipe D_p1	19.48	93.3	0.015	17.26	2.52	57.52	Pipe D_p1	19.48	93.3	0.015	0.66	0.1	0.16
Pipe D_p1	0.3591	93.3	0.015	17.26	2.52	57.5	Pipe D_p1	0.3591	93.3	0.015	17.26	2.52	57.5	Pipe D_p1	0.3591	93.3	0.015	17.26	2.52	57.5	Pipe D_p1	0.3591	93.3	0.015	17.26	2.52	57.5	Pipe D_p1	0.3591	93.3	0.015	0.66	0.1	0.21
Pipe D_p1	2.69	63.7	0.015	0.38	0.12	0.39	Pipe D_p1	2.69	63.7	0.015	0.38	0.12	0.39	Pipe D_p1	2.69	63.7	0.015	0.38	0.12	0.39	Pipe D_p1	2.69	63.7	0.015	0.38	0.12	0.39	Pipe D_p1	2.69	63.7	0.015	0.38	0.12	0.39
Pipe E_p1	3.841	152.8	0.015	0	0	0	Pipe E_p1	3.841	152.8	0.015	0	0	0	Pipe E_p1	3.841	152.8	0.015	0	0	0	Pipe E_p1	3.841	152.8	0.015	0	0	0	Pipe E_p1	3.841	152.8	0.015	0	0	0
Pipe E_p2	4.407	152.8	0.015	0	0	0	Pipe E_p2	4.407	152.8	0.015	0	0	0	Pipe E_p2	4.407	152.8	0.015	0	0	0	Pipe E_p2	4.407	152.8	0.015	0	0	0	Pipe E_p2	4.407	152.8	0.015	0	0	0
Pipe E_p3	3.912	152.8	0.015	0	0	0	Pipe E_p3	3.912	152.8	0.015	0	0	0	Pipe E_p3	3.912	152.8	0.015	0	0	0	Pipe E_p3	3.912	152.8	0.015	0	0	0	Pipe E_p3	3.912	152.8	0.015	0	0	0
Pipe E_p4	2.883	152.8	0.015	0	0	0	Pipe E_p4	2.883	152.8	0.015	0	0	0	Pipe E_p4	2.883	152.8	0.015	0	0	0	Pipe E_p4	2.883	152.8	0.015	0	0	0	Pipe E_p4	2.883	152.8	0.015	0	0	0
Pipe E_p5	2.895	152.8	0.015	0	0	0	Pipe E_p5	2.895	152.8	0.015	0	0	0	Pipe E_p5	2.895	152.8	0.015	0	0	0	Pipe E_p5	2.895	152.8	0.015	0	0	0	Pipe E_p5	2.895	152.8	0.015	0	0	0
Pipe E_p6	15.02	152.8	0.015	0	0	0	Pipe E_p6	15.02	152.8	0.015	0	0	0	Pipe E_p6	15.02	152.8	0.015	0	0	0	Pipe E_p6	15.02	152.8	0.015	0	0	0	Pipe E_p6	15.02	152.8	0.015	0	0	0
Pipe E_p7	3.146	152.8	0.015	0	0	0	Pipe E_p7	3.146	152.8	0.015	0	0	0	Pipe E_p7	3.146	152.8	0.015	0	0	0	Pipe E_p7	3.146	152.8	0.015	0	0	0	Pipe E_p7	3.146	152.8	0.015	0	0	0
Pipe E_p8	4.506	152.8	0.015	0	0	0	Pipe E_p8	4.506	152.8	0.015	0	0	0	Pipe E_p8	4.506	152.8	0.015	0	0	0	Pipe E_p8	4.506	152.8	0.015	0	0	0	Pipe E_p8	4.506	152.8	0.015	0	0	0
Pipe E_p9	2.613	152.8	0.015	0	0	0	Pipe E_p9	2.613	152.8	0.015	0	0	0	Pipe E_p9	2.613	152.8	0.015	0	0	0	Pipe E_p9	2.613	152.8	0.015	0	0	0	Pipe E_p9	2.613	152.8	0.015	0	0	0
Pipe E_p1	1.92	152.8	0.015	0	0	0	Pipe E_p1	1.92	152.8	0.015	0	0	0	Pipe E_p1	1.92	152.8	0.015	0	0	0	Pipe E_p1	1.92	152.8	0.015	0	0	0	Pipe E_p1	1.92	152.8	0.015	0	0	0
Pipe E_p1	7.087	152.8	0.015	0	0	0	Pipe E_p1	7.087	152.8	0.015	0	0	0	Pipe E_p1	7.087	152.8	0.015	0	0	0	Pipe E_p1	7.087	152.8	0.015	0	0	0	Pipe E_p1	7.087	152.8	0.015	0	0	0
Pipe E_p1	5.028	152.8	0.015	0	0	0	Pipe E_p1	5.028	152.8	0.015	0	0	0	Pipe E_p1	5.028	152.8	0.015	0	0	0	Pipe E_p1	5.028	152.8	0.015	0	0	0	Pipe E_p1	5.028	152.8	0.015	0	0	0
Pipe E_p1	12.04	152.8	0.015	0	0	0	Pipe E_p1	12.04	152.8	0.015	0	0	0	Pipe E_p1	12.04	152.8	0.015	0	0	0	Pipe E_p1	12.04	152.8	0.015	0	0	0	Pipe E_p1	12.04	152.8	0.015	0	0	0
Pipe E_p1	12.07	152.8	0.015	0	0	0	Pipe E_p1	12.07	152.8	0.015	0	0	0	Pipe E_p1	12.07	152.8	0.015	0	0	0	Pipe E_p1	12.07	152.8	0.015	0	0	0	Pipe E_p1	12.07	152.8	0.015	0	0	0
Pipe E_p1	0.1834	152.8	0.015	0	0	0	Pipe E_p1	0.1834	152.8	0.015	0	0	0	Pipe E_p1	0.1834	152.8	0.015	0	0	0	Pipe E_p1	0.1834	152.8	0.015	0	0	0	Pipe E_p1	0.1834	152.8	0.015	0	0	0
Pipe E_p1	10.83	152.8	0.015	0	0	0	Pipe E_p1	10.83	152.8	0.015	0	0	0	Pipe E_p1	10.83	152.8	0.015	0	0	0	Pipe E_p1	10.83	152.8	0.015	0	0	0	Pipe E_p1	10.83	152.8	0.015	0	0	0
Pipe E_p1	1.011	152.8	0.015	0	0	0	Pipe E_p1	1.011	152.8	0.015	0	0	0	Pipe E_p1	1.011	152.8	0.015	0	0	0	Pipe E_p1	1.011	152.8	0.015	0	0	0	Pipe E_p1	1.011	152.8	0.015	0	0	0
Pipe E_p1	1.307	152.8	0.015	0	0	0	Pipe E_p1	1.307	152.8	0.015	0	0	0	Pipe E_p1	1.307	152.8	0.015	0	0	0	Pipe E_p1	1.307	152.8	0.015	0	0	0	Pipe E_p1	1.307	152.8	0.015	0	0	0
Pipe E_p1	10.81	152.8	0.015	0	0	0	Pipe E_p1	10.81	152.8	0.015	0	0	0	Pipe E_p1	10.81	152.8	0.015	0	0	0	Pipe E_p1	10.81	152.8	0.015	0	0	0	Pipe E_p1	10.81	152.8	0.015	0	0	0
Pipe E_p2	27.91	152.8	0.015	0	0	0	Pipe E_p2	27.91	152.8	0.015	0	0	0	Pipe E_p2	27.91	152.8	0.015	0	0	0	Pipe E_p2	27.91	152.8	0.015	0	0	0	Pipe E_p2	27.91	152.8	0.015	0	0	0
Pipe E_p2	1.506	152.8	0.015	0	0	0	Pipe E_p2	1.506	152.8	0.015	0	0	0	Pipe E_p2	1.506	152.8	0.015	0	0	0	Pipe E_p2	1.506	152.8	0.015	0	0	0	Pipe E_p2	1.506	152.8	0.015	0	0	0
Pipe E_p2	1.828	152.8	0.015	0	0	0	Pipe E_p2	1.828	152.8	0.015	0	0	0	Pipe E_p2	1.828	152.8	0.015	0	0	0	Pipe E_p2	1.828	152.8	0.015	0	0	0	Pipe E_p2	1.828	152.8	0.015	0	0	0
Pipe E_p2	1.919	152.8	0.015	0	0	0	Pipe E_p2	1.919	152.8	0.015	0	0	0	Pipe E_p2	1.919	152.8	0.015	0	0	0	Pipe E_p2	1.919	152.8	0.015	0	0	0	Pipe E_p2	1.919	152.8	0.015	0	0	0
Pipe E_p2	3.184	152.8	0.015	0	0	0	Pipe E_p2	3.184	152.8	0.015	0	0	0	Pipe E_p2	3.184	152.8	0.015	0	0	0	Pipe E_p2	3.184	152.8	0.015	0	0	0	Pipe E_p2	3.184	152.8	0.015	0	0	0
Pipe E_p2	1.26	152.8	0.015	0	0	0	Pipe E_p2	1.26	152.8	0.015	0	0	0	Pipe E_p2	1.26	152.8	0.015	0	0	0	Pipe E_p2	1.26	152.8	0.015	0	0	0	Pipe E_p2	1.26	152.8	0.015	0	0	0
Pipe E_p2	2.366	152.8	0.015	0	0	0	Pipe E_p2	2.366	152.8	0.015	0	0	0	Pipe E_p2	2.366	152.8	0.015	0	0	0	Pipe E_p2	2.366	152.8	0.015	0	0	0	Pipe E_p2	2.366	152.8	0.015	0	0	0
Pipe E_p2	1.447	152.8	0.015	0	0	0	Pipe E_p2	1.447	152.8	0.015	0	0	0	Pipe E_p2	1.447	152.8	0.015	0	0	0	Pipe E_p2	1.447	152.8	0.015	0	0	0	Pipe E_p2	1.447	152.8	0.015	0	0	0
Pipe E_p2	2.109	152.8	0.015	0	0	0	Pipe E_p2	2.109	152.8	0.015	0	0	0	Pipe E_p2	2.109	152.8	0.015	0	0	0	Pipe E_p2	2.109	152.8	0.015	0	0	0	Pipe E_p2	2.109	152.8	0.015	0	0	0
Pipe E_p2	4.792	152.8	0.015	0	0	0	Pipe E_p2	4.792	152.8	0.015	0	0	0	Pipe E_p2	4.792	152.8	0.015	0	0	0	Pipe E_p2	4.792	152.8	0.015	0	0	0	Pipe E_p2	4.792	152.8	0.015	0	0	0
Pipe F_p3	15.97	130	0.015	-0.3	0.02	0.01	Pipe F_p3	15.97	130	0.015	-0.3	0.02	0.01	Pipe F_p3	15.97	130	0.015	-0.3	0.02	0	Pipe F_p3	15.97	130	0.015	-0.3	0.02	0	Pipe F_p3	15.97	130	0.015	-0.3	0.02	0.01
Pipe F_p6	1.06	130	0.015	-0.1	0.01	0	Pipe F_p6	1.06	130	0.015	-0.1	0.01	0	Pipe F_p6	1.06	130	0.015	-0.1	0.01	0	Pipe F_p6	1.06	130	0.015	-0.1	0.01	0	Pipe F_p6	1.06	130	0.015	-0.1	0.01	0
Pipe F_p7	39.48	130	0.015	-0.2	0.02	0	Pipe F_p7	39.48	130	0.015	-0.2	0.02	0	Pipe F_p7	39.48	130	0.015	-0.2	0.02	0	Pipe F_p7	39.48	130	0.015	-0.2	0.02	0	Pipe F_p7	39.48	130	0.015	-0.2	0.02	0
Pipe F_p8	8.547	130	0.015	-0.1	0.01	0	Pipe F_p8	8.547	130	0.015	-0.1	0.01	0	Pipe F_p8	8.547	130	0.015	-0.1	0.01	0	Pipe F_p8	8.547	130	0.015	-0.1	0.01	0	Pipe F_p8	8.547	130	0.015	-0.1	0.01	0
Pipe F_p9	17.81	130	0.015	-0.1	0.01	0	Pipe F_p9	17.81	130	0.015	-0.1	0.01	0	Pipe F_p9	17.81	130	0.015	-0.1	0.01	0	Pipe F_p9	17.81	130	0.015	-0.1	0.01	0	Pipe F_p9	17.81	130	0.015	-0.1	0.01	0
Pipe F_p1	19.74	130	0.015	-0.1	0.01	0	Pipe F_p1	19.74	130	0.015	-0.1	0.01	0	Pipe F_p1	19.74	130	0.015	-0.1	0.01	0	Pipe F_p1	19.74	130	0.015	-0.1	0.01	0	Pipe F_p1	19.74	130	0.015	-0.1	0.01	0
Pipe F_p1	61.17	130	0.015	-0.1	0.01	0	Pipe F_p1	61.17	130	0.015	-0.1	0.01	0	Pipe F_p1	61.17	130	0.015	-0.1	0.01	0	Pipe F_p1	61.17	130	0.015	-0.1	0.01	0	Pipe F_p1	61.17	130	0.015	-0.1	0.01	0
Pipe F_p1	8.536	130	0.015	-0.1	0.01	0	Pipe F_p1	8.536	130	0.015	-0.1	0.01	0	Pipe F_p1	8.536	130	0.015	-0.1	0.01	0	Pipe F_p1	8.536	130	0.015	-0.1	0.01	0	Pipe F_p1	8.536	130	0.015	-0.1	0.01	0
Pipe 29	11.21	152.8	0.015	-49.28	2.69	35.72	Pipe 29	11.21	152.8	0.015	-49.28	2.69	35.71	Pipe 29	11.21	152.8	0.015	-49.28	2.69	35.72	Pipe 29	11.21	152.8	0.015	-49.28	2.69	35.71	Pipe 29	11.21	152.8	0.015	-6	0.33	0.76
Pipe 30	18.09	150	0.015	-49.28	2.79	39.14	Pipe 30	18.09	150	0.015	-49.28	2.79	39.14	Pipe 30	18.09	150	0.015	-49.28	2.79	39.14	Pipe 30	18.09	150	0.015	-49.28	2.79	39.14	Pipe 30	18.09	150	0.015	-6	0.34	0.83
Pipe 33	5.6	267.9	0.015	68.59	1.22	4.18	Pipe 33	5.6	267.9	0.015	61.7	1.09	3.44	Pipe 33	5.6	267.9	0.015	61.7	1.09	3.44	Pipe 33	5.6	267.9	0.015	68.59	1.22	4.19	Pipe 33	5.6	267.9	0.015	77	1.37	5.18
Pipe 34	2.95	267.9	0.015	68.29	1.21	4.15	Pipe 34	2.95	267.9	0.015	61.4	1.09	3.41	Pipe 34	2.95	267.9	0.015	61.4	1.09	3.41	Pipe 34	2.95	267.9	0.015	68.29	1.21	4.15	Pipe 34	2.95	267.9	0.015	76.7	1.36	5.15
Pipe 35	32.63	93.3	0.015	-17.26	2.52	57.52	Pipe 35	32.63	93.3	0.015	-17.26	2.52	57.52	Pipe 35	32.63	93.3	0.015	-17.26	2.52	57.52	Pipe 35	32.63	93.3	0.015	-17.26	2.52	57.52	Pipe 35	32.63	93.3	0.015	-0.66	0.1	0.16
Valve Ayrt	#N/A	150	#N/A	6.6	0.37	0	Valve Ayrt	#N/A	150	#N/A	6.6	0.37	0	Valve Ayrt	#N/A	150	#N/A	6.6	0.37	1.36	Valve Ayrt	#N/A	150	#N/A	6.6	0.37	0.57	Valve Ayrt	#N/A	150	#N/A	58.29	3.3	0
Valve 6	#N/A	51.1	#N/A	1.48	0.72	17.64	Valve 6	#N/A	51.1	#N/A	1.48	0.72	18.48	Valve 6	#N/A	51.1	#N/A	1.48	0.72	20.48	Valve 6	#N/A	51.1	#N/A	1.48	0.72	19.64	Valve 6	#N/A	51.1	#N/A	1.48	0.72	16.83
Valve 7	#N/A	51.1	#N/A	0.59	0.29	15.51	Valve 7	#N/A	51.1	#N/A	0.59	0.29	16.35	Valve 7	#N/A	51.1	#N/A	0.59	0.29	18.35	Valve 7	#N/A	51.1	#N/A	0.59	0.29	17.52	Valve 7	#N/A	51.1	#N/A	0.59	0.29	14.71
Valve 14	#N/A	51.1	#N/A	0.7	0.34	13.98	Valve 14	#N/A	51.1	#N/A	0.7	0.34	14.82	Valve 14	#N/A	51.1	#N/A	0.7	0.34	16.82	Valve 14	#N/A	51.1	#N/A	0.7	0.34	15.98	Valve 14	#N/A	51.1	#N/A	0.7	0.34	13.18
Valve 17	#N/A	51.1	#N/A	0.88	0.43	13.98	Valve 17	#N/A	51.1	#N/A	0.88	0.43	14.82	Valve 17	#N/A	51.1	#N/A	0.88	0.43	16.82	Valve 17	#N/A	51.1	#N/A	0.88	0.43	15.98	Valve 17	#N/A	51.1	#N/A	0.88	0.43	13.18
Valve 21	#N/A	51.1	#N/A	0.62	0.3	10.18	Valve 21	#N/A	51.1	#N/A	0.62	0.3	11.02	Valve 21	#N/A	51.1	#N/A	0.62	0.3	13.02	Valve 21	#N/A	51.1	#N/A	0.62	0.3	12.19	Valve 21	#N/A	51.1	#N/A	0.62	0.3	9.38
Valve 28	#N/A	51.1	#N/A	0.55	0.27	0	Valve 28	#N/A	51.1	#N/A	0.55	0.27	0	Valve 28	#N/A	51.1	#N/A	0.55	0.27	1.21	Valve 28	#N/A	51.1	#N/A	0.55	0.27	0.37	Valve 28	#N/A	51.1	#N/A	0.55	0.27	0
Valve Bou	#N/A	250	#N/A	68.59	1.4	7.31	Valve Bou	#N/A	250	#N/A	61.7	1.26	7.14	Valve Bou	#N/A	250	#N/A	61.7	1.26	7.14	Valve Bou	#N/A	250	#N/A	68.59	1.4	7.31	Valve Bou	#N/A	250	#N/A	77	1.57	7.55
Valve 32	#N/A	130	#N/A	0.3	0.02	0	Valve 32	#N/A	130	#N/A	0.3	0.02	0	Valve 32	#N/A	130	#N/A	0.3	0.02	0	Valve 32	#N/A	130	#N/A	0.3	0.02	0	Valve 32	#N/A	130	#N/A	0.3	0.02	0
Valve PRV	#N/A	150	#N/A	0.2	0.01	0	Valve PRV	#N/A	150	#N/A	0.2	0.01	0	Valve PRV	#N/A	150	#N/A	0.2	0.01	0	Valve PRV	#N/A	150	#N/A	0.2	0.01	0	Valve PRV	#N/A	150	#N/A	0.2	0.01	0
Valve PRV	#N/A	150	#N/A	49.28	2.79	0	Valve PRV	#N/A	150	#N/A	49.28	2.79	0	Valve PRV	#N/A	150	#N/A	49.28	2.79	0	Valve PRV	#N/A	150	#N/A	49.28	2.79	0	Valve PRV	#N/A	150	#N/A	6	0.34	0

Appendix 3 Holmes Design Advice – Screen Hub

Kylin Gunkel

From:	Martin Jackson [redacted]
Sent:	Wednesday, 18 June 2025 1:07 pm
To:	Kylin Gunkel
Cc:	John Sternberg; Reuben Costello
Subject:	RE: [#CKL A20254] Waterfall Park: Screen Hub Fire Fighting

Hi Kylin,

You are correct for the Film hub we allowed the full 16.6 L/s for sprinkler tank infill and 25 L/s for hydrant. This equates to 2,500 L/min which is what QLDC said would be available for firefighting purposes.

The Northbrook Waterfall Park / Retirement site had a similar approach but only ended up assuming 13.3 L/s for the sprinkler infill line.

Regards,

MARTIN JACKSON
Senior Fire Protection Engineer
Holmes NZ LP

Level 2, 254 Montreal Street | Christchurch
PO Box 6718 | Upper Riccarton | Christchurch 8442 | New Zealand
D: [redacted]
holmesanz.com

Please Note: I am working for Holmes NZ from Brisbane. Available Monday to Thursday, out of office Fridays.

From: Kylin Gunkel [redacted]
Sent: Wednesday, 18 June 2025 9:30 am
To: Martin Jackson [redacted]
Cc: John Sternberg [redacted]
Subject: [#CKL A20254] Waterfall Park: Screen Hub Fire Fighting

Hi Martin,

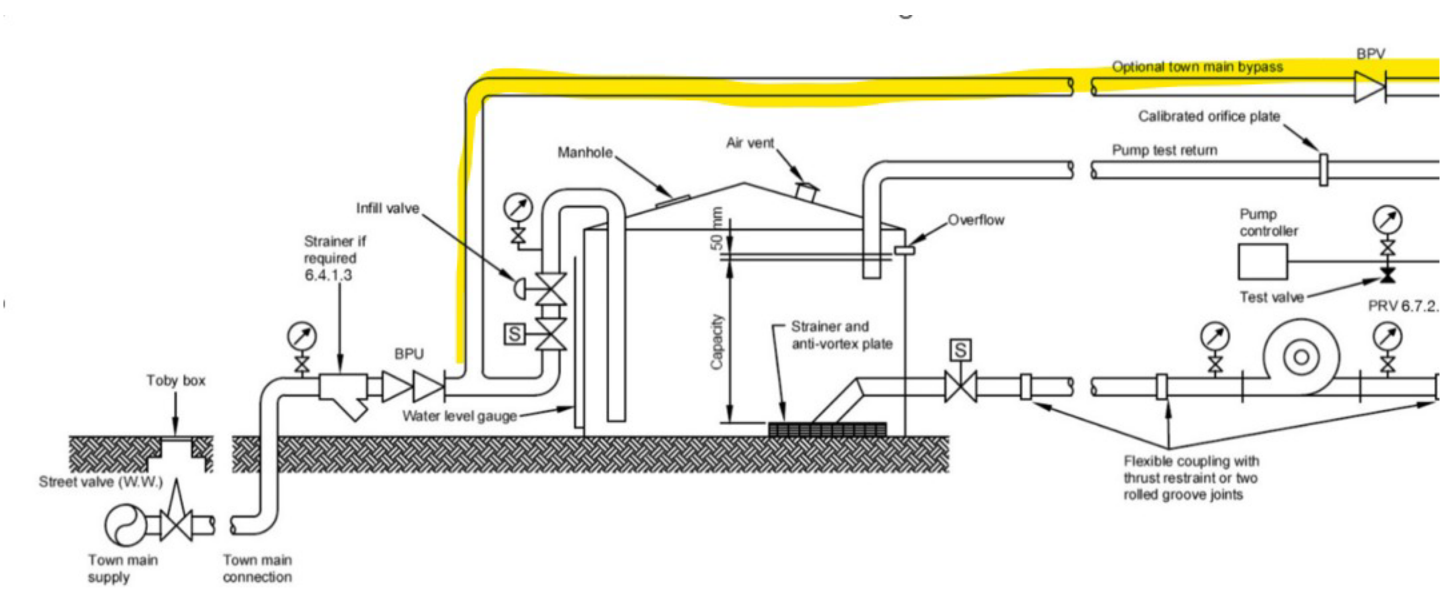
Thank you again for your time earlier.

As discussed, we're seeking a brief explanation of how the sprinkler system is intended to operate in relation to the draw from the water network.

Our current understanding, based on your advice, is that the total firefighting demand is 2,500 L/min, made up of the FW2 requirement (25 L/s) and sprinkler infill (16.6 L/s). We will therefore proceed with modelling a network draw of 16.6 L/s to reflect the sprinkler system demand.

Could you kindly confirm that this is correct, and also advise whether the same approach applies to the Northbrook sprinkler system?

Much appreciated.



Kylin Gunkel
Senior Engineer-BEng Tech (Civil) CMEngNZ
[redacted]
58 Church Road, PO Box 171, Hamilton, 3240 | www.ckl.co.nz

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Design Advice

To:	Shaun Niven	Winton	By Email Only	
	John Sternberg	CKL		
	Kylin Gunkel	CKL		
From:	Martin Jackson		Project:	146046.03
Date:	14 November 2024		Page:	1 of 4
For:	☐ Action / ✓ Information		DA:	2
Subject:	Ayrburn Film Hub - Ayr Avenue, Arrowtown Fire Fighting Water Supplies			

The purpose of this design advice is to identify the minimum firefighting and sprinkler water supply requirements for the development in accordance with the firefighting code of practice SNZ PAS 4509:2008 and NZS 4541:2020. We have assumed full sprinkler coverage is provided to each building, resulting in an FW2 classification, as previously discussed.

1 EXECUTIVE SUMMARY

A tank will be required for the sprinkler water supply for the Depot, Film Studio, Venue and Spa/ Reception buildings due to the combined sprinkler and hydrant demands exceeding the Queenstown Lakes District Council (QLDC) maximum guaranteed supply. A combined fire infrastructure arrangement could be used to cover all the buildings provided it is based on the single most onerous demand for the site or each building. Alternatively, each building can be supplied separately with multiple tanks. A minimum 150 m^3 infill tank will be required for the site.

2 FIRE FIGHTING WATER SUPPLY DEMANDS AND TANK SIZES

The Firefighting water supply for each building will be FW2 which consists of 1,500 L/min for hydrant water plus the demand from the sprinkler system.

The supply to each of the buildings sprinklers systems will be classified as a Class C1 Supply (A single approved primary water supply).

2.1 Flow Rates and Tank Sizes

The table on the following page, addresses the minimum required flow rates and tank sizes each of the various proposed building types.

Our aim is to provide a flexible space, considering likely future uses of the building without overdesigning the system for unlikely scenarios.

General assumptions and notes:

- The single worst fire scenario is taken for the tank size i.e. the water demands from multiple fire events are not added together.
- No general retail tenancies are proposed.
- No loading docks are proposed.
- The water supply tank(s) will require a Diesel Fire Pump to boost the supply.
- From our previous experience on Northbrook Arrowtown, QLDC will only guarantee a supply of 41.6 L/s (2,500 L/min).
- Storage arrangements for the Depot is based Category 6 Expanded Plastics (includes goods such as furniture with foam plastic cushioning, mattresses and polystyrene products) on palletised, bin box or shelf type storage arrangements.

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Christchurch Central
PO Box 6718
Christchurch 8442
holmesanz.com

Building	General	Most Onerous Sprinkler System Design Criteria and Flow	Total Fire Water Tank Size with infill	Independent Sprinkler Tank Size*	Hydrant Flow Required Within 135 m	Hydrant Flow Required Withing 270 m	Additional Assumptions
Film Studio	Tanks to be combined for fire sprinkler and fire hydrants. The Film Studio Infrastructure could be shared with the Depot subject to FENZ approvals.	EHHP (Studios, Store Rooms and Workshops) 3,500 L/min	**135 m^3** This includes a 90 min supply for sprinklers, and factors an infill of 1,000 L/min for 30 min (duration of hydrant demand) and 2,500 L/min for the remaining 60 minutes.	315 m^3	750 L/min	750 L/min	
Depot	Tanks to be combined for fire sprinkler and fire hydrants. The Film Studio Infrastructure could be shared with the depot subject to FENZ approvals.	EHH (Store Room) 4,310 L/min	**154 m^3** This includes a 60 min supply for sprinklers, and factors an infill of 1,000 L/min for 30 min (duration of hydrant demand) and 2,500 L/min for the remaining 30 minutes.	260 m^3	750 L/min	750 L/min	Final storage arrangements will need to be co-ordinated and comply with the sprinkler standard.
Hotel and Offices	Due to the low flows, a tank and pump would not be required for these buildings.	OH1 650 L/min	**N/A**	N/A	750 L/min	750 L/min	No allowance has been made for carparking within the building, or for high rise hotels. Plant Rooms assumed to be no greater than 54 m^2
Spa + Reception & Function Hall	Criteria is similar to NBAT. Tank and pump infrastructure from the film studio and depot could be used to service these buildings.	OH3 (Porte Cochere, Function Space) 1,800 L/min	**50 m^3** This includes a 60 min water supply for sprinklers and an infill rate of 1,000 L/min.	108 m^3	750 L/min	750 L/min	Functions featuring covered kiosks have not been allowed for.

* Sprinkler tank size with no infill provided for information only

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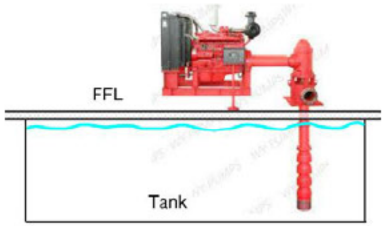
3 TANK OPTIONS

The following tank options are available:

Option 1 – Circular	Option 2 – Modular	Option 3 – Below Ground
Circular tanks are normally the cheapest option and typically installed external to the building. If located inside the building the foundation would likely require additional reinforcement due to tank loading. 	Modular tanks can be used outside but are often located inside the building if it suits the space better. It needs a 0.8 m clearance around the outside for servicing and construction. 	Underground tanks are another option when space is particularly tight on site. These are typically the most expensive option. The vertical turbine pumps associated with belowground tanks come in at a premium compared to a standard pump arrangement. 

The tank must comply with NZSEE:2009, AS 2304:2019 (clause 3.6), and NZS4541:2020

A pump room/s will be required to house the fire pump and associated equipment to boost the water from the tank/s. Allow a minimum of 20 m² with at least one dimension being 5 m.

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4 NEXT STEPS

- Meet to discuss the outcomes and possible tank locations.
- Following feedback on what option is preferred and fits best with the site layouts, we can provide concept infrastructure layouts and progress dialogue with Fire and Emergency New Zealand (FENZ), who will need to approve the final locations.

Regards,

[redacted]

Martin Jackson
SENIOR FIRE PROTECTION ENGINEER
146046.03.DA002.docx

Appendix 4 : Referenced Documents – Download Link

[Download Screen Hub Referenced Docs.zip from 12d Synergy](#)

Appendix 5 2023 Pressure Testing

Miscellaneous	0.05	FW2	25	20	45
Future Capacity (Waterfall Park)	24.9	FW2	25	20	45
Irrigation	1.1	NA			
Sub-Total	**34**	NA			
TOTAL	**45**				

Table 4 presents the figures that were utilized as a base to model the water network in EPANET for both the Ayrburn Domain and Waterfall Park developments. For the Ayrburn Domain, a maximum flow rate of 61 l/s was calculated, which comprises 50 l/s for fire hydrant demand and 11 l/s for peak hour domestic demand. Similarly, for the Waterfall Park, a maximum flow rate of 79 l/s was determined, consisting of 45 l/s for fire hydrant and sprinkler demand and 34 l/s for peak hour domestic demand. These figures include the water demand for future capacity and irrigation purposes.

It is however noted that only 60% of the Peak Water Demand was used to model the network in EPANET in line with the requirements of NZS PAS 4509:2008. This is further clarified in section 9 of this report.

The EPANET model incorporated these flow rates to simulate FW2 and FW3 scenarios, which are further explored in section 10 of this report. It is important to note that the total ultimate domestic flow will not exceed the consented 45 l/s during normal operations; however, it will surpass this threshold during firefighting scenarios. The EPANET model's results help in understanding the water network's capacity to meet the water demand under various conditions and ensure the adequate provision of water supply for both developments.

8. Pressure and Flow Testing of Existing Water Network

8.1 Scope of Work

In this section of the report, the scope of work for pressure and flow testing for the proposed development is discussed. An email was sent to Detection Services South Island Ltd, outlining the requirements and methodology for the testing process, based on the guidelines in Appendix G of SNZ PAS 4509:2008.

Appendix G of SNZ PAS 4509:2008 specifies the following requirements for pressure and flow testing:

1. Testing must be conducted during peak demand periods to simulate real-world conditions and obtain accurate results. Testing was conducted on the 3 April 2023 between 10:51am and 11:46 am.
2. Measurements should be taken at both flowing and non-flowing hydrants to determine static and residual pressures. Results are summarised in section 8.2 of this report.
3. The test should involve at least two hydrants to simulate simultaneous fire demand. Two hydrants within the Ayrburn Domain were discharged and residual pressures throughout the development were recorded.

4. The distance between the flowing hydrants and the pressure hydrant should be recorded. This has been documented in section 8.2.
5. Water main diameter and the approximate vertical height difference between the flowing and pressure hydrants must be noted. This has been documented in section 8.2.
6. The flow rate and pressure readings should be recorded at specified intervals, such as every 500 L/min, to obtain a comprehensive understanding of the system performance. This has been documented in section 8.2.
7. Results should be analyzed and compared against relevant standards and guidelines to determine if the water supply system meets the required performance criteria. This has been documented in section 8.2 and further analyses given in section 10 of this report.

Following these guidelines, the development was tested against both FW3 and FW2 requirements.

The pressure and flow testing ensured that the proposed development's water supply infrastructure met the necessary standards and requirements for both domestic consumption and firefighting purposes. The results of this testing provided valuable input for the water network modelling and design, as discussed further in section 10 of this report.

8.2 Results

Figure 1 below shows the layout and location of the tested hydrants.

The 2 hydrants within the Ayrburn Domain, “Fire Flow Test Site 1” and “Fire Flow Test Site 2” were discharged simultaneously over various flow rates and the residual pressures at FH (CH805) and FH (CH460) were recorded over the testing duration. A graphical representation of this data can be found in Figures 3 and 4 below.

A third hydrant was meant to have been tested for its corresponding residual pressure however, this hydrant has not yet been installed and therefore could not be tested. For this reason, we have relied on the EPANET model to determine the residual pressure within the Ayrburn Domain. This is further discussed under section 10.1.1.1 of this report.

CKL have analysed data provided by Detection Services South Island Ltd and our analysis is discussed further below. Raw Data can be found in Annexure C.

Figure 3: Hydrant Locations

Figure 2 presents an expanded view of the associated decrease in residual pressure at hydrant FH (CH460) during the simultaneous discharge of the two hydrants within the Ayrburn Domain. Throughout the testing, the residual pressure at FH (CH805) did not fall below 826 kPa or 82.6m of residual head, while FH (CH460) maintained a minimum residual pressure of 791 kPa or 79.1m of residual head. The observed flow rates ranged from a minimum of 500 L/min to a maximum of 2,235 L/min per hydrant. The raw data is available in Annexure C. Notably, at 11:24:35 am, the flow rates of the two discharging hydrants converged at approximately 1500 L/min per hydrant, with corresponding residual pressures at FH (CH805) and FH (CH460) measuring 892 kPa and 815 kPa, respectively.

The results indicate residual pressures are well above the required 100 kPa for hydrants and between 400 kPa and 550 kPa for sprinklers mentioned in section 6.3 of this report with flow rates in excess of 3000 lpm (FW3 – 2 hydrants discharging at max 1500 l/m each).

Figure 4: Residual Pressure at FH (CH460) – Macro Scale

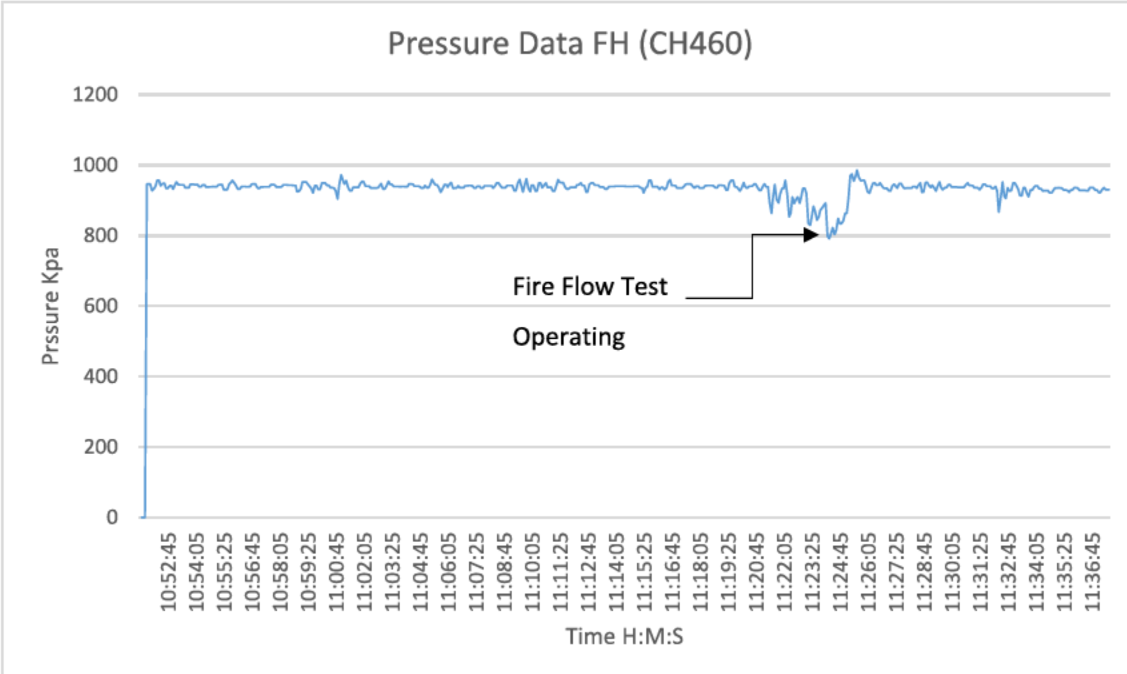


Figure 5: Flow Data Site 2 & Residual Pressure Data FH (CH 805)

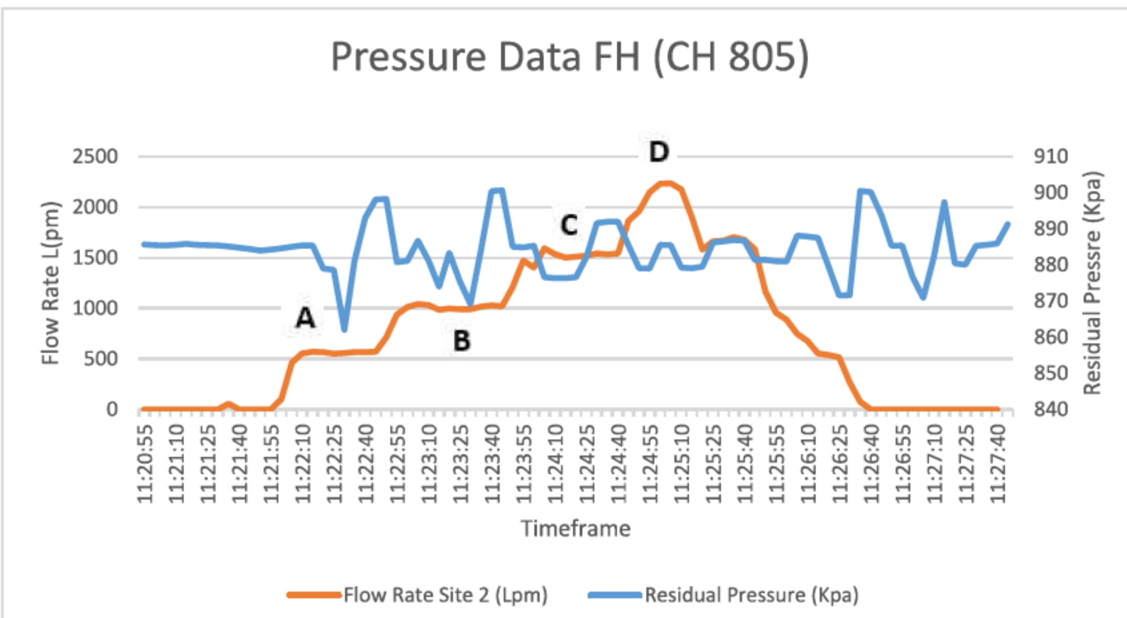
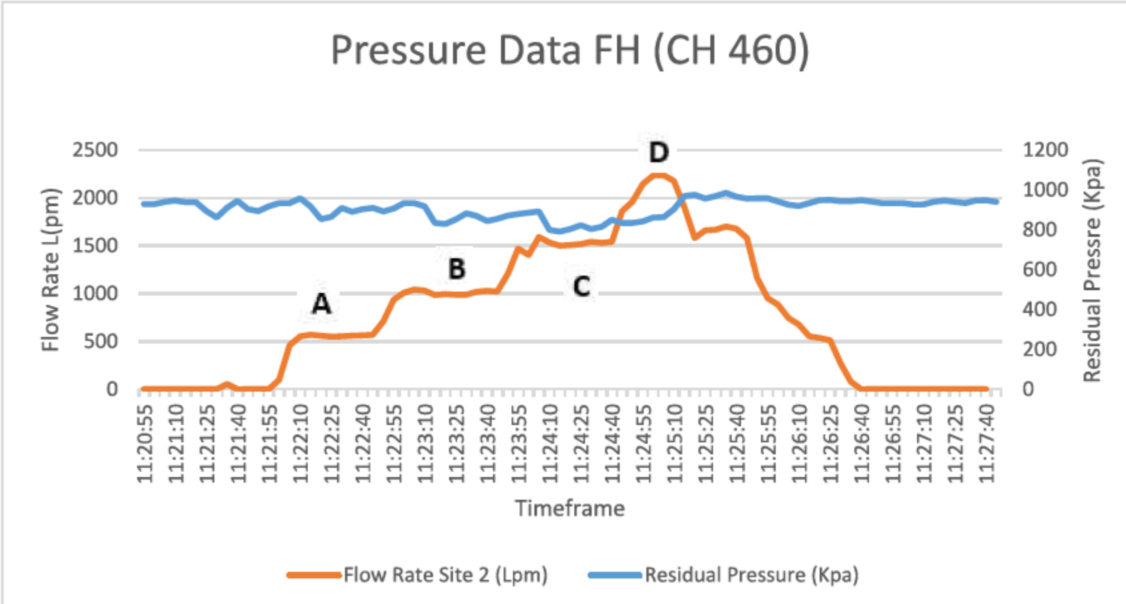


Figure 6: Flow Data Site 2 & Residual Pressure Data FH (CH 460)



A = Flow at 500 lpm

B = Flow at 1000 lpm

C = Flow at 1500 lpm

D = Flow at Max

Static pressures (minimum) were also recorded before and after the test as follows:

- FH (CH805)= 725 Kpa or 72.5m
- FH(CH460)= 867 Kpa or 86.7 m
- FH (112,928) = 925 Kpa or 92.5m
- FH (113,183) = 925 Kpa or 92.5m
- FH (112,968) = 900 Kpa or 90m (Adopted Static Pressure for Modeling – See Figure 6)

Figure 7: Arrowtown-Lake Hayes Rd and Speargrass Flat Rd Intersection

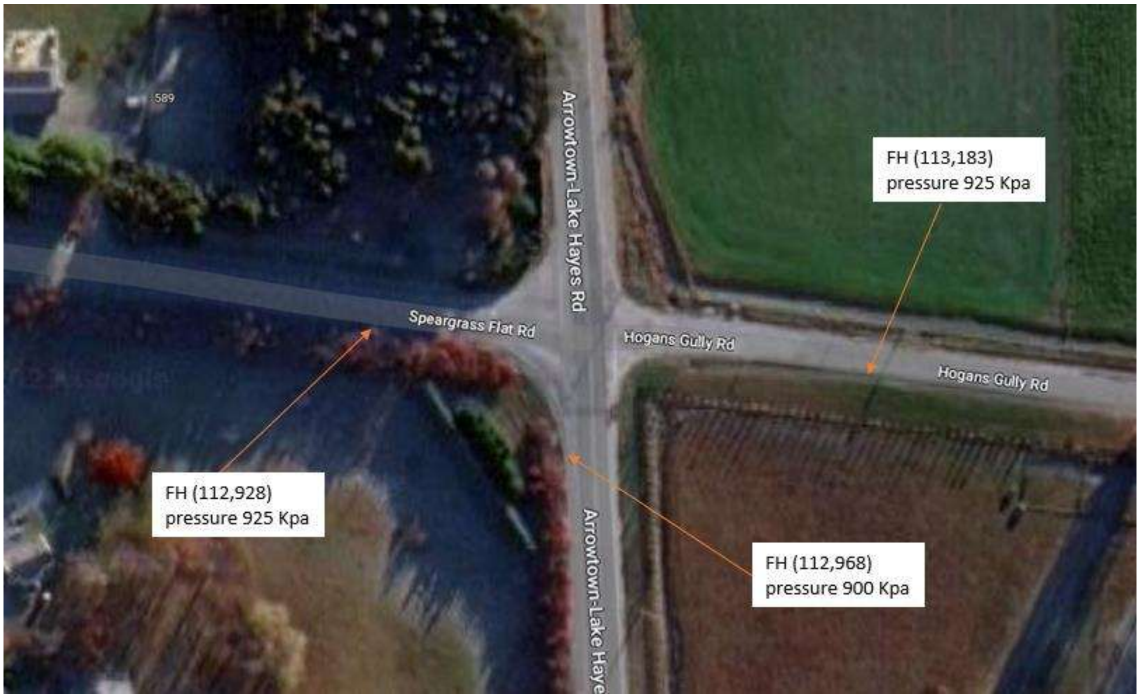
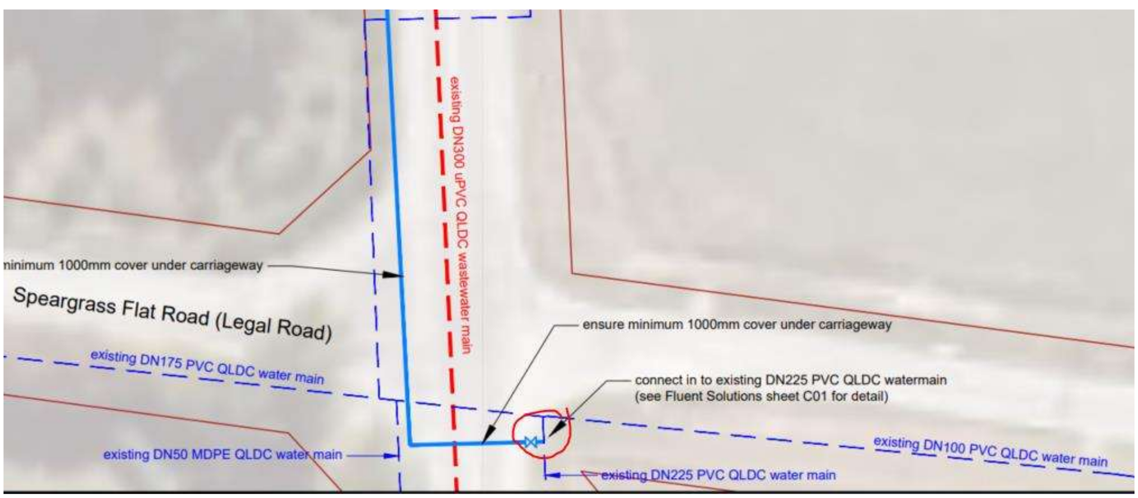


Figure 8: Proposed Development Connection Point



9. Explanation of the EPANET model

The EPANET model is designed to simulate water distribution networks and provides output data that includes flow rates, velocities, frictional losses and pressures. The model also calculates the minimum and maximum pressures at each node in the network.

Two scenarios were each modelled for the Ayrburn Domain and the Waterfall Park namely for an FW2 and FW 3 scenario. In compliance with SNZ PAS 5409:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice, fire flows must be maintained with a minimum residual pressure of 100Kpa

Appendix 6 Mott Macdonald and BECA/HAL Modelling Reports

Report

Waterfall Park Development Wastewater Modelling

Prepared for Queenstown Lakes District Council (Client)

By Beca Limited (Beca)

7 February 2018

Revision History

Revision Nº	Prepared By	Description	Date
A	Tracey Myers	Draft Report	8/2/18
B	Tracey Myers	Report updated with Developer's Comments	16/2/18
C	Tracey Myers	Final Report	19/04/18

Document Acceptance

Action	Name	Signed	Date
Prepared by	Tracey Myers	[redacted]	23/04/18
Reviewed by	Dan Stevens	[redacted]	24/04/18
Approved by	Dan Stevens	[redacted]	24/04/18
on behalf of	Beca Limited		

Contents

Appendices

1 Background

Beca Limited (Beca) have been engaged by Queenstown Lakes District Council (QLDC) to model a new development at Waterfall Park, Lake Hayes (see Appendix A, Development Plan). Modelling work has been completed previously for this development. However, the development has now expanded, and further modelling work is required.

2 Demand and Loads to the Wastewater Network

2.1 Development Demand Assessment

We have been given average, and peak flow information by the developer. We have converted these flows into population equivalents, as this is what the model uses. The daily flow per person in the QLDC Land Development and Subdivision Code of Practice is 250 L/day. The population equivalent for the average flows are given in Table 1 below.

Table 1 - Population Equivalent for Flows

Development Type	Average Daily Flows (L/s)	Total Daily Flows (m^3)	Population Equivalent (rounded)
Hotel	2.9	247.1	988
Residential	1.8	156.4	626

We have, therefore, used a population equivalent of 1,614 in the wastewater model to represent the flows.

Appendix A, **Figure 1** shows the sewer network in the vicinity of the new development, and includes the modelled network for the development.

2.2 Loads in the Wastewater Network

The peak wet weather flows entering the Lake Hayes #1 and #2, and Bendemeer pump stations are given in Table 2 below. Appendix B, **Figures 2 to 10**, show the peak wet weather flows entering the pump stations during the 2 year ARI event. Appendix C, **Figures 11 to 19**, show the flows discharging from the pump stations during the same period. No pump curve has been provided for the Lake Hayes #2 pump station, and a fixed flow rate has been set at 16 L/s for both pumps.

Table 2 - Peak Flows Entering Lake Hayes #1 and #2 Pump Stations

Pump Station	Current WWF (L/s)	2028 WWF Including Growth Model (L/s)	2028 WWF with Growth Model and Waterfall Park Flows (L/s)
Lake Hayes #1	15	21	21
Lake Hayes #2	24	25	25
Bendemeer	146	148	157

We removed the Waterfall Park flows that were previously included in the growth model before we simulated the runs. The Waterfall Park development has a peak dry weather flow of 11.7 L/s, and a peak wet weather flow of 23.4 L/s.

3 Design Horizon Checks

We have simulated three scenarios, using the 2028, and 2058 design horizons. The simulations have been run with a 2year ARI design storm event, which is the standard Level of Service for QLDC. Appendix D, **Figures 20 to 23** show the peak wet weather flow in the long sections.

3.1 Scenario 1 – DWF Gravity Fed to Speargrass Flat Road

This is the developer's preferred option. In the previous modelling work, the network had insufficient capacity to take the extra flows from Waterfall Park. Therefore, we were requested to initially simulate dry weather flow from the development, but with wet weather flows in the rest of the model. Simulating the dry weather flow only allows us to see the impact of minimising the development inflow and infiltration on the existing network.

Without the development, one manhole (SM11957) floods downstream of the Lake Hayes #1 PS.

When the full development is added, three manholes flood upstream of the Lake Hayes #1 PS. These manholes are SM11804, SM11807, and SM11930.

The capacity in the current network is 7.1 L/s. Adding a peak residential flow of 4.5 L/s leaves the remaining capacity as 2.6 L/s, without adding any storage at the development. Therefore, the remaining flow from the development will need to be stored.

3.1.1 Scenario 1a – Residential DWF Gravity Fed to Speargrass Flat Road

We simulated the DWF for only the residential development, with the wet weather flows in the rest of the model. The network upstream of the Lake Hayes #1 pump station has capacity to take these flows.

3.1.2 Scenario 1b – Hotel DWF Gravity Fed to Speargrass Flat Road

We simulated the DWF for only the hotel development, with the wet weather flows in the rest of the model. One manhole (SM11930) floods. Therefore, the network upstream of the Lake Hayes #1 pump station does not have the capacity to take the hotel flows.

3.2 Scenario 2 – DWF Pumped to Arrowtown-Lake Hayes Road

We modelled a pump station, and 300mm diameter rising main to take the flows to connect into the existing network on Arrowtown-Lake Hayes Road. The pump rate is 15 L/s. We then simulated the model with dry weather flow from the development, but with wet weather flows in the rest of the model. We considered whether or not the new pump station could run at the same time as the peak flows from the Arrowtown-Lake Hayes pump station. We found that the new pump station has insignificant impact on the existing pump station.

Without the development, one manhole (SM11957) floods downstream of the Lake Hayes #1 PS. Adding the development does not create any more areas of flooding.

3.3 Scenario 3 – WWF Pumped to Arrowtown-Lake Hayes Road

This scenario is the same as scenario 2, except we simulated the 2 year ARI event through the development as well. The pump rate remains 15 L/s. As before, we managed the pumping from the development using Real-Time Control. We also simulated the model without the Real-Time Control.

During the 2028 design horizon, SM11957 floods. This is regardless of whether the development is modelled or not. The flood volume is 75m^3, during the 2028 design horizon.

During the 2058 design horizon, two manholes flood (SM11952 and SM11957) downstream of the Lake Hayes #1 PS without the development. The flood volume is 75m³.

With the development included, no extra manholes flood. As with Scenario 2, the new pump station has an insignificant impact on the existing pump station. Table 3 below details the pressure in the 300mm diameter pipe at the connection point for the 2058 design horizon.

Table 3 – Pressure at Connection Point for Scenario 3

Design Horizon	Static Pressure (m)	Pressure with No Waterfall Park Flow (m)	Pressure with Arrowtown and Waterfall Park Flows (m)
2058	4.6	4.8	5

4 Future Upgrades Required

Jayne Richards at Fluent Solutions Ltd requested that we look at the maximum flow that can be added to both Scenarios 1 and 3.

4.1 Scenario 1a

The capacity in the current network is 7.1 L/s. Adding a peak residential flow of 4.5 L/s leaves the remaining capacity as 2.6 L/s, without adding any storage at the development. Therefore, the remaining flow from the development will need to be stored.

4.2 Scenario 3

A Capital Scheme, Lake Hayes #2 PS, is already included in the current Capital Programme. This scheme includes upgrades that will relieve the flooding anticipated in 2028. In terms of effect on the network, we would recommend that Scenarios 2 and 3 are taken further. Neither of those scenarios affect the current flooding.

No other upgrades are required to contain the extra flows from Waterfall Park development during the 2028 or 2058 design horizons.

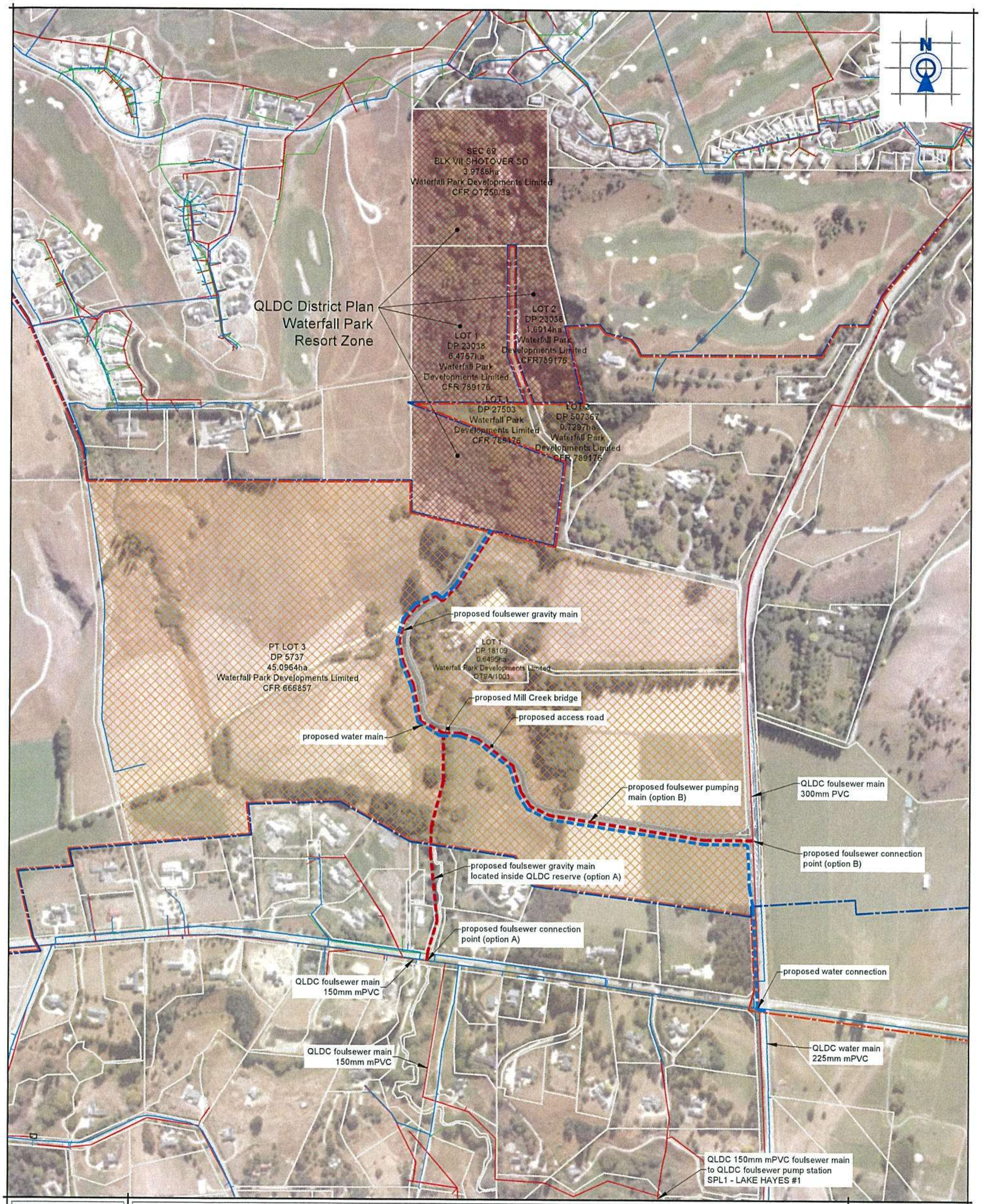
5 Conclusion

The sewer network between Speargrass Flat Road and Lake Hayes #1 PS has insufficient capacity to take all of the dry weather flows from the Waterfall Park development. After adding the residential development only, there is spare capacity of 2.6 L/s peak flow in the Speargrass Flat Road network.

A Capital Scheme, Lake Hayes #2 PS, is already included in the current Capital Programme. This scheme includes upgrades that will relieve the flooding anticipated in 2028. In terms of effect on the network, we would recommend that Scenarios 2 and 3 are taken further. Neither of those scenarios affect the current flooding, and no other upgrades would be required to the sewer network.

Appendix A

Plans



QUEENSTOWN:
Terrace Junction,
1092 Frankton Road,
PO Box 2645,
Queenstown 9349.
T 03 441 4715
E queenstown@ppgroup.co.nz

Notes:
1. Lot boundaries shown in grey
2. Existing QLDC services from QLDC GIS (15/12/17)

- QLDC sewer scheme boundary
- QLDC water scheme boundary
- QLDC sewer infrastructure
- QLDC water infrastructure
- QLDC drainage infrastructure

0m 100m 200m 300m

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Client/Location:
Waterfall Park Developments Ltd
Sec 69 Blk VII Shotover SD, Lots 1 & 2
DP 23038, Lot 1 DP 27503, Lots 1 & 2
DP 507367, Pt Lot 3 DP 5737 and Lot 1 DP 18109

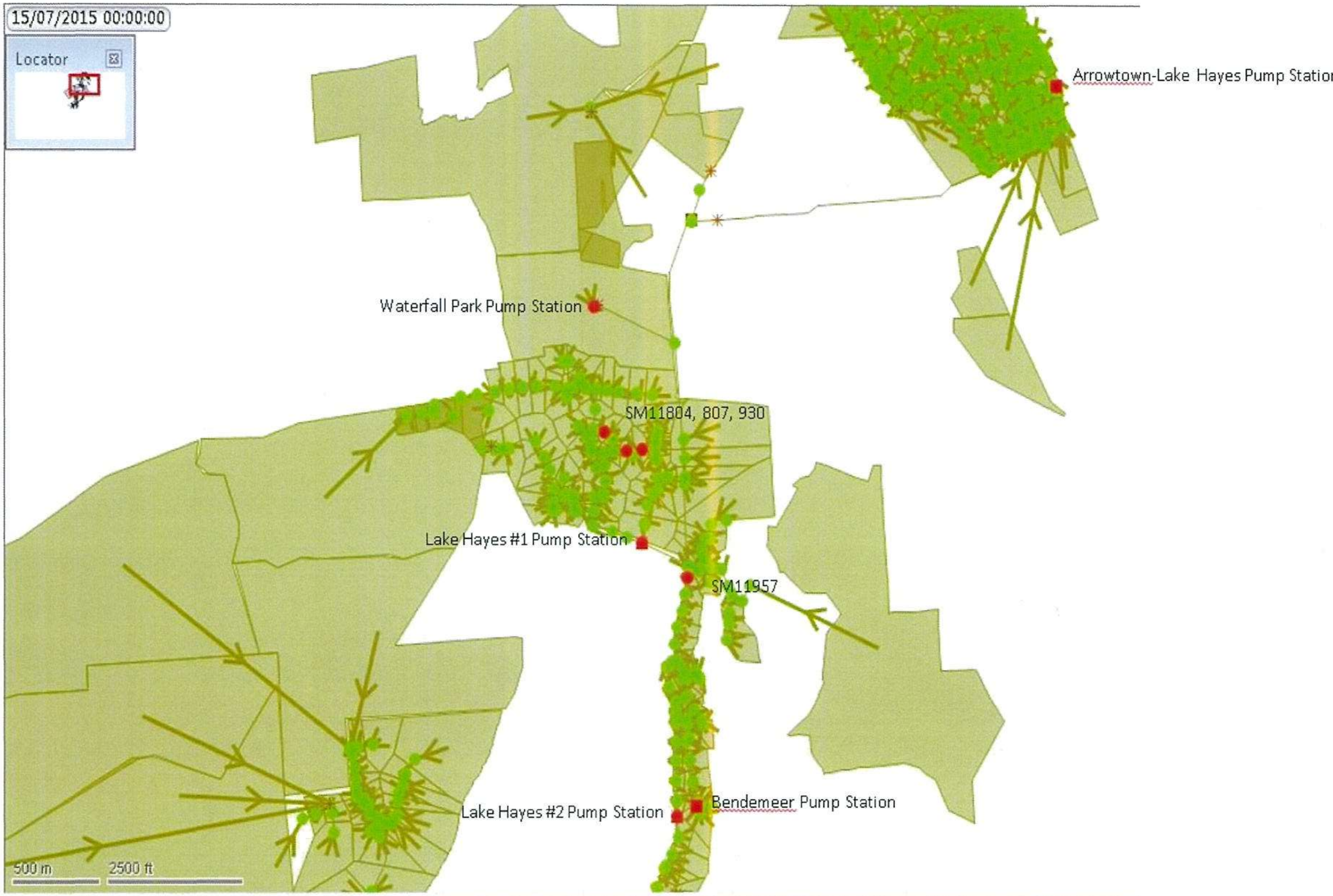
Purpose/Drawing Title:
Proposed Connections to Council Services
Plan for Discussion

Surveyed by:		Original Size: A3	Scale: 1:5000
Designed by:			
Drawn by:	SJP		
Checked by:			
Approved by:			DO NOT SCALE
Job Ref: Q6388 - 26 - 2	Sheet No: 1	Revision No: C	Date Created: 19/12/2017

PLOT DATE 19 December, 2017 - 6:25 PM BY: Stephen Popenhagen

J:\JOBS\Q_6388__WINTON PARTNERS WATERFALL PARK\CAD\Q6388-26-2-1C_SERVICES CONNECTIONS.DWG

Figure 1: Sewer network, with pump stations, and flooding manholes highlighted (add note showing SM11957)



Appendix B

Inflows to the Lake Hayes Pump Stations

Figure 2: Current peak wet weather inflow to Lake Hayes #1 PS

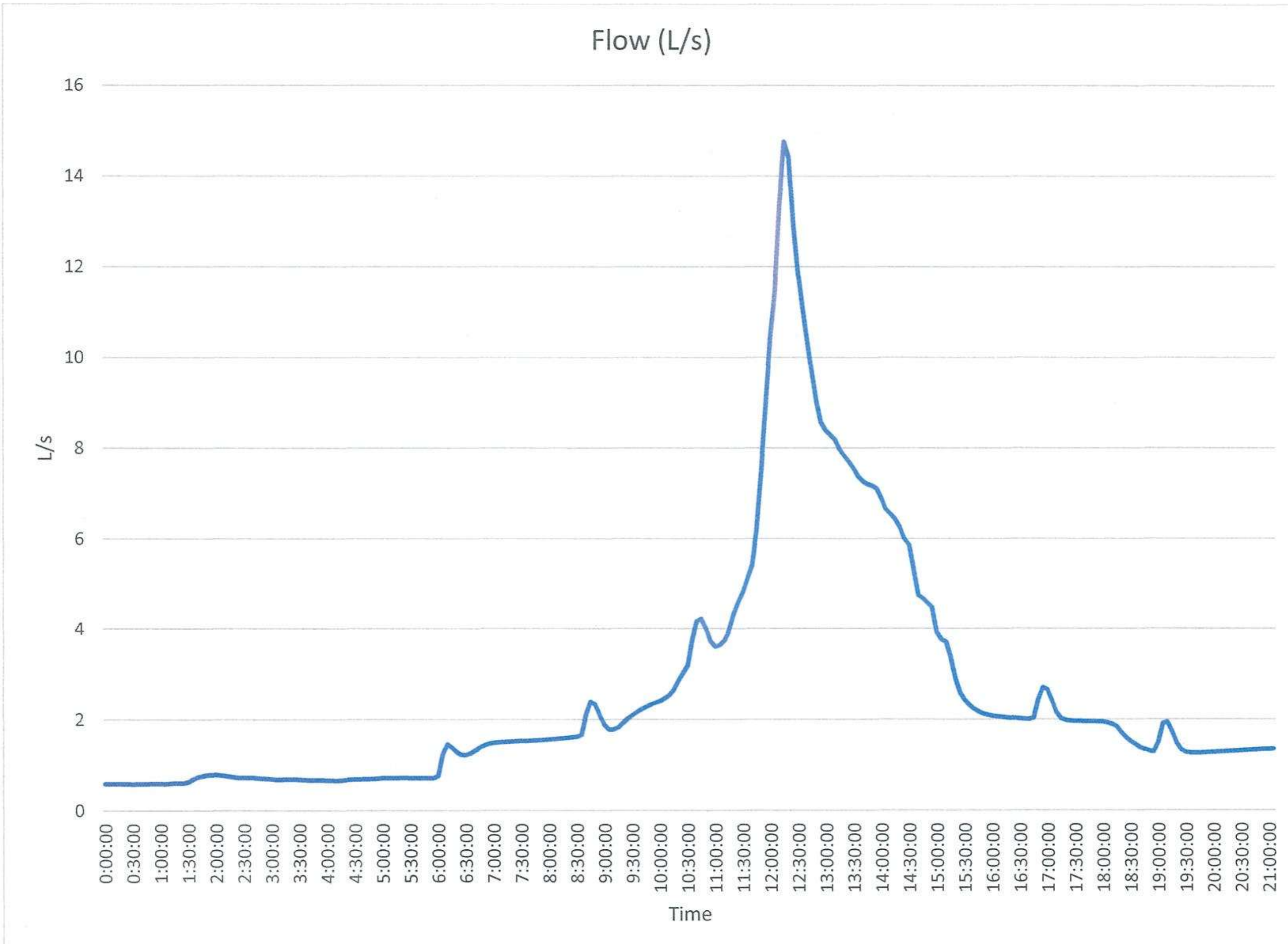


Figure 3: Peak wet weather inflow to Lake Hayes #1 PS using 2028 Growth Model (No Waterfall Park Development)

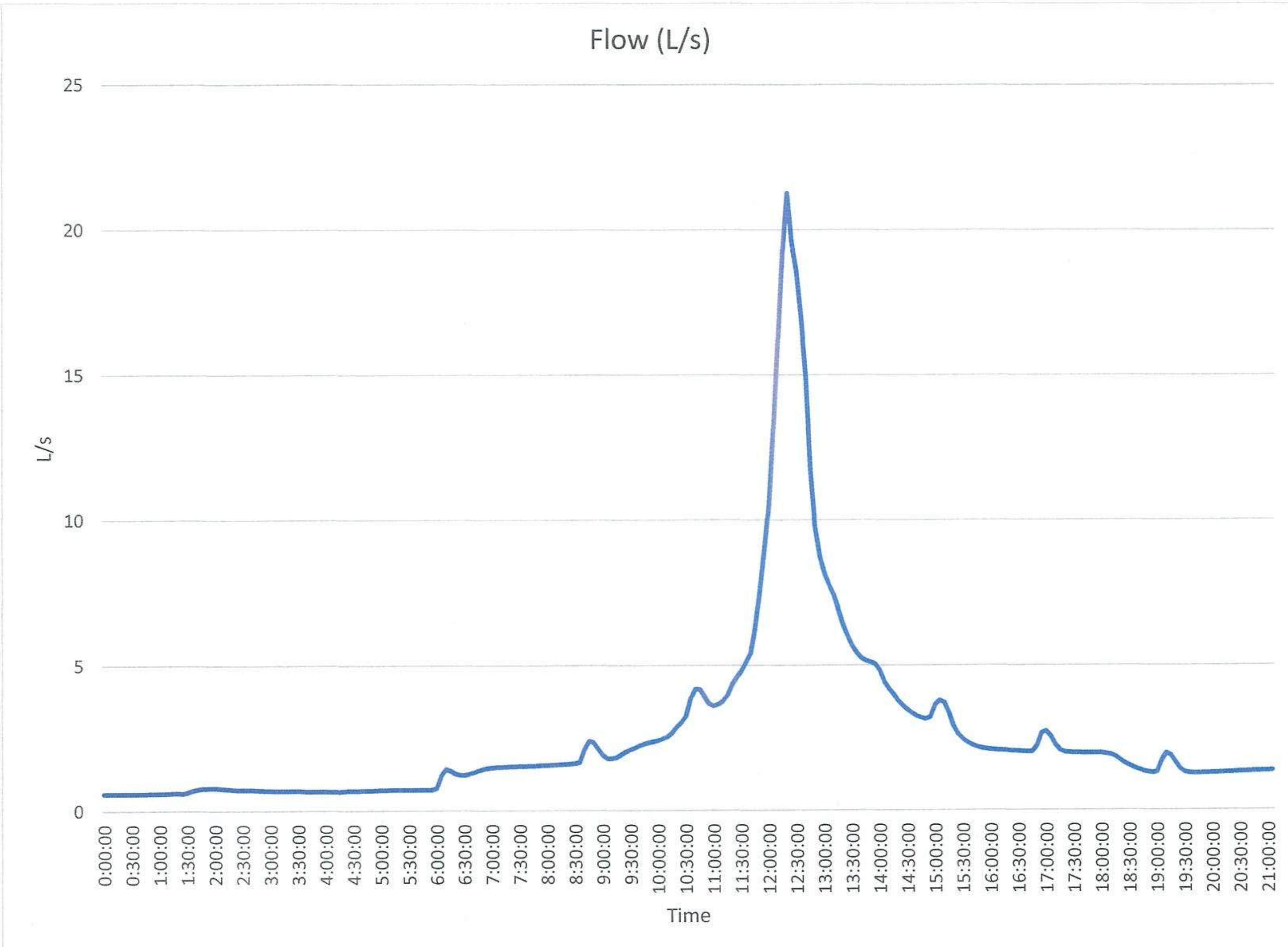


Figure 4: Peak wet weather inflow to Lake Hayes #1 PS using 2028 Growth Model, including Waterfall Park Development

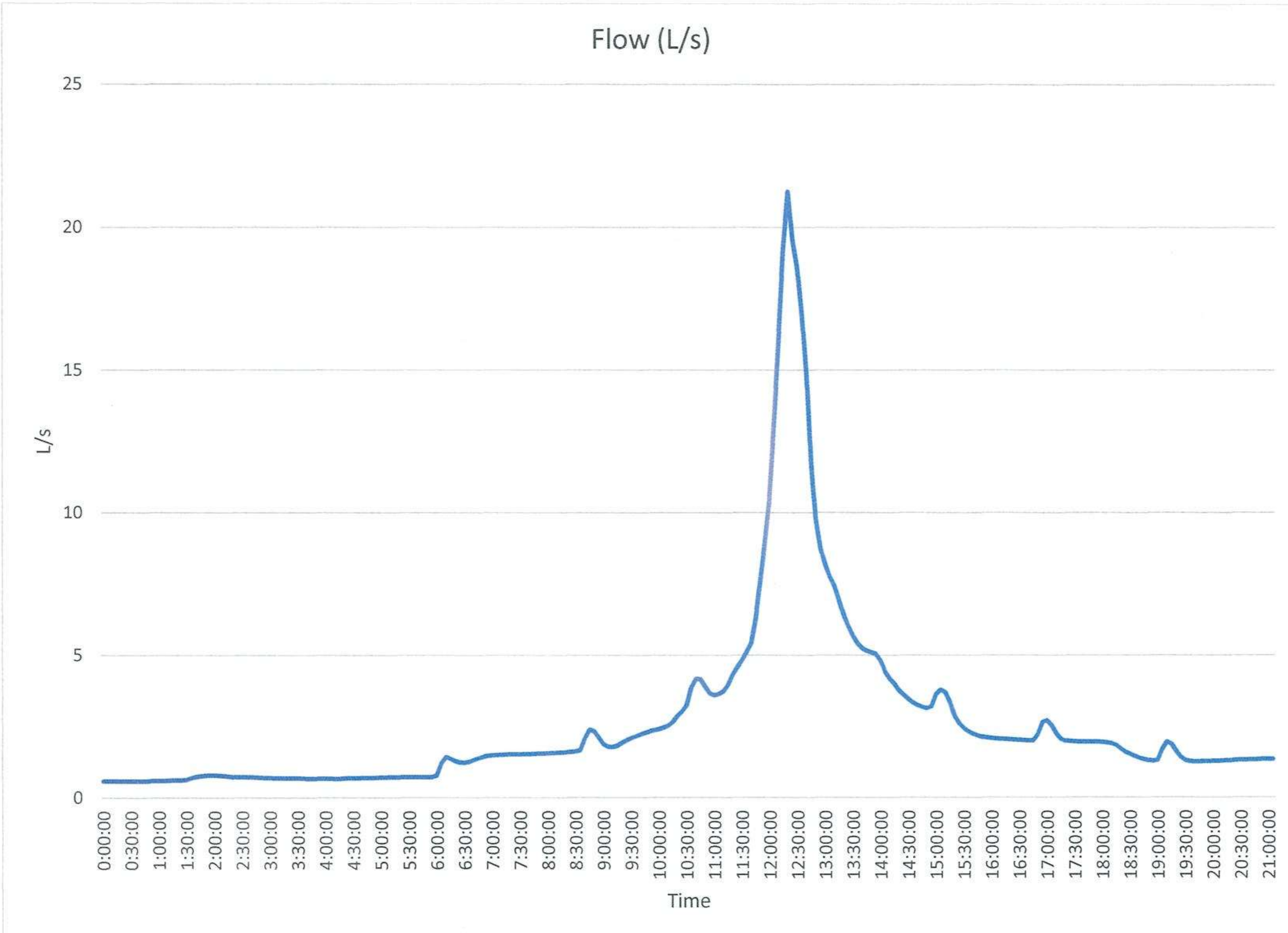


Figure 5: Current peak wet weather inflow to Lake Hayes #2 PS

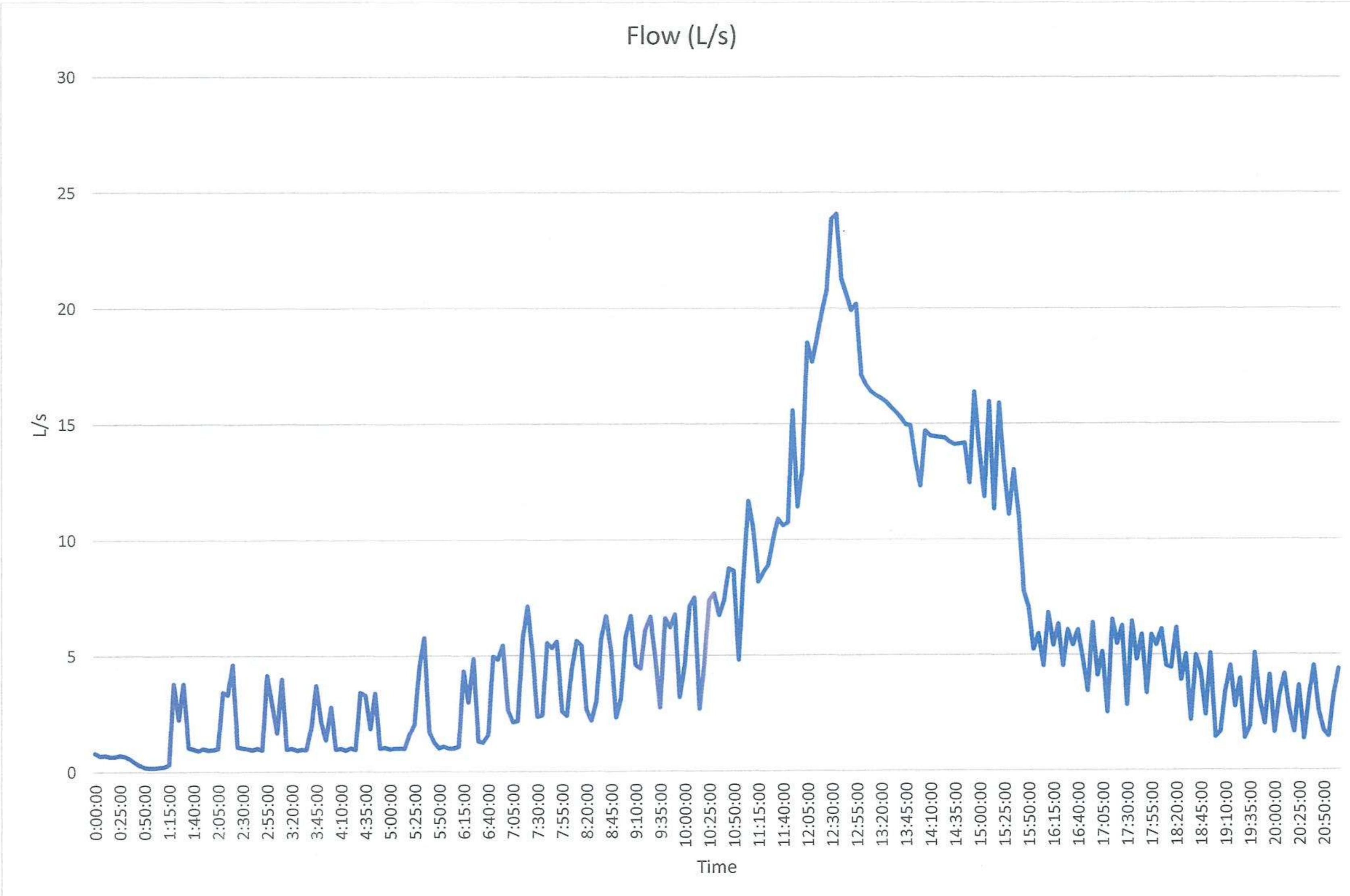


Figure 6: Peak wet weather inflow to Lake Hayes #2 PS using 2028 Growth Model (No Waterfall Park Development)

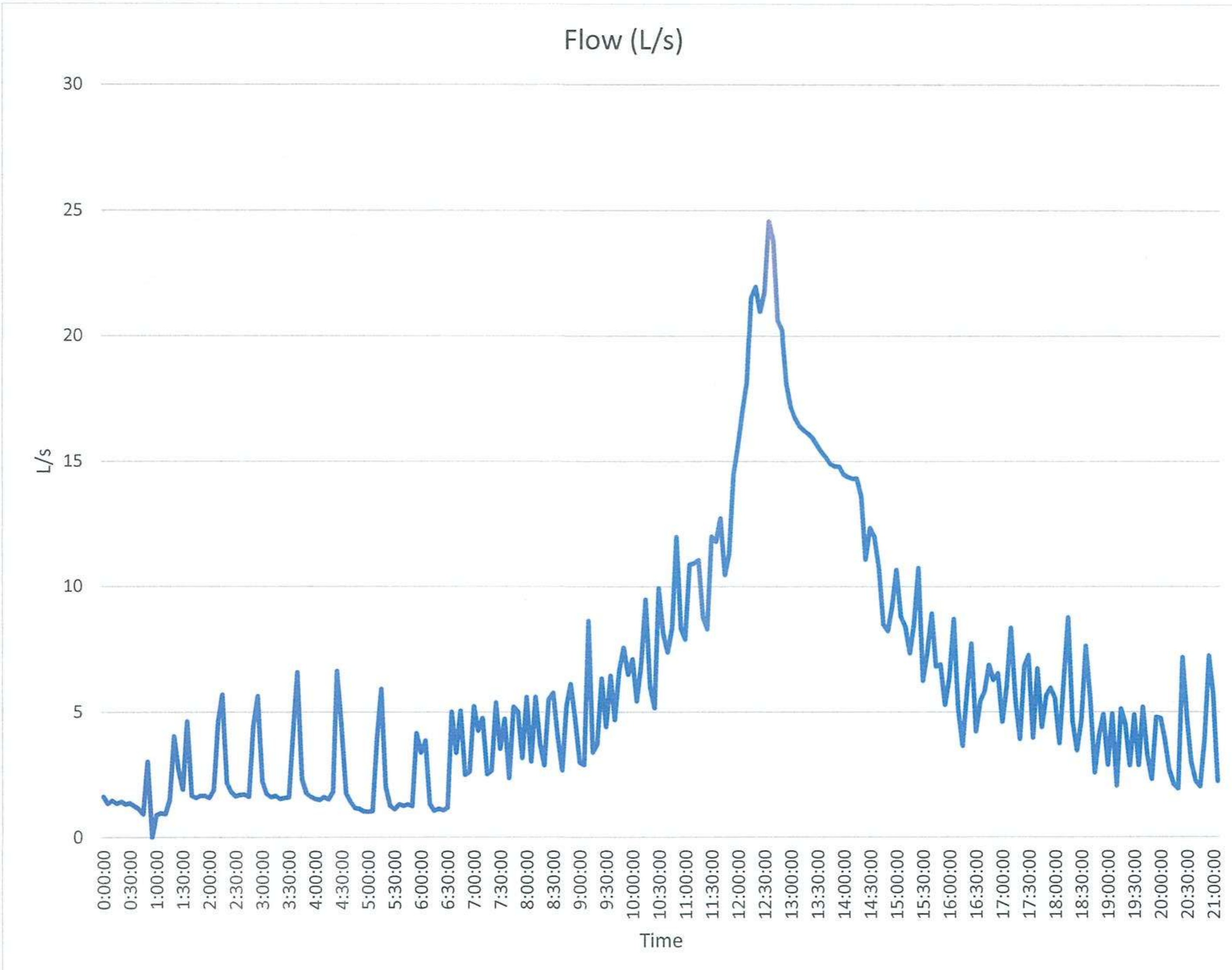


Figure 7: Peak wet weather inflow to Lake Hayes #2 PS using 2028 Growth Model, including Waterfall Park Development

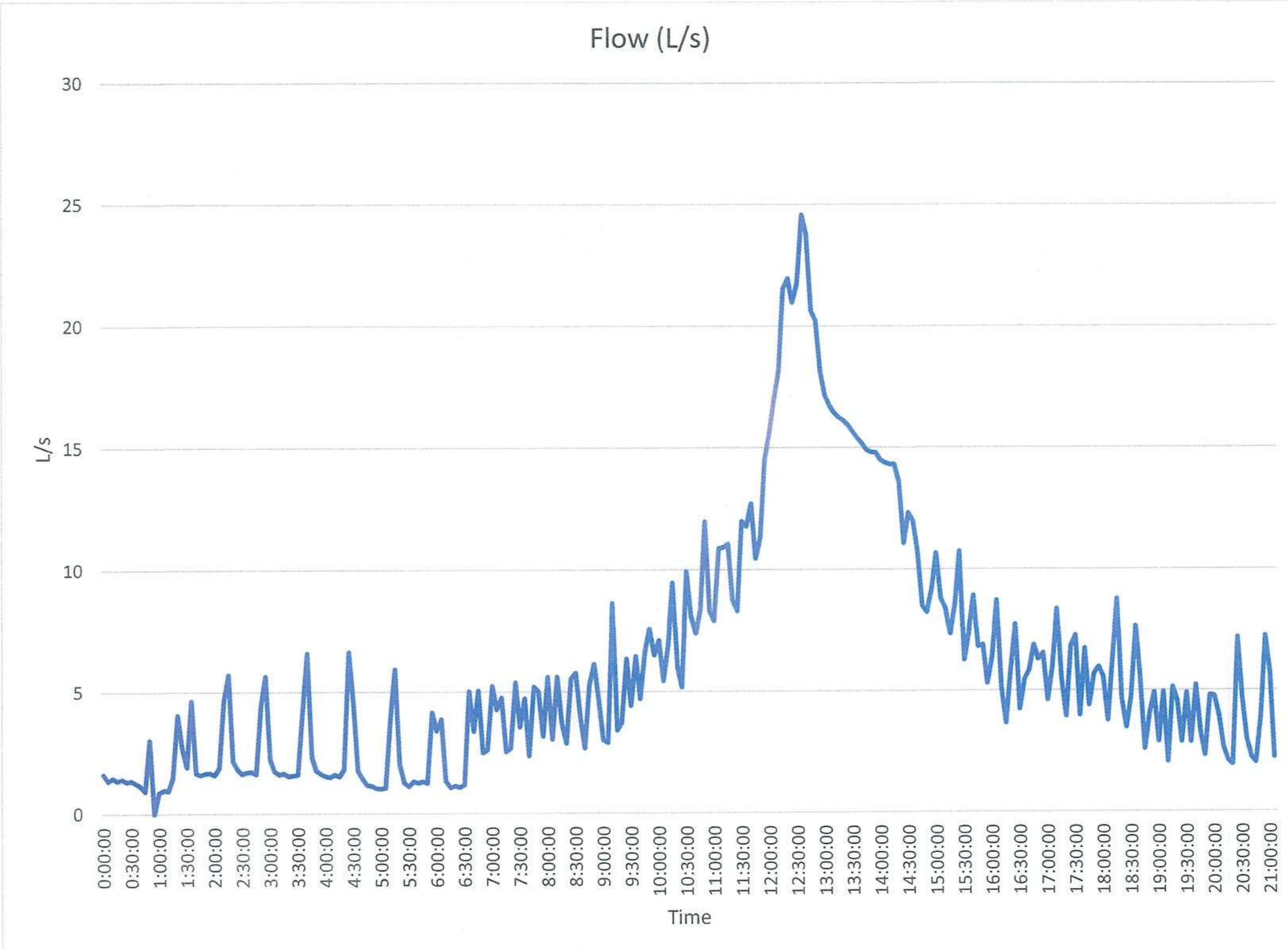


Figure 8: Current peak wet weather inflow to Bendemeer PS

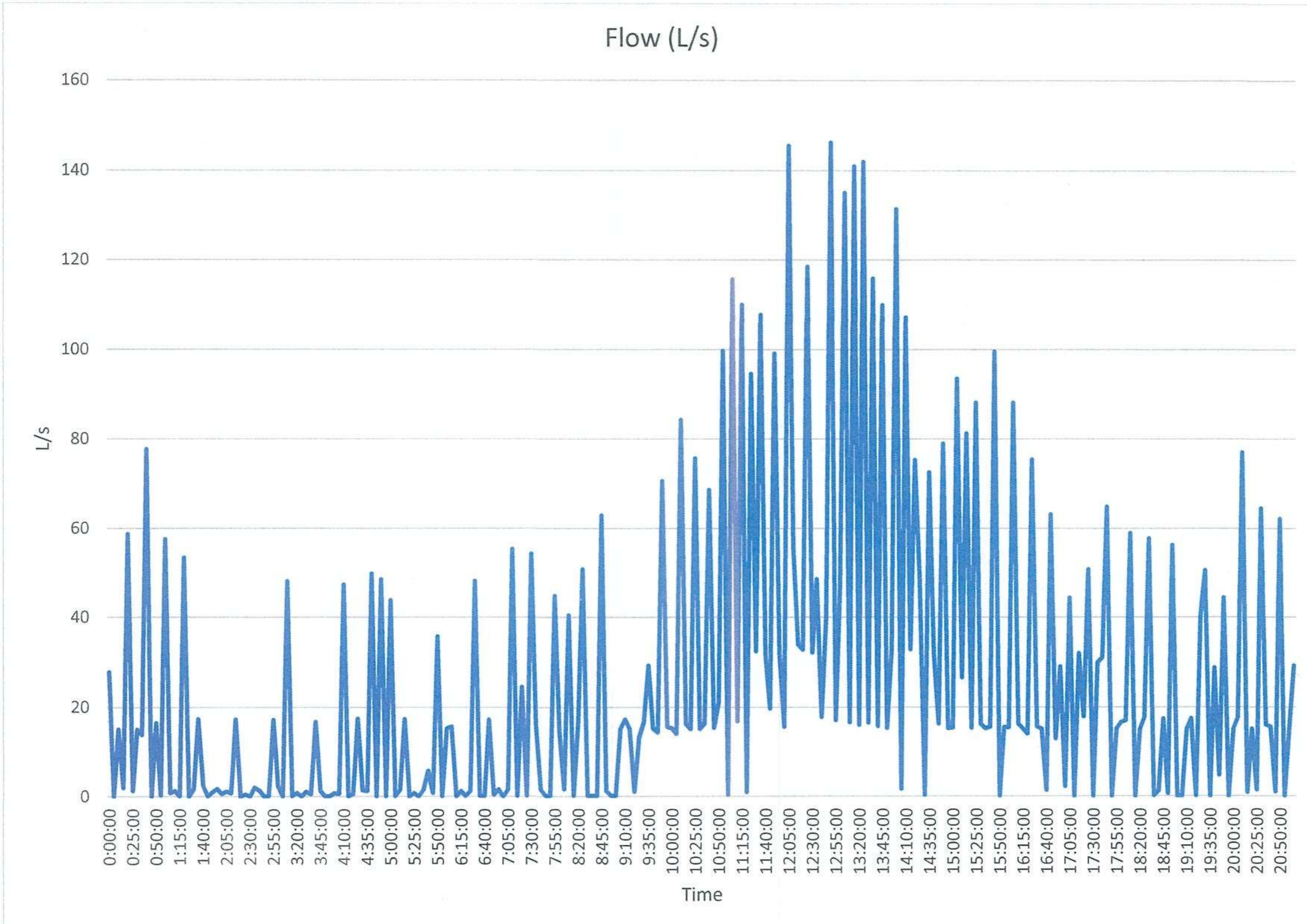


Figure 9: Peak wet weather inflow to Bendemeer PS using 2028 Growth Model (No Waterfall Park Development)

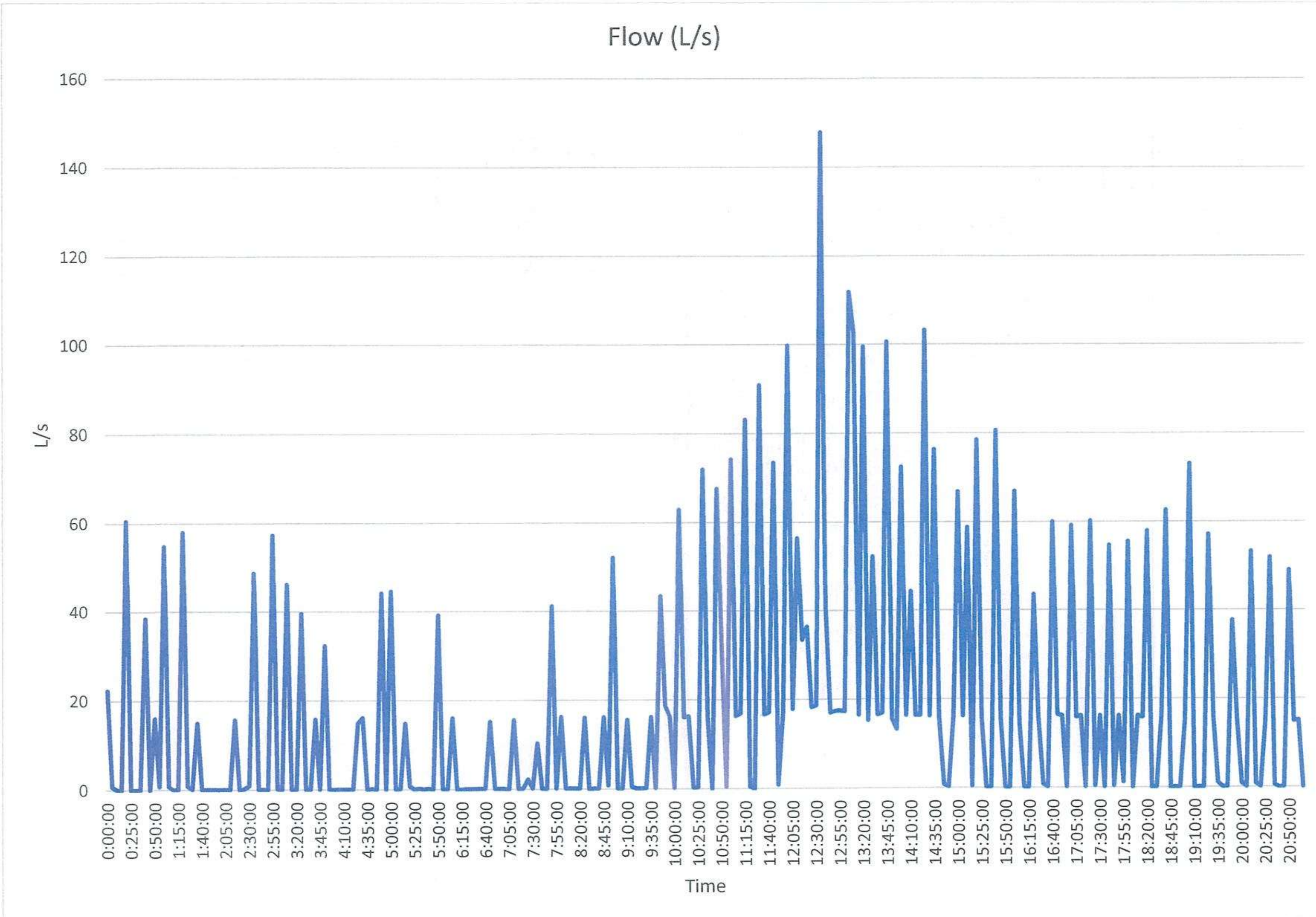
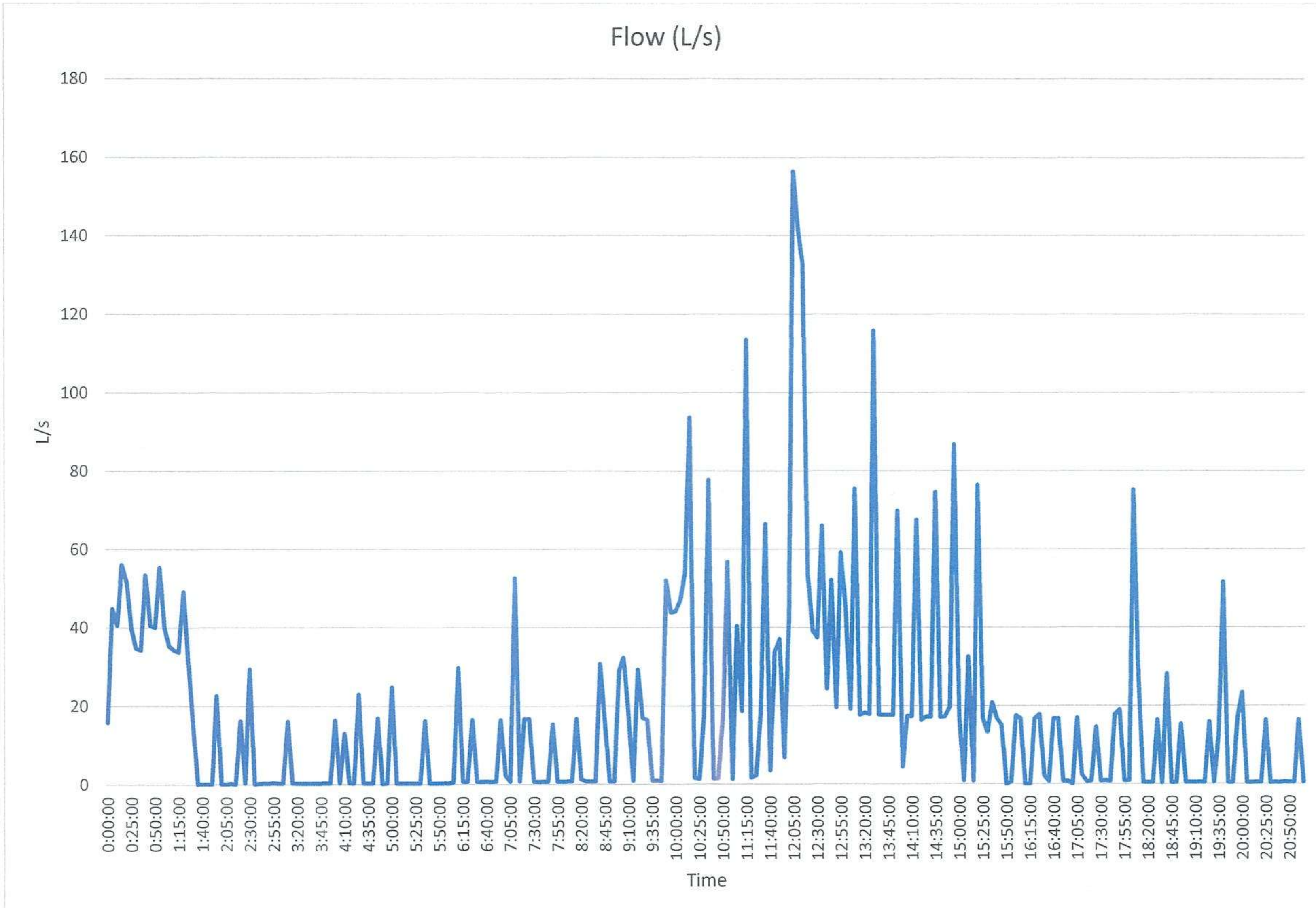


Figure 10: Peak wet weather inflow to Bendemeer PS using 2028 Growth Model, including Waterfall Park Development



Appendix C

Outflows from the Lake Hayes Pump Stations

Figure 11: Current peak wet weather outflow from Lake Hayes #1 PS

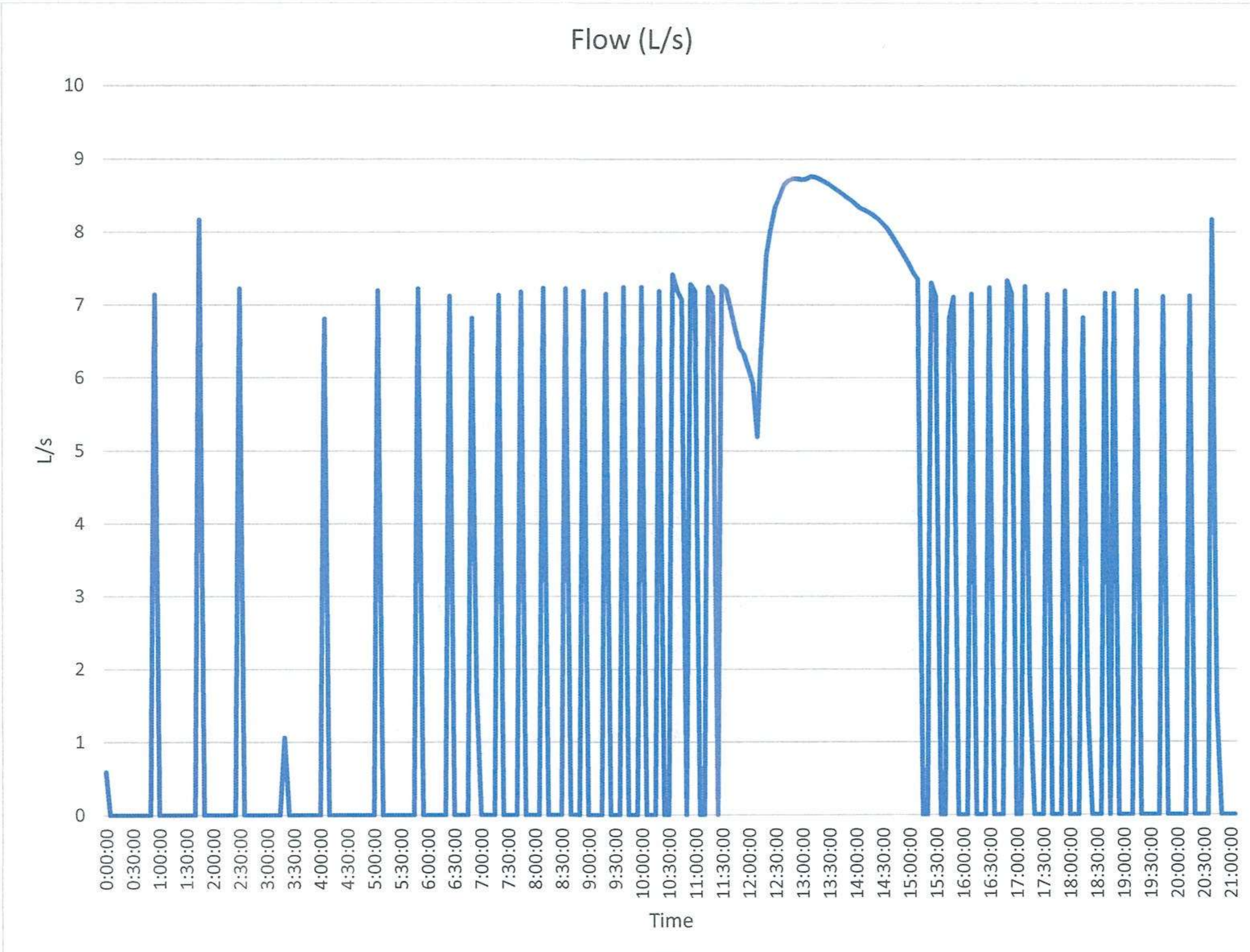


Figure 12: Peak wet weather outflow from Lake Hayes #1 PS using 2028 Growth Model (No Waterfall Park Development)

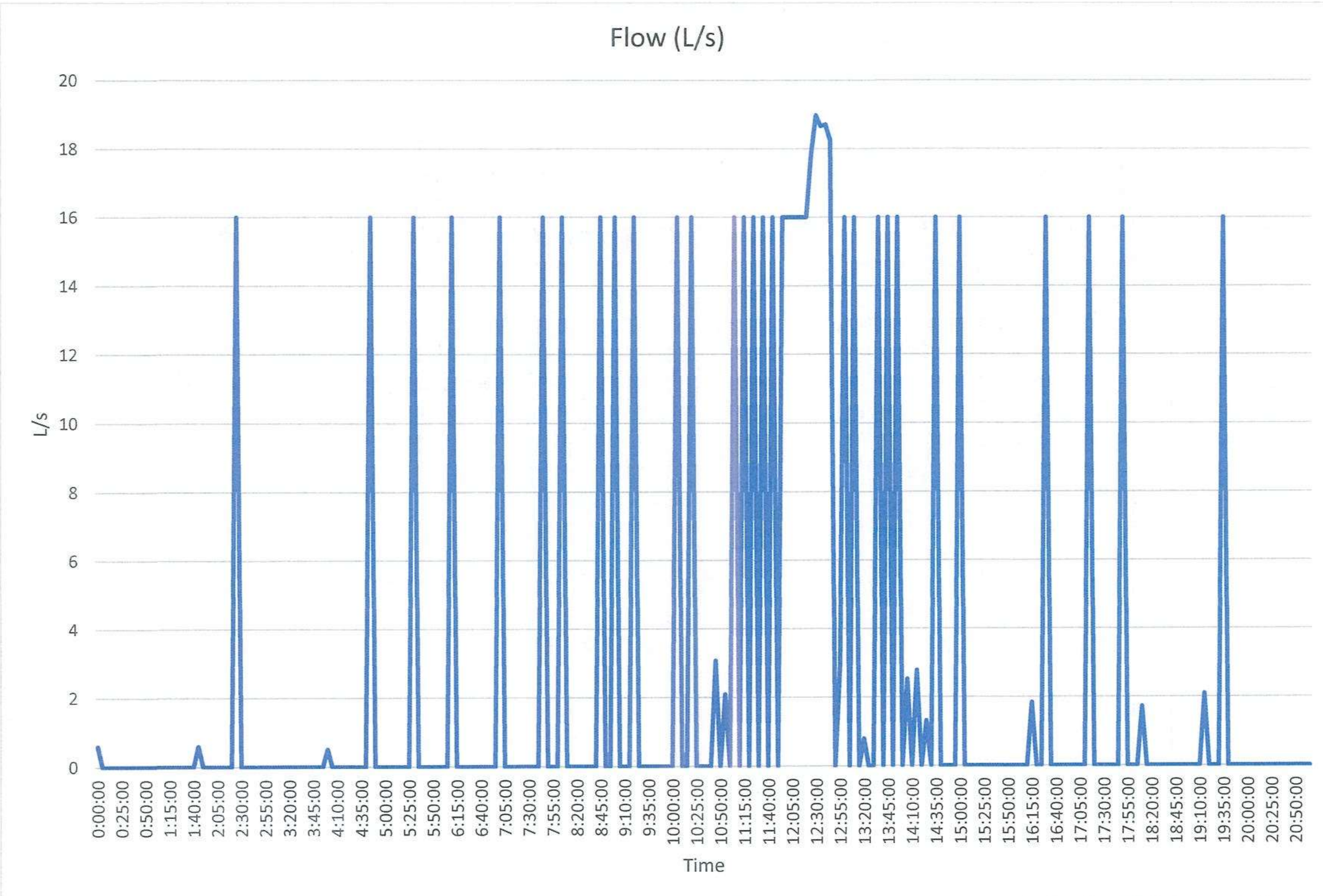


Figure 13: Peak wet weather outflow from Lake Hayes #1 PS using 2028 Growth Model, and Including Waterfall Park Development

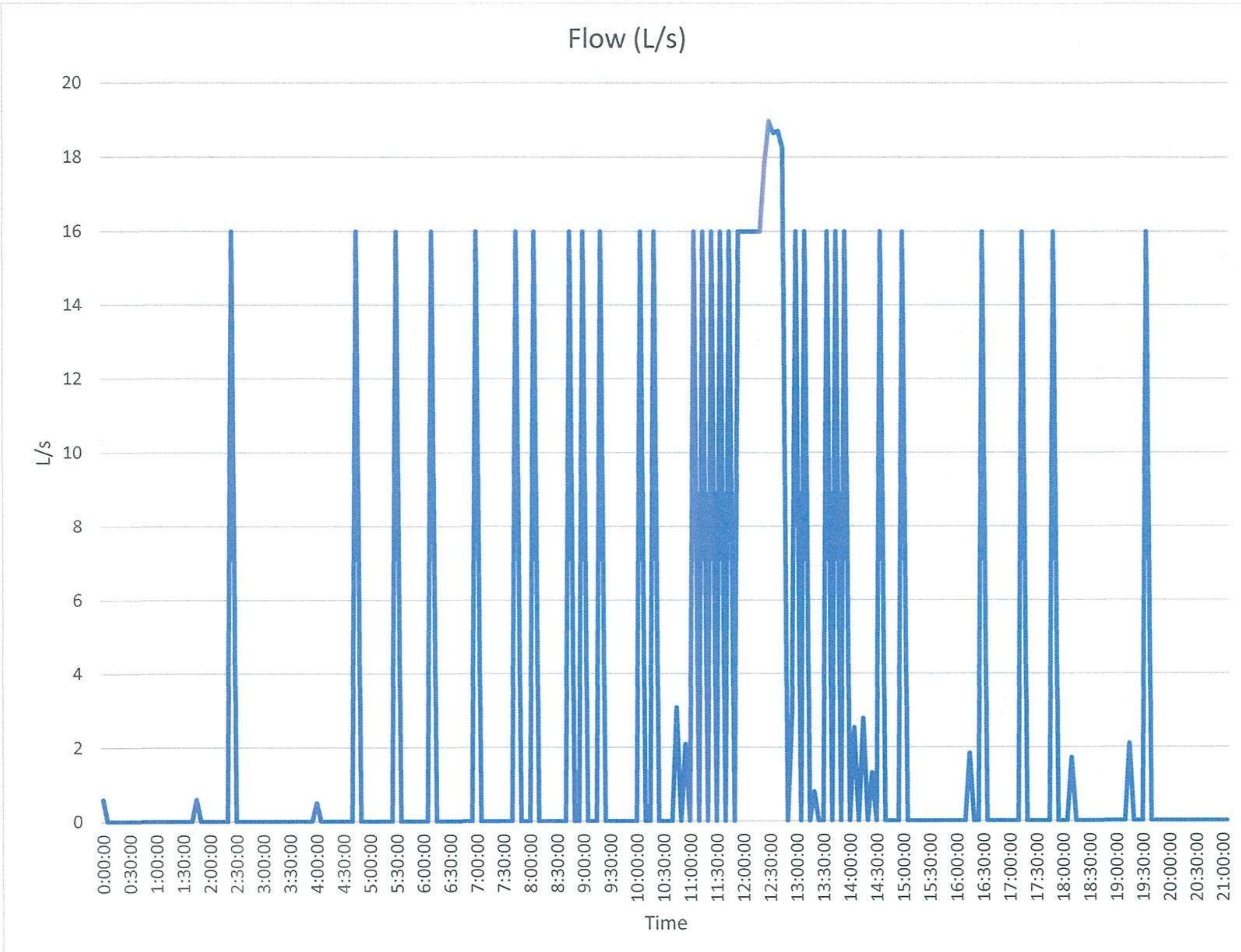


Figure 14: Current peak wet weather outflow from Lake Hayes #2 PS

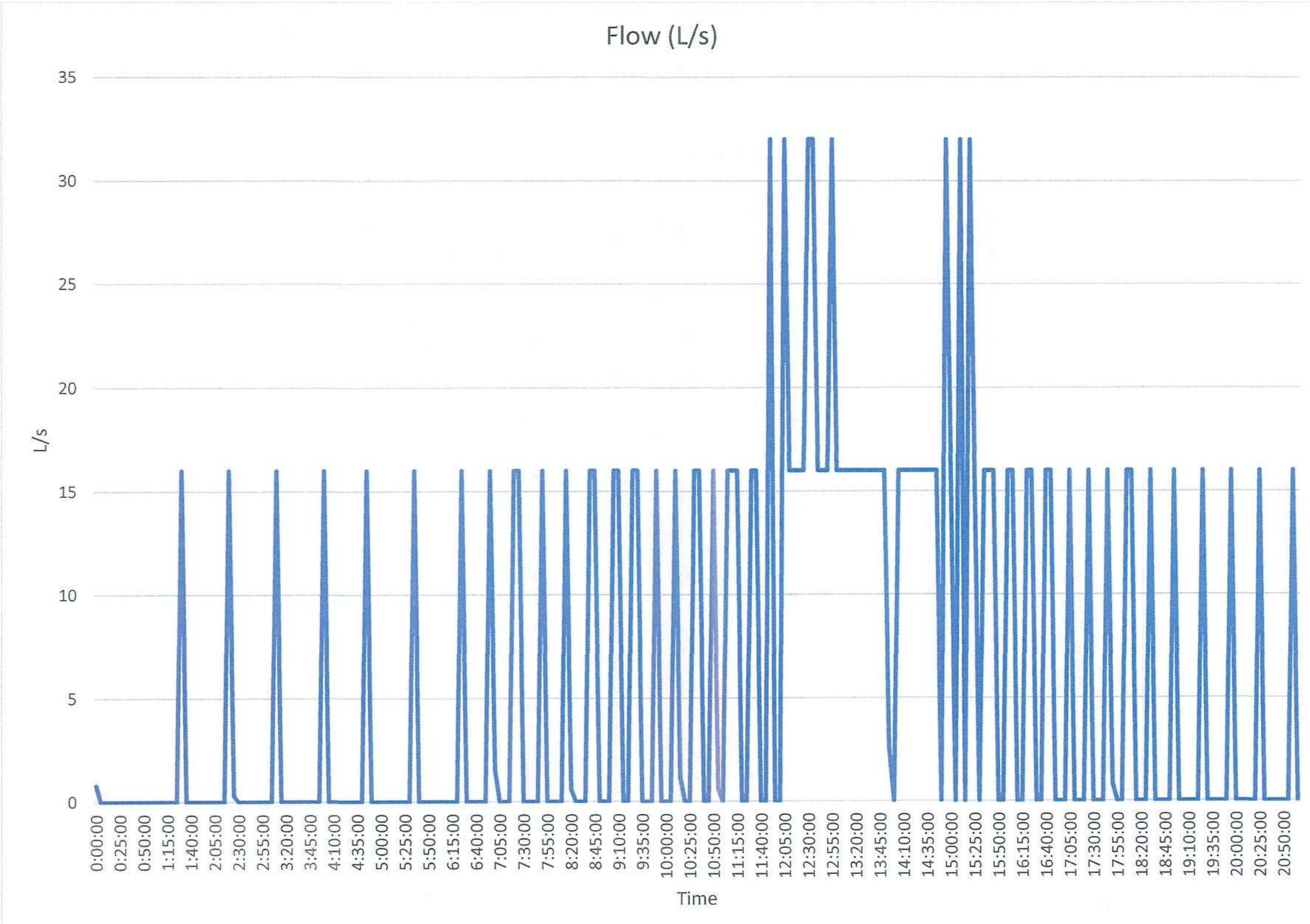


Figure 15: Peak wet weather outflow from Lake Hayes #2 PS using 2028 Growth Model (No Waterfall Park Development)

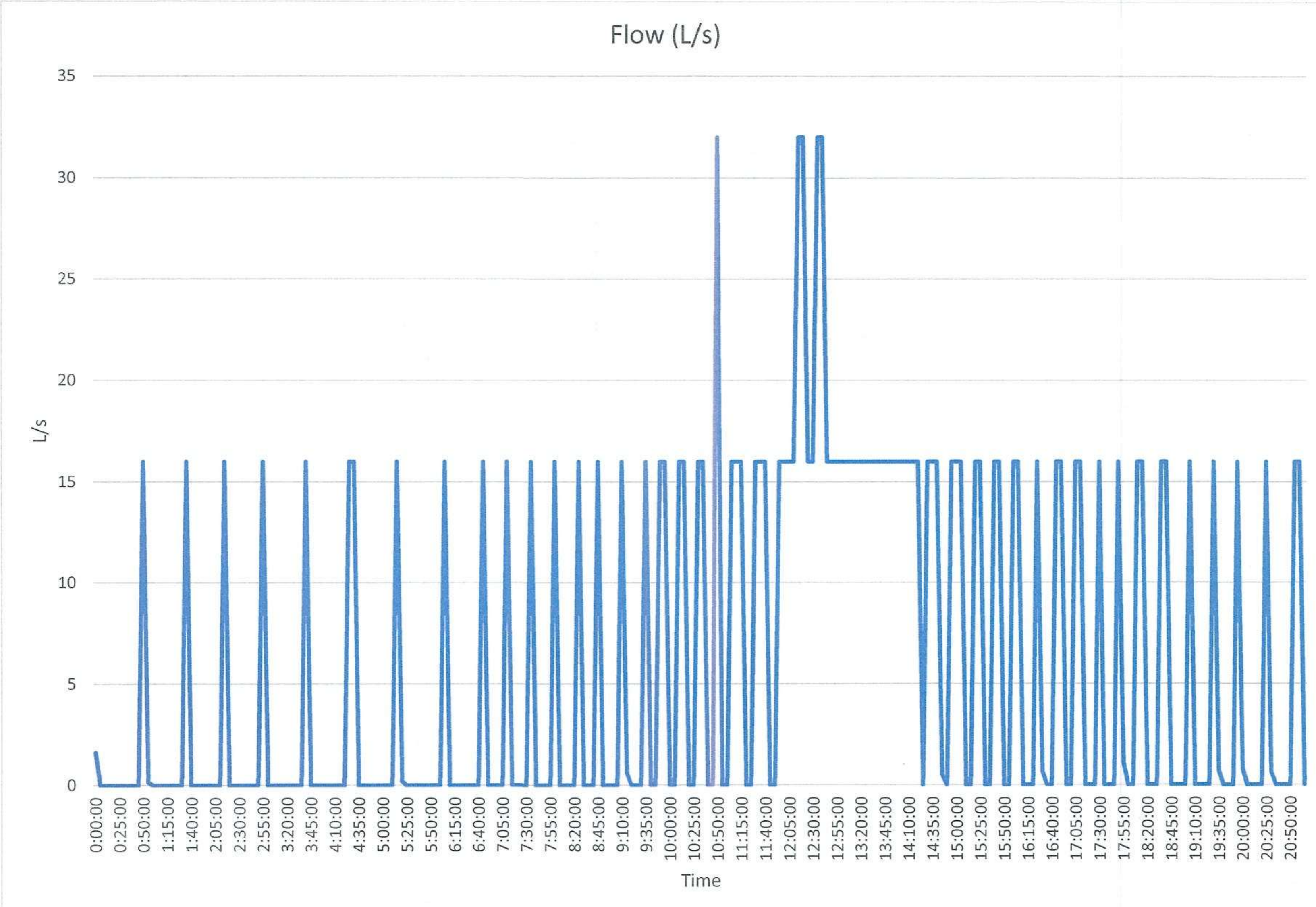


Figure 16: Peak wet weather outflow from Lake Hayes #2 PS using 2028 Growth Model, and including Waterfall Park Development

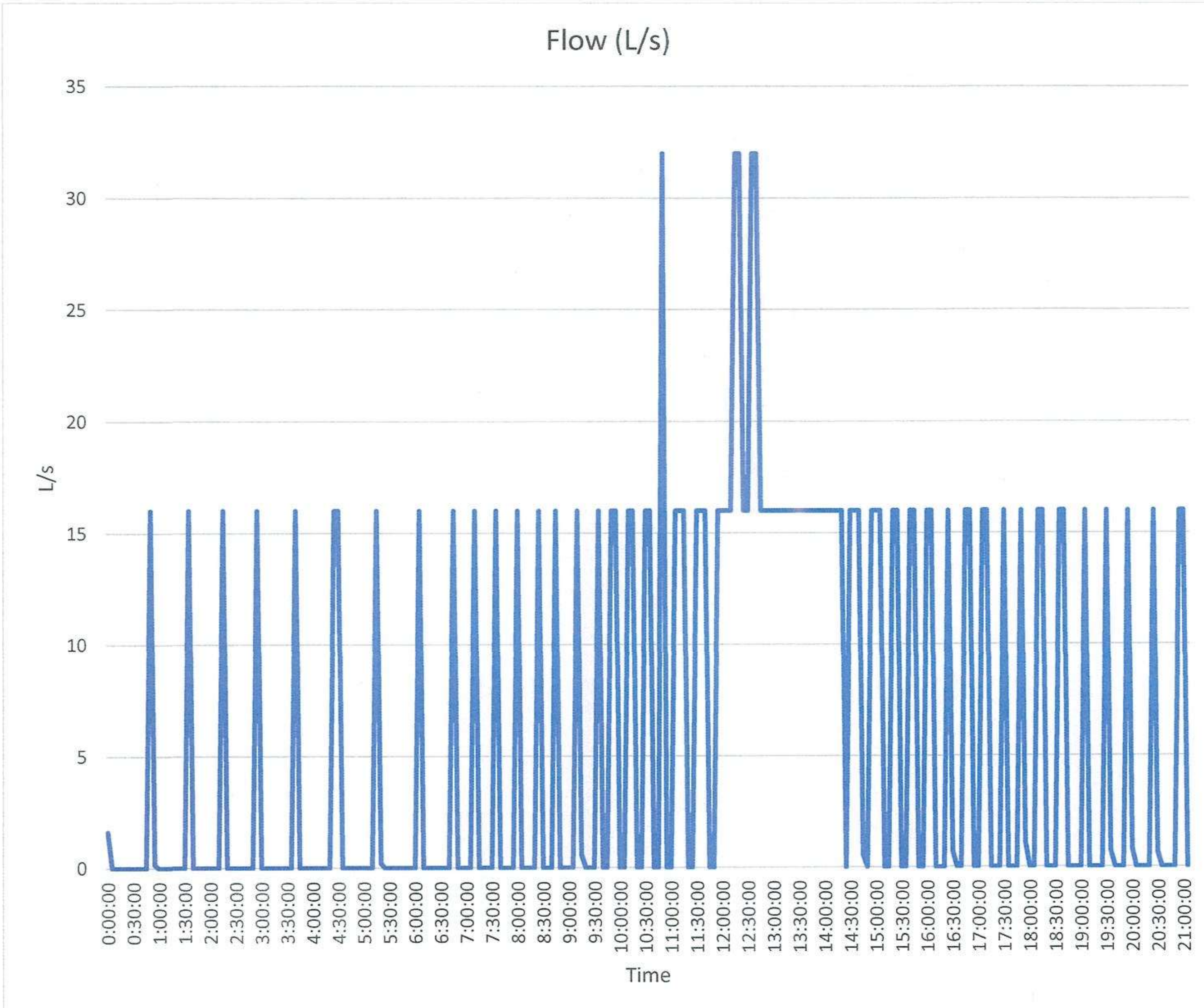


Figure 17: Current peak wet weather outflow from Bendemeer PS

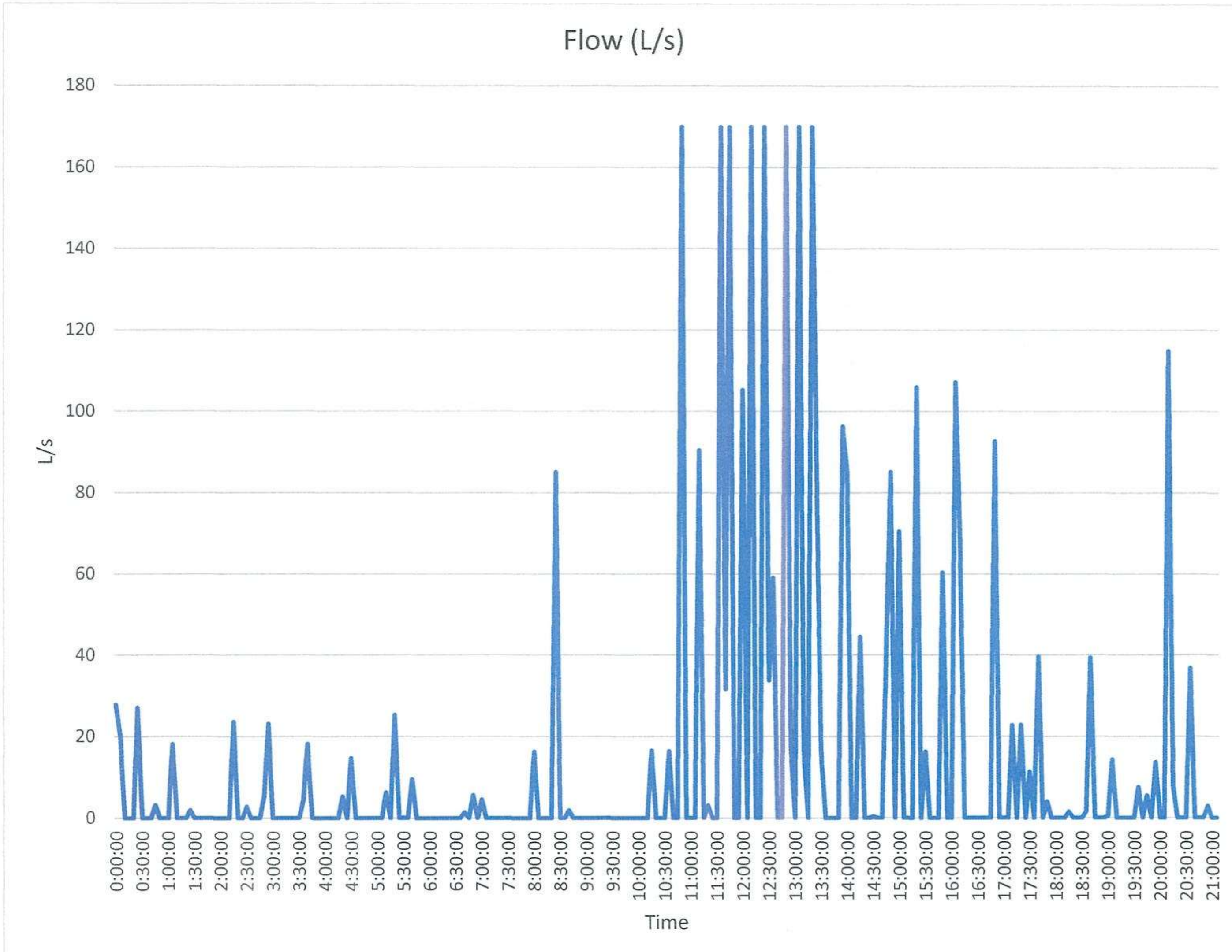


Figure 18: Peak wet weather outflow from Bendemeer PS using 2028 Growth Model (No Waterfall Park Development)

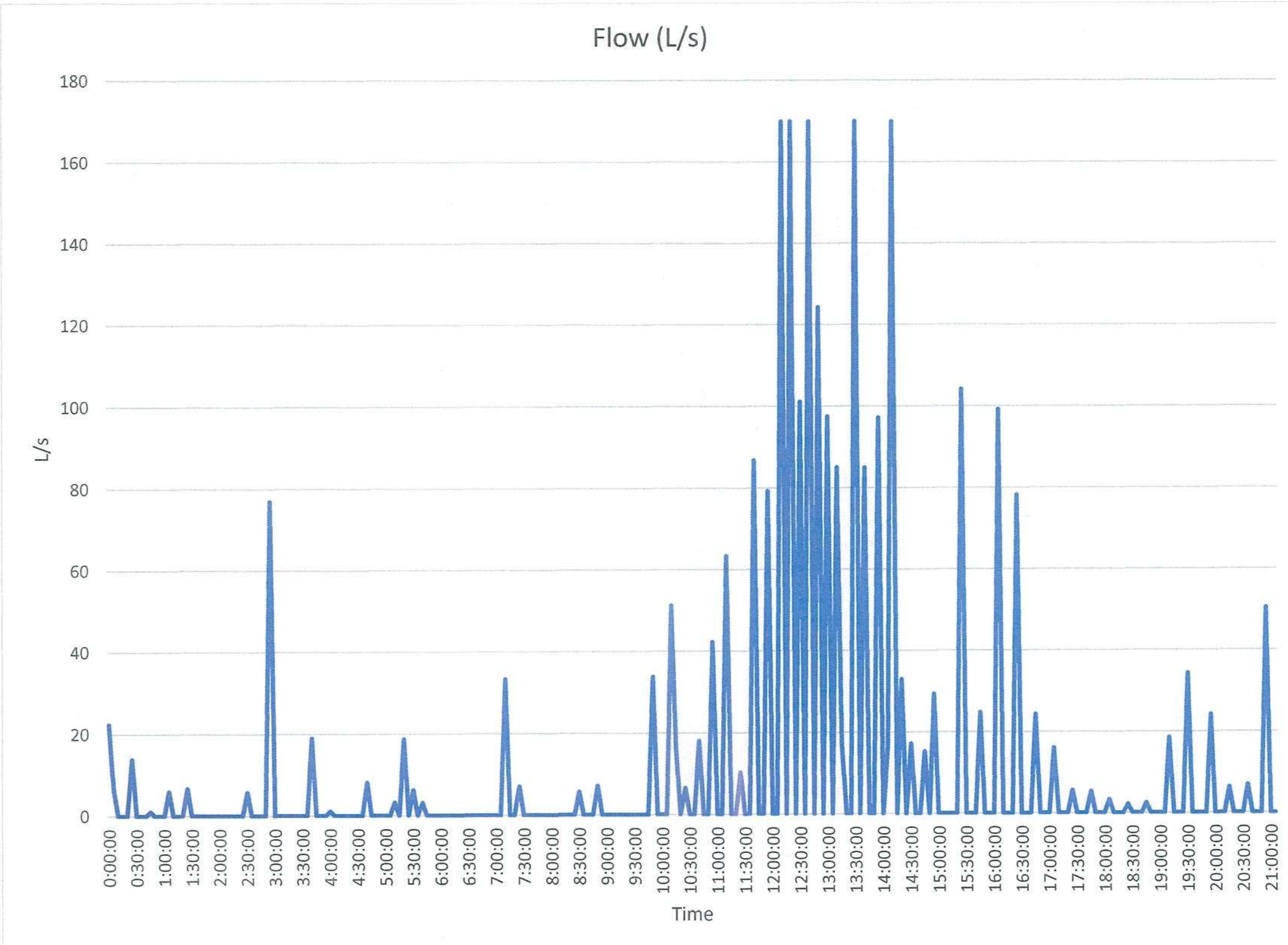
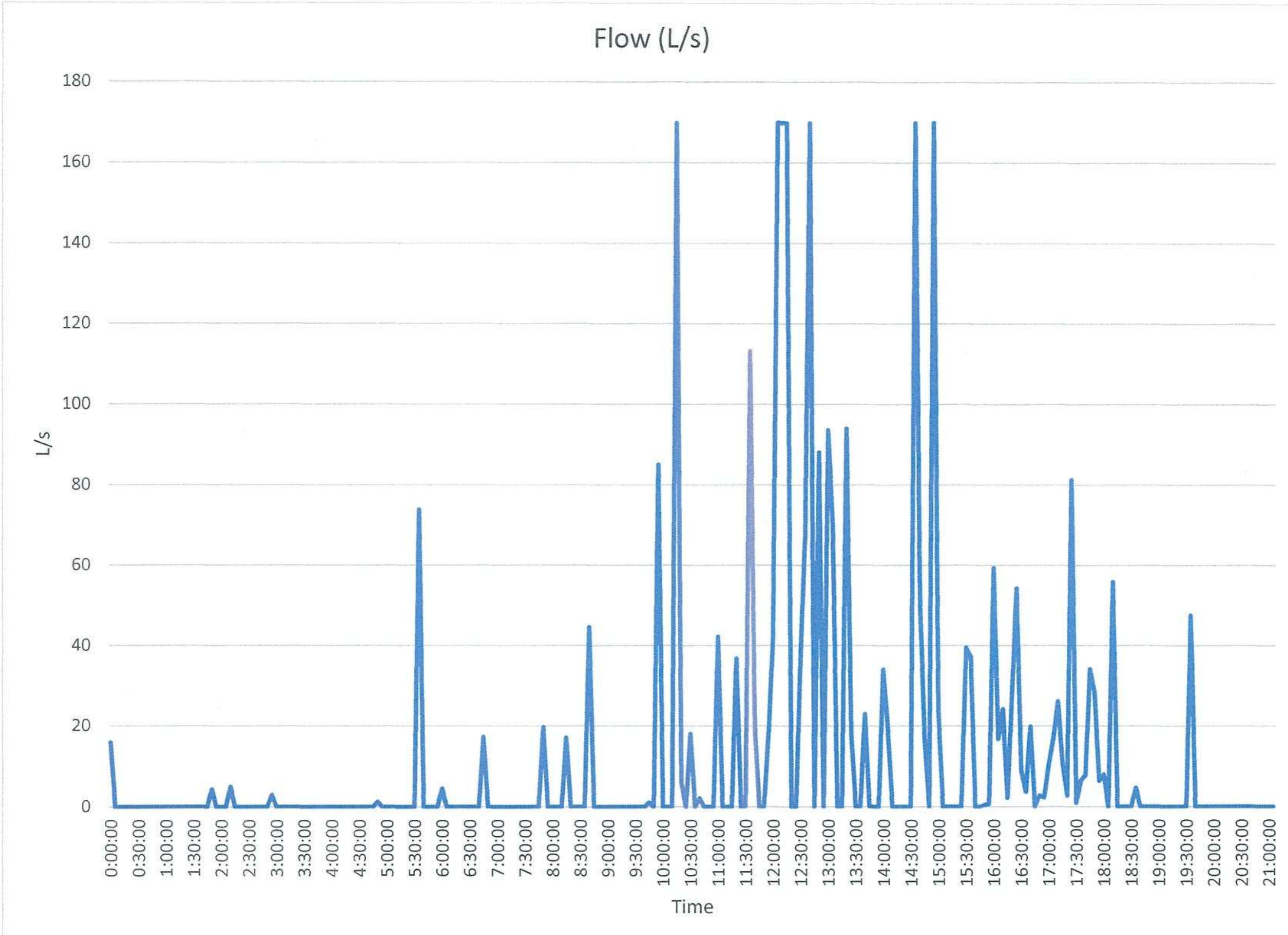


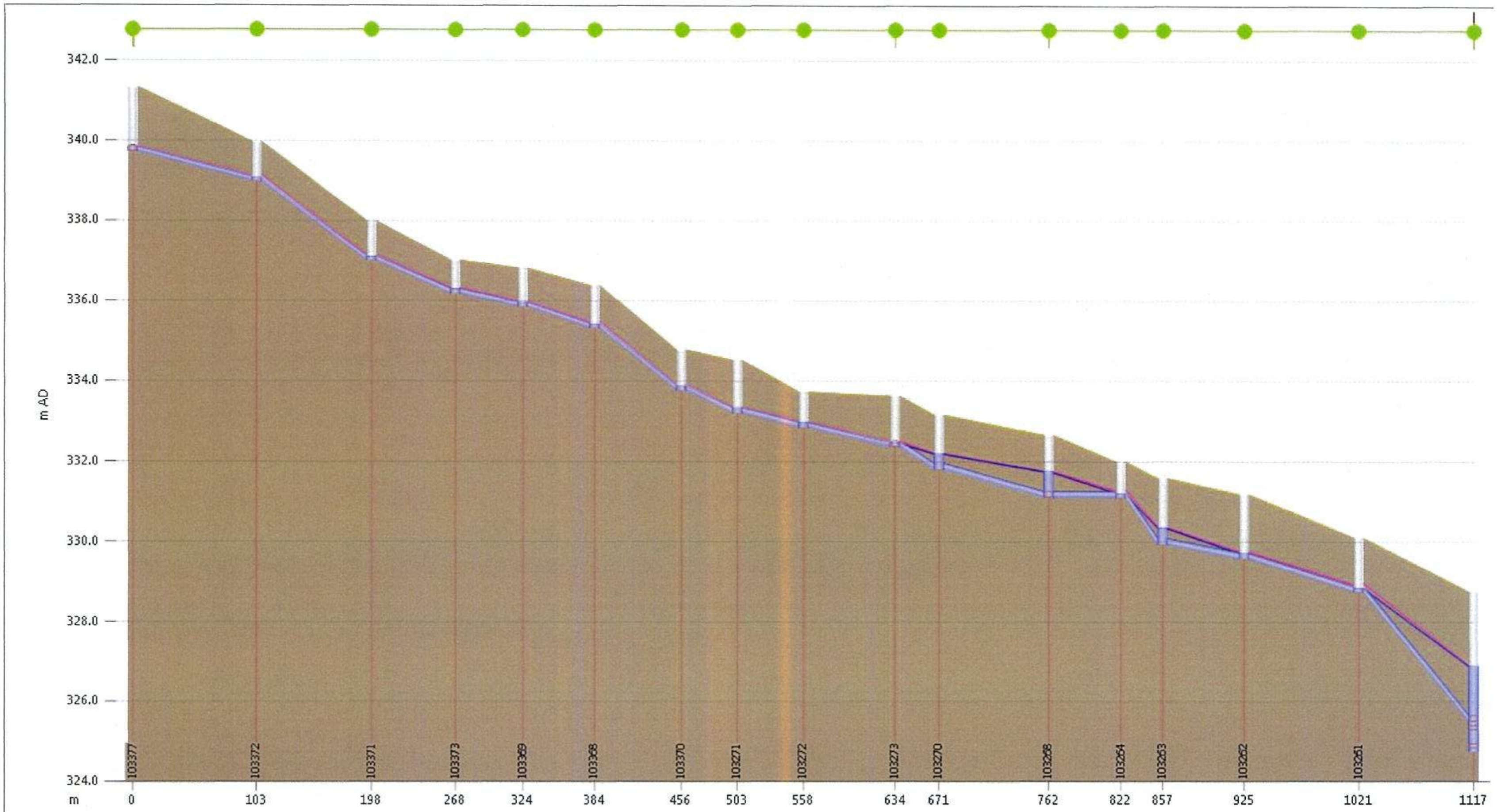
Figure 19: Peak wet weather outflow from Bendemeer PS using 2028 Growth Model, and Including Waterfall Park Development



Appendix D

Long Sections

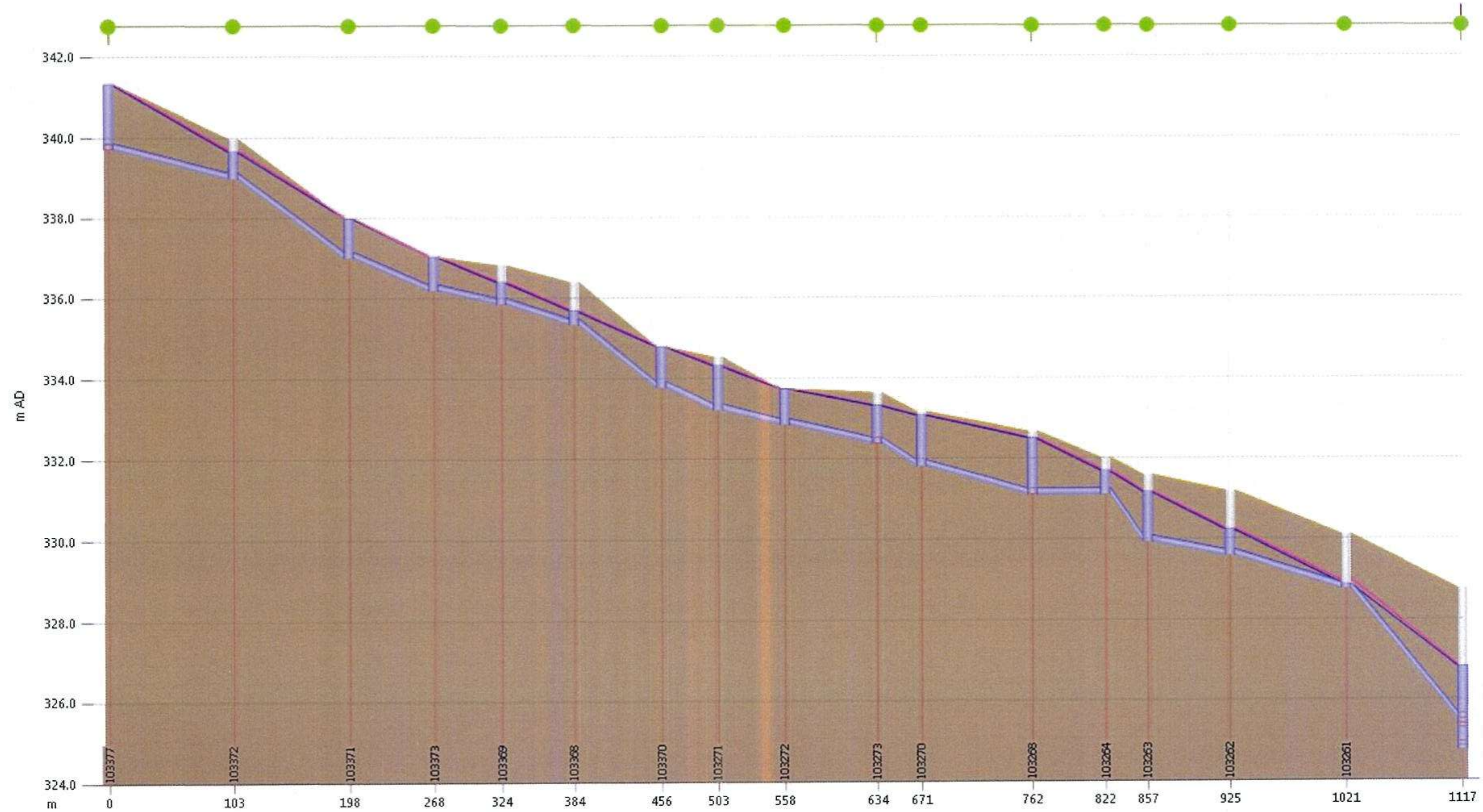
Figure 20: Long Section Upstream of Lake Hayes #1 PS without Development



Link	width (mm)	us inv (m AD)	ds inv (m AD)
103377.1	150	339.720	338.990
103372.1	150	338.990	337.010
103371.1	150	337.010	336.190
103373.1	150	336.190	335.860
103369.1	150	335.860	335.340
103368.1	150	335.340	333.780
-	150	333.780	333.220
103271.1	150	333.220	332.850
103272.1	150	332.850	332.370
-	150	-	-
103270.1	150	331.810	331.100
103268.1	150	331.100	331.100
-	150	-	-
103263.1	150	329.930	329.580
103262.1	150	329.580	328.760
103261.1	150	328.760	325.500

Node	ground (m AD)	level (m AD)
103377	341.330	339.831
103372	339.970	339.063
103371	337.990	337.103
103373	337.020	336.303
103369	336.820	335.962
103368	336.390	335.414
103370	334.780	333.870
103271	334.520	333.335
103272	333.730	332.966
103273	333.630	332.466
103270	333.160	332.194
103268	332.660	331.749
103264	-	-
103263	331.580	330.344
103262	331.180	329.718
103261	330.100	328.841
107909	-	-

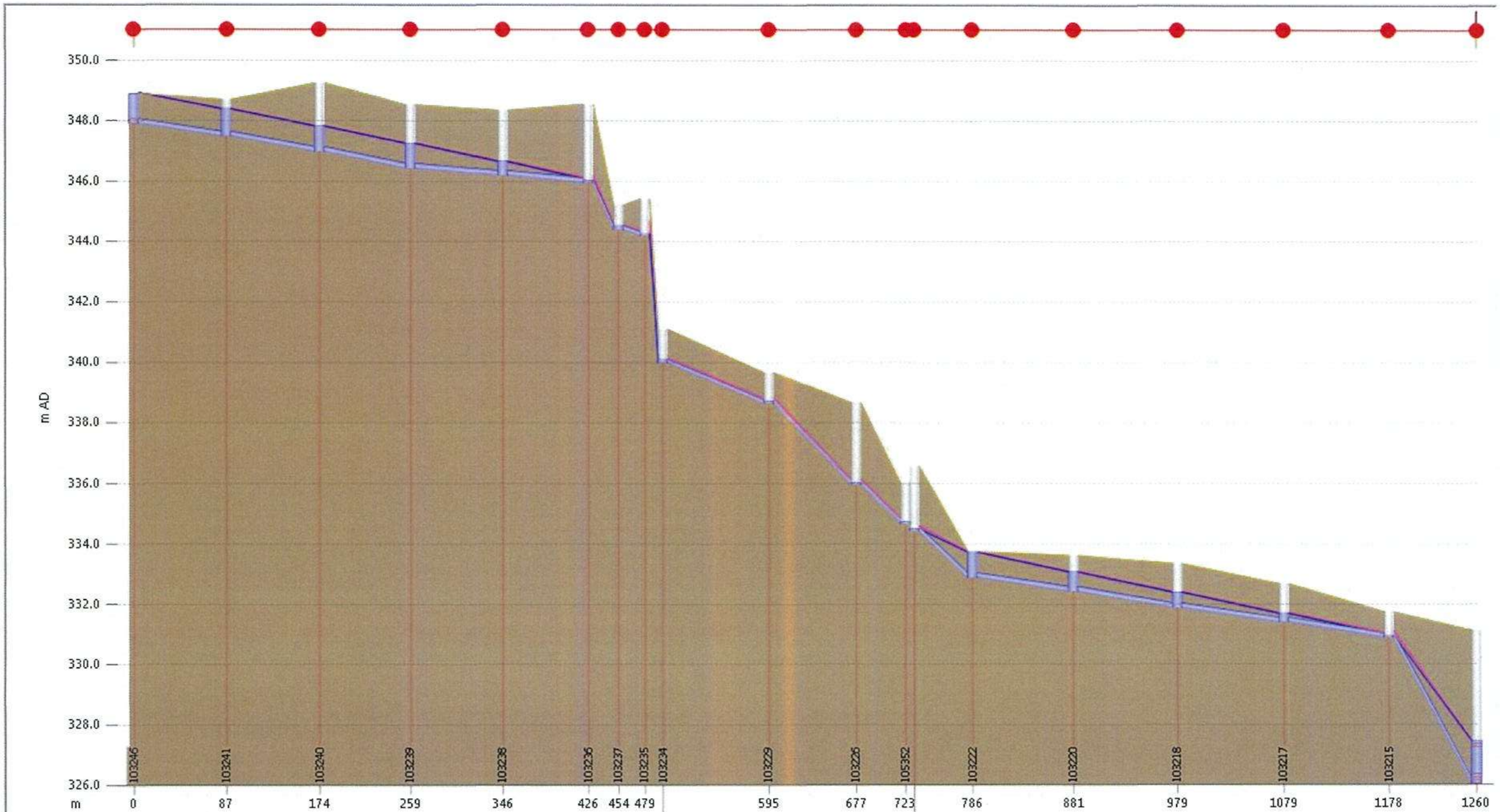
Figure 21: Long Section Upstream of Lake Hayes #1 PS with Maximum Development



Link	width (mm)	us inv (m AD)	ds inv (m AD)
103377.1	150	339.720	338.990
103372.1	150	338.990	337.010
103371.1	150	337.010	336.190
103373.1	150	336.190	335.860
103369.1	150	335.860	335.340
103368.1	150	335.340	333.780
-	150	333.780	333.220
103271.1	150	333.220	332.850
103272.1	150	332.850	332.370
-	150	-	-
103270.1	150	331.810	331.100
103268.1	150	331.100	331.100
-	150	-	-
103263.1	150	329.930	329.580
103262.1	150	329.580	328.760
103261.1	150	328.760	325.500

Node	ground (m AD)	level (m AD)
103377	341.330	341.330
103372	339.970	339.652
103371	337.990	337.990
103373	337.020	337.020
103369	336.820	336.400
103368	336.390	335.689
103370	334.780	334.780
103271	334.520	334.314
103272	333.730	333.730
103273	333.630	333.326
103270	333.160	333.076
103268	332.660	332.500
103264	-	-
103263	331.580	331.157
103262	331.180	330.226
103261	330.100	328.854
107909	-	-

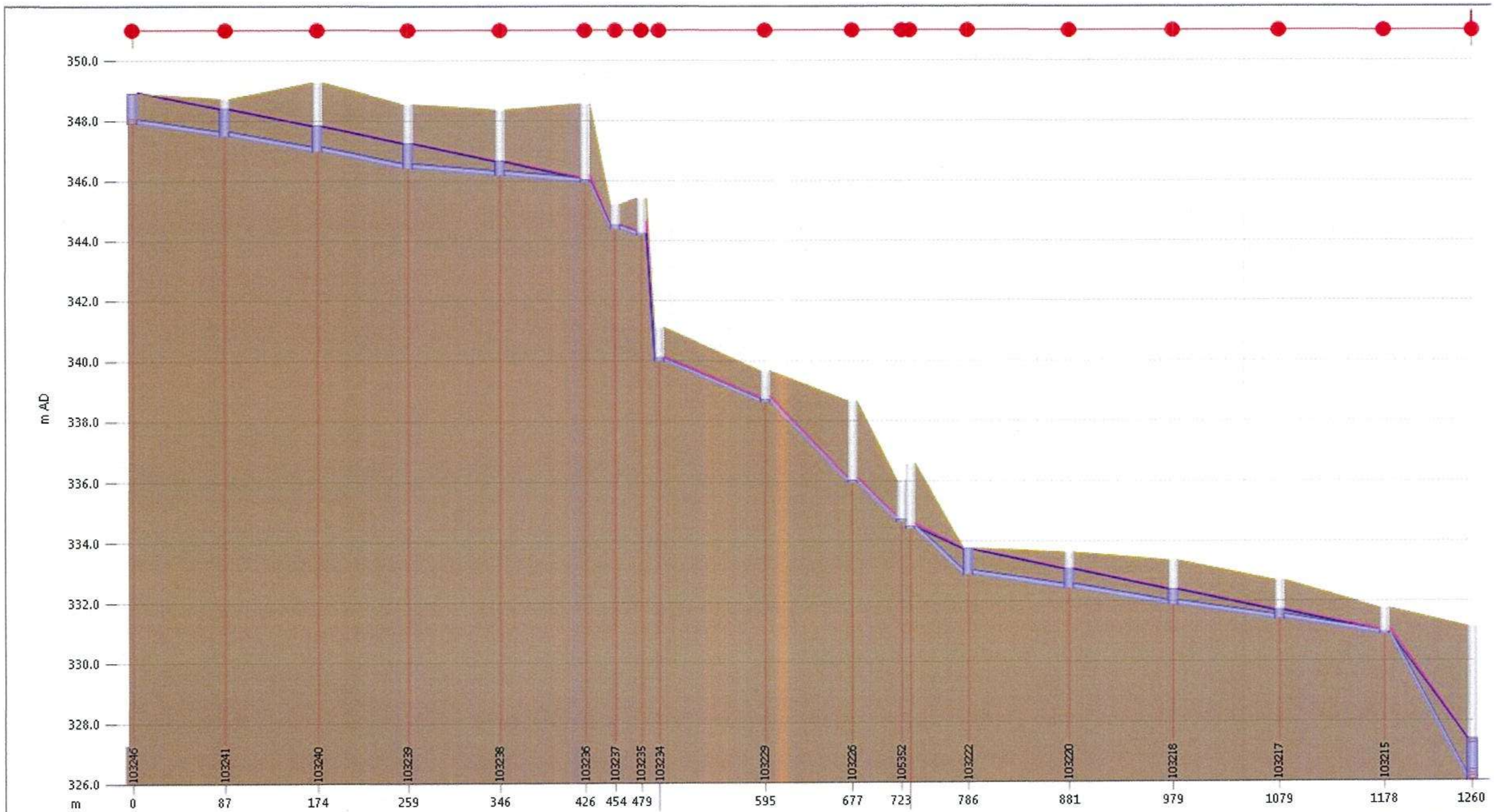
Figure 22: Long Section Upstream of Lake Hayes #2 PS without Development



Link	103246.1	103241.1	103240.1	103239.1	103238.1	-	-	-	103234.1	103229.1	-	105353.1	103222.1	103220.1	103218.1	103217.1	103215.1
width (mm)	150	150	150	150	150	150	150	-	150	150	150	150	150	150	150	150	150
us inv (m AD)	347.910	347.500	346.990	346.440	346.200	-	-	-	340.000	338.650	-	334.420	332.890	332.440	331.880	331.400	330.890
ds inv (m AD)	347.500	346.990	346.440	346.200	345.976	-	-	-	338.650	335.950	-	332.890	332.440	331.880	331.400	330.890	326.030

Node	-	103241	103240	103239	103238	103236	-	-	103234	103229	103226	-	-	103222	103220	103218	103217	103215	-
ground (m AD)	-	348.710	349.260	348.540	348.360	-	-	-	341.110	339.670	338.670	-	-	333.750	333.620	333.350	332.680	331.750	-
level (m AD)	-	348.398	347.831	347.254	346.657	-	-	-	340.110	338.725	336.031	-	-	333.733	333.076	332.393	331.690	330.953	-

Figure 23: Long Section Upstream of Lake Hayes #2 PS with Maximum Development



Link	103246.1	103241.1	103240.1	103239.1	103238.1	-	-	-	103234.1	103229.1	-	105353.1	103222.1	103220.1	103218.1	103217.1	103215.1
width (mm)	150	150	150	150	150	150	150	-	150	150	150	150	150	150	150	150	150
us inv (m AD)	347.910	347.500	346.990	346.440	346.200	-	-	-	340.000	338.650	-	334.420	332.890	332.440	331.880	331.400	330.890
ds inv (m AD)	347.500	346.990	346.440	346.200	345.976	-	-	-	338.650	335.950	-	332.890	332.440	331.880	331.400	330.890	326.030

Node	-	103241	103240	103239	103238	103236	-	-	103234	103229	103226	-	-	103222	103220	103218	103217	103215	-
ground (m AD)	-	348.710	349.260	348.540	348.360	-	-	-	341.110	339.670	338.670	-	-	333.750	333.620	333.350	332.680	331.750	-
level (m AD)	-	348.399	347.831	347.254	346.657	-	-	-	340.110	338.725	336.031	-	-	333.735	333.078	332.394	331.691	330.953	-

APPENDIX B

Wastewater Modelling Report Addendum

WATERFALL PARK DEVELOPMENT: WASTEWATER NETWORK ASSESSMENT

To:	Richard Powell	Queenstown Lakes District Council (QLDC)
Distribution:	Jayne Richards	Fluent Solutions (FS)

From:	Brian Robinson; Rebecca Ellmers (HAL)
Subject:	Waterfall Park Development – Wastewater Network Assessment
Date:	16 January 2019

1 Introduction

1.1 Objective

The objective of this study is to utilise the existing hydraulic model (Wakatipu Wastewater Model with HAL updates, 2018) of the Queenstown, Arrowtown and Lake Hayes wastewater network to assess the impact of the proposed Waterfall Park development on the wastewater network.

1.2 Background

The Waterfall Park development proposal seeks to discharge a maximum flow rate of 23.4 l/s to the existing network. The initial hydraulic modelling carried out by BECA (Waterfall Park Development Wastewater Modelling, 2018) considered a number of private pump station scenarios at various connection points to the existing network. The development consultant has since requested further assessment of the Waterfall Park development impact.

2 Waterfall Park Development

2.1 Overview

The Waterfall Park development seeks to discharge a maximum PWWF of 23.4 l/s and has considered two potential network connection points as summarized below:

1. Connection to the existing local 150mm network to the south discharging to Lake Hayes #1 Pump Station, and eventually to the Arrowtown-Lake Hayes Pump Station
2. Connection to the existing transmission 300mm gravity/pressure main connecting Norfolk Street Pump Station to the Arrowtown-Lake Hayes Pump Station

The connection point to the existing 150mm network to the south was shown in the assessment undertaken by Beca to result in overflows from the local network upstream of the Lake Hayes #1 pump station. This assessment has focused on the connection point to the existing 300mm gravity/pressure main with a proposed pump rate of 23.4 l/s (i.e. matching expected design flows for the full development.

The location of the development and proposed connection points is shown in Figure 1 below.

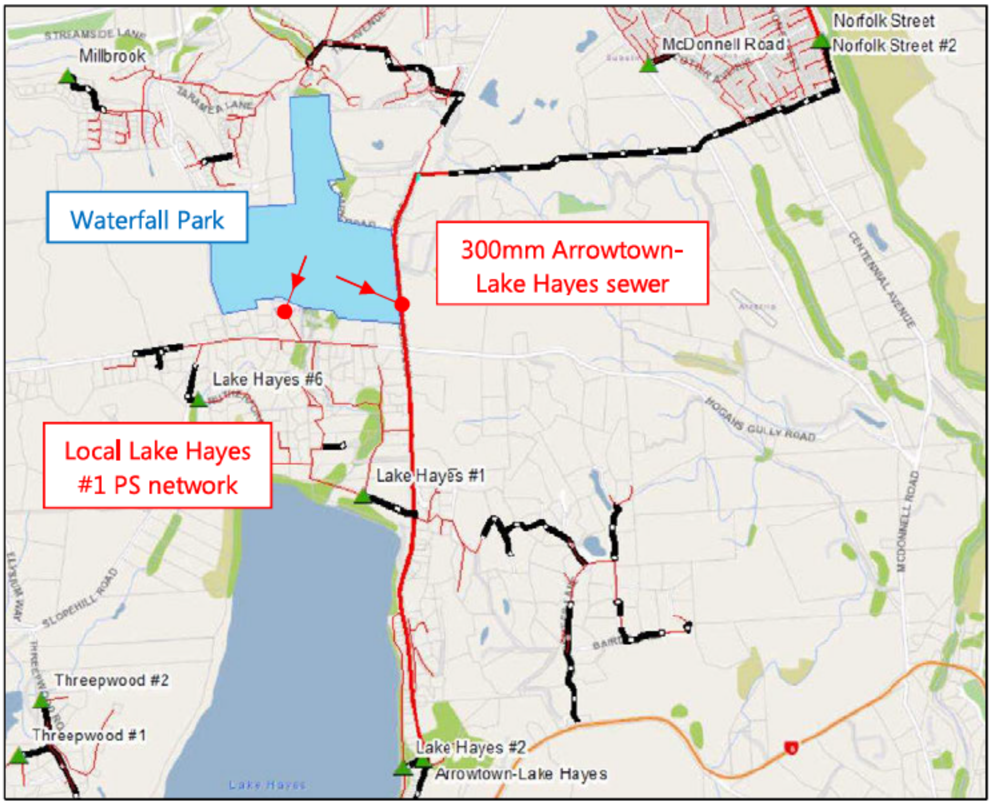


Figure 1: Waterfall Park Development Wastewater Connection

3 Waterfall Park Development Impact

3.1 Proposed Modelling Scenarios

The development consultant Fluent Solutions have since requested further assessment of the Waterfall Park development impact. The initial hydraulic modelling carried out by BECA (Waterfall Park Development Wastewater Modelling, 2018) considered a private pump station with storage and off-peak pumping (assumed to lessen the effect of the development load on the network), with an arbitrary pumped rate of 15 l/s. Fluent Solutions have requested modelling of the maximum proposed development discharge of 23.4 l/s at the Arrowtown-Lake Hayes 300mm connection point (identified as Scenario 3 in the BECA report).

3.2 Scenario 3: Waterfall Park (23.4 l/s) to Arrowtown-Lake Hayes 300mm line

The Wakatipu wastewater model (with 2018 HAL updates included update of pump station capacities) was run under the current (2015) scenario, with and without the proposed Waterfall Park development. The network was assessed against a 5-year ARI design storm to understand the system performance. As shown in the Figure 2 long-section below, the existing network has sufficient capacity in the 300mm Arrowtown-Lake Hayes Wastewater line, discharging to the Arrowtown-Lake Hayes Pump Station.

Figure 2: Existing (2015) Long Section (300mm Arrowtown WW line) – 5 year ARI design storm

The additional peak wet weather flows of 23.4 l/s from the Waterfall Park development were added in to the model, with connection to the 300mm Arrowtown-Lake Hayes wastewater line. As shown in the Figure 3 long-section below, the post-development network has adequate capacity within the 300mm line to receive the full peak wet weather flows from the proposed development.

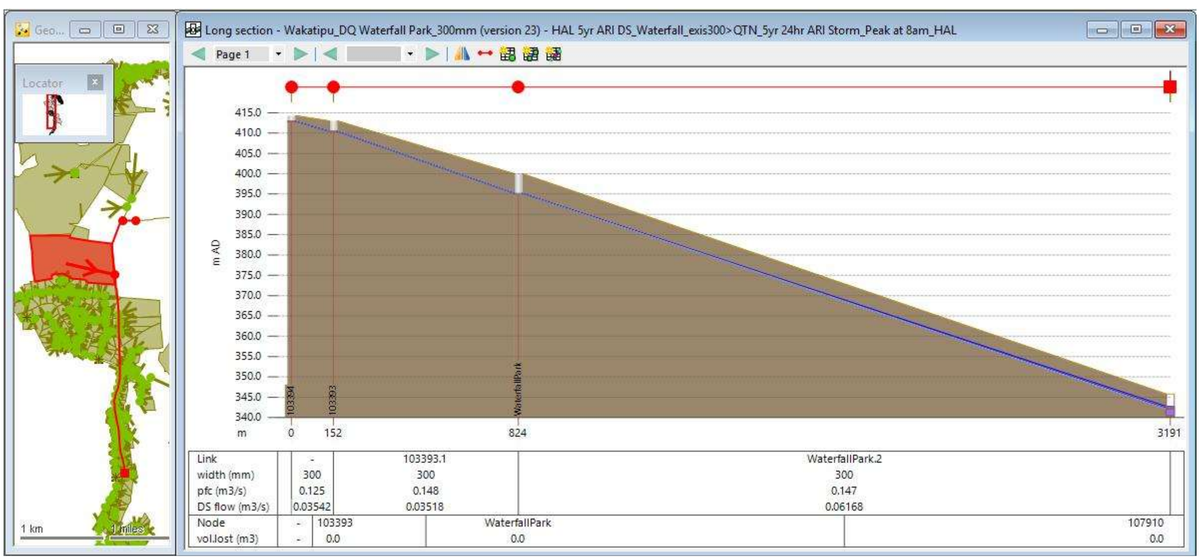


Figure 3: Post Development (2015) Long Section (300mm Arrowtown WW line) with additional Waterfall Park Flows (23.4 l/s) – 5 year ARI design storm

It should be noted that limited information has been made available to date regarding the levels of this 300mm wastewater pipe, with modelled levels taken from QLDC's GIS which just provides invert and ground levels at the upstream end of the pipe (at the confluence with the Norfolk St and Millbrook rising mains) and at the downstream end (at the Arrowtown-Lake Hayes pump station), with no information provided regarding levels at intermediate points along its length. It is understood that this pipeline, whilst generally operating as a gravity pipe, is designed to operate under pressure if flows exceed the on-grade capacity of the pipeline

3.3 Pump Station Assessment – Current Scenario (2015)

The 300mm Arrowtown-Lake Hayes wastewater line conveys flow from the Norfolk Road Pump Station (maximum capacity 70 l/s) and the Millbrook pump station (maximum capacity 24 l/s) to the Arrowtown-Lake Hayes Pump Station. The modelled inflows and outflows for the Arrowtown-Lake Hayes PS post-development scenario are shown in Figure 4 below.

The Arrowtown-Lake Hayes Pump Station has a maximum capacity of 85 l/s with one pump operating (based on QLDC records). In the post-development scenario (with the 23.4 l/s from Waterfall Park connected), the peak modelled inflow to the pump station is 81 l/s in the 5-year ARI design storm (as shown by the red trace). As shown by the yellow trace, the majority of flows entering the pump station are received from the 300mm line and the Waterfall Park development.

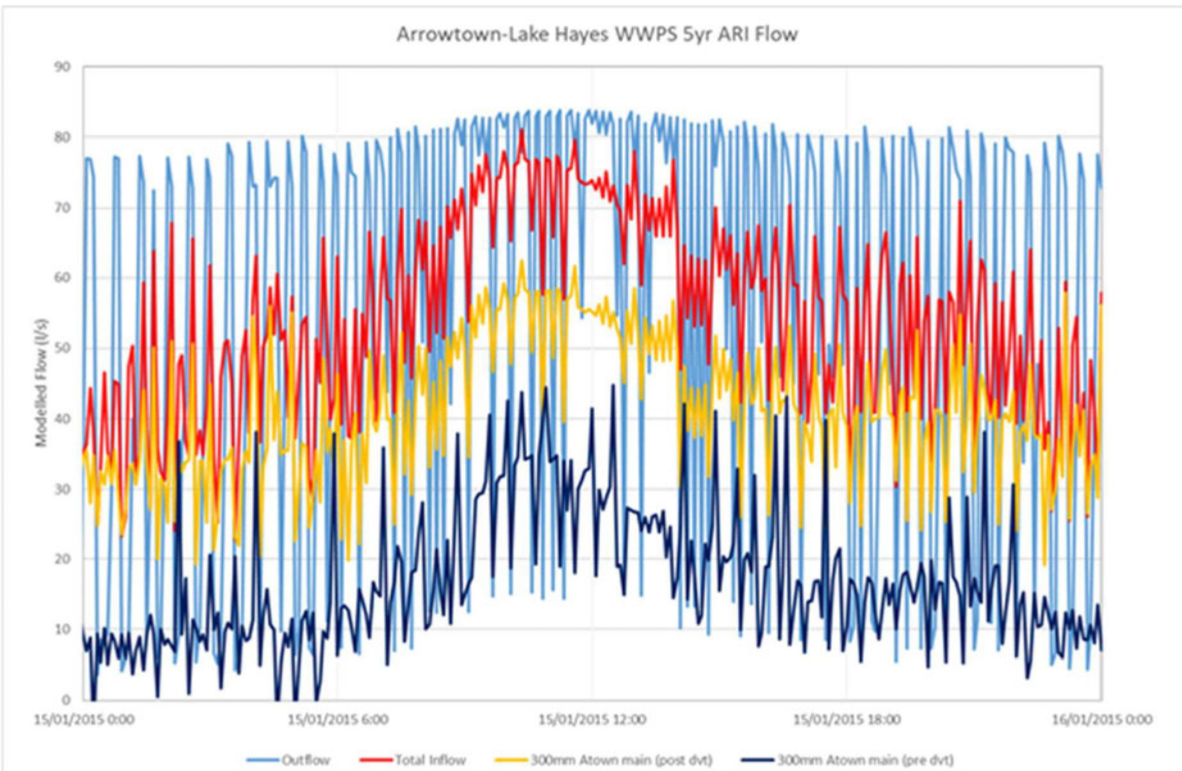


Figure 4: Modelled Arrowtown-Lake Hayes Pump Station flows – 5 year ARI design storm

3.4 Pump Station Assessment – Future Scenario (2055)

Based on a future (2055) population scenario, an assessment was made of the capacities of the relevant pump stations discharging to the Arrowtown-Lake Hayes Pump Station, and can be summarised in the Figure 5 schematic below.

While there is current (2015) capacity in the Arrowtown-Lake Hayes Pump Station for the proposed development, future significant growth in the remainder of the contributing catchment (in addition to the proposed Waterfall Park flow of 23.4 l/s) will likely trigger pump station upgrade requirements.

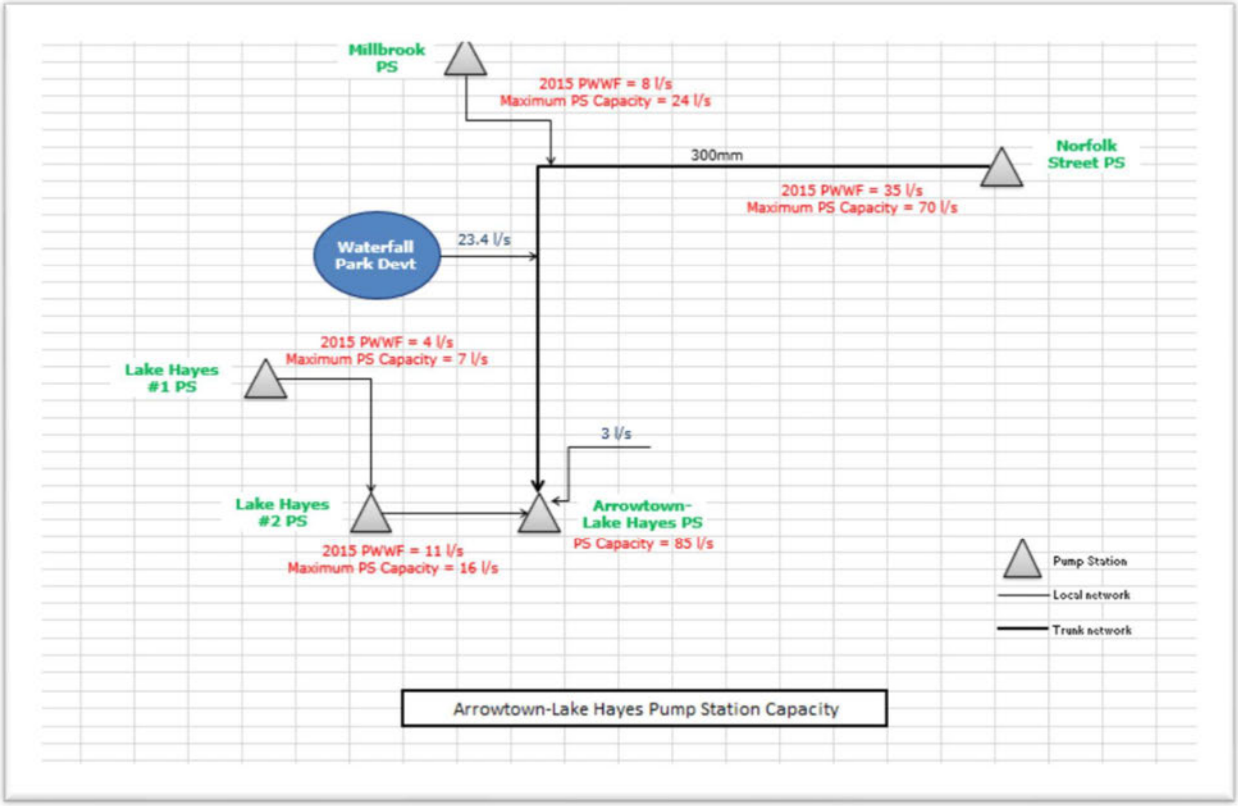


Figure 5: Pump station capacity current (2015) scenario versus theoretical maximum flows

3.5 Pressure at Arrowtown-Lake Hayes 300mm line connection point

In both the current (2015) and future (2055) scenarios, there is sufficient capacity within the 300mm line to receive the additional flows from the Waterfall Park development. Based on the GIS data available, the wastewater line appears to discharges as free flow via gravity (i.e. not pressurized) to the Arrowtown-Lake Hayes Pump Station.

The proposed connection point of the Waterfall Park development to the Arrowtown-Lake Hayes 300mm line has been constructed in the model with an estimated ground and invert level based on existing data. Insufficient level data is available to determine whether there are sections of this pipeline that don't operate under gravity conditions (and hence may operate under pressure), and is recommended as part of the design process for the Waterfall Park development, an assessment is made of actual levels at the proposed connection point to determine whether the pipeline is expected to operate under pressure, and to determine the head that the proposed Waterfall pump station will operate at.

Fluent SOLUTIONS

APPENDIX C

Water Modelling Report

Queenstown Lakes District Council
Private Bag 50072
Queenstown 9348,
New Zealand

Waterfall Park Development – Water Impact Assessment

19 March 2018

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PO Box 37525, Parnell,
1151
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mottmac.com

This letter summarises the results of the assessment undertaken for a proposed development consisting of mixed land use, including a hotel (380 rooms) and a residential development of 125 units (double dwelling). The project is located on the northwest side of Arrowtown-Lake Hayes Rd and Speargrass Flat Rd.

1 Background

In January 2018 Mott MacDonald was commissioned by Queenstown Lakes District Council (QLDC) to assess the system performance in terms of Level of Service (LOS) and firefighting capacity in the proposed development.

In this analysis, the latest Lake Hayes water supply model was used. Three scenarios were investigated, with and without additional demand from the proposed development for existing and future conditions. These are further detailed in the scenarios investigation section of this letter.

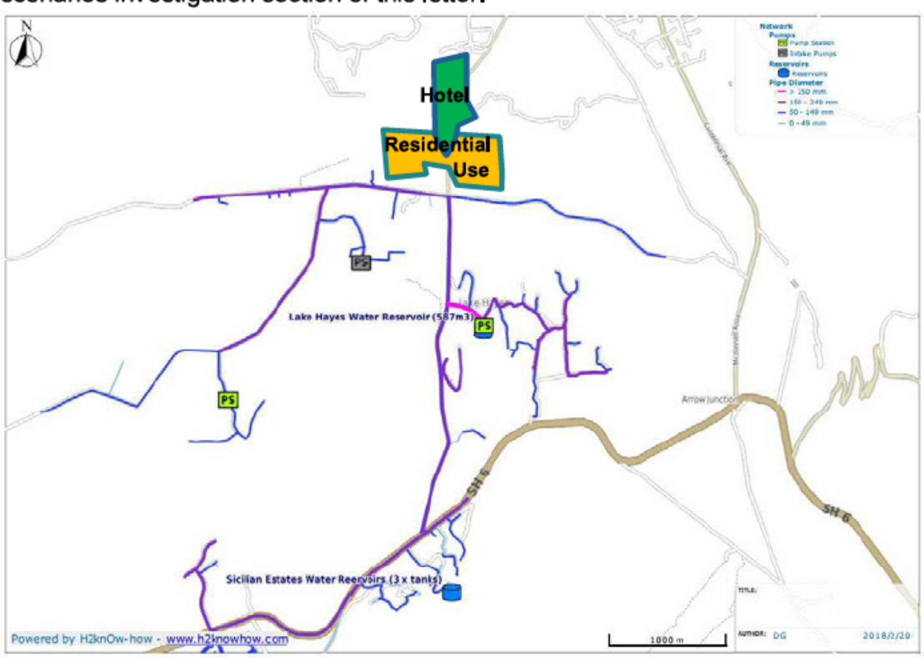

Figure 1 - Proposed Development Location

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2 Assumptions

2.1 Demand Calculations

A demand assessment was provided by the client as summarised in Table 1 below. The detailed calculation is attached in appendix.

Table 1 - Demand Calculation

Hotel Facility (Elevation: RL 368m)	
No. Hotel rooms	380
Maximum people per room	2
Peak daily consumption (l/day/room)	440
Peak water demand (m^3/day) - room	167.2
Additional demand (conference centre, restaurant, irrigation, etc) (m^3/day)	205.2
Instantaneous Peak Flow (l/s)	**18.9**

Residential Development (Elevation: RL 367m)	
No. Primary Dwelling (3 people)	125
No. Secondary Dwelling (2 people)	125
Peak consumption Primary Dwelling (l/day/property)	2,100
Peak consumption Secondary Dwelling (l/day/property)	700
Peak water demand (m^3/day)	350
Instantaneous Peak Flow (l/s)	**26.7**

The calculated demand seems conservative when compared to the observed consumption in Queenstown (2000l/property/day) and Lake Hayes (see table below).

Table 2 - Lake Hayes Demands

DMA Zone	Total demand (m^3/day)	Number of connections	Average demand per connection (l/prop/day)
Shotover Country	374	495	756
Lake Hayes Estate	822	596	1379
Lake Hayes	928	421	2204
Bendeemer	17	13	1308
Terraces	25	9	2778
DMAs Combined	**2,166**	**1,534**	**1,412**

As shown in the table above, the proposed development peak day demand is equivalent to a third of the current peak day demand in the entire service area.

2.2 Proposed Connection Point

The minimum and maximum elevations within the proposed development areas of the lots are shown in the table below:

Table 3 - Proposed Development Elevations

	Min elevation in proposed development area	Max elevation in proposed development area
Hotel Development	347.5m (with 4 story hotel building ~12.8m height)	368m (with single story building only)
Residential Development	342m	367m

Overall, the maximum elevation within the lot proposed for the residential development is 423m.

As suggested by the developer, it was assumed that the proposed development would be connected to the 235 mm ID main at the Arrowtown-Lake Hayes Rd and Speargrass Flat Rd junction. Figure 2 below shows the development location, and the proposed network and connection point considered in this study.

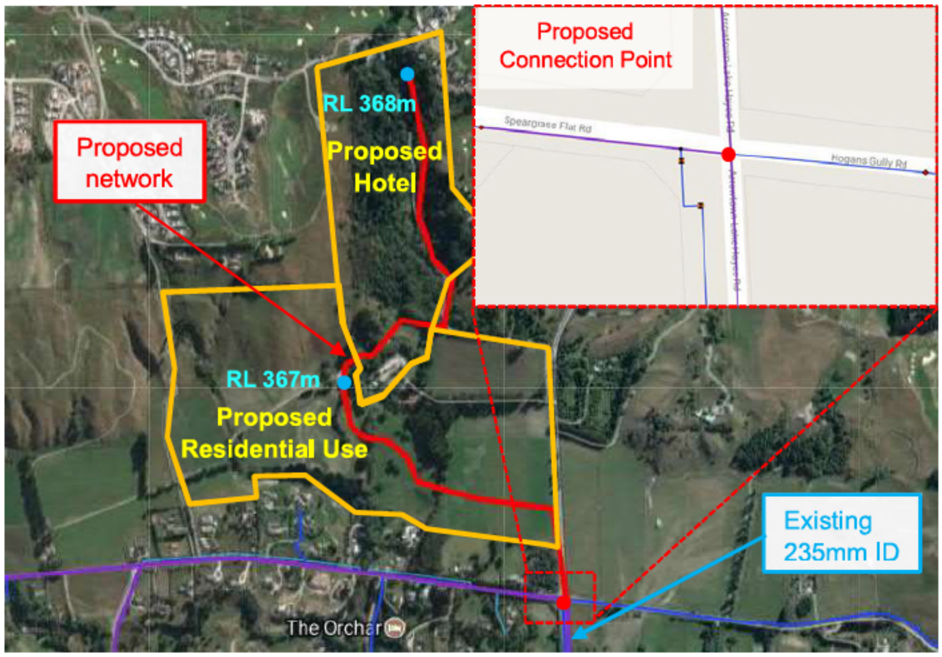

Figure 2 – Proposed Development Location, Network and Connection Point

3 Scenario Investigated

Three scenarios were investigated, including the above demand and the current network operations:

- Existing peak day scenario.
- 2028 peak day scenario.
- 2058 peak day scenario.

Planned upgrades along Frankton Ladies Mile Highway were included in the future 2028 and 2058 scenarios.

To ensure head losses in the proposed network remain between 1 and 3 m/km (recommended head losses for pipeline design), it was assumed that the proposed development would be serviced through a 260mm (ID) pipe connected to the supply point. The proposed network layout was provided by the client and is attached in appendix.

Two elevation points were included, one for the hotel (max. elevation:368m) and one for the residential development (max. elevation:367m). Respective demands were assigned to each point.

Fire flow capacity was assessed based on FW2 requirement plus sprinklers flow of 16.6l/s, as defined by the client.

4 Model Results

4.1 System Performance Analysis in the Proposed Development

This section describes the results of the system performance analysis undertaken for the above scenarios after including the proposed development demands. Results have been analysed to verify whether levels of service can be met in the proposed development without any network modification. The table below summarises the results in terms of minimum and maximum pressure, maximum head losses in the proposed network (260mm pipe) and fire flow capacity.

Table 4 - Minimum Pressure and Maximum Head Losses in Proposed Development

Scenario	Minimum Pressure (m)	Maximum Pressure (m)	Maximum Head Losses (m/km)	Fire Flow
Existing	60.9	97.1	3.0	Can meet residential fire flow (FW2 –25 l/s + 16.6l/s sprinklers flow)
2028	59.9	97.1		
2058	58.0	97.0		

The normal operating pressure set by QLDC addendum to NZS4404:2004 (Development ad Subdivision Engineering Standards) is 30 to 90m. As shown in the table above, minimum pressure in the proposed development is predicted to meet the recommended LOS for all scenarios. However, pressures higher than the recommended LOS are predicted in areas below 349m.

FW2 fire flow was tested at the end of the proposed 260mm (ID) line. The model predicts that residential fireflow (FW2 – 25l/s) plus the sprinkler flow required can be provided with a residual pressure of 47m at RL 368m.

The highest elevation that would be serviceable for the residential development is 395m. Recommended LOS in terms of pressure and fire flow are predicted to be met up to this point.

4.2 System Performance Analysis in the Remaining of the Network

The section below describes the results of the system performance in the remaining of the Lake Hayes network. Results have been analysed to assess the effect of the proposed development for each scenario.

Figure 3 to Figure 8 below show the system performance for current operational conditions, including current, 2028 and 2058 peak demand.

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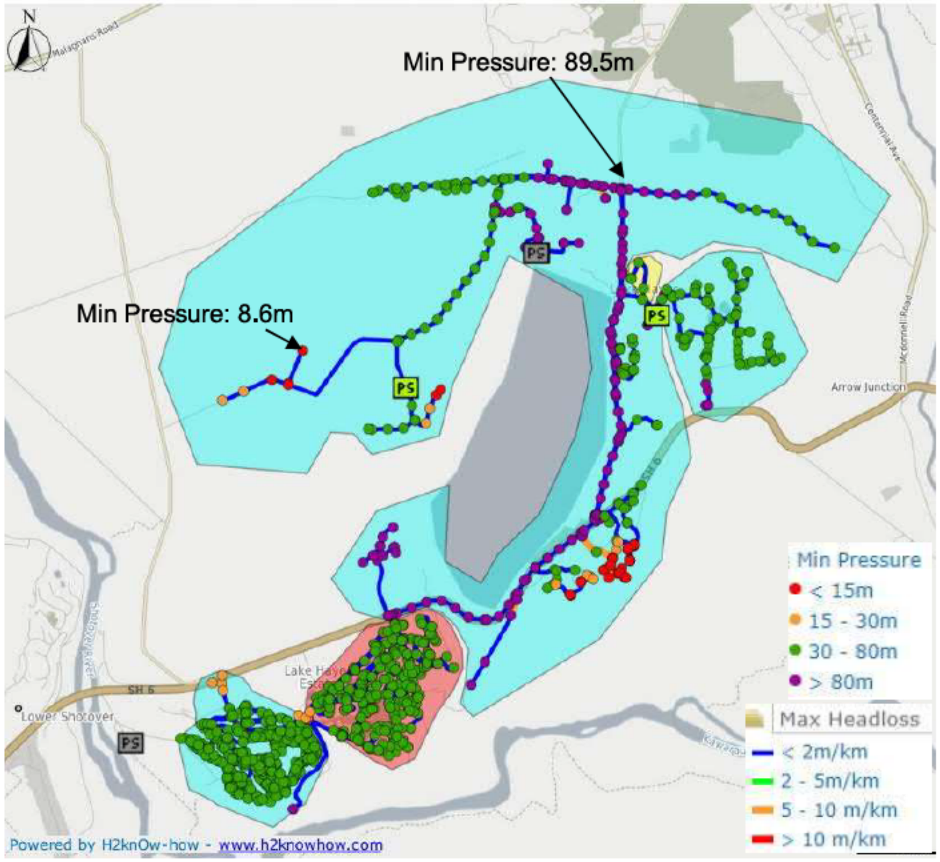

Figure 3 – Current Peak Day System Performance – Prior Development

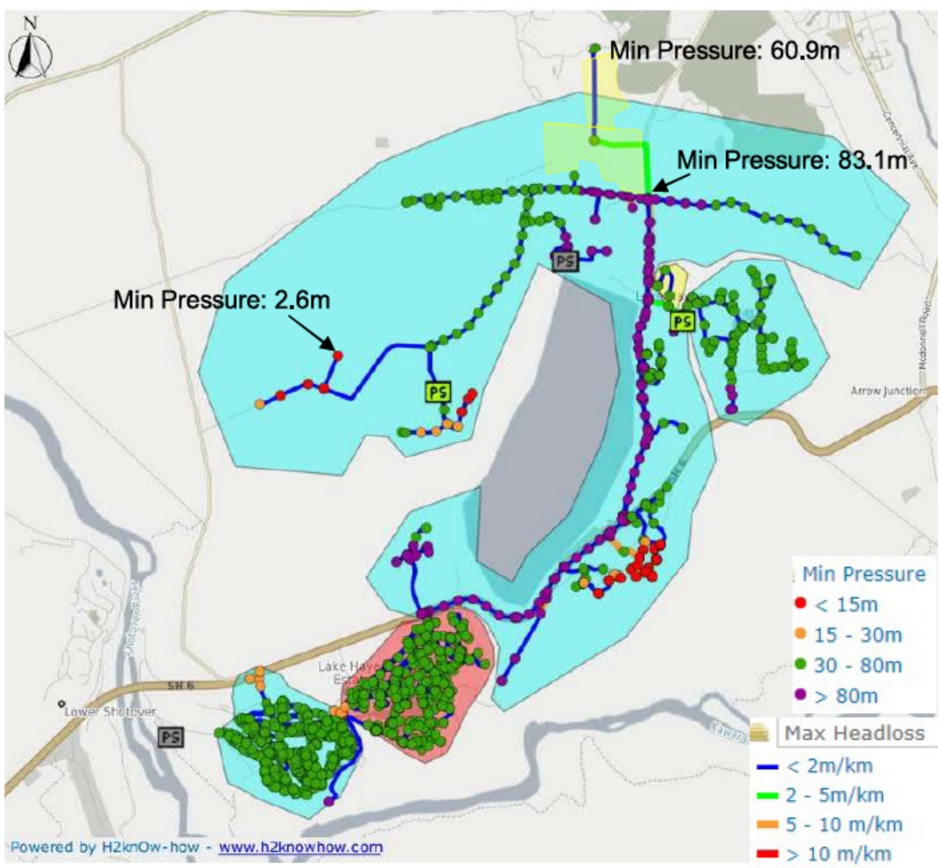

Figure 4 – Current Peak Day System Performance - Post Development

MOTT MACDONALD

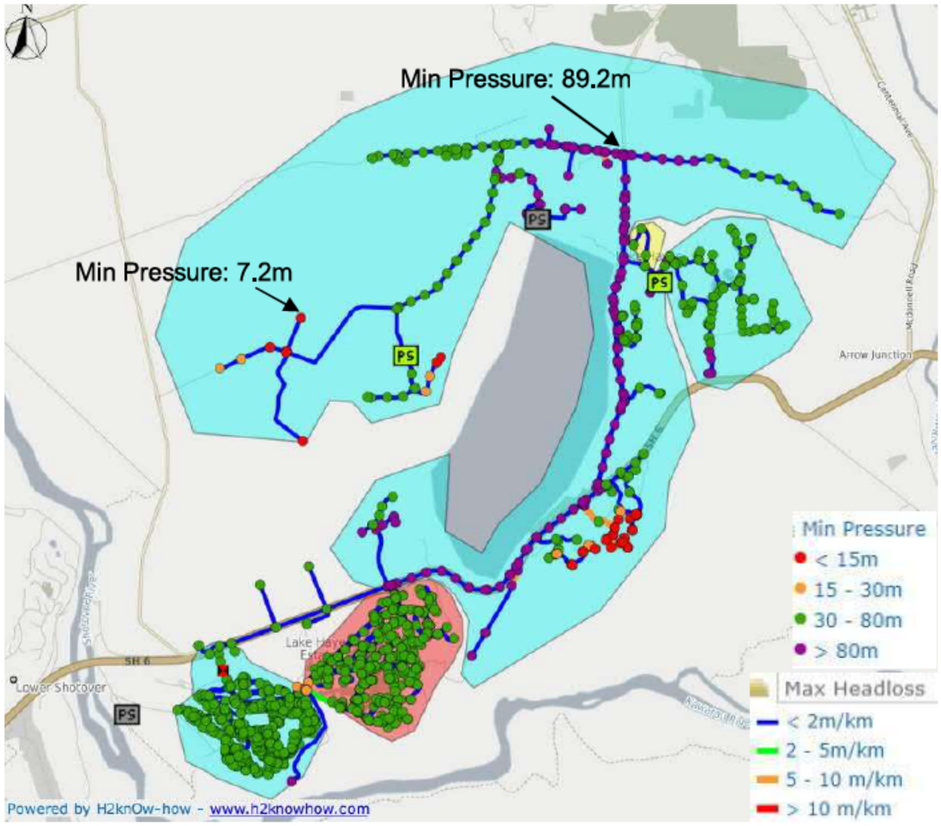

Figure 5 - 2028 Peak Day System Performance - Prior Development

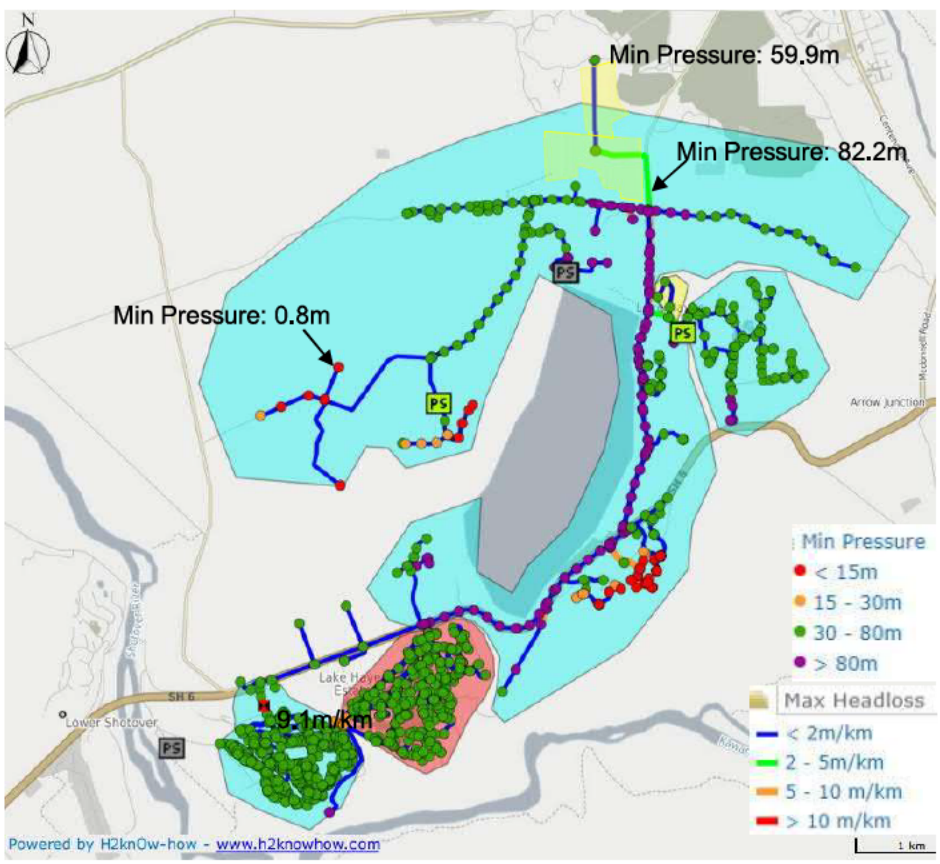

Figure 6 - 2028 Peak Day System Performance - Post Development

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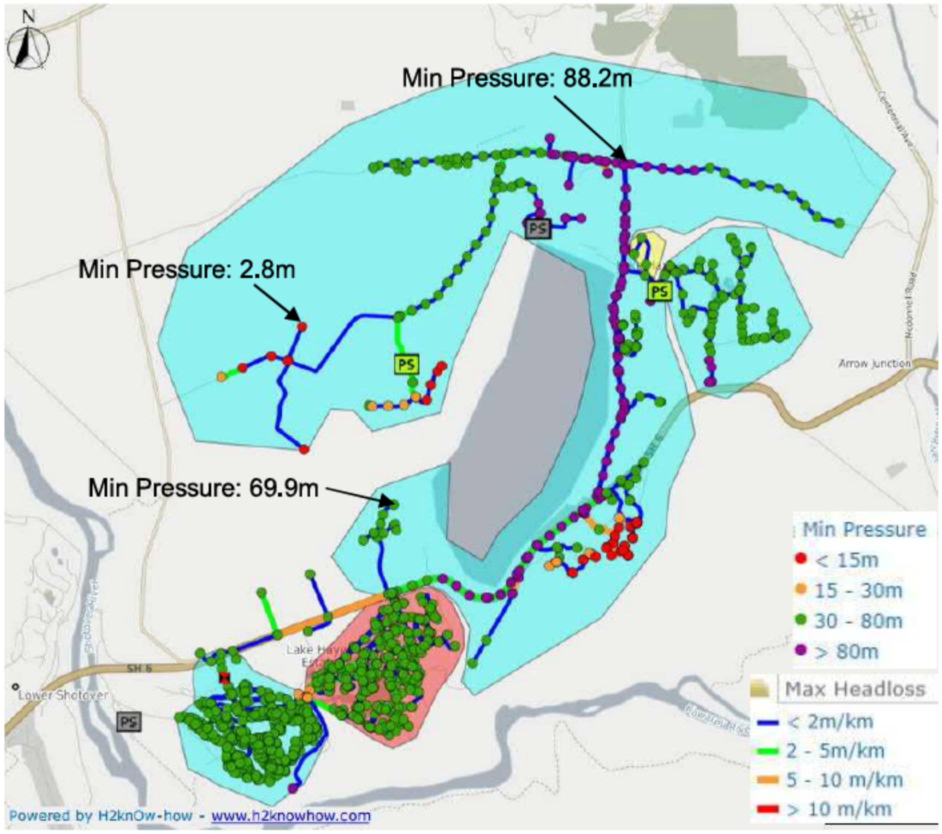

Figure 7 - 2058 Peak Day System Performance - Prior Development

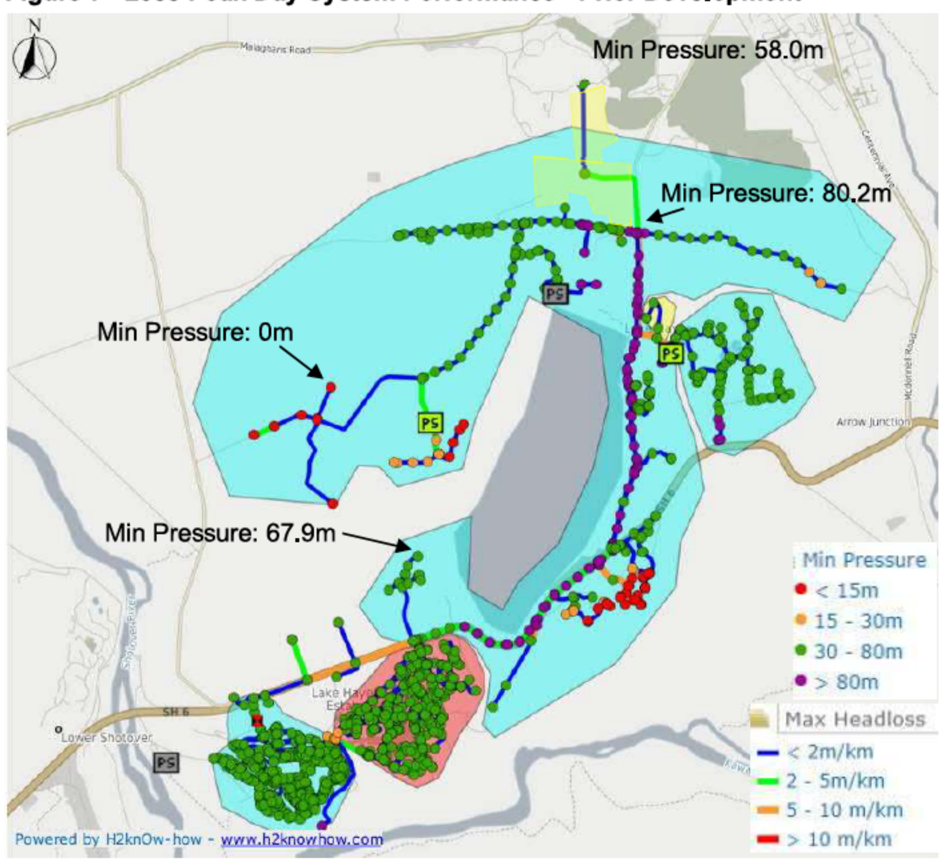

Figure 8 - 2058 Peak Day System Performance - Post Development

The table below summarises the maximum head losses in the existing 235mm ID pipe along Arrowtown Lake Hayes Rd and the minimum pressure forecasted at the supply point, before and after the proposed development:

Table 5 - Minimum Pressure at Supply Point

Demand	Min pressure before development (m)	Min pressure after development (m)	Pressure drop (m)
Current Peak Day	89.5	83.1	6.4
2028 Peak Day	89.2	82.2	7.0
2058 Peak Day	88.2	80.2	8.0

Table 6 - Maximum Head Losses in 235mm ID Pipe

Demand	Max head losses before development (m/km)	Max head losses after development (m/km)	Head losses increase (m/km)
Current Peak Day	0.4	6.0	5.6
2028 Peak Day	0.6	6.6	6.0
2058 Peak Day	1.1	7.8	6.7

As shown in the pictures and above tables, the proposed development is predicted to have a noticeable impact on the remaining of the water network with a maximum pressure drop of 8.0m. Pressures are generally high along Arrowtown Lake Hayes Rd and Speargrass Flat Rd, so pressure remains well above the recommended LOS in this area, for current and future scenarios. However, pressures below the recommended LOS are predicted in the properties located in the elevated areas of Slope Hill Rd and Threewood Rd. This is an existing LOS issue that needs to be addressed.

Head losses are predicted to increase by up to 6.7m/km reaching 7.8m/km in the 235mm (ID) along Arrowtown Lake Hayes Rd due to the additional demand. The predicted head losses exceed the recommended LOS, 5m/km. This LOS issue needs to be addressed.

5 Conclusions and Recommendations

Demand from the proposed Waterfall Park development has been added to the network for the current, future 2028 and 2058 peak day models to determine if suitable levels of service could be obtained.

Levels of service are expected to be met in terms of minimum pressure and head losses in the proposed development, however pressures higher than the recommended LOS are predicted in areas below 349m. The model predicts that fireflow requirements (FW2 – 25l/s and 16.6l/s sprinklers flow) can be provided with a residual pressure of 47m at RL 368m, for current and future scenarios. The highest elevation that would be serviceable for the residential development is 395m.

The system performance in the remaining of the network has been verified. The proposed development is predicted to cause a maximum pressure drop of 8m at the connection point. Since pressures are high in this area recommended LOS can still be met in terms of pressure. However, pressures dropping to zero are predicted in 2058 in properties located in the elevated areas of Slope Hill Rd and Threewood Rd due to the additional demand. These areas already experience pressures below the recommended LOS, the additional demand causes the pressure to deteriorate even further.

Maximum head losses greater than 5 m/km are predicted along Arrowtown Lake Hayes Rd for all scenarios. This system performance issue is related to the additional demand, the proposed development impact needs to be mitigated.

MOTT MACDONALD

Diana Galindo
Hydraulic Engineer
diana.galindo@mottmac.com

Revision	Date	Originator	Checker	Approver	Description
A	23/02/2018	Diana Galindo	Julie Plessis	Julie Plessis	Draft for client review
B	19/03/2018	Diana Galindo	Julie Plessis	Julie Plessis	Draft for client review
C	30/05/2018	Diana Galindo	Nasrine Tomasi	Nasrine Tomasi	Final

6 Appendix - Demand Calculation and proposed Pipe Layout

Waterfall Park Water Demand Estimate Summary

Table 1: Waterfall Park Hotel Complex - Water Demand Estimate

Hotel facility	No. Facilities	Max no. People / Facility	Average Daily Water Demand (L/p/d)	Average Daily Water Demand (m3/day)	Average Daily Water Demand (L/s)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)	Peak Day Peaking Factor	Peak Day Demand (L/s)	Comment / Reference
Hotel Room	380	2	220	167.2	1.94	6.6	12.77	3.30	6.39	*AS/NZS 1547:2012, Table H4.*
Conference Centre	1	600	30	18	0.21	6.6	1.38	3.30	0.69	*Metcalfe and Eddy, Table 3-2. Wedding can occur at same time as conference*
Restaurants	1	1520	30	45.6	0.53	6.6	3.48	3.30	1.74	*AS/NZS 1547:2012, Table H4. Restaurants can seat 270 people. Assume hotel full (760 people) asssume each person eats two meals at hotel, total no. diners = 1520 over a day*
Lounge Bar and bar	1	250	20	5	0.06	6.6	0.38	3.30	0.19	*AS/NZS 1547:2012, Table H4. Lounge and bar can accommodate 115 people, assume 250 people max over a day*
Chapel / wedding venue	1	100	40	4	0.05	6.6	0.31	3.30	0.15	*Assume 40L/guest. Wedding can occur at same time as conference.*
Wellness centre - pool, gym, spa	1	100	40	4	0.05	6.6	0.31	3.30	0.15	*Metcalfe and Eddy Table 3-4 for swimming pools. Assume pool is filled overnight when irrigation is not running.*
Non residential staff	1	120	30	3.6	0.04	6.6	0.28	3.30	0.14	*AS/NZS 1547:2012, Table H4.*
Irrigation demand	1	n/a	n/a	125	1.45	n/a	n/a	n/a	4.35	*Based on calculated irrigation requirements with irrigation over an eight hour period overnight*
Total				**372.59**	**4.31**		**18.90**		**13.80**	

Table 2: Waterfall Park Residential Development - Water Demand Estimate

Hotel facility	No. Dwellings	No. people/ dwelling	Average Daily Water Demand (L/p/d)	Average Daily Water Demand (m3/day)	Average Daily Water Demand (L/s)	Peak Hour Peaking Factor	Peak Hour Demand (L/s)	Peak Day Peaking Factor	Peak Day Demand (L/s)	Comment / Reference
Primary Dwelling	125	3	700	262.5	3.04	6.6	20.05	3.30	10.03	*Total of 125 lots*
Secondary Dwelling	125	2	350	87.5	1.01	6.6	6.68	3.30	3.34	*Assume each lot may also have a secondary dwelling. Assume average of 2 person occupancy per secondary dwelling, assume no irrigation requirements for secondary dwelling*
Total				**350.00**	**4.05**		**26.74**		**13.37**	

Notes:
- *Average day to peak hour peaking factor of 6.6 has been applied as per QLDC CoP Section 6.3.5.6*
- *The average day to peak day peaking factor is assumed to be 50% of average day to peak hour peaking factor*
- *It is assumed that each residential lot may have a primary dwelling and a secondary dwelling*

References:

Metcalfe and Eddy, 2003, Wastewater Engineering: Treatment and Reuse, McGraw-Hill
AS/NZS 1547:2012 - Onsite wastewater management
QLDC Land Development and Subdivision Code of Practice, 2015

Appendix 7 CKL CV's

John Sternberg
Engineering Manager

CKL
Planning | Surveying | Engineering | Environmental

Professional Profile

John is a chartered engineer with 35+ years of experience in the 3-water's industry, covering design, project management and team leadership – in both the private and public sectors. Areas of technical specialty include design of water and wastewater reticulation, pumpstations, bulk transfer schemes, water demand management, smart water metering, infiltration and inflow management. His technical (MEc Water Eng) qualifications and experience is complimented with his business management qualifications (MBA) and experience providing valuable input to optioneering, value-for money and whole of life/business case inputs to projects. Johns experience also includes asset renewal/upgrade planning and implementation, early contractor involvement and design and build contracts. John is innovative and versatile with a positive attitude, strong ability to network and build good team and customer relations and strives for the achievement of best practices. John's experience with Tauranga City Council as Principal Engineer from 2007 – 2014 provides valuable insight to council planning and implementation protocols.

Qualifications & Professional Status

- BSc Eng. Civil
- MSc W, W, SW Engineering
- MBA
- CPEng, IntPE, CMEngNZ

Areas of Expertise

- Project Management
- 3 Waters Engineering
- Infrastructure Development
- Business Management & Development

Employment History

2021– Present	CKL Ltd
2017-2021	Calibre Group
2015-2017	BioFiltro NZ Ltd
2007-2015	Tauranga CC
Pre 2007	South Africa

Experience

Tauranga Engineering Manager (2021- current): CKL

- Tauranga City Council (TCC) - Awaiti Place dxv reduction, Tauranga – Options/ multi-criteria assessments, discussion with public, Iwi and Mana Whenua
- TCC – Welcome Bay interchange upgrade – Project delivery manager
- TCC Windsor/Bellevue, Princess, Windermere upgrades, PM and ETC.
- Western Bay of Plenty District Council (WBOPDC) - Design manager/lead for Te Matai water booster pumpstation and storage supplementation project.
- WBOPDC – Lund Rd, Douglas Rd, Wharawhara road and No. 1 road sites water supply infrastructure upgrades.
- WBOPDC Katikati WW pumpstation upgrade – project/design manager.
- Whakatane DC – Eastern bay of Plenty spatial plan 3 waters assessment for Opotiki, Kawerau, Whakatane – project manager and water supply lead
- Hauraki DC – Design lead for Waihi 80 kW wastewater pumpstation – design and build appointment for Camex construction.
- Hauraki DC – Resource consent and design reviews for multiple land developments/sub-divisions including 3 waters.
- Puhinui WW trunk main – peer review of pumpstation and 300 OD PE pipeline, including review of transient analysis.
- Solomon Water - prepaid/smart water metering technical investigation and management of procurement process.
- Queenstown Winton retirement village – delivery manager for water and wastewater demand assessments and Haybarn WW pumpstation design.
- Engineering assessments of sub-division resource consent applications including advisory and assistance services for Matamata-Piako DC.
- Doncaster 40 Lot subdivision in Tauranga – soakage design reviews, water pressure testing, producer statements.

Principal Water Engineer (2017-2021): Calibre

- Design Lead and Project Manager Awaiti Place pipeline and McFetridge attention dam for Tauranga CC. Managed a multi-disciplinary team.
- Design Manager for Ngatea WW pumpstation (HDC) – design and build for Camex construction.
- Project Manager for Gorman Rupp sewage pump station upgrade (SWDC)
- Project Management and design review of Helensville WW Pond liner/cover as a D&C (Fulton Hogan) project for Watercare.

Experience

Principal Water Engineer (2017-2021) Continued:

- South Waikato DC - Glenshea water booster pumpstation asset condition assessment, renewal/upgrade design, bore/ storage assessments, PM for reservoir condition assessment.
- Engineers' representative for the Park Road sub division (19 houses) development Katikati, including WW pumpstation design.
- Design lead for WW and W treatment package plants for Tamahere retirement village.
- Business Development, Design/Project Management of 3-waters infrastructure projects in the Bay of Plenty & nationally for local government, private developers, and contractors.
- Project Management for Bayfair seismic strengthening (Foster's) project, layout and also public transport stations to identify where increased development density could be located.
- Engineers' representative for Bethlehem Shores retirement village development, WW pumpstation design and commissioning.
- Project Management for seismic priority response agreement for Tauranga City Council.

General Manager (2015-2017): BioFiltro

BioFiltro is a wastewater treatment process utilising vermibiofiltration (worm) technology for domestic, industrial and dairy sector wastewater treatment. While working there, John was involved in the engineering design, managing processes, R&D work, operations and maintenance management (for 6 treatment plants – domestic/dairy effluent), general management and collaboration with international (Chile) patent holders.

Principal Engineer (2007-2014): Tauranga City Council

- Asset renewal planning/ implementation – water networks.
- Developed, managed smart metering investigations and business case evaluation tool.
- Development and implementation of TCC water demand management strategy.
- Development/management of water meter renewals strategy and protocol.
- Development/management of a wastewater infiltration & inflow reduction strategy.
- Coordination of roading and waters renewals projects.
- Engineer to Contract – Te Maunga WW outfall (UV plant to beach) and Totara SW outfall.
- Managed a team of three engineers and project managed various projects.
- Privately developed various business plans for ventures for local entrepreneurs

Projects Prior to 2007: SA

John was an Associate with Scott Wilson Kirkpatrick (consulting), Director of HCE (Integrated water IT solutions), director of Bambamanzi (prepayment water management) in South Africa. Highlights of experience include – design lead for a 45m high rollcrete dam, award winning bulk water transfer (incl. surge protection) scheme, wastewater pumping schemes, liquid effluent treatment plant design for Mossgas (oil from gas), integrated water management systems (EDAMS), water demand management and prepayment water metering projects in Africa, chairperson of the technical water distribution division and fellow member of WISA (Water Institute of Southern Africa).

Kylin Gunkel

Planning | Surveying | Engineering | Environmental

Senior Civil Engineer

Profile

Kylin is a Senior Civil Engineer with over 15 years' experience in the Civil Engineering industry, including more than 5 years in the Waikato and surrounding regions. Kylin has a strong background in managing private and public projects, undertaking civil infrastructure design, land development, reticulation modelling, preparing technical assessments, design reporting, and contract administration for 3 waters and roading pavement infrastructure. With a keen focus on Safety in Design and a deep understanding of Council design standards, Kylin excels in delivering high-quality solutions on time and within budget.

Key Work Experience

CKL (September 2021 to Current)

Land & Infrastructure Development

- **R2 Growth Cell, Hamilton**: Fulfilled the role of lead engineer for water and wastewater infrastructure feasability studies, managing technical reporting, supply-demand assessments & modelling for a 210Ha proposed subdivision.
- **Metlifecare Retirement Village, Hamilton**: Responsible for design management of a 30-unit retirement village, overseeing intermediate engineers, and managing engineering input through the resource consent stage. Delivered on client expectations through effective project management and liaison.
- **Hikuai Settlement Road, Pauini**: Managed the design of a 40-lot high-income residential development through resource consent, handling client management, fee proposals, and project change notices.
- **Festival Way Roading & Stormwater, Ngaruwahia**: Managed the design of a secondary collector road including extensive stormwater modelling, utilities, pavement design, stakeholder engagement, tender assistance and construction monitoring.
- **Galbraith Subdivision, Ngaruwahia**: Managed the design of an 86-lot subdivision, providing engineering input through various resource consent processes.
- **9A Borman Road Subdivision, Hamilton**: Managed the design of a 40-lot subdivision, overseeing engineering input through to Engineering Plan Approval.
- **35 Borman Road**: Managed the design of a 25-lot subdivision, ensuring compliance with resource consent processes and Engineering Plan Approval.
- **Garden Hills, Paerata Road, Pukekohe**: Led the preliminary design of onsite water and wastewater solutions for a 301-unit retirement village to support resource consent.
- **Putaruru WWTP Wetland**: Managed the design of a proposed wastewater wetland, including earthworks design and ecological assessments.
- **T11 Growth Cell**: Assisted in the design of a terminal pump station for T11 and T14 growth cells, managing flow assessments and stakeholder engagement.

Contact

[redacted]

58 Church Road, PO Box 171,
Hamilton, 3240 |
www.ckl.co.nz

Education

- **Bachelor of Technology in Civil Engineering**

  Completed in 2016

- **National Diploma in Civil Engineering**

  Completed in 2009

Area of Expertise

- Design Management
- Land Development
- Infrastructure Design
- Project Management
- Client Liaison

Positions Held

- Design Manager
- Team Lead

Professional Registration

CMEngNZ (Eng. Technologist)
1170465

Software

- Civil 3D
- Storm & Sanitary Analysis
- EPANET
- CIRCLY
- Microsoft Project

Certifications

- Civil 3D Advanced User
- Erosion & Sediment Control Design
- AES Onsite Wastewater disposal
- CIRCLY – Mechanistic Pavement Design
- NZHIT Pavement Rehabilitation

Work Experience Continued

- **Broadwater Retirement Village:** Designed water and wastewater infrastructure for a 235-unit retirement village.
- **Queenstown Waterfall Park:** Designed water reticulation and wastewater services including water network modelling for a high-end retirement village near Queenstown.

Pavement Design

- **Ōhaupō Road, Te Awamutu – Waka Kotahi:** Drafted mechanistic-empirical pavement design for a proposed roundabout.
- **Crater Lakes Sand Quarry Road – SH3/SH21:** Prepared a robust and cost effective mechanistic-empirical pavement design for a 400m long sand quarry road.
- **T11 Growth Cell:** Prepared a mechanistic-empirical pavement design for numerous residential roads in accordance with RITS and AUSTROADS requirements.
- **Tokoroa Roading & Pavement Design - SWDC:** Design and project manager for pavement and geometric design for two roads in Tokoroa in accordance with RITS standards.
- **Festival Way – Ngaruwahia:** Prepared a pavement design for a proposed road and roundabout in Festival Way Ngaruwahia

Harrison Grierson (2019-2021)

Land & Infrastructure Development

- **Tauriko Business Estate WWP - Tauranga:** Assisted in designing a wastewater pump station and rising main, including developing a Detailed Design Report and Technical Specification.
- **The Crescent Subdivision - Waihi:** Prepared the detailed design for water and stormwater networks for a 67-lot subdivision including the design of a stormwater pond.
- **Amberfield Subdivision, Peacockes, Hamilton:** Supported the design of 3 Waters infrastructure for an 800+ lot residential subdivision including modelling of the wastewater network.
- **Rangitahi Ltd – Rangitahi Precinct B – Raglan:** Involved in various aspects of the design of Precinct B of a new subdivision development on the Rangitahi Peninsula in Raglan. Responsibilities included the design of the 3 waters infrastructure and pavement design, serving as the Engineers Representative during construction, preparing tender and contract documentation, client liaison, and maintaining a project programme.

Pavement Design

- **Hamilton City Zoo Entrance & Roading Upgrade:** Prepared mechanistic-empirical pavement design for road rehabilitation and geometric road design for the zoo entrance upgrade.
- **McLeod Crane Yard, Tauranga:** Prepared mechanistic-empirical pavement design for a crane yard.

Experience in South Africa

Kylin has extensive experience as a Civil Engineering Technologist and Project Manager at Lukhozi Consulting Engineers, where he managed all stages of the project life cycle for various land development projects. Notably, he worked on a 567-lot subdivision in South Africa, which required the installation of water, wastewater, and stormwater infrastructure. Kylin led the infrastructure assessment, optioneering, and modeling aspects of the project, including analyzing current water demands and projecting future needs. His work identified the necessary upgrades to the bulk infrastructure, ensuring they were appropriately timed to align with projected population growth. Prior to that, Kylin worked for a construction company installing bulk water infrastructure and for a consultancy designing and installing roading infrastructure.