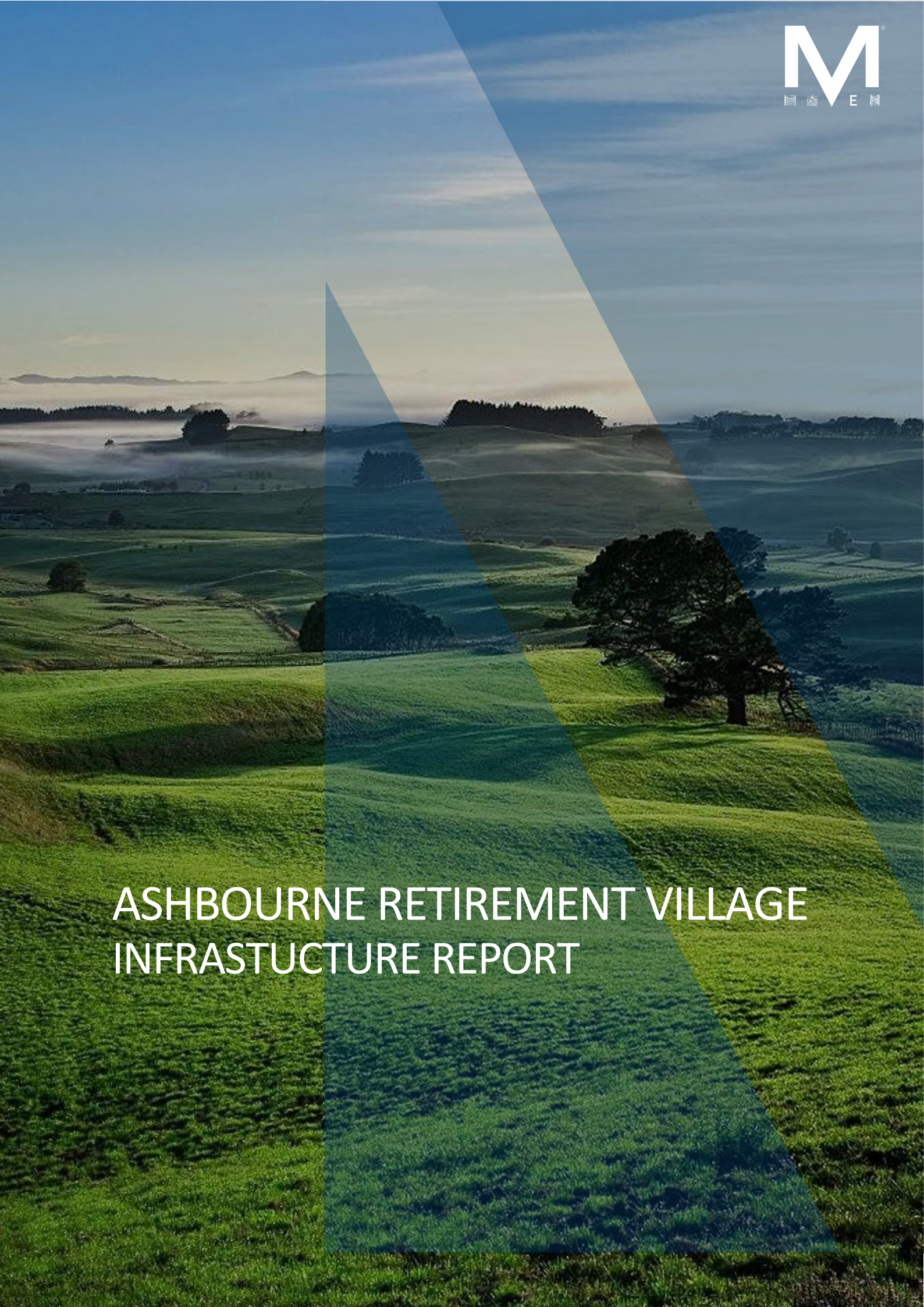

ASHBOURNE RETIREMENT VILLAGE INFRASTUCTURE REPORT

PROJECT INFORMATION

CLIENT	UNITY DEVELOPMENTS LTD
PROJECT	J00606 – STATION ROAD, MATAMATA, MATAMATA-PIAKO

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CONTENTS

1. INTRODUCTION

1.1. BACKGROUND

Maven Matamata Ltd have been engaged by Unity Developments Ltd to undertake the infrastructure design in support of Ashbourne Retirement Village development at Station Road, Matamata.

This report is provided to support a 20.0 hectare (ha) retirement village comprising of 218 villas, an aged care hospital and other supporting facilities.

1.2. PURPOSE OF THIS REPORT

The purpose of this report is to outline the design specifications and considerations for the earthworks and supporting infrastructure needed to accommodate the proposed retirement village and ensure it meets the necessary standards as per the Waikato's Regional Infrastructure Technical Specification (RITS) Design Standards, Waikato Regional's Erosion and Sediment Control guide, and Matamata Piako District Council (MPDC) Development Manual.

The information provided herein outlines the methodology associated with the proposed infrastructure onsite.

This report has been updated following further winter groundwater level investigations during October and November 2025. The proposed stormwater solution has been updated to address the challenges posed by near surface peak groundwater levels in the Retirement Village. Updates for revision B of this report are marked in blue for ease of review.

This report is to be read in conjunction with the Engineering Drawings and Calculations and is to accompany the resource consent application.

1.3. SITE DESCRIPTION

The Ashbourne Retirement Village area is circa 20 ha block of land within Matamata Piako District. It is located in a predominantly rural area, on the outskirts of Matamata, approximately 1.8 kilometers south-west of the center of Matamata in the Waikato region

The current site access is opposite 190 Station Road, through a steel and wire gate, and is not an official vehicle crossing.

The site adjoins with the new Highgrove Development to the north-east, an existing dwelling to the west and the remainder of the site is surrounded by pastoral land.

Most of the site is low-lying flat farmland, that is interspersed with artificial farm drains.

There is an existing stormwater swale that follows the northeast boundary and the Waitoa river which runs south to north, approximately 500m to the west of the subject site.

Figure 1: Site Locality Map

1.4. LEGAL DESCRIPTION

The site is legally described as the following:

Address	Lot	Appellation	Area (ha)
247 Station Road	Lot 2	DP 21055	27.38

Table 1: Legal Descriptions with Area

The development site comprises an area of 20ha of the 27.38ha.

2. CONSTRUCTION STAGING

The proposed development will comprise of 218 units, an aged care hospital, and other supporting facilities to accommodate the retirement village.

The development will include private stormwater, wastewater and water supply infrastructure, as well as power, fibre and street lighting.

15 new roads, and 28 common accessways are proposed to provide access to all proposed dwellings and facilities. These roads and accessways will not be vested to council.

A staged approach is proposed, from north to south, to establish a high-quality development. Refer to Proposed Site Overview plan C1100 in Engineering drawings for the development stages.

The 20.0-ha site is currently divided into ten stages. Stage 1 occupies approximately 3.4ha of the site, which will be developed first, and other stages will follow suit.

3. EARTHWORKS

Earthworks will be undertaken in accordance with NZS4431:2022 Engineered fill construction for lightweight structures, to facilitate the development outcome and will include re-contouring, excavations for services, drainage reticulation, formation of building platforms, roading, and accessway construction.

3.1.GEOTECHNICAL INVESTIGATION

A site-specific geotechnical investigation has been undertaken for the development site by CMW Geosciences dated 4th July 2024.

The published geological maps for the area generally align with the geology encountered onsite as comprised of cross-bedded pumice sand, silt and gravel of the Hinuera Formation. Ground water was encountered at 1.6m with the maximum depth of more than 2.6m near the western boundary.

From the ground investigations undertaken by CMW, they have summarized the site geology results in Table 2 below.

Unit	Depth to base (m)		Thickness (m)**	
	Min	Max	Min	Max
Topsoil/Fill	0.1	0.5	0.1	0.5
Stiff to Very Stiff Silt (Hinuera Formation)	1.0	1.1	0.5	1
Dense to Very Dense Sand with interbedded Silt (Hinuera Formation)	5.9	17.3	4.9	16.3
Very Stiff to Hard Silt/Clay (Walton Subgroup)	0.1	18.1	9*	18*
Very Dense Silty Sand (Walton Subgroup)	-	-	**	**
Notes: * Strata not encountered within all test locations. **Thickness only recorded were base of strata has been confirmed.				

Table 2: Summary of Strata Encountered

Upon completion of the proposed earthworks an Earthworks Completion Report will be prepared by the Geotechnical Engineer. This report will certify the adequacy of earthworks and make recommendations on bearing strengths for foundation design purposes.

Per WGA's latest memo, November 2025, results of the further winter groundwater level investigations indicated that groundwater levels are already very close to the ground surface in the northern areas of the planned Retirement Village.

Based on the above, we have adjusted our proposed stormwater design accordingly as detailed in updated section 5 such that it is not reliant on low groundwater levels.

However, it is worth noting that whilst existing peak groundwater levels are near the existing surface, the proposed development includes subsoil drainage beneath each of the roadways as well as a new stormwater pipe network, artificial wetlands, raingardens and a greenway to the south as shown in the engineering plans. The combination of the infrastructure described above will lower the peak groundwater elevation preventing areas of ponding due to groundwater. Refer to WGA's latest technical memo November 2025 which explains this in further detail.

A subgrade CBR of 6 was adopted based on Geotech result Hand Auger Borehole logs within the retirement village area.

3.2. BULK EARTHWORKS

The Engineering Drawings (Refer to Appendix A) detail the extent of the earthworks, refer to engineering plan C2400.

The bulk earthwork for whole site is summarized in table below:

Bulk Earthworks (excluding topsoil strip)	
Total area of ground disturbance	214,800 m² (21.4ha)
Total volume of cut	43500 m^3
Total volume of fill	77300 m^3
Total Volume (net fill)	33800 m^3
Maximum CUT and FILL depth	2.8m FILL / 3.4m CUT
Others	
Topsoil Stripping (200mm)	42,960 m^3

Table 3: Bulk Earthwork Summary

3.3. EROSION AND SEDIMENT CONTROL

Erosion and sediment controls are subject to the Waikato Regional Council 'Sediment and Erosion Control Guideline' and plans outline proposed measures are provided in the engineering plan C2300.

Prior to commencing earthwork operations, it is anticipated that a pre-construction meeting with the WRC monitor team will take place. During this meeting, the erosion and sediment control measures will be discussed and confirmed to ensure that the potential impacts of earthworks and erosion are effectively mitigated.

For a comprehensive understanding of the specific application of sediment and erosion control measures for each area of earthworks, please consult the Construction Management Plan (CMP) which provides detailed guidance on these measures.

4. TRANSPORTATION

4.1. DESIGN STANDARDS

All roads have been designed to accommodate the development and considering RITS, MPDC Development Manual and the Austroads design guidelines with the recommendations of Commute Kiwi transportation consultants.

The design of the road strongly supports a low-speed environment for the retirement village with an emphasis to support vulnerable road users and to encourage walking and cycling. It is conceptual in nature for resource consent purpose only. Finer design details will be confirmed at engineering approval stage.

4.1.1. ENGINEERING EXCEPTION DECISIONS

- No engineering exceptions are proposed for this application.

4.2. DUE DILIGENCE ASSESSMENT – TRAFFIC

Due Diligence Assessment (Traffic) was carried out by Commute Kiwi considering the traffic and transportation effects of the proposed residential development.

For further details, please refer Commute Kiwi Due Diligence Assessment – Traffic.

4.3. PROPOSED ACCESS

There are two entrances to the retirement village. The main entrance will be at the northern end of the development on Station Road frontage where proposed Road 1 (primary main loop) will connect to. This road will provide primary access to the development. Another entrance will be formed at the southern end connecting to the residential site of this development and will be part of Stage 8 of the development.

4.4. ROAD TYPOLOGY AND DESIGN

Road 1 is contained within a 13.5m corridor and include a carriageway width of 7.0m and design of:

- 30mm DG10 asphaltic concrete (on full Grade 5 Primecoat)
- 350mm granular pavement of 100mm AP40 / 250mm GAP 65
- On compacted natural subgrade to a design subgrade of CBR 6

Road 4 and 6 is contained within a 11.0m corridor and include a carriageway width of 7.0m and design of:

- 30mm DG10 asphaltic concrete (on full Grade 5 Primecoat)
- 350mm granular pavement of 100mm AP40 / 250mm GAP 65
- On compacted natural subgrade to a design subgrade of CBR 6

Road 2 to 3, 5, 7 to 13, and 15 are contained within 10.0m corridor and include a carriageway width of 6.0m and design of:

- 30mm DG10 asphaltic concrete (on full Grade 5 Primecoat)
- 350mm granular pavement of 100mm AP40 / 250mm GAP 65
- On compacted natural subgrade to a design subgrade of CBR 6

Road 14 is contained within 9.0m corridor and include a carriageway width of 5.0m and design of:

- 30mm DG10 asphaltic concrete (on full Grade 5 Primecoat)
- 350mm granular pavement of 100mm AP40 / 250mm GAP 65
- On compacted natural subgrade to a design subgrade of CBR 6

There are 28 Accessways varying in width of 4m, 5m, 6m, and 7m wide to accommodate the retirement village access to units.

4.5. PARKING

One parking space is to be provided per dwelling unit. Additional parking is provided throughout the development however none provided within carriageway

4.6. WALKING AND CYCLING

Interconnected footpaths are provided throughout with widths of 1.5m to all the proposed roads. Cyclists would be expected to share the road with motorised vehicles.

5. STORMWATER

5.1. DESIGN STANDARDS

The MPDC Council Development Manual sets out design and construction standards for stormwater and requires all land development projects to be provided with a means of stormwater disposal.

Stormwater systems have been designed in accordance with RITS and other relevant standards including the MPDC Development Manual 2010 and caters for the primary soakage system up to the 10-year event as well as the secondary system and overland flow paths to manage excess runoff that cater for events exceeding the capacity of the primary soakage system for events exceeding the 10-year event.

5.1.1. ENGINEERING EXCEPTION DECISIONS

- No engineering exceptions are proposed for this application.

5.2. EXISTING RETICULATION

There is no existing public network located near the site identified on MPDC GIS data. The existing stormwater infrastructure within the site is limited to farm/roadside swales, culverts and streams. There is an existing stormwater swale located along the eastern and northern boundaries of the site to maximum depth of 2m. There is an existing 375mm diameter culvert crossing Station Road NE of the site. There is also an existing farm drain which runs east to west just south of the site.

The proposed development will have new stormwater systems.

5.3. STORMWATER MANAGEMENT PLAN (SMP)

The proposed Stormwater Management Plan (SMP) has been prepared to support a discharge consent application for the proposed overall Ashbourne Development, which includes:

- Retirement Village (related to this Infrastructure Report);

- Residential Development and;
- Northern and Southern Solar Farms.

Each site has been considered in detail through hydrological and hydraulic modelling, including sensitivity scenarios under future climate conditions.

For further details, please refer to the Stormwater Management Plan (SMP) prepared by Maven Waikato Ltd which outlines the proposed management of stormwater within this development.

5.4. PROPOSED STORMWATER NETWORK

Ashbourne Retirement Village will be serviced by a proposed stormwater network which will collect stormwater runoff from the buildings and road corridors via lot connections and catchpits respectively and discharge up to the 10-year ARI storm event including climate change to 3 raingardens and 2 proposed artificial wetlands. Secondary flows up to the 100-year ARI including climate change will be conveyed via overland flow contained within the road corridors and swales to the proposed wetlands. Raingardens and artificial wetlands will provide water quality treatment and extended detention. The wetlands will also provide attenuation and flood storage to ensure discharge from the proposed development is at 80% pre-development flows for the 10-year and 100-year ARI events.

5.4.1. STORMWATER RETICULATION SUMMARY

With the site being generally flat, the proposed stormwater network utilizes shallow grade pipe networks and swales to convey flows. The network will collect stormwater runoff from the lots and road corridors via lot connections and catchpits and discharge to their respective artificial wetlands or raingardens.

- The north and eastern sub-catchments discharge to artificial wetland 1 located in the NE corner of the site.
- Northwestern sub-catchments are serviced by raingardens 1 and 2 before discharging to the existing drain at the NE corner of the development.
- The southeastern sub-catchment is serviced by raingarden 3 before discharging to the existing drain running north along the eastern edge of the development.
- The southwestern sub-catchment is serviced by artificial wetland 2 located in the SW corner of the site.
- A localized small sub-catchment at the southeast corner of the site will be managed via a roadside raingarden before discharging to the greenway due to levels.

Refer to appendix B for pipe network calculations and sub-catchment areas.

5.4.2. OVERLAND FLOW PATHS (OLFPS)

Additional branches of OLFPs will be created as roading corridors are formed. The following measures will be adopted to mitigate their effects of these overland flowpaths on the proposed development.

- Identify and maintain natural overland flow/watercourse locations to convey concentrated stormwater from the site.
- Utilise existing culverts (where possible) to maintain the same discharge locations, post development.
- Identify and retain any upstream OLFPs and/or watercourses to avoid any upstream flooding.

- Ensure OLFPs are to be designed where possible within the roading network and discharge into watercourses and detention devices.

The preliminary OLFP design is shown in Maven Matamata Ltd drawings C4900 contained within Appendix A. Summary of results provided below and detailed design of the OLFPs will be provided at future detail design stage following the approval of the resource consent.

An assessment of the post development overland flow paths (OLFPs) has been carried out to evaluate the behaviour of surface runoff in the road carriageway under the proposed stormwater management system. The design scenario is based on the 2081-2100 RCP8.5 climate change scenario, incorporating all proposed soakage and treatment devices and the assessment is done through Autodesk Hydroflo software. The OLFPs represents the conveyance of surface runoff because of the proposed system during the 100-year storm event.

Flow depths and velocities were assessed at key locations throughout the development covering all the various road/accessway typologies ensuring and confirming conveyance of the OLFP is viable through proposed carriageway. See below table showing results at the key locations.

	CATCHMENT AREA (HA)	SECTION	FLOW RATE m^3/s	MAX DEPTH m	VELOCITY m/s	DEPTH x VELOCITY
CATCHMENT 02	4.64	A	0.513	0.156	0.71	0.11
		B	0.33	0.141	0.6	0.09
		C	0.33	0.205	0.614	0.13
		D	0.635	0.179	0.679	0.12
		E	0.205	0.125	0.536	0.067
		F	0.505	0.128	0.705	0.09
CATCHMENT 04	4.05	G	0.835	0.191	0.696	0.132
		H	1.240	0.171	1.132	0.193
		I	0.371	0.141	0.635	0.089
CATCHMENT 05	3.16	O	0.360	0.149	0.476	0.070
CATCHMENT 06	5.69	J	0.270	0.133	0.507	0.067
		K	0.330	0.142	0.604	0.085
		L	0.250	0.139	0.501	0.069
		M	0.170	0.097	0.473	0.045
		N	0.320	0.107	0.440	0.047

Table 4: OLFP Results

For OLFP plans, please refer to Appendix A – Engineering Plans.

All OLFP sections comply with standard design thresholds and does not exceed 200mm maximum depth threshold.

Depth x velocity (m^2/s) values remain well below critical safety thresholds defined in Austroads 2012 Part 5, which specify:

- < $0.4m^2/s$ for pedestrian safety
- < $0.6m^2/s$ for vehicle safety

The highest recorded value was 0.193m^2/s confirming safe flow conveyance for both pedestrians and vehicles under design conditions. Flow is primarily routed along proposed roads conveyed into roadside treatment and 10-year mitigation devices prior to spilling back (during event above the 10-year) onto the road and get discharged into the proposed ponds or greenway.

It is noted that a separate flood sensitivity analysis has been completed using HEC-RAS 2D modelling assuming all stormwater devices are fully blocked. The assessment detailed in section 7 of SMP, evaluates overland flow behaviour under worst case flooding conditions within and surrounding the site.

5.5. CAPACITY AND QUALITY

Stormwater Strategy for Lot Areas

Roof runoff is managed using inert roofing materials, while driveway runoff is directed through a catch pit with a sump for pre-treatment before disposal into the proposed stormwater network via lot connections. The artificial wetlands and raingardens will provide treatment of runoff from the lot areas. The artificial wetlands are designed to attenuate the 10-year and 100-year ARI storm event including climate change for the lot areas.

Stormwater Strategy for Road Carriageway

The road carriageway runoffs will be collected via catchpits. The artificial wetlands and raingardens will provide treatment of runoff from the road carriageways. The artificial wetlands are designed to attenuate the 10-year and 100-year ARI storm event including climate change for the road carriageway.

Stormwater Strategy for Stormwater Raingardens 1, 2 and 3

Stormwater raingardens 1, 2 and 3 will provide treatment of the water quality volume for their corresponding catchments. Extended detention up to 300mm depth is provided in accordance with RITS. Larger flows up to the 10-year ARI storm event will be discharged via a scruffy dome. Flood storage and attenuation will be provided for by wetland 1.

Stormwater Strategy for Artificial Wetlands 1 and 2

Artificial wetlands 1 and 2 forms a critical part of the overall stormwater mitigation system. Wetlands will be incorporated into the stormwater system to treat the water quality volume, provide extended detention (1.2xWQV) for their corresponding catchments as well as manage peak flows up to a 100-year return period storm event (including climate change) for the proposed retirement village. These wetlands are designed to temporarily store runoff during storm events and release it at a controlled rate, thereby reducing downstream flooding risk and protecting receiving environments. Wetland 1 discharges to an existing culvert which crosses Station Road and heads north via an existing channel eventually reaching Waitoa river. Wetland 2 discharges to the proposed greenway before discharging into the Waitoa River.

Key design considerations include:

- Sizing based on achieving water quality volume within the permanent storage zone, the extended detention and attenuation of the 10 and 100-year storm events releasing at 80% of pre-development.
- Extended detention up to max 350mm depth and release over 24-hours.
- Flow splitter device upstream of each wetland to direct <2-year event through the wetland, >2-year event is directed to a highflow bypass channel to prevent scour of treatment elements and re-mobilisation of accumulated sediments.

- Highflow bypass channel outlet includes an outlet control. Flows back up and engage flood storage within the wetland.
- Permanent storage pool bathymetry per RITS to be detailed during EPA.
- Maintenance access ramp and platform adjacent the forebay will be detailed during EPA.
- Freeboard and spillway design to safely pass extreme events.

Refer to appendix B for wetland and raingarden calculations.

5.6. FLOODING

The WRC hazard portal has indicated there is potential flooding along the eastern side of the development and boundary with Highgrove Development in the 100 year ARI storm event, however there is no flooding indicated within the subject development. No flood modelling assessment has been undertaken, as part of the fast-track application. A flood modelling assessment will be undertaken, as part of the future detailed design phase.

5.7. CONNECTION POINTS AND STAGING

- Stage 1 to 4 (Part of 3) - These stages collectively form catchments 2 and 5, which is serviced by the proposed raingardens 1 and 2 and artificial wetland 1. The proposal allows for the construction of raingardens 1 and 2 and artificial wetland 1 during stage 1. This will ensure that required stormwater devices are in place before establishment of future stages within catchment 2 and 5. Stage 2 to 4 will follow, completing the remainder of stages within Catchments 2, and 5.
- Stage 5 to 6 (Part of 3) - These stages form the extent of catchment 6, which is serviced by artificial wetland 2. The proposal allows for the construction of Artificial wetland 2 during stage 3. This will ensure that required stormwater devices are/is in place before establishment of future stages within catchment 6. Stage 5 to 6 will follow, completing the remainder of stages within Catchment 6.
- The earlier stages will enable the construction of these Stormwater mitigation devices, with the later stages to follow.
- Stage 7 - This stage forms part of Catchment 4 and will be serviced by wetland 1.
- Stage 8 - This stage forms part of Catchment 4 and 6 and will be serviced by raingarden 1, wetland 1 and 2.
- Stage 9 to 10 - This stage forms part of Catchment 3 and 4, will be serviced by raingarden 3 and wetland 1.

6. WASTEWATER

6.1. DESIGN STANDARDS

The RITS Wastewater Design Standard sets out design and construction standards for wastewater and requires all land development projects to be provided with a suitable means of wastewater disposal.

The existing public wastewater network near the development is currently at capacity as advised by MPDC therefore the retirement village will have its own wastewater treatment to manage and treat wastewater on site.

6.1.1. ENGINEERING EXCEPTION DECISIONS

- No engineering exceptions are proposed for this application.

6.2. CATCHMENT AREA

The proposed development consists of 218 villas, one Aged Care Hospital, and other facilities across approx. 16 ha. The wastewater design has been based on 45 persons per hectare as per the requirements of RITS.

6.3. DESIGN FLOWS

Calculations for wastewater demand indicate a peak wet weather flow (PWWF) discharge to the proposed wastewater treatment plant of 10.74 l/s. Refer to Wastewater Demand Calculations in Appendix B.

6.4. RETICULATION

6.4.1. EXISTING RETICULATION

There is no existing reticulation at the proposed site.

6.4.2. PROPOSED RETICULATION

MPDC have confirmed that the public wastewater system does not have enough capacity to service this development. This means all wastewater infrastructure within the development will not be vested to be council and will be managed and treated on site.

The wastewater system proposed is based on a gravity sewer inlet and conventional pump station. It will be sized to accommodate associated peak wet weather flows as calculated in wastewater demand calculation in Appendix B.

A range of new 150mmØ and 225mmØ reticulation lines are proposed for this development as shown on C5000-C5003 plans.

These reticulation lines will gravity feed into the proposed pump station (SSMH A1) which pressurise the sewage into the rising main. The rising main will then discharge the wastewater into the proposed wastewater treatment plant (WWTP) located central and slightly east to the proposed development, before discharging to a dispersal field located east of the retirement village. The dispersal field is sized at 24,148m2 and an allowance for a reserve field sized at 50% is shown further to the west. An easement will be provided for both the dispersal field and reserve field as shown on the latest scheme plans.

Refer to updated Inno flow concept design provided in Appendix C for more information on the WWTP, WWPS and dispersal field. This includes a full specification report on design parameters and assumptions.

Further specification and detailing of the new wastewater pump station, WWTP and dispersal field will be provided in detailed design.

6.5. UNIT CONNECTIONS

All units will be serviced with connections as per RITS guidelines and specifications.

6.6. CONNECTION POINTS AND STAGING

- Stage 1 – Gravity reticulation network will be provided. The wastewater would then be conveyed to the new wastewater pump station within Stage 2, servicing up to 52 lots for stages 1 and 2. As part of Stage 1, the WWTP will be constructed.
- Stage 2 to 10 – All stages will contain new gravity reticulation network that would be directed to the new wastewater pumpstation then to the WWTP.

7. WATER SUPPLY

7.1. DESIGN STANDARDS

The RITS Water Supply Design Standard sets out design and construction standards for water reticulation, potable water supply and firefighting supply in accordance with SNZPAS 4509:2008 (NZ Fire Service Fire Fighting Water Supply Code of Practice).

7.2. EXISTING PUBLIC INFRASTRUCTURE

MPDC have confirmed that the existing water supply network in Matamata will not have enough capacity to service the retirement village. This means that all water supply infrastructure within the development will not be vested to be council and will be managed and treated on site.

7.3. DESIGN FLOWS

An estimate of water demand from the proposed building development has been made using the methodology set out in RITS 6.2.3 – Ordinary Supply Requirements.

Calculations for water demand indicate a calculated peak demand of:

- 6.56 l/s for the residential dwellings
- 0.65 l/s for the facilities and;
- 1.31 l/s for hospital – night day facility.

Refer to Water Demand Calculations in Appendix B.

7.4. PROPOSED WATER SUPPLY

The retirement village will be serviced by a proposed 120m deep borehole located near the western boundary, approximately 50m from the indicative wastewater treatment and disposal field.

The groundwater extracted from the 120m deep borehole will be distributed through a network of 16 water tanks and a treatment facility before being pumped via a 200mm OD HDPE PN 12.5 main from the pump station to the supporting riser main, ensuring a reliable and potable water supply for development.

Refer to engineering drawing C6000-C6003 plans for Water Supply layout plans.

The drawings C6000-C6003 plans show the proposed water supply systems. It ensures adequate water supply for all dwellings and other facilities, along with fire hydrants and valves to meet minimum requirement detailed in Section 7.5 below.

7.4.1. PROPOSED BOREHOLE AND STORAGE TANKS

A comprehensive assessment of the council's water main has confirmed that boreholes and storage tanks have sufficient pressure to support the development up to Stage 10, including all associated fire flow requirements.

The assessment of the water storage tanks confirmed that the Borehole water supplied by a borehole pump is capable of meeting water supply demand. There are 16 heavy-duty water tanks proposed to meet this demand. Potable water supply for the proposed development will be provided via a storage tank integrated with additional treatment processes(if needed). Water will be distributed through a pump station and a 200mm OD water reticulation system. The primary water network will comprise of 180mm OD mains, reducing to 125mm OD for subsequent development stages

As per the RITS demand for water age calculations, the water age is to be less than 72 hours. The water model confirms storage duration is below 45 hours.

Refer to Water Storage and EPANET Model calculations in Appendix B.

7.5. FIRE FIGHTING SUPPLY

The minimum firefighting water supply classification required by the RITS is to be in accordance with SNA PAS 4509 NZ Fire Service Fire Fighting Water Supply Code of Practice

Minimum water supply is specified as FW2. Therefore, the proposed residential development must meet the following water supply requirements:

- A primary water flow of 25L/s within a distance of 135m.
- An additional secondary flow of 25L/s within a distance of 270m.
- The required flow must be achieved from a maximum of 3 hydrants operating simultaneously.
- A minimum firefighting residential running pressure shall be 100kPa.
- A minimum working residential water pressure shall be 300kPa.

Based on the fire hydrant flow and pressure test following NZS 3500 Clause 3.2.3 and Table 3.2.3, a FW2 and 125mmOD HDPE is suitable to ensure fire safety. This is shown in the calculations, resulting in a flow rate of 1500 L/min. Eight fire hydrants have been proposed for the entire development to meet compliance with the above fire fighting supply requirements.

Aged care Hospital and Facilities will have sprinklers installed to improve fire safety within these facilities.

Refer to Water Demand Calculations in Appendix B.

8. SERVICES

It is noted that a utility service network is present in the surrounding area and HPA will liaise with utility providers for new underground services such as power, and fibre networks.

C7000 services plan provided in the engineering drawings is indicative and will be confirmed by the HPA group.

All streetlighting will be confirmed by HPA group.

9. CONCLUSIONS

Based on this engineering report we consider that the proposed development can be accommodated at the subject site without generating any adverse effects on the existing infrastructure and stormwater receiving environment.

Stormwater drainage can be provided for the development through overland flowpaths, proposed stormwater network, rain gardens and wetlands. Overland flow paths will be managed through the development, and it will reduce any potential flooding risks to properties. An overarching stormwater strategy has been developed, and this sets out the high-level, best practice approach for stormwater management within the catchment.

Wastewater drainage can be provided for the development though piped networks to intermediary pump stations that will transfer wastewater through the site for discharge into the new Wastewater Treatment Plant.

Potable water for the development will be supplied via an on-site bore, supported by storage tanks and pumps designed to meet demand as required. This approach has been adopted following confirmation from MPDC and WSP that there is no available capacity within the existing council network.

Additional investigation work and detailed reporting for three waters and earthworks will be required to support future structure plans.

10. LIMITATIONS

The calculations and assessments included in this report are a 'desktop' analysis and are preliminary in nature based on information available at time of issue. To the best of our knowledge, it represents a reasonable interpretation of available information.

Depending on the outcome of the high-level structure plan, further community; stakeholder engagement, and feasibility investigations, including engineering design and calculations, will be required to determine the suitability of the areas proposed for the retirement village development.

This report is solely for our clients use for the purpose for which it is intended in accordance with the agreed scope of work. It may not be disclosed to any person other than the client and any use or reliance by any person contrary to the above, to which Maven has not given its prior written consent, is prohibited.

This report must be read in its entirety and no portion of it should be relied on without regard to the limitations and disclaimers set out.

Maven makes no assurances with respect to the accuracy of assumptions and exclusions listed within this report and some may vary significantly due to ongoing stakeholder engagement.

APPENDIX A – ENGINEERING DRAWINGS

APPENDIX B – ENGINEERING CALCULATIONS

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	1	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 1		Regional Council	Waikato/BOP
Contributing Catchment	34213	m^2		
Max Slope Angle	5	%		
Length of Slope	330	m		
Storage Volume Per Ha	300	m^3/ha		
Required Volume	1,026	m^3		
Required Forebay Volume	103	m^3	*10% of Pond volume*	
Dead storage Vol. Required	308	m^3	*30% of Pond Volume*	
Live storage Vol. Required	718	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.0m and 1.5m. Desired Depth = 1.0m)
@ Emergency Spillway	1.30	m	
@ Crest	1.50	m	

Side Batters 1: 3 V: H

Width

Base (A)	15.0	m
Primary Spillway	21.0	m
Crest (B)	24.0	m

Length

Base (C)	60.0	m
Primary Spillway	66.0	m
Crest (D)	69.0	m

Volume at Primary Spillway 1134 m^3

> Required Volume? OK

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Pond L to W ratio: OK

Forebay

Side Batters 1: 3 V: H

Depth	1.00	m	Base (A)	18 m
Width (E)	8.0	m	Base (C)	2 m
Length (F)	24	m		
Volume	108.0			

> Required Volume? OK

Decant

Requred Rate	10.3	l/s (3l/s/ha of contributing catchment)
No of holes	452	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	2	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 2		Regional Council	Waikato/BOP
Contributing Catchment	18980	m^2		
Max Slope Angle	5	%		
Length of Slope	200	m		
Storage Volume Per Ha	200	m^3/ha		
Required Volume	380	m^3		
Required Forebay Volume	38	m^3	*10% of Pond volume*	
Dead storage Vol. Required	114	m^3	*30% of Pond Volume*	
Live storage Vol. Required	266	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.0m and 1.5m. Desired Depth = 1.0m)
@ Emergency Spillway	1.30	m	
@ Crest	1.50	m	

Side Batters 1: 3 V: H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	19.0	m

Length

Base (C)	45.0	m
Primary Spillway	51.0	m
Crest (D)	54.0	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway 624 m^3

> Required Volume? OK

Pond L to W ratio: OK

Forebay

Side Batters 1: 3 V: H

Depth	1.00	m	Base (A)	6 m
Width (E)	8.0	m	Base (C)	2 m
Length (F)	12	m		
Volume	48.0			

> Required Volume? OK

Decant

Requred Rate	5.7	l/s (3l/s/ha of contributing catchment)
No of holes	251	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

	Maven BOP Ltd	Job Number	Sheet	Rev
		J00606	3	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 3		Regional Council	Waikato/BOP
Contributing Catchment	26340	m^2		
Max Slope Angle	5	%		
Length of Slope	250	m		
Storage Volume Per Ha	300	m^3/ha		
Required Volume	790	m^3		
Required Forebay Volume	79	m^3	*10% of Pond volume*	
Dead storage Vol. Required	237	m^3	*30% of Pond Volume*	
Live storage Vol. Required	553	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	60.0	m
Primary Spillway	66.0	m
Crest (D)	70.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	817	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3			
	V:	H			
Depth	1.00	m	Base (A)	14	m
Width (E)	8.0	m	Base (C)	2	m
Length (F)	20	m			
Volume	88.0				
> Required Volume?	OK				

Decant

Requred Rate	7.9	l/s (3l/s/ha of contributing catchment)
No of holes	348	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	4	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 4		Regional Council	Waikato/BOP
Contributing Catchment	17332	m^2		
Max Slope Angle	5	%		
Length of Slope	250	m		
Storage Volume Per Ha	300	m^3/ha		
Required Volume	520	m^3		
Required Forebay Volume	52	m^3	*10% of Pond volume*	
Dead storage Vol. Required	156	m^3	*30% of Pond Volume*	
Live storage Vol. Required	364	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	60.0	m
Primary Spillway	66.0	m
Crest (D)	70.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	817	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3			
	V:	H			
Depth	1.00	m	Base (A)	14	m
Width (E)	8.0	m	Base (C)	2	m
Length (F)	20	m			
Volume	88.0				
> Required Volume?	OK				

Decant

Requred Rate	5.2	l/s (3l/s/ha of contributing catchment)
No of holes	229	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	5	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 5		Regional Council	Waikato/BOP
Contributing Catchment	16876	m^2		
Max Slope Angle	5	%		
Length of Slope	200	m		
Storage Volume Per Ha	200	m^3/ha		
Required Volume	338	m^3		
Required Forebay Volume	34	m^3	*10% of Pond volume*	
Dead storage Vol. Required	101	m^3	*30% of Pond Volume*	
Live storage Vol. Required	236	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	60.0	m
Primary Spillway	66.0	m
Crest (D)	70.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	817	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3			
	V:	H			
Depth	1.00	m	Base (A)	14	m
Width (E)	8.0	m	Base (C)	2	m
Length (F)	20	m			
Volume	88.0				
> Required Volume?	OK				

Decant

Requred Rate	5.1	l/s (3l/s/ha of contributing catchment)
No of holes	223	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	6	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name			Regional Council	Waikato/BOP
Contributing Catchment	15379	m^2		
Max Slope Angle	5	%		
Length of Slope	200	m		
Storage Volume Per Ha	200	m^3/ha		
Required Volume	308	m^3		
Required Forebay Volume	31	m^3	*10% of Pond volume*	
Dead storage Vol. Required	92	m^3	*30% of Pond Volume*	
Live storage Vol. Required	215	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	45.0	m
Primary Spillway	51.0	m
Crest (D)	55.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	624	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3		
	V:	H		
Depth	1.00	m	Base (A)	6 m
Width (E)	8.0	m	Base (C)	2 m
Length (F)	12	m		
Volume	48.0			
> Required Volume?	OK			

Decant

Requred Rate	4.6	l/s (3l/s/ha of contributing catchment)
No of holes	203	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	7	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 7		Regional Council	Waikato/BOP
Contributing Catchment	16545	m^2		
Max Slope Angle	5	%		
Length of Slope	200	m		
Storage Volume Per Ha	200	m^3/ha		
Required Volume	331	m^3		
Required Forebay Volume	33	m^3	*10% of Pond volume*	
Dead storage Vol. Required	99	m^3	*30% of Pond Volume*	
Live storage Vol. Required	232	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	45.0	m
Primary Spillway	51.0	m
Crest (D)	55.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	624	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3		
	V:	H		
Depth	1.00	m	Base (A)	6 m
Width (E)	8.0	m	Base (C)	2 m
Length (F)	12	m		
Volume	48.0			
> Required Volume?	OK			

Decant

Requred Rate	5.0	l/s (3l/s/ha of contributing catchment)
No of holes	218	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	8	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

STAGE 8 AND 9

Site Characteristics

Device Name	Stage 8		Regional Council	Waikato/BOP
Contributing Catchment	25339	m^2		
Max Slope Angle	5	%		
Length of Slope	350	m		
Storage Volume Per Ha	300	m^3/ha		
Required Volume	760	m^3		
Required Forebay Volume	76	m^3	*10% of Pond volume*	
Dead storage Vol. Required	228	m^3	*30% of Pond Volume*	
Live storage Vol. Required	532	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	60.0	m
Primary Spillway	66.0	m
Crest (D)	70.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	817	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3			
	V:	H			
Depth	1.00	m	Base (A)	14	m
Width (E)	8.0	m	Base (C)	2	m
Length (F)	20	m			
Volume	88.0				
> Required Volume?	OK				

Decant

Requred Rate	7.6	l/s (3l/s/ha of contributing catchment)
No of holes	334	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Maven BOP Ltd	Job Number	Sheet	Rev
	J00606	9	A

		Author	Date	Checked
Job Title	Eldonwood Retirement Village, Matamata			
Calculation Title	Sediment Retention Pond Design	KQ	16/04/2025	SB

Site Characteristics

Device Name	Stage 9		Regional Council	Waikato/BOP
Contributing Catchment	11066	m^2		
Max Slope Angle	5	%		
Length of Slope	150	m		
Storage Volume Per Ha	200	m^3/ha		
Required Volume	221	m^3		
Required Forebay Volume	22	m^3	*10% of Pond volume*	
Dead storage Vol. Required	66	m^3	*30% of Pond Volume*	
Live storage Vol. Required	155	m^3	*70% of Pond Volume*	

Pond Dimensions

Relative Depths

@ Base	0.00	m	
@ Primary Spillway	1.00	m	(May vary between 1.5m and 2m. Desired Depth = 1.5m)
@ Emergency Spillway	1.50	m	
@ Crest	1.80	m	

Side Batters	1:	3
	V:	H

Width

Base (A)	10.0	m
Primary Spillway	16.0	m
Crest (B)	20.8	m

Length

Base (C)	45.0	m
Primary Spillway	51.0	m
Crest (D)	55.8	m

Pond should be no less than 3:1 ratio and no more than 5:1 ratio

Volume at Primary Spillway	624	m^3
> Required Volume?	OK	
Pond L to W ratio:	OK	

Forebay

Side Batters	1:	3		
	V:	H		
Depth	1.00	m	Base (A)	6 m
Width (E)	8.0	m	Base (C)	2 m
Length (F)	12	m		
Volume	48.0			
> Required Volume?	OK			

Decant

Requred Rate	3.3	l/s (3l/s/ha of contributing catchment)
No of holes	146	

The standard decant flow is 4.5l/s which is achieved by drilling 6 rows of 10mm diameter holes at 60mm spacings along the 2m decant arm.

Ensure dead storage is a minmum of 30% of the total sediment retention pond storage by positioning the lowest decant at 0.5m above the invert level of the retention pond

Winter Works Design

Is the pond required for Winter works? No

Live storage must hold 1% AEP 24 hour rainfall event

SRP Live storage volume **	-
Rainfall depth for 1% AEP 24hour event (mm) ***	
Coefficient of Runoff	-
Catchment area that can be exposed in Winter period	-

Project Name	Ashbourne Retirement Village
Site Address	Station Road, Matamata
Client	Ashbourne Retirement Village
Prepared By	SB
Reviewed By	NP
Date	16/04/2025
Calculation Title	Flexible Pavement Design for Moderate-Heavy Design
Calculation No.	1

Maven Matamata

Flexible Pavement Design for Moderate-Heavy Design Traffic Loading Using AUSTROADS "Guide to Pavement Technology - Part 2 Pavement Structural Design" (AGPT02-17)

Parameter	Symbol	Reference
Annual Average Daily Traffic:	AADT	Typically estimated as 10 movements per day per lot within the subdivision.
Design Period:	P	Section 7.4.2, Table 7.2
Lane Distribution Factor:	LDF	Section 7.4.3, Table 7.3
Direction Factor:	DF	Section 7.4.4, Equation 30
Average Percentage of Heavy Vehicles:	%HV	Section 7.4.4, Equation 30
Initial Daily Heavy Vehicles in Design Lane	N_i	Section 7.4.4, Equation 30
Annual Growth Rate	R	Section 7.4.5, Table 7.4
Cumulative Growth Factor	CGF	Section 7.4.5, Equation 31
Design Traffic in Cumulative Heavy Vehicles	N_{HV}	Section 7.4.5, Equation 32
Average Number of Axle Groups per Heavy Vehicle	N_{HVAG}	Section 7.4.7, Equation 35, Table 7.6
Heavy Vehicle Axle Groups in Design Lane Over Design Period	N_{DT}	Section 7.4.7, Equation 35
Equivalent Single Axles per Heavy Vehicle Axle Group	ESA/HVAG	Section 12.7.1, Table 12.2
Design Equivalent Single Axle Groups	DESA	Section 7.6.2, Equation 37
Thickness of Base Material	-	Section 8.3.1, Figure 8.4
Thickness of Basecourse	-	Section 8.3.1, Figure 8.4 with CBR set to 30

Equations Used

Equation 30:

$$N_i = AADT \times DF \times \%HV/100 \times LDF$$

Equation 31:

$$CGF = \frac{(1+0.01R)^P - 1}{0.01R} \text{ for R>0, } CGF = P \text{ for R=0}$$

Equation 32:

$$N_{HV} = 365 \times CGF \times N_i$$

Equation 35:

$$N_{DT} = N_{HV} \times N_{HVAG}$$

Equation 37:

$$DESA = ESA/HVAG \times N_{DT}$$

Thickness of Base Material:

$$t = [219 - 211(logCBR) + 58(logCBR)^2] \times \log(^{DESA}/_{120})$$

Thickness of Basecourse:

$$t = [219 - 211(log30) + 58(log30)^2] \times \log(^{DESA}/_{120})$$

AADT

Description			Movements	Contingency
Road Description	No of Lots / Units	Equivalent Car Movements	Total Vehicle Movements Per Day for all Lanes	10% Contingency
Main Road (CBR 3)	240	10	2400	2640
Ring Roads (CBR 3)	28	10	280	308
Main Road (CBR 6)	240	10	2400	2640
Ring Roads 3 (CBR 6)	28	10	280	308

Design Traffic

(AustRoads Pavement Design Manual - Chapter 7 & Chapter 12)

Lanes	Design Period	LDF	AADT/Lane	DF	%HV	N_i	R	CGF	Days	N_{HV}	Design Check	N_{HVAG}	N_{DT}	ESA/HVAG	Design ESA	Design Check
No of Lanes	Design Period	Lane Distribution Factor	Average Annual Daily Traffic per Lane	Direction Factor	Average Percentage of Heavy Vehicles	Initial Daily Heavy Vehicles	Annual Growth Rate %	Cumulative Growth Factor	Days per Year of Traffic	Cumulative Heavy Vehicles	Check Design Lane Operating Below Capacity Over Design Life	No of Axle Groups per Heavy Vehicle	Cumulative HVAG in Design Lane over Deign Period	Equivalent Single Axles per Heavy Vehicle Axle Group	Design Equivalent Single Axles	Design Traffic Loading Check
1	25	1	2640	1	3	79.2	1	28	365	8.09E+05	YES	2.0	1.6E+06	0.2	3.24E+05	OK
1	25	1	308	1	3	9.24	1	28	365	9.44E+04	YES	2.0	1.9E+05	0.2	3.78E+04	Low DESA, see AGPT02-17 Sec. 12.8
1	25	1	2640	1	3	79.2	1	28	365	8.09E+05	YES	2.0	1.6E+06	0.2	3.24E+05	OK
1	25	1	308	1	3	9.24	1	28	365	9.44E+04	YES	2.0	1.9E+05	0.2	3.78E+04	Low DESA, see AGPT02-17 Sec. 12.8

Pavement Design

(AustRoads Pavement Design Manual - Chapter 8)

CBR	Granular Material	Basecourse	Sub-base
Design Subgrade CBR	**Thickness of Material (mm)**	AP40 Basecourse (mm)	GAP65 Sub-base (mm)
3	**451**	116	335
3	**329**	100	229
6	**309**	116	192
6	**225**	100	165

Adopted Design

Base	Basecourse	Sub-base
Thickness of Granular material (mm)	AP40 Basecourse (mm)	GAP65 Sub-base (mm)
475	125	350
350	100	250
325	125	200
275	100	175

Project Specifications

Project Name: Ashbourne Retirement Village
Client Name: Ashbourne Retirement Village
Location: Matamata

CIRTEX GAIN MORE GROUND

CAPLab2020

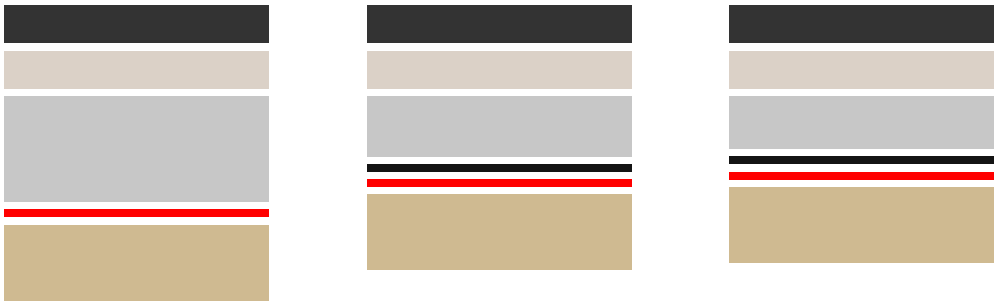
CBR Value	**3%**	DESA Value	**3.24E5**	D85 Aggregate	**<65**
Cost of Geogrid	**$6.2**	Width of Pavement	**7m**	Length of Pavement	**1000m**
Cost of Material Delivered	**$85**	Placement & Compaction Cost	**$20**	Excavation & Disposal Cost	**$20**

Layers	Austroads Fig. 8.4	NZTA Section	Optimised Section
Base Course:	120mm	120mm	120mm
Sub Base:	340mm	190mm	170mm
Geogrid:	N/A	Tenax 3D T	Tenax 3D T
Geotextile:	DuraForce® AS410	DuraForce® AS410	DuraForce® AS410

Cost Savings

Savings/m2:	$0.00	$12.18	$14.68
Total savings:	$0.00	$85,246	$102,746

Cross Sections:



You must make your own enquiries and seek independent advice from a suitably qualified pavement engineer and other relevant industry professionals before relying or acting on any information made available in this report or otherwise through CAPLab2020.

Subbase aggregate must be well graded crushed rock, base course material must be M/4 AP40 base course or as directed by the project engineer. Compaction must be in lifts of no more than 200mm to 98% MDD. Site engineer to confirm characteristic subgrade strength before starting construction.

Best practice for pavement construction as regards drainage and detailing must be followed as set out in the applicable local regulations and project documents.

Important note: Refer to the information section of the CAPLab2020 program for details of the design methodology and derivation of the figures used. This suggested pavement layout is not to be used for construction until approved by a suitably qualified engineer.

Report generated on : Wed Apr 16 2025 05:06:45 GMT+1200 (New Zealand Standard Time)

Project Specifications

Project Name: Ashbourne Retirement Village
Client Name: Ashbourne Retirement Village
Location: Matamata

CIRTEX GAIN MORE GROUND

CAPLab2020

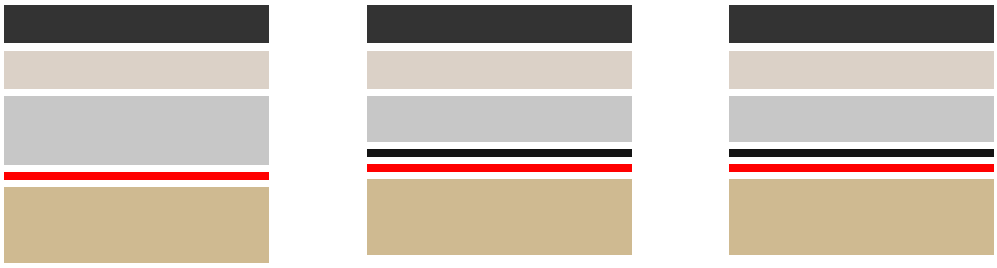
CBR Value	**5%**	DESA Value	**3.24E5**	D85 Aggregate	**<65**
Cost of Geogrid	**$6.2**	Width of Pavement	**7m**	Length of Pavement	**1000m**
Cost of Material Delivered	**$85**	Placement & Compaction Cost	**$20**	Excavation & Disposal Cost	**$20**

Layers	Austroads Fig. 8.4	NZTA Section	Optimised Section
Base Course:	120mm	120mm	120mm
Sub Base:	230mm	150mm	150mm
Geogrid:	N/A	Tenax 3D T	Tenax 3D T
Geotextile:	DuraForce® AS280	DuraForce® AS280	DuraForce® AS280

Cost Savings

Savings/m2:	$0.00	$3.43	$3.43
Total savings:	$0.00	$23,996	$23,996

Cross Sections:



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Subbase aggregate must be well graded crushed rock, base course material must be M/4 AP40 base course or as directed by the project engineer. Compaction must be in lifts of no more than 200mm to 98% MDD. Site engineer to confirm characteristic subgrade strength before starting construction.

Best practice for pavement construction as regards drainage and detailing must be followed as set out in the applicable local regulations and project documents.

Important note: Refer to the information section of the CAPLab2020 program for details of the design methodology and derivation of the figures used. This suggested pavement layout is not to be used for construction until approved by a suitably qualified engineer.

Report generated on : Wed Apr 16 2025 05:33:28 GMT+1200 (New Zealand Standard Time)

Maven BOP Ltd	Job Number J606	Sheet 1	Rev A
Job Title Eldonwood Retirement Village, Matamata **Calculation Title** Flexible Pavement Design - using Austroads	**Author** SB	**Date** 28-Jan	**Checked** NP

Design Traffic

Road Name / No.	Road 1
No of Lots	218
ECMs per lot	2
Traffic generated by subdvision	436
Existing Traffic (if applicable)	0
Total Vehs/day (AADT)	436

Using table 7.9 from Section 7.4 of Austroads AP-T36-06 Pavement Design

Table 7.9: Indicative heavy vehicle axle group volumes for lightly trafficked urban streets

Street type	AADT two-way	Percent heavy vehicles	Design AADHV (single lane)	Design period (years)	Annual growth rate (%)	Cumulative growth factor (Table 7.4 of the Guide)	Axle groups per heavy vehicle	Cumulative HVAG over design period	ESA/HVAG	Indicative design traffic (ESA)
Minor with single lane traffic	30	3	0.9	20	0	20	2.0	13,140	0.2	3×10^3
				40	0	40	2.0	26,280	0.2	5×10^3
Minor with two lane traffic	90	3	1.35	20	0	20	2.0	19,710	0.2	4×10^3
				40	0	40	2.0	39,420	0.2	8×10^3
Local access with no buses	400	4	8	20	1	22.0	2.1	128,480	0.3	4×10^4
				40	1	48.9	2.1	285,576	0.3	9×10^4
Local access with buses	500	6	15	20	1	22.0	2.1	240,900	0.3	8×10^4
				40	1	48.9	2.1	535,455	0.3	1.5×10^5
Local access in industrial area	400	8	16	20	1	22.0	2.3	256,960	0.4	1.5×10^5
				40	1	48.9	2.3	571,152	0.4	3×10^5
Collector with no buses	1200	6	36	20	1.5	23.1	2.2	607,068	0.6	4×10^5
				40	1.5	54.3	2.2	1,427,004	0.6	10^6
Collector with buses	2000	7	70	20	1.5	23.1	2.2	1,180,410	0.6	8×10^5
				40	1.5	54.3	2.2	2,774,730	0.6	2×10^6

Note: Direction factor is 0.5, except for minor street with single lane traffic where DF= 1.0

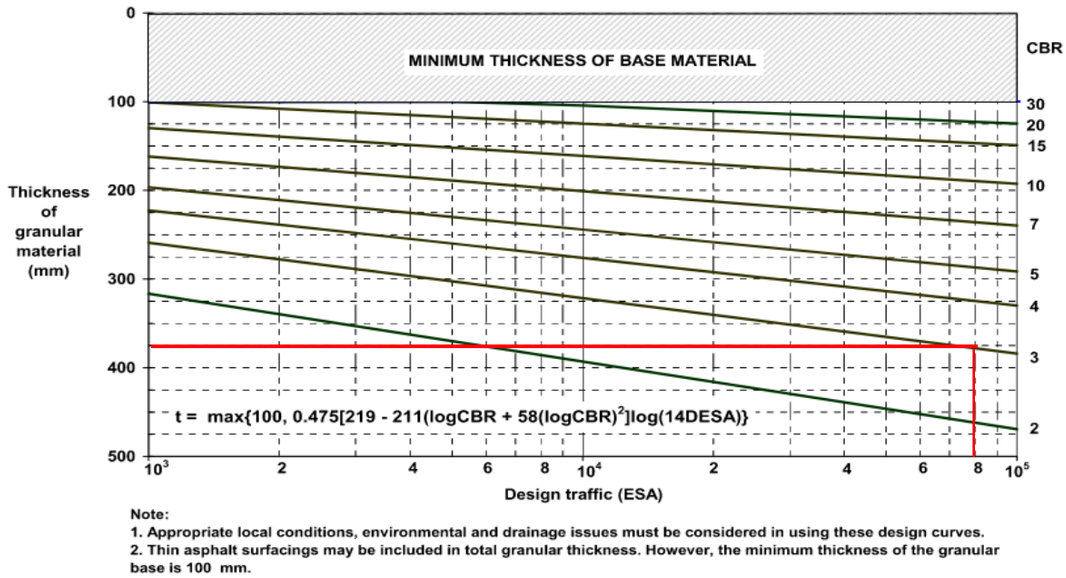
Interpolated ESA value 8×10^4

Pavement Thickness

Design CBR 3 As recommended in Geotech Report or assume a min. value of 3

Maven BOP Ltd	Job Number J606	Sheet 2	Rev A
Job Title Eldonwood Retirement Village, Matamata **Calculation Title** Flexible Pavement Design - using Austroads	**Author** SB	**Date** 28-Jan	**Checked** NP

Using Figure 8.5 of Austroads AP-T36-06 Pavement Design, The Design Traffic and Design CBR, determine the minimum thickness of pavement



Note:
1. Appropriate local conditions, environmental and drainage issues must be considered in using these design curves.
2. Thin asphalt surfacings may be included in total granular thickness. However, the minimum thickness of the granular base is 100 mm.

Figure 8.5: Light traffic design chart for granular pavements with thin bituminous surfacings

Pavement Thickness Min, 375 mm

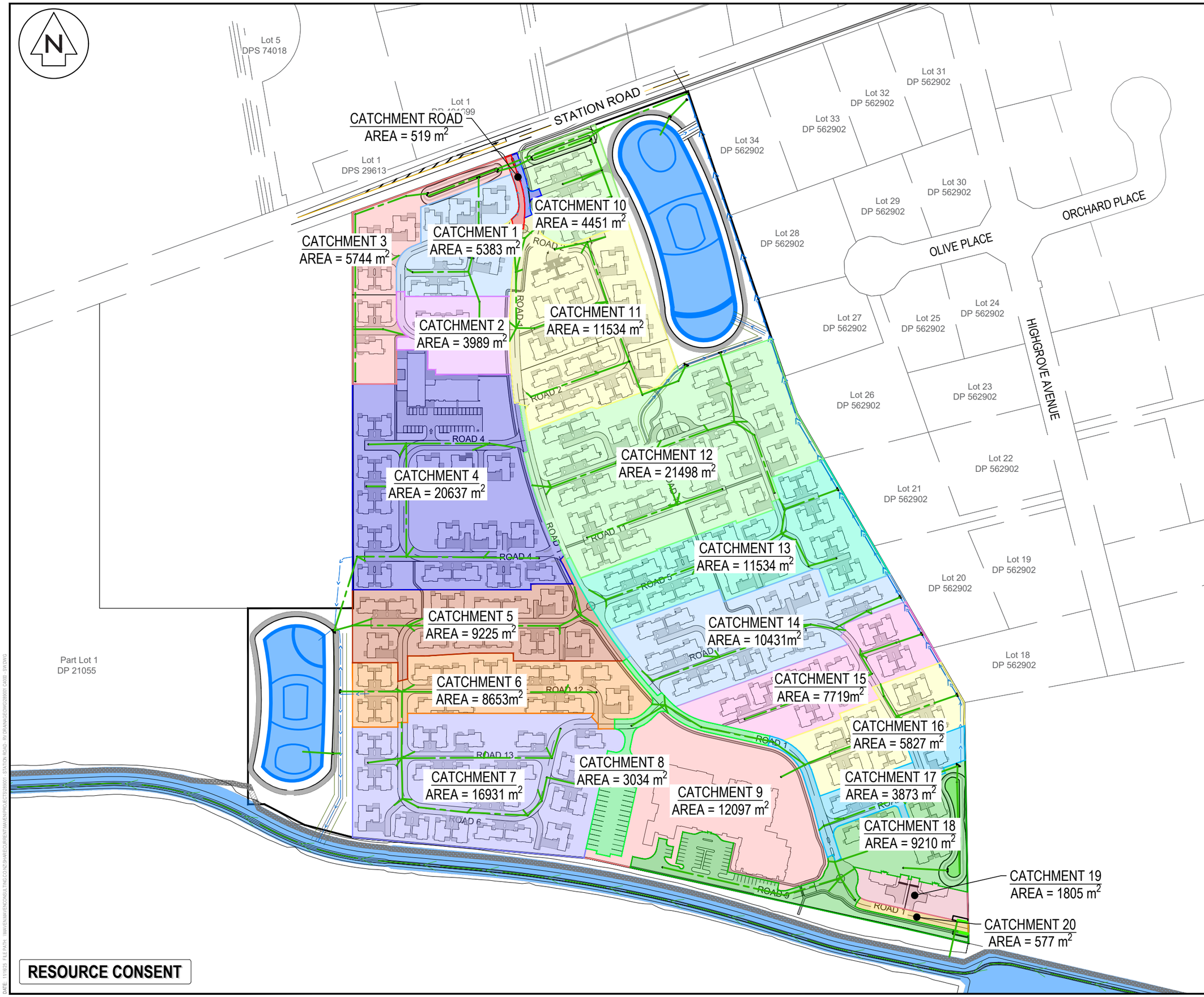
Pavement Design

	Thickness	Type
Surfacing*	0	3/5 Chip Seal
Basecourse**	100	AP40
Subbase***	275	GAP65

* If chipseal is to be use, the chipseal thickness is 0mm as its not to be included in the pavement thickness

** Basecourse must have a minimum thickness of 100mm, and layer thickness should be at least 2.5 x maximum stone dimension

*** Subbase layer thickness must be at least 2.5 x maximum stone dimension (i.e. GAP65 requires at least 163mm depth)



RESOURCE CONSENT

NOTES

1. ALL WORKS TO BE IN ACCORDANCE WITH RITS STANDARDS.
2. COORDINATES IN TERMS OF NZ GEODETIC DATUM MT EDEN 2000. LEVELS IN TERMS OF THE NEW ZEALAND VERTICAL DATUM 2016.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE ALL SERVICES THAT MAY BE AFFECTED BY THEIR OPERATIONS.
4. PIPE BEDDING: 0 - 10% GRANULAR BEDDING,10 - 20% WEAK CONCRETE BEDDING.GREATER THAN 20% WEAK CONCRETE BEDDING (7MPA PLUS ANTI SCOUR BLOCKS AT 6M CRS).
5. EACH CONNECTION SHALL BE MARKED BY A 50MMX50MM TREATED PINE STAKE EXTENDING 600MM ABOVE GROUND LEVEL WITH THE TOP PAINTED. THIS MARKER POST SHALL BE PLACED ALONGSIDE A TIMBER MARKER INSTALLED AT THE TIME OF PIPELAYING AND EXTENDING FROM THE CONNECTION TO 150MM BELOW FINISHED GROUND LEVEL. CONNECTIONS SHALL BE ACCURATELY INDICATED ON "AS BUILT" PLANS.
6. APPROVED HARDFILL IS TO BE USED IN BACKFILLING OF ALL ROAD CROSSINGS AND VEHICLE CROSSINGS TO COUNCIL STANDARDS.
7. HEAVY DUTY MANHOLE LIDS AND FRAMES TO BE USED IN TRAFFICKED AREAS.
8. ALL MANHOLES ARE TO BE 1050MMØ PRECAST CONCRETE UNLESS SHOWN OTHERWISE.
9. ALL CATCHPIT LEADS SHALL HAVE MIN COVER 1.0M.
10. ALL LINES TO BE ABANDONED SHALL BE SEALED AT EACH END. TIMING OF ALL SEALING TO BE COORDINATED WITH COUNCIL STAFF.
11. ALL LOT CONNECTION TO BE MIN 100mm uPVC SN16 UNLESS SHOWN OTHERWISE.
12. PIPE WITH LESS THAN 600mm COVER TO BE CONCRETE ENCASED FOR PROTECTION OR RE-GRADED TO ACHIEVE COVER.

LEGEND

- EX BDY
- PROP BDY
- EX STORMWATER
- PR STORMWATER
- EX/PR SWALE
- EX/PROP SWMH
- PROP SWCP SINGLE
- PROP SWCP DOUBLE
- PR LOT CONNECTION

Rev	Description	By	Date
A	RESOURCE CONSENT	DIJ	11/2025

	By	Date
Survey	MAVEN	10/2024
Design	DIJ	11/2025
Drawn	DIJ	11/2025
Checked	MS	11/2025

Maven Associates
09 571 0050
info@maven.co.nz
www.maven.co.nz
5 Owens Road, Epsom
Auckland 1023

Project

ASHBOURNE RETIREMENT VILLAGE MATAMATA FOR UNITY DEVELOPMENT LTD

Title

PROPOSED STORMWATER DRAINAGE CATCHMENT PLAN

Project no.	289001		
Scale	1:2500 @ A3		
Cad file	289001 C4000 - SW.DWG		
Drawing no.	C4500	Rev	A

MAVEN ASSOCIATES	Job Number	Sheet	Rev	Title	Author		Date	Checked
	289001	1	A	Calc Title: SW Pipe Capacity	DIJ		11/11/2025	MS

Rainfall Depth	ARI 10YR	ARI 2YR
NIWA RAINFALL DATA (RCP8.5) 2081-2100	133.00	80

mm/hr

Pipe ks factor = 1.5 mm (pipes up to 1.0m dia)
0.6 mm (pipes over 1.0m dia)
0.06 mm (uPVC pipes)

Zoning	C Number
General Residential (excluding Hamilton City)	0.65
Roads	0.80

From number	To number	Catchment letter	Catchment Area m2	C	Peak Flow rate - 10YR ARI l/s	Cum. Flow l/s	Pipe dia m	Gradient %	Capacity l/s	Percent Capacity %	Remaining l/s	Velocity m/s	Check OK
	2-3		169	0.65	4.06	4.06	0.225	0.20	30.4	13.33%	26.4	0.8	OK
2-3-1	2-3		256	0.80	7.57	7.57	0.225	0.20	30.4	24.85%	22.9	0.8	OK
2-3	2-2		3131	0.65	75.19	86.81	0.450	0.10	90.9	95.48%	4.1	0.6	OK
2-2-1	2-2		436	0.80	12.89	12.89	0.225	0.20	30.4	42.32%	17.6	0.8	OK
2-2	2-1		0	0.65	0.00	99.70	0.525	0.10	136.6	72.98%	36.9	0.6	OK
2-1	1-3		0	0.65	0.00	99.70	0.525	0.10	136.6	72.98%	36.9	0.6	OK
1-4-1	1-4		278	0.80	8.22	8.22	0.225	0.30	37.4	21.97%	29.2	0.9	OK
1-4	1-3		2758	0.65	66.23	74.45	0.375	0.30	141.8	52.51%	67.3	1.3	OK
1-3	1-2		0	0.65	0.00	174.15	0.600	0.10	194.3	89.62%	20.2	0.7	OK
1-5-1	1-5		357	0.80	10.55	10.55	0.225	0.10	21.4	49.31%	10.8	0.5	OK
1-5	1-2		1079	0.65	25.91	36.46	0.300	0.10	45.4	80.31%	8.9	0.6	OK
1-2	1-1		834	0.65	20.03	230.63	0.600	0.20	274.9	83.90%	44.2	1.0	OK
			9298										
3-6	3-5		0	0.65	0.00	0.00	0.225	0.30	37.4	0.00%	37.4	0.9	OK
3-8-1	3-8		223	0.80	6.59	6.59	0.225	0.10	21.4	30.80%	14.8	0.5	OK
3-8	3-5		1852	0.65	44.47	51.06	0.300	0.30	79.2	64.44%	28.2	1.1	OK
3-5	3-4		0	0.65	0.00	51.06	0.300	0.30	79.2	64.44%	28.2	1.1	OK
3-7-1	3-7		233	0.80	6.89	6.89	0.225	0.30	37.4	18.42%	30.5	0.9	OK
3-7	3-4		2521	0.65	60.54	67.43	0.300	0.30	79.2	85.09%	11.8	1.1	OK
3-4	3-3		0	0.65	0.00	118.49	0.375	0.30	141.8	83.58%	23.3	1.3	OK
3-3	3-2		0	0.65	0.00	118.49	0.375	0.30	141.8	83.58%	23.3	1.3	OK
3-2	3-1		0	0.65	0.00	118.49	0.450	0.20	128.6	92.13%	10.1	0.8	OK
			4829										
	4-6		1264	0.65	30.35	30.35	0.225	0.30	37.4	81.17%	7.0	0.9	OK
4-6-1	4-6		1123	0.80	33.19	33.19	0.225	0.30	37.4	88.76%	4.2	0.9	OK
4-6-2	4-6		881	0.80	26.04	26.04	0.225	0.30	37.4	69.63%	11.4	0.9	OK
4-6	4-5		5161	0.65	123.94	213.52	0.525	0.30	236.7	90.20%	23.2	1.1	OK
4-10	4-5		1322	0.65	31.75	31.75	0.225	0.30	37.4	84.90%	5.6	0.9	OK
4-5-1	4-5		225	0.80	6.65	6.65	0.225	0.30	37.4	17.78%	30.7	0.9	OK
4-5	4-4		0	0.65	0.00	251.91	0.600	0.30	336.7	74.82%	84.8	1.2	OK

4-9	4-4	1583	0.65	38.01	38.01	0.225	0.40	43.3	87.89%	5.2	1.1	OK
4-4-1	4-4	106	0.80	3.13	3.13	0.225	0.30	37.4	8.38%	34.3	0.9	OK
4-4-2	4-4	234	0.80	6.92	6.92	0.225	0.30	37.4	18.49%	30.5	0.9	OK
4-4	4-3	0	0.65	0.00	299.98	0.600	0.30	336.7	89.10%	36.7	1.2	OK
4-8	4-7	2258	0.65	54.22	54.22	0.300	0.30	79.2	68.43%	25.0	1.1	OK
4-7-1	4-7	412	0.80	12.18	12.18	0.225	0.30	37.4	32.56%	25.2	0.9	OK
4-7	4-3	3424	0.65	82.22	148.62	0.450	0.30	157.5	94.34%	8.9	1.0	OK
4-3-1	4-3	805	0.80	23.79	23.79	0.225	0.30	37.4	63.63%	13.6	0.9	OK
4.3	4-2	1642	0.65	39.43	511.82	0.675	0.40	530.4	96.50%	18.5	1.5	OK
4-2-1	4-2	208	0.80	6.15	6.15	0.225	0.30	37.4	16.44%	31.2	0.9	OK
4-2	4-1	0	0.65	0.00	517.97	0.675	0.40	530.4	97.66%	12.4	1.5	OK
		20648										
5-5-1	5-5	102	0.80	3.01	3.01	0.225	0.30	37.4	8.06%	34.4	0.9	OK
5-5-2	5-5	378	0.80	11.17	11.17	0.225	0.30	37.4	29.88%	26.2	0.9	OK
5-5-3	5-5	127	0.80	3.75	3.75	0.225	0.30	37.4	10.04%	33.6	0.9	OK
5-5	5-4	854	0.65	20.51	38.45	0.300	0.30	79.2	48.52%	40.8	1.1	OK
5-4-1	5-4	82	0.80	2.42	2.42	0.225	0.30	37.4	6.48%	35.0	0.9	OK
5-4	5-3	2863	0.65	68.75	109.62	0.375	0.30	141.8	77.33%	32.1	1.3	OK
5-3-1	5-3	336	0.80	9.93	9.93	0.225	0.30	37.4	26.56%	27.5	0.9	OK
5-3	5-2	1719	0.65	41.28	160.83	0.525	0.30	236.7	67.95%	75.9	1.1	OK
5-2-1	5-2	321	0.80	9.49	9.49	0.225	0.30	37.4	25.37%	27.9	0.9	OK
5-2-2	5-2	329	0.80	9.72	9.72	0.225	0.30	37.4	26.00%	27.7	0.9	OK
5-2	5-1	1918	0.65	46.06	226.10	0.600	0.30	336.7	67.15%	110.6	1.2	OK
5-1-1	5-1	204	0.80	6.03	6.03	0.225	0.30	37.4	16.12%	31.4	0.9	OK
5-1	4-1	0	0.65	0.00	232.13	0.600	0.30	336.7	68.95%	104.6	1.2	OK
		9233										
7-12	7-11	1658	0.65	39.82	39.82	0.300	0.30	79.2	50.25%	39.4	1.1	OK
7-11	7-10	0	0.65	0.00	39.82	0.300	0.30	79.2	50.25%	39.4	1.1	OK
7-10-1	7-10	291	0.80	8.60	8.60	0.225	0.30	37.4	23.00%	28.8	0.9	OK
7-10	7-9	943	0.65	22.65	71.06	0.300	0.30	79.2	89.68%	8.2	1.1	OK
7-9-1	7-9	263	0.80	7.77	7.77	0.225	0.30	37.4	20.79%	29.6	0.9	OK
7-9	7-8	1955	0.65	46.95	125.78	0.375	0.30	141.8	88.72%	16.0	1.3	OK
7-8-1	7-8	278	0.80	8.22	8.22	0.225	0.30	37.4	21.97%	29.2	0.9	OK
7-8	7-7	1176	0.65	28.24	162.24	0.525	0.30	236.7	68.54%	74.5	1.1	OK
7-7	7-6	676	0.65	16.23	178.47	0.525	0.30	236.7	75.40%	58.2	1.1	OK
7-6-1	7-6	119	0.80	3.52	3.52	0.225	0.30	37.4	9.41%	33.9	0.9	OK
7-6-2	7-6	571	0.80	16.88	16.88	0.225	0.30	37.4	45.13%	20.5	0.9	OK
7-6	7-1	784	0.65	18.83	217.69	0.525	0.30	236.7	91.97%	19.0	1.1	OK
7-4	7-3	754	0.65	18.11	18.11	0.225	0.30	37.4	48.42%	19.3	0.9	OK
7-3-1	7-3	298	0.80	8.81	8.81	0.225	0.30	37.4	23.55%	28.6	0.9	OK
7-3	7-2	2367	0.65	56.84	83.75	0.375	0.30	141.8	59.08%	58.0	1.3	OK
7-2-1	7-2	301	0.80	8.90	8.90	0.225	0.30	37.4	23.79%	28.5	0.9	OK
7-2	7-1	2351	0.65	56.46	149.11	0.450	0.30	157.5	94.65%	8.4	1.0	OK

7-13	7-1	1541	0.65	37.01	37.01	0.225	0.30	37.4	98.96%	0.4	0.9	OK
7-1-1	7-1	512	0.80	15.13	15.13	0.225	0.30	37.4	40.47%	22.3	0.9	OK
7-1-2	7-1	103	0.80	3.04	3.04	0.225	0.30	37.4	8.14%	34.4	0.9	OK
7-1	6-2	0	0.65	0.00	421.98	0.600	0.50	434.7	97.07%	12.7	1.5	OK
6-5	6-4	1513	0.65	36.33	36.33	0.225	0.30	37.4	97.16%	1.1	0.9	OK
6-4-1	6-4	337	0.80	9.96	9.96	0.225	0.30	37.4	26.64%	27.4	0.9	OK
6-4	6-3	2692	0.65	64.65	110.94	0.375	0.30	141.8	78.25%	30.8	1.3	OK
6-3-1	6-3	364	0.80	10.76	10.76	0.225	0.30	37.4	28.77%	26.6	0.9	OK
6-3	6-2	1681	0.65	40.37	162.06	0.525	0.30	236.7	68.47%	74.6	1.1	OK
6-2-1	6-2	103	0.80	3.04	3.04	0.225	0.30	37.4	8.14%	34.4	0.9	OK
6-2-2	6-2	559	0.80	16.52	16.52	0.225	0.30	37.4	44.18%	20.9	0.9	OK
6-2	6-1	1409	0.65	33.84	637.45	0.675	0.60	649.6	98.13%	12.2	1.8	OK
		25599										
10-4	10-3	1254	0.65	30.11	30.11	0.375	0.30	141.8	21.24%	111.7	1.3	OK
10-3	10-2	0	0.65	0.00	30.11	0.375	0.30	141.8	21.24%	111.7	1.3	OK
10-5	10-2	2339	0.65	56.17	56.17	0.300	0.30	79.2	70.88%	23.1	1.1	OK
10-2-1	10-2	159	0.80	4.70	4.70	0.225	0.30	37.4	12.57%	32.7	0.9	OK
10-7	10-2	0	0.65	0.00	90.98	0.300	0.30	79.2	114.81%	-11.7	1.1	Undersize
10-2	10-1	0	0.65	0.00	125.79	0.375	0.60	201.1	62.56%	75.3	1.8	OK
		3752										
11-13-1	11-13	389	0.80	11.50	11.50	0.225	0.10	21.4	53.73%	9.9	0.5	OK
11-13-2	11-13	241	0.80	7.12	7.12	0.225	0.10	21.4	33.29%	14.3	0.5	OK
11-13	11-12	0	0.65	0.00	18.62	0.225	0.10	21.4	87.02%	2.8	0.5	OK
11-12-1	11-12	197	0.80	5.82	5.82	0.225	0.10	21.4	27.21%	15.6	0.5	OK
11-12-2	11-12	186	0.80	5.50	5.50	0.225	0.30	37.4	14.70%	31.9	0.9	OK
11-12	11-11	0	0.65	0.00	29.94	0.300	0.20	64.5	46.39%	34.6	0.9	OK
11-11-1	11-11	198	0.80	5.85	5.85	0.225	0.30	37.4	15.65%	31.5	0.9	OK
11-11-2	11-11	176	0.80	5.20	5.20	0.225	0.30	37.4	13.91%	32.2	0.9	OK
11-11-3	11-11	172	0.80	5.08	5.08	0.225	0.30	37.4	13.59%	32.3	0.9	OK
11-11	11-10	0	0.65	0.00	46.08	0.300	0.30	79.2	58.15%	33.2	1.1	OK
11-10	11-5	2814	0.65	67.58	113.65	0.375	0.30	141.8	80.17%	28.1	1.3	OK
11-7	11-6	1178	0.65	28.29	28.29	0.300	0.10	45.4	62.31%	17.1	0.6	OK
11-6-1	11-6	444	0.80	13.12	13.12	0.225	0.10	21.4	61.33%	8.3	0.5	OK
11-6-2	11-6	61	0.80	1.80	1.80	0.225	0.10	21.4	8.43%	19.6	0.5	OK
11-6	11-5	1073	0.65	25.77	68.98	0.375	0.10	81.3	84.85%	12.3	0.7	OK
11-5-1	11-5	406	0.80	12.00	12.00	0.225	0.30	37.4	32.09%	25.4	0.9	OK
11-5-2	11-5	389	0.80	11.50	11.50	0.225	0.25	34.1	33.72%	22.6	0.9	OK
11-5	11-4	1568	0.65	37.65	243.78	0.600	0.30	336.7	72.41%	92.9	1.2	OK
11-9-1	11-9	388	0.80	11.47	11.47	0.225	0.30	37.4	30.67%	25.9	0.9	OK
11-9	11-8	1847	0.65	44.35	55.82	0.300	0.30	79.2	70.44%	23.4	1.1	OK
11-8-1	11-8	389	0.80	11.50	11.50	0.225	0.30	37.4	30.75%	25.9	0.9	OK
11-8	11-4	1011	0.65	24.28	91.60	0.375	0.30	141.8	64.61%	50.2	1.3	OK
11-4	11-3	827	0.65	19.86	355.24	0.675	0.30	459.3	77.35%	104.0	1.3	OK

11-3	11-2	0	0.65	0.00	355.24	0.675	0.30	459.3	77.35%	104.0	1.3	OK
11-2	11-1	0	0.65	0.00	355.24	0.675	0.30	459.3	77.35%	104.0	1.3	OK
		13954										
12-7-1	12-7	234	0.80	6.92	6.92	0.225	0.30	37.4	18.49%	30.5	0.9	OK
12-7-2	12-7	382	0.80	11.29	11.29	0.225	0.30	37.4	30.19%	26.1	0.9	OK
12-7-3	12-7	180	0.80	5.32	5.32	0.225	0.30	37.4	14.23%	32.1	0.9	OK
12-7	12-6	1974	0.65	47.40	70.93	0.300	0.30	79.2	89.51%	8.3	1.1	OK
	12-6	1770	0.65	42.50	42.50	0.300	0.30	79.2	53.64%	36.7	1.1	OK
12-6-1	12-6	416	0.80	12.30	12.30	0.225	0.30	37.4	32.88%	25.1	0.9	OK
12-6	12.5	693	0.65	16.64	142.37	0.450	0.30	157.5	90.37%	15.2	1.0	OK
12-10	12-8	1202	0.65	28.86	28.86	0.225	0.30	37.4	77.19%	8.5	0.9	OK
12-9	12-8	3716	0.65	89.24	89.24	0.375	0.30	141.8	62.94%	52.5	1.3	OK
12-8-1	12-8	421	0.80	12.44	12.44	0.225	0.30	37.4	33.27%	25.0	0.9	OK
12-8-2	12-8	283	0.80	8.36	8.36	0.225	0.30	37.4	22.37%	29.0	0.9	OK
12-8	12-5	0	0.65	0.00	138.91	0.375	0.30	141.8	97.98%	2.9	1.3	OK
12-5-1	12-5	294	0.80	8.69	8.69	0.225	0.30	37.4	23.24%	28.7	0.9	OK
12-5-2	12-5	168	0.80	4.97	4.97	0.225	0.30	37.4	13.28%	32.4	0.9	OK
12-5	12.4	2043	0.65	49.06	343.99	0.600	0.40	388.8	88.48%	44.8	1.4	OK
12-4-1	12-4	399	0.80	11.79	11.79	0.225	0.30	37.4	31.54%	25.6	0.9	OK
12-4	12-3	439	0.65	10.54	366.33	0.600	0.40	388.8	94.22%	22.5	1.4	OK
12-12	12-11	2444	0.65	58.69	58.69	0.300	0.40	91.6	64.05%	32.9	1.3	OK
12-11	12-3	920	0.65	22.09	80.78	0.300	0.40	91.6	88.16%	10.9	1.3	OK
12-3-1	12-3	537	0.80	15.87	15.87	0.225	0.30	37.4	42.44%	21.5	0.9	OK
12-3	12-2	2729	0.65	65.53	528.52	0.675	0.40	530.4	99.65%	1.8	1.5	OK
12-2-1	12-2	267	0.80	7.89	7.89	0.225	0.30	37.4	21.10%	29.5	0.9	OK
12-2	12-1	0	0.65	0.00	536.41	0.675	0.50	593.0	90.46%	56.6	1.7	OK
		21511										
13-6-1	13-6	128	0.80	3.78	3.78	0.225	0.30	37.4	10.12%	33.6	0.9	OK
13-6-2	13-6	427	0.80	12.62	12.62	0.225	0.30	37.4	33.75%	24.8	0.9	OK
13-6	13-5	3008	0.65	72.23	88.64	0.375	0.30	141.8	62.52%	53.1	1.3	OK
13-5-1	13-5	264	0.80	7.80	7.80	0.225	0.30	37.4	20.87%	29.6	0.9	OK
13-5	13-4	1784	0.65	42.84	139.28	0.375	0.30	141.8	98.24%	2.5	1.3	OK
13-4-1	13-4	397	0.80	11.73	11.73	0.225	0.30	37.4	31.38%	25.7	0.9	OK
13-4	13-3	882	0.65	21.18	172.19	0.525	0.30	236.7	72.74%	64.5	1.1	OK
13-9	13-8	2049	0.65	49.20	49.20	0.300	0.30	79.2	62.09%	30.0	1.1	OK
13-8	13-7	0	0.65	0.00	49.20	0.300	0.30	79.2	62.09%	30.0	1.1	OK
13-3-1	13-3	249	0.80	7.36	7.36	0.225	0.30	37.4	19.68%	30.0	0.9	OK
13-7	13-3	0	0.65	0.00	56.56	0.300	0.30	79.2	71.38%	22.7	1.1	OK
13-2-1	13-2	388	0.80	11.47	11.47	0.225	0.30	37.4	30.67%	25.9	0.9	OK
13-3	13-2	0	0.65	0.00	240.23	0.600	0.30	336.7	71.35%	96.5	1.2	OK
13-2	13-1	1964	0.65	47.16	287.39	0.600	0.30	336.7	85.36%	49.3	1.2	OK
		11540										
14-6-1	14-6	55	0.80	1.63	1.63	0.225	0.30	37.4	4.35%	35.8	0.9	OK
14-6	14-5	2080	0.65	49.95	51.57	0.300	0.30	79.2	65.08%	27.7	1.1	OK

	14-5	1081	0.65	25.96	25.96	0.225	0.30	37.4	69.42%	11.4	0.9	OK
14-5-1	14-5	352	0.80	10.40	10.40	0.225	0.30	37.4	27.82%	27.0	0.9	OK
14-5-2	14-5	215	0.80	6.35	6.35	0.225	0.30	37.4	16.99%	31.0	0.9	OK
14-5	14-4	4456	0.65	107.01	201.30	0.525	0.30	236.7	85.04%	35.4	1.1	OK
14-4-1	14-4	636	0.80	18.80	18.80	0.225	0.30	37.4	50.27%	18.6	0.9	OK
14-4	14-3	0	0.65	0.00	220.09	0.525	0.30	236.7	92.98%	16.6	1.1	OK
14-3-1	14-3	413	0.80	12.21	12.21	0.225	0.30	37.4	32.64%	25.2	0.9	OK
14-3	14-2	981	0.65	23.56	255.86	0.600	0.30	336.7	75.99%	80.8	1.2	OK
14-2-1	14-2	117	0.80	3.46	3.46	0.225	0.30	37.4	9.25%	33.9	0.9	OK
14-2	14-1	0	0.65	0.00	259.32	0.600	0.30	336.7	77.02%	77.4	1.2	OK
		10386										
15-6	15-5	2279	0.65	54.73	54.73	0.300	0.30	79.2	69.06%	24.5	1.1	OK
15-5-1	15-5	220	0.80	6.50	6.50	0.225	0.30	37.4	17.39%	30.9	0.9	OK
15-5	15-4	2346	0.65	56.34	117.57	0.375	0.30	141.8	82.93%	24.2	1.3	OK
15-4-1	15-4	250	0.80	7.39	7.39	0.225	0.30	37.4	19.76%	30.0	0.9	OK
15-4	15-3	0	0.65	0.00	124.96	0.375	0.30	141.8	88.14%	16.8	1.3	OK
15-3-1	15-3	204	0.80	6.03	6.03	0.225	0.30	37.4	16.12%	31.4	0.9	OK
15-3-2	15-3	115	0.80	3.40	3.40	0.225	0.30	37.4	9.09%	34.0	0.9	OK
15-3	15-2	2209	0.65	53.05	187.43	0.525	0.30	236.7	79.18%	49.3	1.1	OK
15-2	15-1	0	0.65	0.00	187.43	0.525	0.30	236.7	79.18%	49.3	1.1	OK
		7623										
9-1	8-1	12097	0.65	290.50	290.50	0.600	0.30	336.7	86.28%	46.2	1.2	OK
8-5	8-4	2020	0.80	59.70	59.70	0.300	0.30	79.2	75.34%	19.5	1.1	OK
8-4-1	8-4	426	0.80	12.59	12.59	0.225	0.30	37.4	33.67%	24.8	0.9	OK
8-4-2	8-4	275	0.80	8.13	8.13	0.225	0.30	37.4	21.74%	29.3	0.9	OK
8-4-3	8-4	314	0.80	9.28	9.28	0.225	0.30	37.4	24.82%	28.1	0.9	OK
8-4	8-3	0	0.80	0.00	89.70	0.375	0.30	141.8	63.27%	52.1	1.3	OK
8-3	8-2	0	0.80	0.00	89.70	0.375	0.30	141.8	63.27%	52.1	1.3	OK
8-2	8-1	0	0.80	0.00	89.70	0.375	0.30	141.8	63.27%	52.1	1.3	OK
8-1	16-4	0	0.80	0.00	380.20	0.600	0.40	388.8	97.79%	8.6	1.4	OK
16-4	16-3	3096	0.65	74.35	454.54	0.600	0.60	476.2	95.45%	21.7	1.7	OK
16-3-1	16-3	274	0.80	8.10	8.10	0.225	0.30	37.4	21.66%	29.3	0.9	OK
16-3	16-2	0	0.65	0.00	462.64	0.600	0.60	476.2	97.15%	13.6	1.7	OK
16-5-1	16-5	274	0.80	8.10	8.10	0.225	0.30	37.4	21.66%	29.3	0.9	OK
16-5	16-2	0	0.65	0.00	8.10	0.225	0.30	37.4	21.66%	29.3	0.9	OK
16-7-1	16-7	313	0.80	9.25	9.25	0.225	0.30	37.4	24.74%	28.1	0.9	OK
16-7	16-6	792	0.65	19.02	28.27	0.225	0.30	37.4	75.60%	9.1	0.9	OK
16-6	16-2	0	0.65	0.00	28.27	0.225	0.30	37.4	75.60%	9.1	0.9	OK
16-2-1	16-2	115	0.80	3.40	3.40	0.225	0.30	37.4	9.09%	34.0	0.9	OK
16-2	16-1	2069	0.65	49.68	552.09	0.675	0.50	593.0	93.10%	40.9	1.7	OK
		22065										
17-6-1	17-6	365	0.80	10.79	10.79	0.225	0.30	37.4	28.85%	26.6	0.9	OK

17-6	17-5	0	0.80	0.00	10.79	0.225	0.30	37.4	28.85%	26.6	0.9	OK
17-5-1	17-5	454	0.80	13.42	13.42	0.225	0.30	37.4	35.88%	24.0	0.9	OK
17-5	17-4	909	0.65	21.83	46.03	0.300	0.30	79.2	58.09%	33.2	1.1	OK
17-4-1	17-4	239	0.80	7.06	7.06	0.225	0.30	37.4	18.89%	30.3	0.9	OK
17-4-2	17-4	193	0.80	5.70	5.70	0.225	0.30	37.4	15.25%	31.7	0.9	OK
17-4	17-3	429	0.65	10.30	69.10	0.375	0.30	141.8	48.74%	72.7	1.3	OK
17-2-1	17-2	313	0.80	9.25	9.25	0.225	0.30	37.4	24.74%	28.1	0.9	OK
17-2-2	17-2	185	0.80	5.47	5.47	0.225	0.30	37.4	14.62%	31.9	0.9	OK
17-3	17-2	0	0.65	0.00	83.82	0.375	0.30	141.8	59.13%	57.9	1.3	OK
17-2	17-1	792	0.65	19.02	102.84	0.375	0.30	141.8	72.54%	38.9	1.3	OK
		3879										
18-6	18-5	2058	0.80	60.83	60.83	0.300	0.30	79.2	76.76%	18.4	1.1	OK
18-5	18-4	1211	0.65	29.08	89.91	0.375	0.30	141.8	63.42%	51.9	1.3	OK
18-4-1	18-4	433	0.80	12.80	12.80	0.225	0.30	37.4	34.22%	24.6	0.9	OK
18-4-2	18-4	281	0.80	8.31	8.31	0.225	0.30	37.4	22.21%	29.1	0.9	OK
18-4	18-3	0	0.80	0.00	111.01	0.375	0.20	115.5	96.11%	4.5	1.0	OK
18-3-1	18-3	145	0.80	4.29	4.29	0.225	0.30	37.4	11.46%	33.1	0.9	OK
18-3	18-2	960	0.65	23.05	138.35	0.525	0.30	236.7	58.45%	98.4	1.1	OK
.												
18-2	18-1	4126	0.65	99.08	237.43	0.600	0.30	336.7	70.52%	99.3	1.2	OK
		9214										
19-2	19-1	318	0.80	9.40	9.40	0.225	0.30	37.4	25.13%	28.0	0.9	OK
19-2	19-1	1488	0.65	35.73	45.13	0.300	0.30	79.2	56.95%	34.1	1.1	OK
		1806										
	RG A	302	0.80	8.93	8.93	0.150	0.20	10.5	84.73%	1.6	0.6	OK
	RG B	275	0.80	8.13	8.13	0.150	0.20	10.5	77.16%	2.4	0.6	OK
RG A &B	GREENWAY	0	0.65	0.00	17.05	0.150	0.60	18.4	92.70%	1.3	1.0	OK
		577										

Maven ASSOCIATES	Job Number	Sheet	Rev
	289001	1	A

		Author	Date	Checked
Job Title	STATION ROAD - RV			
Calculation Title	Rain Garden Design 1	YZ	14/11/2025	MS

Flow Rate for Water Quality Treatment			
Stormwater WQV	122.10	m³	1/3 Vol of 2-Year 24-Hour Storm (TR20-07 Page 1
Required Storage Volume	0	m³	

Parameters for sizing WQD based on TR20-07

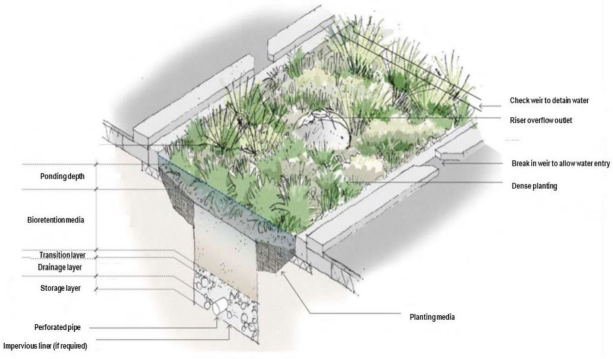
Water Quality Treatment Device (WQD)			
Retention Time of WQD	1.00	days	1Day (TR20-07 Page 155)
Permeability of Bioretention Media (K)	0.75	m/day	0.75m/day (TR20-07 Page 155)
Revised Area from Decreased Depth	AREA OK		0.5 (GD01 C3.2.3.2)
Calculated Area of WQD	138.38	m²	$A = \frac{WQV \times d_{rg}}{k \times (h + d_{rg}) \times t_{rg}}$

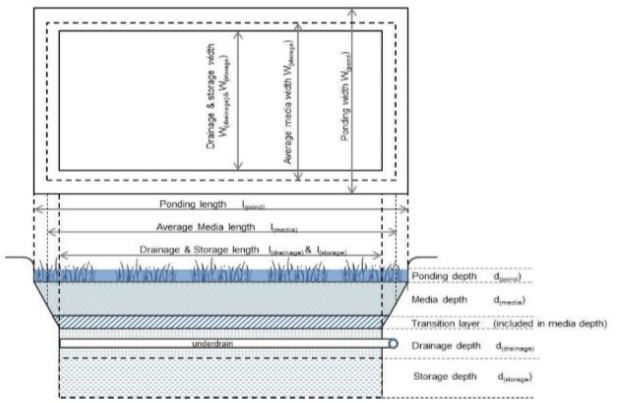
WQD area using rain garden base area for drainage

Rain Garden Capacity		
Device Top Length	69.5	m
Device Top Width	2	m
Side Slope	3	:1 (H:V)
Design Rain Garden Treatment Area	13.54	m²
Required Treatment Area Achieved	124.84	m² needed
Total Attenuation Provided	58.78	m³
Required Storage Volume Achieved	YES	

Rain Garden Dimensions

Ponding Depth	300	mm	300mm max (BOPRC 2012/01 9.5.9 3)
Planting Soil Depth (incl transition)	850	mm	850mm standard (TR20-07 Page 155)
Transition Layer Depth	100	mm	100mm (GD01 C3.2.3.2)
Drainage Layer Depth	300	mm	200-300mm (GD01 C3.2.3.2)
Underdrain Cover Depth	50	mm	50mm minimum (TCC IDC DS-5.5.17.1)





MAVEN ASSOCIATES		Job Number 289001	Sheet 1	Rev A
Job Title	RV DRAINAGE	Author	Date	Checked
Calc Title	Rain Garden Pipe Sizing - RG1	YZ	5/11/2025	

Post development flows

Inflow into raingarden

1/3 of 2yr =	0.008	m^3/s	

Assume no infiltration, therefore outflow must equal inflow

Outlet pipe size =	300	mm	
grade =	10	%	
capacity =	0.306	m^3/s	3%
check	**OK**		

number of underdrains =	1		
underdrain size =	150	mm	
grade =	0.5	%	
capacity =	0.011	m^3/s	
total capacity =	0.010768823	m^3/s	74%
check	**OK**		

Maven ASSOCIATES	Job Number	Sheet	Rev
	289001	2	A

		Author	Date	Checked
Job Title	STATION ROAD - RV			
Calculation Title	Rain Garden Design 2	YZ	14/11/2025	MS

Flow Rate for Water Quality Treatment			
Stormwater WQV	151.70	m³	1/3 Vol of 2-Year 24-Hour Storm (TR20-07 Page 1
Required Storage Volume	0	m³	

Parameters for sizing WQD based on TR20-07

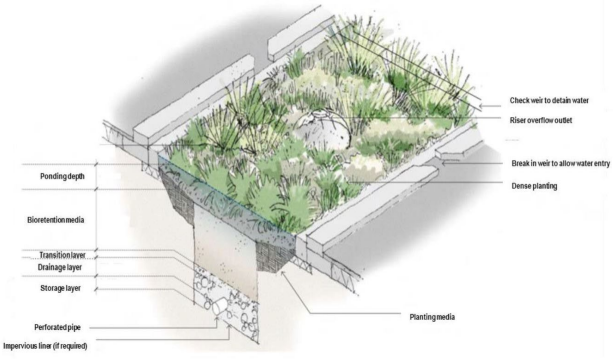
Water Quality Treatment Device (WQD)			
Retention Time of WQD	1.00	days	1Day (TR20-07 Page 155)
Permeability of Bioretention Media (K)	0.75	m/day	0.75m/day (TR20-07 Page 155)
Revised Area from Decreased Depth	AREA OK		0.5 (GD01 C3.2.3.2)
Calculated Area of WQD	171.93	m²	$A = \frac{WQV \times d_{rg}}{k \times (h + d_{rg}) \times t_{rg}}$

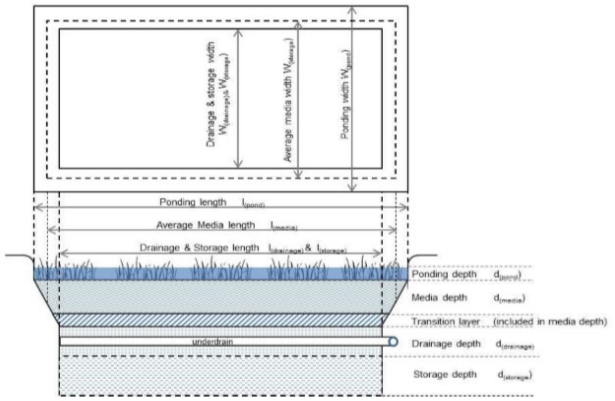
WQD area using rain garden base area for drainage

Rain Garden Capacity		
Device Top Length	43.0	m
Device Top Width	4	m
Side Slope	3	:1 (H:V)
Design Rain Garden Treatment Area	90.64	m²
Required Treatment Area Achieved	81.29	m² needed
Total Attenuation Provided	116.25	m³
Required Storage Volume Achieved	YES	

Rain Garden Dimensions

Ponding Depth	300	mm	300mm max (BOPRC 2012/01 9.5.9 3)
Planting Soil Depth (incl transition)	850	mm	850mm standard (TR20-07 Page 155)
Transition Layer Depth	100	mm	100mm (GD01 C3.2.3.2)
Drainage Layer Depth	300	mm	200-300mm (GD01 C3.2.3.2)
Underdrain Cover Depth	50	mm	50mm minimum (TCC IDC DS-5.5.17.1)





MAVEN ASSOCIATES		Job Number 289001	Sheet 1	Rev A
Job Title	RV DRAINAGE	Author	Date	Checked
Calc Title	Rain Garden Pipe Sizing - RG2	YZ	5/11/2025	

Post development flows

Inflow into raingarden

1/3 of 2yr =	0.010	m^3/s	

Assume no infiltration, therefore outflow must equal inflow

Outlet pipe size =	300	mm	
grade =	0.5	%	
capacity =	0.068	m^3/s	15%
check	**OK**		

number of underdrains =	1		
underdrain size =	150	mm	
grade =	0.5	%	
capacity =	0.011	m^3/s	
total capacity =	0.010768823	m^3/s	93%
check	**OK**		

Maven ASSOCIATES	Job Number	Sheet	Rev
	289001	3	A

		Author	Date	Checked
Job Title	STATION ROAD - RV			
Calculation Title	Rain Garden Design 3	YZ	14/11/2025	MS

Flow Rate for Water Quality Treatment			
Stormwater WQV	328.70	m³	1/3 Vol of 2-Year 24-Hour Storm (TR20-07 Page 1
Required Storage Volume	0	m³	

Parameters for sizing WQD based on TR20-07

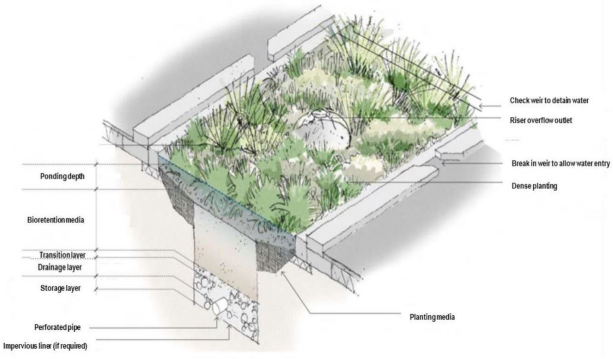
Water Quality Treatment Device (WQD)			
Retention Time of WQD	1.00	days	1Day (TR20-07 Page 155)
Permeability of Bioretention Media (K)	0.75	m/day	0.75m/day (TR20-07 Page 155)
Revised Area from Decreased Depth	AREA OK		0.5 (GD01 C3.2.3.2)
Calculated Area of WQD	372.53	m²	$A = \frac{WQV \times d_{rg}}{k \times (h + d_{rg}) \times t_{rg}}$

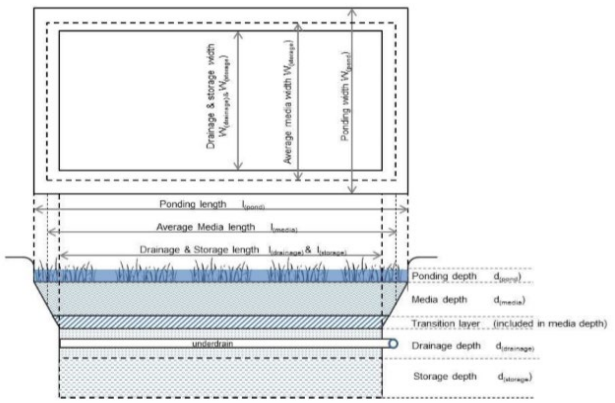
WQD area using rain garden base area for drainage

Rain Garden Capacity		
Device Top Length	86.0	m
Device Top Width	2	m
Side Slope	3	:1 (H:V)
Design Rain Garden Treatment Area	16.84	m²
Required Treatment Area Achieved	355.69	m² needed
Total Attenuation Provided	72.80	m³
Required Storage Volume Achieved	YES	

Rain Garden Dimensions

Ponding Depth	300	mm	300mm max (BOPRC 2012/01 9.5.9 3)
Planting Soil Depth (incl transition)	850	mm	850mm standard (TR20-07 Page 155)
Transition Layer Depth	100	mm	100mm (GD01 C3.2.3.2)
Drainage Layer Depth	300	mm	200-300mm (GD01 C3.2.3.2)
Underdrain Cover Depth	50	mm	50mm minimum (TCC IDC DS-5.5.17.1)





MAVEN ASSOCIATES		Job Number 289001	Sheet 1	Rev A
Job Title	RV DRAINAGE	Author	Date	Checked
Calc Title	Rain Garden Pipe Sizing - RG3	YZ	5/11/2025	

Post development flows

Inflow into raingarden

1/3 of 2yr =	0.021	m^3/s	

Assume no infiltration, therefore outflow must equal inflow

Outlet pipe size =	300	mm	
grade =	0.5	%	
capacity =	0.068	m^3/s	31%
check	**OK**		

number of underdrains =	1		
underdrain size =	200	mm	
grade =	0.5	%	
capacity =	0.023	m^3/s	
total capacity =	0.023191999	m^3/s	91%
check	**OK**		

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title Calc Title	STATION ROAD - RV Catchment Areas	Author LP	Date 10/11/2025	Checked MHS

Wetland 1 Catchment	ha	Area (m2)	% impervious
catchment	10.3531	103531	60%

MAVEN	**Maven Associates**		**Job Number** 289001	**Sheet** 1	**Rev: A**
Job Title	**STATION ROAD - RV**		**Author**	**Date**	**Checked**
Calc Title	**Pre-development**		**LP**	**10/11/2025**	**MHS**

Wetland 1
Total Catchment 103531

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (100%)	74	10.35	766.13
C		Impervious (0%)	98	0.00	0.00
					0.00
			Totals =	10.35	766.13

CN (weighted) = total product / total area = 766.13 / 10.353 = **74.0**

S= $\left(\frac{1000}{CN} - 10\right) * 25.4$ $\frac{(1000 - 10) * 25.4}{74.0}$ = **89.2** mm

Ia= 0.05*S 0.05x 89.2 = **4.5** mm

2. Time of Concentration
Unnecessary for volume calculations

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001.00	Sheet 2	Rev: A
Job Title	STATION ROAD - RV	Author	Date	Checked
Calc Title	Pre-development	LP	10/11/2025	MSH

1. Data

Catchment Area	A=	0.103531	km2(100ha =1km2)
Runoff curve number	CN=	74.0	(from worksheet 1)
Initial abstraction	Ia=	4.5	mm (from worksheet 1)
Time of concentration	tc=	0.00	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 89 mm

	WQV					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24	27.3	(mm)	82	127	198	(mm)
*as per HIRDS Historical data						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.093		0.290	0.398	0.514	
6. Specific peak flow rate q*	0.029		0.082	0.106	0.127	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.083**	m^3/s	**0.698**	**1.390**	**2.597**	m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	4.7		36.0	70.9	132.5	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	483	m^3	**3732.08**	**7340.47**	**13713.61**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001.00	Sheet 1	Rev: A
Job Title Calc Title	STATION ROAD - RV Post development (Pervious)		Author LP	Date 10/11/2025	Checked MHS

Wetland 1
Total Catchmen 103531

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (40%)	74	4.14	306.45
C		Impervious (60%)	98		0.00
					0.00
			Totals =	4.14	306.45

CN (weighted) = total product / total area = 306.45 / 4.141 = **74.0**

S= (1000/CN -10) * 25.4 = (1000 - 10) *25.4 / 74.0 = **89.2** mm

Ia= 0.05*S = 0.05x 89.2 = **4.5** mm

2. Time of Concentration

Unnecessary for volume calculations

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001.00	Sheet 2		Rev: B
Job Title Calc Title	STATION ROAD - RV Post development (Pervious)	Author LP	Date 10/11/2025		Checked MHS

1. Data
   Catchment Area A= 0.0414124 km2(100ha =1km2)

   Runoff curve number CN= 74.0 (from worksheet 1)

   Initial abstraction Ia= 4.5 mm (from worksheet 1)

   Time of concentration tc= 0.00 hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 89 mm

	WQV		RCP 8.5			RCP8.5	
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	100	
4. 24 hour rainfall depth, P24	35.0	(mm)	105	166.1		262.7	(mm)
*as per RITS v2b RCP8.5 adjustment							
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S			Unnecessary for volume calculations				
6. Specific peak flow rate q*			Unnecessary for volume calculations				
7. Peak flow rate, q_p=q*A*P_{24}		m^3/s	Unnecessary for volume calculations				m^3/s
8. Runoff depth, Q_{24} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	7.8		53.3	104.1	0.2	191.9	
9. Runoff volume, V_{24} = 1000xQ_{24}A	322	m^3	**2205.65**	**4312.69**	**9.73**	**7947.65**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title Calc Title	STATION ROAD - RV Post development (Impervious)		Author LP	Date 10/11/2025	Checked MHS

Wetland 1
Total Catchmen 103531

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (40%)	74		0.00
C		Impervious (60%)	98	6.21	608.76
					0.00
			Totals =	6.21	608.76

CN (weighted) = total product / total area = 608.76 / 6.212 = **98.0**

S= (1000/CN -10) * 25.4 = (1000 - 10) *25.4 / 98.0 = **5.2** mm

Ia= 0.05*S = 0.05x 5.2 = **0.3** mm

2. Time of Concentration

Unnecessary for volume calculations

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001.00	Sheet 2		Rev: B
Job Title Calc Title	STATION ROAD - RV Post development (Impervious)	Author LP	Date 10/11/2025		Checked MHS

1. Data

Catchment Area	A=	0.0621186	km2(100ha =1km2)	
Runoff curve number	CN=	98.0	(from worksheet 1)	
Initial abstraction	Ia=	0.3	mm (from worksheet 1)	
Time of concentration	tc=	0.00	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 5 mm

	WQV		RCP 8.5			RCP8.5	
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	100	yr
4. 24 hour rainfall depth, P24	35.0	(mm)	105	166.1		262.7	(mm)
*as per HIRDS RCP 6.0 2081-2100 data							
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S			Unnecessary for volume calculations				
6. Specific peak flow rate q*			Unnecessary for volume calculations				
7. Peak flow rate, $q_p=q^*A^*P_{24}$		m^3/s	Unnecessary for volume calculations				m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	30.2		99.8	160.8	0.0	257.4	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1878	m^3	**6199.53**	**9989.56**	**0.85**	**15986.69**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 289001	Sheet 1	Rev: A
Job Title: STATION ROAD - RV Calc Title: Post development (whole site)	Author: LP	Date: 10/11/2025	Checked: MHS

Wetland 1
Total Catchmer 103531

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (40%)	74	4.14	306.45
C		Impervious (60%)	98	6.21	608.76
					0.00
			Totals =	10.35	915.21

CN (weighted) = total product / total area = 915.21 / 10.353 = **88.4**

S= (1000/CN -10) * 25.4 = (1000/88.4 - 10) *25.4 = **33.3** mm

Ia= 0.05*S = 0.05x 33.3 = **1.7** mm

2. Time of Concentration

Unnecessary for volume calculations

MAVEN	**Maven Associates**	**Job Number** **289001.00**	**Sheet** **2**		**Rev: B**
Job Title **Calc Title**	**STATION ROAD - RV** **Post development (whole site)**	**Author** **LP**	**Date** **10/11/2025**		**Checked** **MHS**

1. Data

Catchment Area A= 0.103531 km2(100ha =1km2)

Runoff curve number CN= 88.4 (from worksheet 1)

Initial abstraction Ia= 1.7 mm (from worksheet 1)

Time of concentration tc= #REF! hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 33 mm

		WQV		RCP 8.5			RCP8.5	
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	100	yr
4. 24 hour rainfall depth, P24	26.25	35.0	105	166.1		262.7	(mm)
*as per HIRDS RCP 6.0 2081-2100 data							
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.256	0.322	0.604	0.709	-0.053	0.796	
6. Specific peak flow rate q*	0.074	0.090	0.140	0.152	-0.018	0.159	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.201**	**0.324**	**1.520**	**2.613**	**0.000**	**4.328**	m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$							
9. Runoff volume, $V_{24} = 1000xQ_{24}A$							m^3

Pre development run off volume	3732.08	7340.47	13713.61	13713.61	m^3
Post development run off volume - Pervious	2205.65	4312.69	9.73	7947.65	m^3
Post development run off volume - Impervious	6199.53	9989.56	0.85	15986.69	m^3
Post development run off volume - total	8405.18	14302.25	10.57	23934.35	m^3
		6961.78		10220.73	
Pre development flow rate	0.70	1.39	2.60	2.60	m^3/s
Post development flow rate	1.52	2.61	0.00	4.33	m^3/s

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001.00	Sheet 2	Rev: A
Job Title Calc Title	STATION ROAD - RV WQV and ED	Author LP	Date 10/11/2025	Checked MHS

1. Data

Runoff volume (pervious)	V_p=	322	m^3	
Runoff volume (impervious)	V_{ip}=	1878	m^3	
Combined volume	V=	2200.3	m^3	
Pre-development initial abstration	I_{a1}=	4.5	mm	
Post-development compacted pervious area CN		80		Class D
Post-development initial abstration of pervious area	I_{a2}=	3.2	mm	
Post development Impervious lot roof area (40% of lot)	A_{ip}=		ha.	Assume no reduction for WQV on lot
Post development compacted pervious areas	A_{pp}=		ha.	

2. Retention reduction

Impervious surface retention	Vrip=	0.0	m^3
Pervious surface retention	Vrp=	0.0	m^3

3. Water Quality Volume WQV= 2200.3 m^3

4. Extended Detention Volume ED= 2640 m^3

Worksheet 2: Graphical Peak Flow Rate

MAVEN	**Maven Associates**	**Job Number** 289001	**Sheet** 1	**Rev: A**
Job Title	**STATION ROAD - RV**	**Author**	**Date**	**Checked**
Calc Title	**Catchment Areas**	**LP**	**10/11/2025**	**MHS**

Stormwater Wetland2 Catchments		Area (m2)	% impervious
catchment	5.497	54970	60%

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title: STATION ROAD - RV Calc Title: Pre-development		Author: MHS	Date	Checked

Wetland 2
Total Catchment 54970

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (100%)	74	5.50	406.78
C		Impervious (0%)	98	0.00	0.00
					0.00
			Totals =	5.50	406.78

CN (weighted) = total product / total area = 406.78 / 5.497 = **74.0**

S= $\left(\frac{1000}{CN} - 10\right) * 25.4$ $\frac{(1000 - 10) * 25.4}{74.0}$ = **89.2** mm

Ia= 0.05*S 0.05x 89.2 = **4.5** mm

2. Time of Concentration
Unnecessary for volume calculations

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001.00	Sheet 2	Rev: B
Job Title	STATION ROAD - RV	Author	Date	Checked
Calc Title	Pre-development	LP	10/11/2025	MHS

1. Data

Catchment Area	A=	0.05497	km2(100ha =1km2)
Runoff curve number	CN=	74.0	(from worksheet 1)
Initial abstraction	Ia=	4.5	mm (from worksheet 1)
Time of concentration	tc=	0.00	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 89 mm

	WQV					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24	27.3	(mm)	82	127	198	(mm)
*as per HIRDS Historical data						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.093		0.290	0.398	0.514	
6. Specific peak flow rate q*	0.029		0.082	0.106	0.127	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.044**	m^3/s	**0.371**	**0.738**	**1.379**	m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	4.7		36.0	70.9	132.5	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	256	m^3	**1981.56**	**3897.44**	**7281.27**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001.00	Sheet 1	Rev: A
Job Title Calc Title	STATION ROAD - RV Post development (Pervious)		Author LP	Date 10/11/2025	Checked MHS

Wetland 2
Total Catchmen 54970

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (40%)	74	2.20	162.71
C		Impervious (60%)	98		0.00
					0.00
			Totals =	2.20	162.71

CN (weighted) = total product / total area = 162.71 / 2.199 = **74.0**

S= (1000 / CN -10) * 25.4 = (1000 - 10) *25.4 / 74.0 = **89.2** mm

Ia= 0.05*S = 0.05x 89.2 = **4.5** mm

2. Time of Concentration

Unnecessary for volume calculations

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001.00	Sheet 2		Rev: B
Job Title Calc Title	STATION ROAD - RV Post development (Pervious)	Author LP	Date 10/11/2025		Checked MHS

1. Data

Catchment Area	A=	0.021988	km2(100ha =1km2)
Runoff curve number	CN=	74.0	(from worksheet 1)
Initial abstraction	Ia=	4.5	mm (from worksheet 1)
Time of concentration	tc=	0.00	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 89 mm

	WQV		RCP 8.5			RCP8.5	
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	100	
4. 24 hour rainfall depth, P24	35.0	(mm)	105	166.1		262.7	(mm)
*as per HIRDS RCP 6.0 2081-2100 data							
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S			Unnecessary for volume calculations				
6. Specific peak flow rate q*			Unnecessary for volume calculations				
7. Peak flow rate, $q_p=q^*A^*P_{24}$		m^3/s	Unnecessary for volume calculations				m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	7.8		53.3	104.1	0.2	191.9	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	171	m^3	**1171.09**	**2289.83**	**5.16**	**4219.82**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title: STATION ROAD - RV Calc Title: Post development (Impervious)		Author: LP	Date: 10/11/2025	Checked: MHS

Wetland 2
Total Catchmen 54970

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (40%)	74		0.00
C		Impervious (60%)	98	3.30	323.22
					0.00
			Totals =	3.30	323.22

CN (weighted) = total product / total area = 323.22 / 3.298 = **98.0**

S= (1000/CN -10) * 25.4 = (1000 - 10) *25.4 / 98.0 = **5.2** mm

Ia= 0.05*S = 0.05x 5.2 = **0.3** mm

2. Time of Concentration

Unnecessary for volume calculations

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001.00	Sheet 2		Rev: B
Job Title Calc Title	STATION ROAD - RV Post development (Impervious)	Author LP	Date 10/11/2025		Checked MHS

1. Data

Catchment Area	A=	0.032982	km2(100ha =1km2)
Runoff curve number	CN=	98.0	(from worksheet 1)
Initial abstraction	Ia=	0.3	mm (from worksheet 1)
Time of concentration	tc=	0.00	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 5 mm

	WQV		RCP 8.5			RCP8.5	
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	100	yr
4. 24 hour rainfall depth, P24	35.0	(mm)	105	166.1		262.7	(mm)
*as per HIRDS RCP 6.0 2081-2100 data							
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S			Unnecessary for volume calculations				
6. Specific peak flow rate q*			Unnecessary for volume calculations				
7. Peak flow rate, $q_p=q^*A^*P_{24}$		m^3/s	Unnecessary for volume calculations				m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	30.2		99.8	160.8	0.0	257.4	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	997	m^3	**3291.66**	**5303.98**	**0.45**	**8488.17**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 289001	Sheet 1	Rev: A
Job Title / Calc Title: STATION ROAD - RV / Post development (whole site)	Author LP	Date 10/11/2025	Checked MHS

Wetland 2
Total Catchmer 54970

1. Runoff Curve Number (CN) and initial Abstraction (Ia) CALCS to WRC TR2020/06

Soil name and classification	ID	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1 ha	Product of CN x area
C		Pervious (40%)	74	2.20	162.71
C		Impervious (60%)	98	3.30	323.22
					0.00
			Totals =	5.50	485.93

CN (weighted) = total product / total area = 485.93 / 5.497 = **88.4**

S= (1000/CN -10) * 25.4 = (1000/88.4 - 10) *25.4 = **33.3** mm

Ia= 0.05*S = 0.05x 33.3 = **1.7** mm

2. Time of Concentration

Unnecessary for volume calculations

Maven Associates		Job Number 289001.00	Sheet 2		Rev: B
Job Title Calc Title	STATION ROAD - RV Post development (whole site)	Author LP	Date 10/11/2025		Checked MHS

1. Data

Catchment Area	A=	0.05497	km2(100ha =1km2)
Runoff curve number	CN=	88.4	(from worksheet 1)
Initial abstraction	Ia=	1.7	mm (from worksheet 1)
Time of concentration	tc=	0.00	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 33 mm

	WQV		RCP 8.5			RCP8.5	
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	100	yr
4. 24 hour rainfall depth, P24	26.25	35.0	105	166.1		262.7	(mm)
*as per HIRDS RCP 6.0 2081-2100 data							
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.256	0.322	0.604	0.709	-0.053	0.796	
6. Specific peak flow rate q*	0.074	0.090	0.140	0.152	-0.018	0.159	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.107**	**0.172**	**0.807**	**1.388**	**0.000**	**2.298**	m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$							
9. Runoff volume, $V_{24} = 1000xQ_{24}A$							m^3

Pre development run off volume	1981.56	3897.44	7281.27	7281.27	m^3
Post development run off volume - Pervious	1171.09	2289.83	5.16	4219.82	m^3
Post development run off volume - Impervious	3291.66	5303.98	0.45	8488.17	m^3
Post development run off volume - total	4462.75	7593.81	5.61	12707.99	m^3
		3696.37		5426.72	
Pre development flow rate	0.37	0.74	1.38	1.38	m^3/s
Post development flow rate	0.81	1.39	0.00	2.30	m^3/s

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001.00	Sheet 2	Rev: A
Job Title Calc Title	STATION ROAD - RV WQV and ED	Author LP	Date 10/11/2025	Checked MHS

1. Data

Runoff volume (pervious)	V_p=	171	m^3	
Runoff volume (impervious)	V_{ip}=	997	m^3	
Combined volume	V=	1168.2	m^3	
Pre-development initial abstration	I_{a1}=	4.5	mm	
Post-development compacted pervious area CN		80		Class D
Post-development initial abstration of pervious area	I_{a2}=	3.2	mm	
Post development Impervious lot roof area	A_{ip}=		ha.	Assume no reduction for WQV at lot
Post development compacted pervious areas	A_{pp}=		ha.	

2. Retention reduction

Impervious surface retention	Vrip=	0.0	m^3
Pervious surface retention	Vrp=	0.0	m^3

3. Water Quality Volume — WQV= 1168.2 m^3

4. Extended Detention Volume — ED= 1402 m^3

Worksheet 2: Graphical Peak Flow Rate

MAVEN ASSOCIATES	Job Number 289001	Sheet 1	Rev A
Job Title / Calc Title: RV / Wetland 1 Outlet design	Author LP	Date 10-Nov	Checked MHS

Refer TR202006 Wetland WQV 2yr 100yr for volume and flow rate calculations.

Wetland 1

Refer Hec report for modelling and Flow rates

SUMMARY TABLE - VOLUMES

Actual WQV	2200	m3	Taking permanent water depth x wetland area
Actual ED	2640	m^3	1.2WQV
Designed ED	2640	m^3	From model; OK

LEVELS

PWL.	65.2	m	
EDV el.	65.55	m	Set to 350mm above PWL per ICMP
2yr el.	65.85	m	Set 300mm above EDV
Q2 post	1.52	m^3/s	See "TR202006 Wetland WQV 2yr 100yr" for calculations

Calc. 1: Extended Detention Orifice

Outlet to be sized to release the EDV over a 24-hour period

Qed = 2640 per 24 hours
0.03 m3/s

At full EDV elev., maximum release rate is assumed to be Qmax = 2Qed

Qmax = 0.061 m3/s

Vol. of storage savings can be realised if edv is determined by routing flow through the pond

Qi = 0.62A(2gh)&0.5 where A = area of ED orifice

orifice dia	0.240	m	
A =	0.0452389	m	
h =	0.23	m	
Qi =	0.060	m3/s	OK

Use 240 mm orifice

Outpool 2YR spillway design

(this is more representative for spillway to a channel)

Q $0.57\ (2g)^{1/2}\ (2/3Lh^{3/2} + 8/15Zh^{5/2})$

Where

Q=	discharge through the spillway	m3/s	
L =	horizontal bottom width of the spillway	m	
h =	depth of design flow	m	
z=	horizontal/vertical side slope (recommended t		

Q=	1.43	m3/s	(Q2 post - Qi 2yr)
Q=	1.4409626	m3/s	
h=	0.3	m	
z=	3		1V:3H slope
L=	4.49	m	trial and error **OK**

Min. Weir width = **L= 4.5 m**

MAVEN ASSOCIATES	Job Number 180006	Sheet 1	Rev A
Job Title / Calc Title: RV / Wetland 2 Outlet design	Author LP	Date 10-Nov	Checked MHS

Refer TR202006 Wetland WQV 2yr 100yr for volume and flow rate calculations.

Wetland 2

Refer Hec report for modelling and Flow rates

SUMMARY TABLE - VOLUMES

Actual WQV	**1168**	m3	Taking permanent water depth x wetland area
Actual ED	1402	m^3	1.2WQV
Designed ED	1595	m^3	From model; OK

LEVELS

PWL.	65.5	m	
EDV el.	65.85	m	Set to 350mm above PWL per ICMP
2yr el.	66.15	m	Set 300mm above EDV
Q2 post	0.81	m^3/s	See "TR202006 Wetland WQV 2yr 100yr" for calculations

Calc. 1: Extended Detention Orifice

Outlet to be sized to release the EDV over a 24-hour period

Qed = 1402 per 24 hours

0.02 m3/s

At full EDV elev., maximum release rate is assumed to be Qmax = 2Qed

Qmax = 0.032 m3/s

Vol. of storage savings can be realised if edv is determined by routing flow through the pond

Qi = 0.62A(2gh)&0.5 where A = area of ED orifice

orifice dia	0.176	m	
A =	0.0243081	m	
h =	0.2620368	m	
Qi =	0.034	m3/s	too large

Use 176 mm orifice

Outpool 2YR spillway design

(this is more representative for spillway to a channel)

Q $0.57\ (2g)^{1/2}\ (2/3Lh^{3/2} + 8/15Zh^{5/2})$

Where

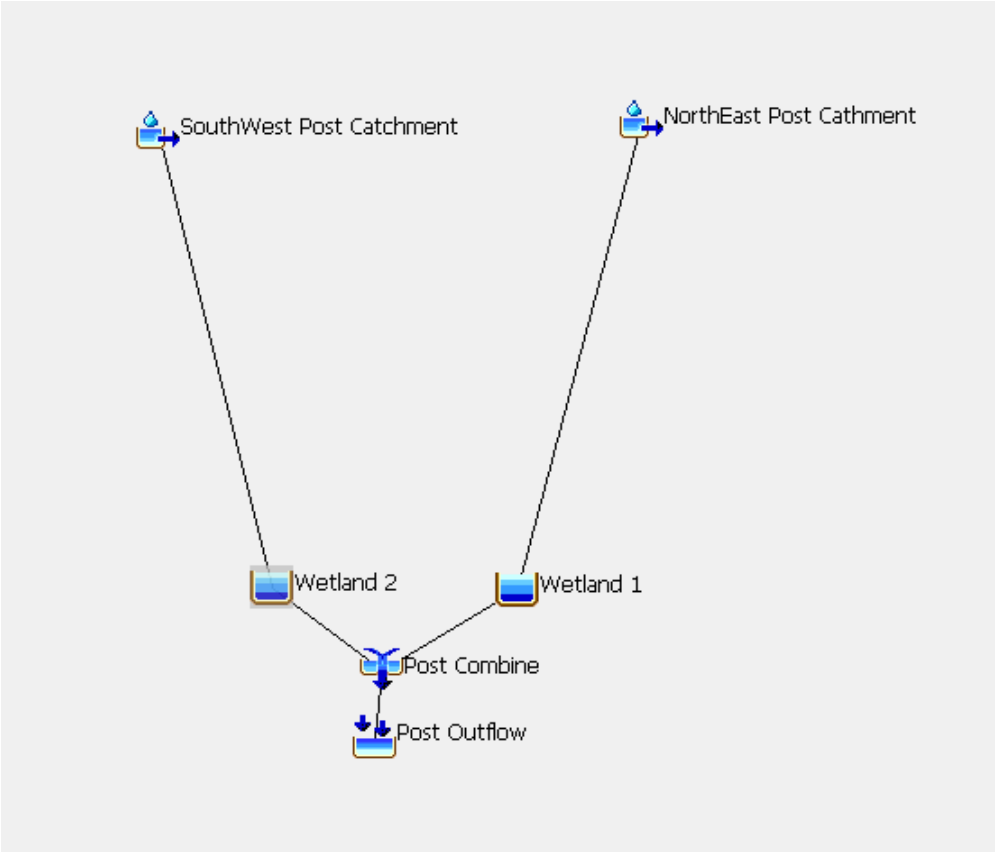
Q=	discharge through the spillway	m3/s
L =	horizontal bottom width of the spillway	m
h =	depth of design flow	m
z=	horizontal/vertical side slope (recommended t	

Q= 0.76 m3/s (Q2 post - Qi 2yr)

Q=	0.79	m3/s	
h=	0.3	m	
z=	3		1V:3H slope
L=	2.14	m	trial and error **OK**

Min. Weir width = **L= 2.2 m**

HEC-HMS Summary Report



Basin Model – Post Development

Wetland 1 and 2 10year Results

Global Summary Results for Run "10Yr TP108 - no ed"

Project: PV Post only updated 2 Simulation Run: 10Yr TP108 - no ed

Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: DATA CHANGED, RECOMPUTE

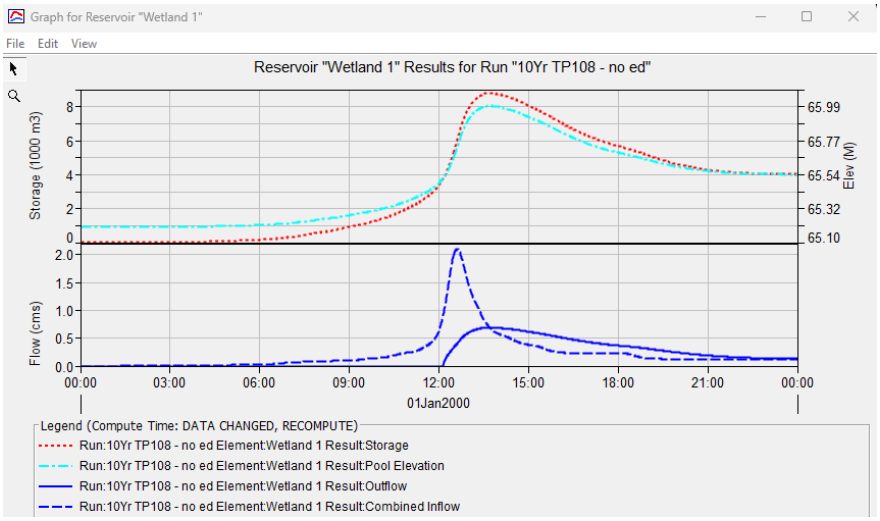
Basin Model: RV Development no ED
Meteorologic Model: Met 10Yr
Control Specifications: TP108 24H

Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Post Combine	0.27919	0.98898	1 January 2000, 13:40	23.66626
Post Outflow	0.27919	0.98898	1 January 2000, 13:40	23.66626
SouthWest Post Catchment	0.09160	1.26275	1 January 2000, 12:23	9.45570
NorthEast Post Cathment	0.18759	2.09892	1 January 2000, 12:36	19.74991
Wetland 1	0.18759	0.69002	1 January 2000, 13:42	15.73227
Wetland 2	0.09160	0.30022	1 January 2000, 13:27	7.93399

10year Post - Summary Result

Wetland 1 – 10yr



Wetland 1 Graph

Summary Results for Reservoir "Wetland 1"

Project: PV Post only updated 2 Simulation Run: 10Yr TP108 - no ed
Reservoir: Wetland 1

Start of Run:	01Jan2000, 00:00	Basin Model:	RV Development no ED
End of Run:	02Jan2000, 00:00	Meteorologic Model:	Met 10Yr
Compute Time:	DATA CHANGED, RECOMPUTE	Control Specifications:	TP108 24H

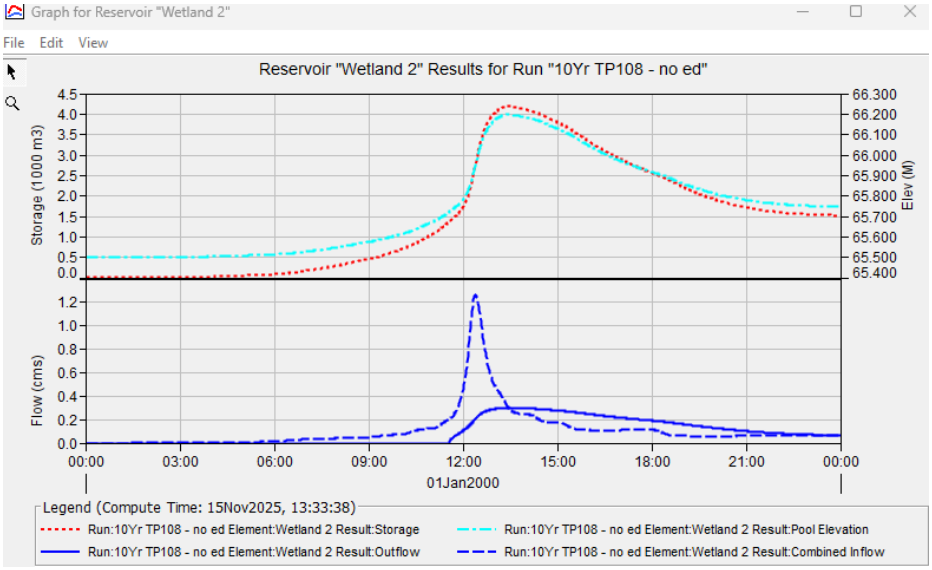
Volume Units: ○ MM ◉ 1000 M3

Computed Results

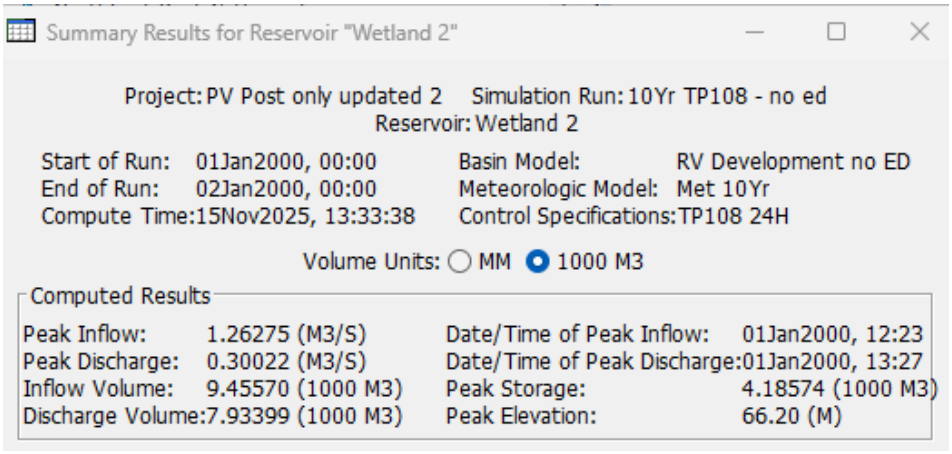
Peak Inflow:	2.09892 (M3/S)	Date/Time of Peak Inflow:	01Jan2000, 12:36
Peak Discharge:	0.69002 (M3/S)	Date/Time of Peak Discharge:	01Jan2000, 13:42
Inflow Volume:	19.74991 (1000 M3)	Peak Storage:	8.79644 (1000 M3)
Discharge Volume:	15.73227 (1000 M3)	Peak Elevation:	65.99 (M)

Summary Result – Wetland 1 10yr

Wetland 2 – 10yr



Wetland 2 – 10yr Graph



Summary Result – Wetland 2 10yr

Wetland 1 and 2 100year Results

Global Summary Results for Run "100Yr TP108 - no ed"

Project: PV Post only updated 2 Simulation Run: 100Yr TP108 - no ed

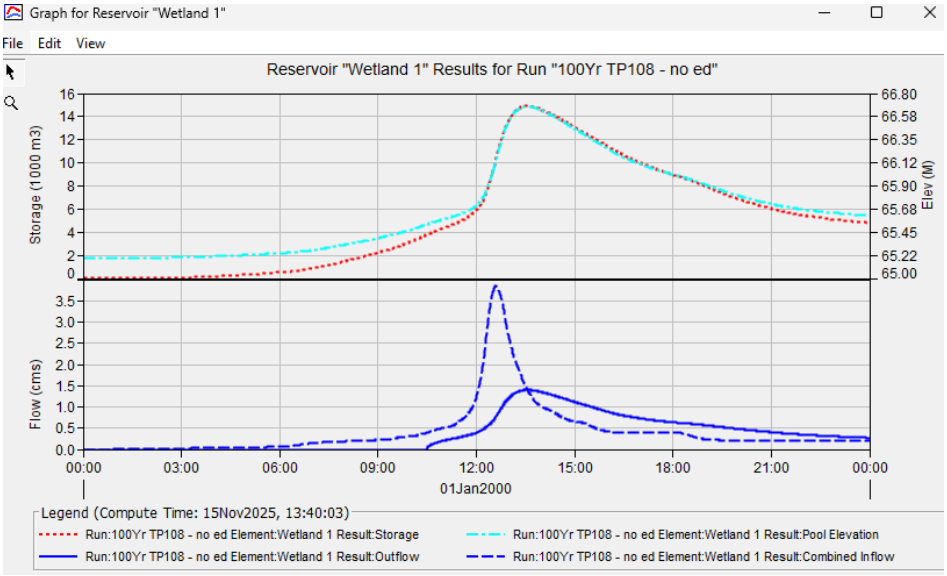
Start of Run: 01Jan2000, 00:00
End of Run: 02Jan2000, 00:00
Compute Time: 15Nov2025, 13:40:03

Basin Model: RV Development no ED
Meteorologic Model: Met 100Yr
Control Specifications: TP108 24H

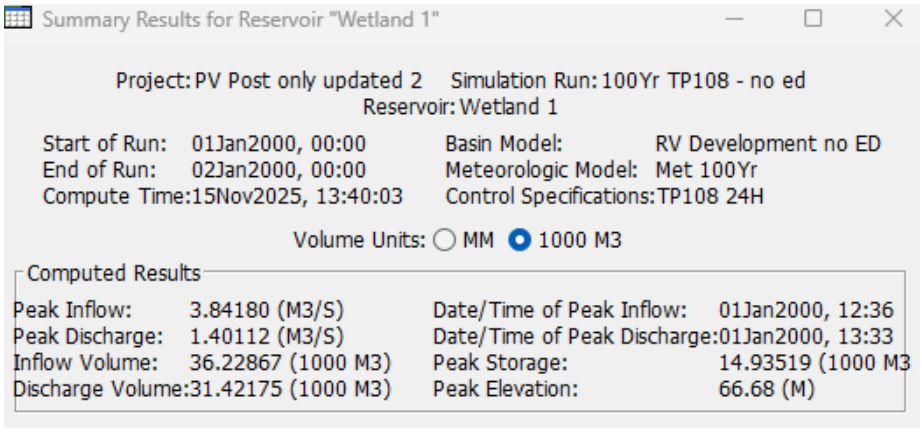
Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Watershed Explorer

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (1000 M3)
Post Combine	0.27919	2.03508	1 January 2000, 13:29	46.86548
Post Outflow	0.27919	2.03508	1 January 2000, 13:29	46.86548
SouthWest Post Catchment	0.09160	2.33055	1 January 2000, 12:23	17.46602
NorthEast Post Cathment	0.18759	3.84180	1 January 2000, 12:36	36.22867
Wetland 1	0.18759	1.40112	1 January 2000, 13:33	31.42175
Wetland 2	0.09160	0.64351	1 January 2000, 13:18	15.44373

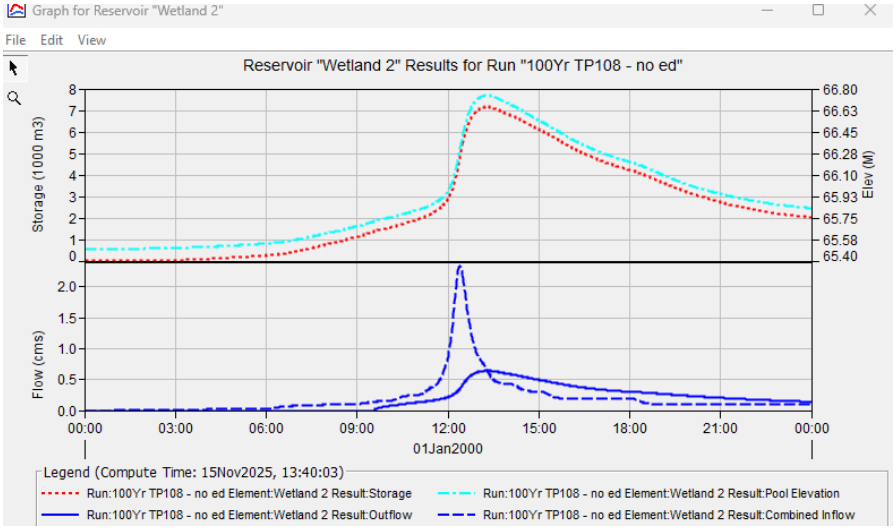
100year Post - Summary Result



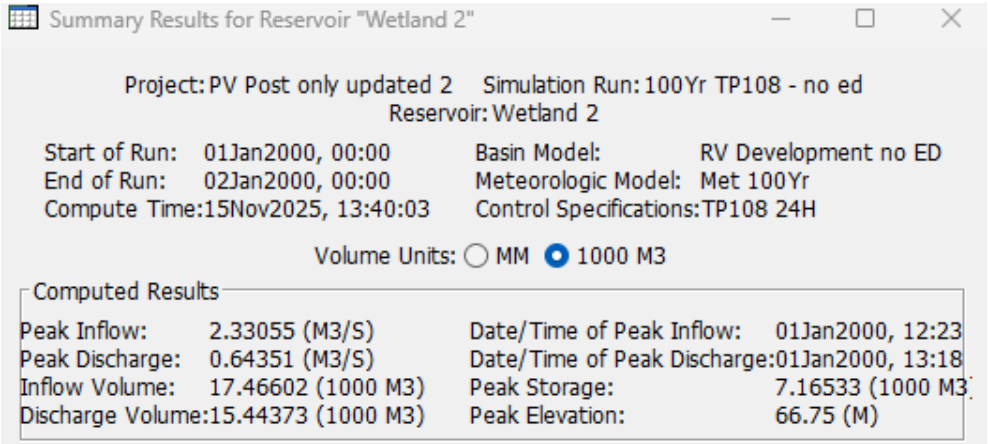
Wetland 1 – 100yr Graph



Summary Result – Wetland 1 100yr



Wetland 2– 100yr Graph



Summary Result – Wetland 2 100yr

Summary Proposal Wetland 1 and 2

Wetland 1 Orifice and Spillway

- 650mm @ outlet IL: 65.20m
- Spillway IL 65.99m and Length 0.45m

Wetland 2 Orifices and Spillway

- 450mm Orifice IL: 65.50m
- Spillway IL 66.20m and Length: 0.3m

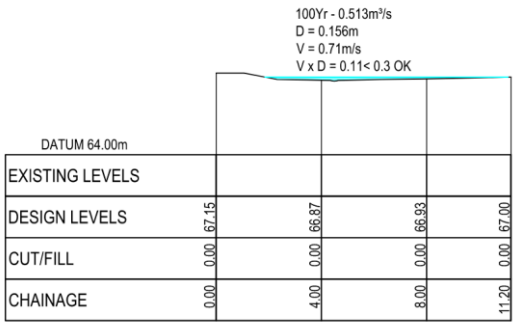
HEC HMS Result summary

		Pre-Dev flow m3/s	Pre-Dev flow (80%), m3/s	Post-Dev flow Hec Hms Result m3/s	
Wetland 1	10 YR	0.869	0.70	0.69	ok
	100 YR	1.78	1.42	1.40	ok
Wetland 2	10 YR	0.394	0.32	0.30	ok
	100 YR	0.807	0.65	0.64	ok

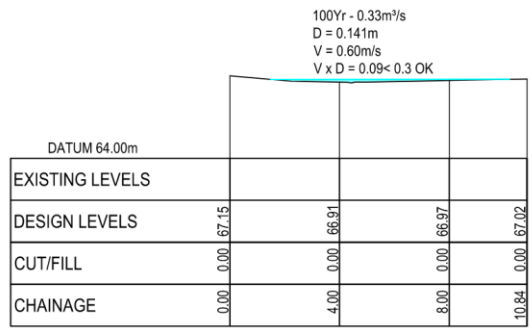
Maven BOP		Job Number J606	Sheet 35	Rev A
Job Title Calc Title	Ashbourne Retirement Village, Matamata Overland Flow Paths	Author SB	Date 17/04/2025	Checked NP

Refer to drawing C4900 Series, which indicates the critical overflow paths for the 100Yr event
This has been designing as a sensitivity check for a 100Yr event without any soakage
We allowed for min of 300mm freeboard as per E1/AS1 on all villas
Manning's n value
Grass 0.03
Road 0.015
Slope of the road was considered
We consider V x D < 0.3 inculding the following parameters
V < 2m/s
D < 0.3m
V x D < 0.3 Low Hazard

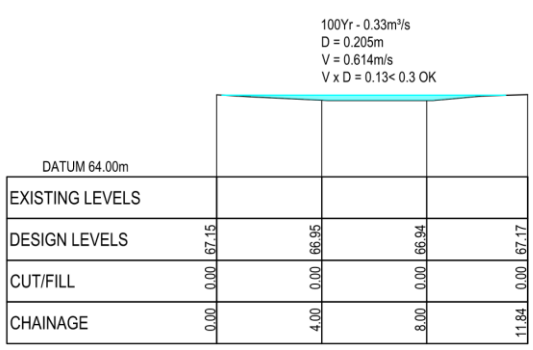
DV (m^2s^{-1})	Infants, small children (H.M ≤ 25) and frail/older persons	Children (H.M = 25 to 50)	Adults (H.M > 50)
0	Safe	Safe	Safe
0 – 0.4		Low Hazard[1]	
0.4 – 0.6		Significant Hazard; Dangerous to most	Low Hazard[1]
0.6 – 0.8	Extreme Hazard; Dangerous to all		Moderate Hazard; Dangerous to some[2]
0.8 – 1.2		Extreme Hazard; Dangerous to all	Significant Hazard; Dangerous to most[3]
> 1.2			Extreme Hazard; Dangerous to all



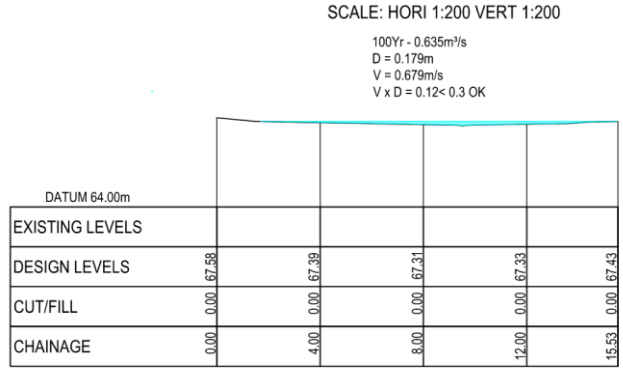
PV - OLF CROSS-SECTION-A
SCALE: HORI 1:200 VERT 1:200



PV - OLF -CROSS-SECTION-B
SCALE: HORI 1:200 VERT 1:200



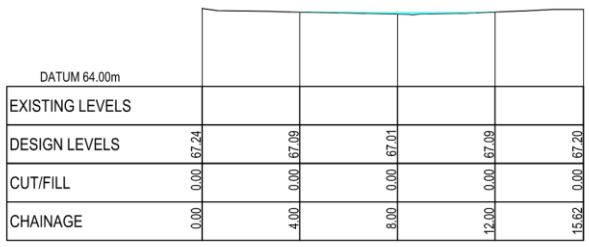
PV - OLF CROSS-SECTION C
SCALE: HORI 1:200 VERT 1:200



PV - OLF-CROSS-SECTION-D
SCALE: HORI 1:200 VERT 1:200

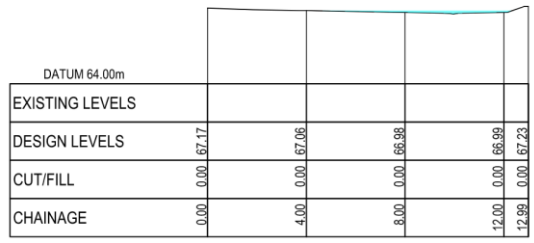
	Maven BOP	Job Number J606	Sheet 36	Rev A
Job Title Calc Title	Ashbourne Retirement Village, Matamata Overland Flow Paths	Author SB	Date 17/04/2025	Checked NP

100Yr - 0.205m³/s
D = 0.125m
V = 0.536m/s
V x D = 0.067< 0.3 OK



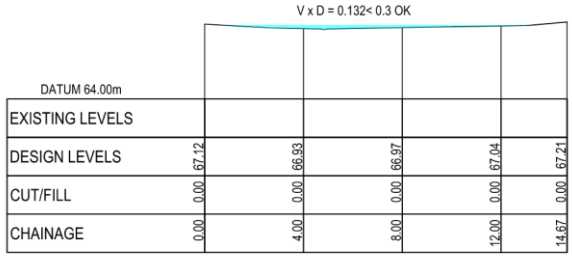
PV - OLF-CROSS-SECTION-E
SCALE: HORI 1:200 VERT 1:200

100Yr - 0.505m³/s
D = 0.128m
V = 0.705m/s
V x D = 0.09< 0.3 OK



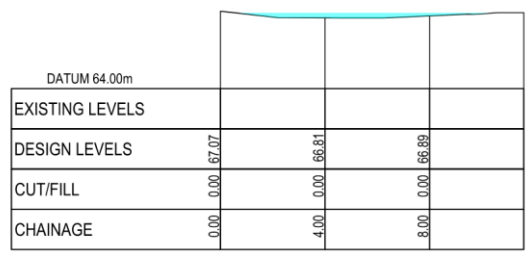
PV - OLF-CROSS-SECTION-F
SCALE: HORI 1:200 VERT 1:200

100Yr - 0.835m³/s
D = 0.191m
V = 0.696m/s
V x D = 0.132< 0.3 OK



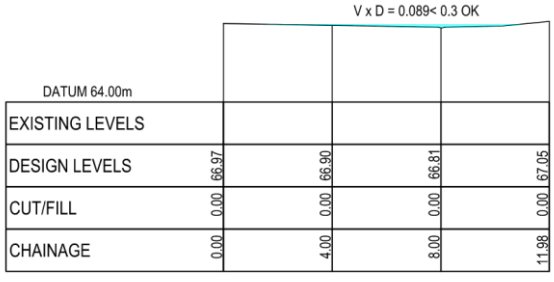
PV - OLF-CROSS-SECTION-G
SCALE: HORI 1:1000 VERT 1:1000

100Yr - 1.24m³/s
D = 0.171m
V = 1.132m/s
V x D = 0.193< 0.3 OK



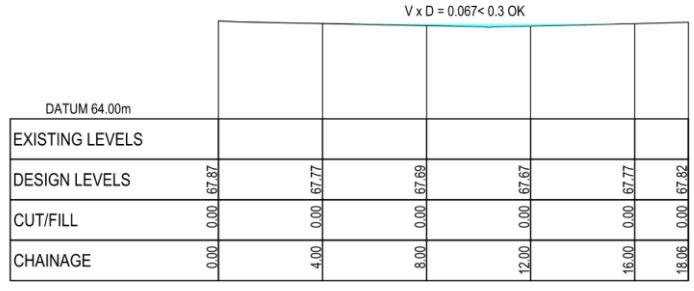
PV - OLF-CROSS-SECTION-H
SCALE: HORI 1:1000 VERT 1:1000

100Yr - 0.371m³/s
D = 0.141m
V = 0.635m/s
V x D = 0.089< 0.3 OK



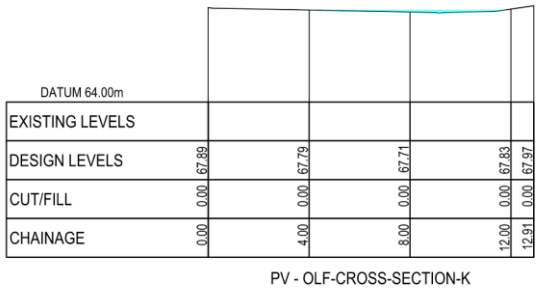
PV - OLF-CROSS-SECTION-I
SCALE: HORI 1:1000 VERT 1:1000

100Yr - 0.270m³/s
D = 0.133m
V = 0.507m/s
V x D = 0.067< 0.3 OK



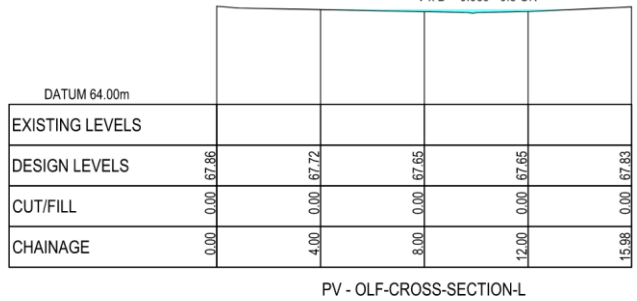
PV - OLF-CROSS-SECTION-J
SCALE: HORI 1:1000 VERT 1:1000

100Yr - 0.330m³/s
D = 0.142m
V = 0.604m/s
V x D = 0.085< 0.3 OK



PV - OLF-CROSS-SECTION-K
SCALE: HORI 1:1000 VERT 1:1000

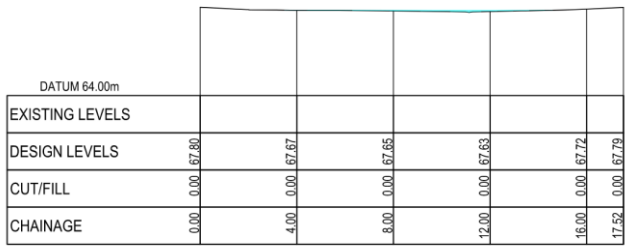
100Yr - 0.250m³/s
D = 0.139m
V = 0.501m/s
V x D = 0.069< 0.3 OK



PV - OLF-CROSS-SECTION-L
SCALE: HORI 1:1000 VERT 1:1000

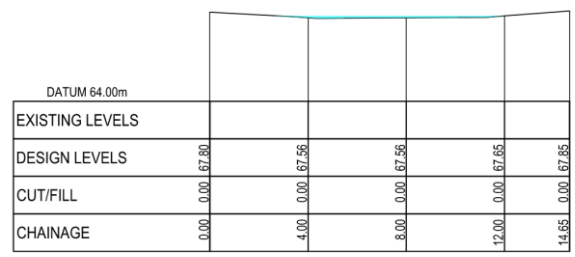
	Maven BOP	Job Number J606	Sheet 37	Rev A
Job Title Calc Title	Ashbourne Retirement Village, Matamata Overland Flow Paths	Author SB	Date 17/04/2025	Checked NP

100Yr - 0.170m³/s
D = 0.097m
V = 0.473m/s
V x D = 0.045< 0.3 OK



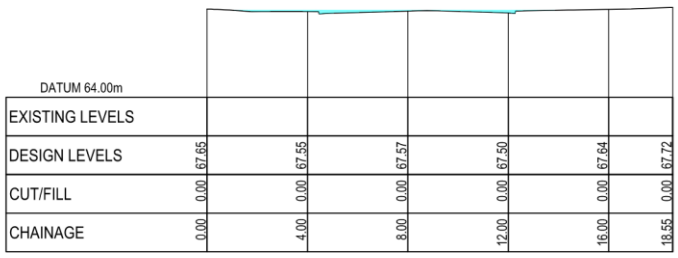
PV - OLF-CROSS SECTION-M
SCALE: HORI 1:200 VERT 1:200

100Yr - 0.320m³/s
D = 0.107m
V = 0.440m/s
V x D = 0.047< 0.3 OK



PV - OLF-CROSS SECTION-N
SCALE: HORI 1:200 VERT 1:200

100Yr - 0.360m³/s
D = 0.149m
V = 0.476m/s
V x D = 0.070< 0.3 OK



PV - OLF-CROSS SECTION-O
SCALE: HORI 1:200 VERT 1:200

Maven BOP	Job Number J00606	Sheet 1	Rev A
Job Title: Ashbourne Retirement Village, Matamata Calc Title: Wastewater Demand Calculations:	Author SB	Date 16/04/2025	Checked NP

As per Waikato Local Authority RITS standards - Clause 5.2.4.2:

Domestic Average Daily Flow (Water Consumption) =	200	*l/person/day*
Infiltration Allowance =	2,250	*l/Ha/day*
Surface Water Ingress =	16,500	*l/Ha/day*
No of dwellings =	218	
Person/dwellings =	2.7	
Retirement village - Person/dwellings =	1.6	

Villas Only, Retirement village will have 1.6x per dwelling

Catchment Area (Villa only)=	14.00	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
	348.8	*persons*
Wastewater Peaking factor as per Table 5-2=	3.7	
Average Daily Flow (ADF)=	101.3	*m³/day*
Peak Daily Flow (PDF)=	3.352	*L/sec*
Peak Wet Weather Flow (PWWF)=	**6.026**	*L/sec*

Facilities - Consider wet retail

Catchment Area (Facilities - wet retail only)=	1.00	*Ha*
Population Equivalent as per Table 5-3=	30	*person per Ha*
	30.0	*persons*
Wastewater Peaking factor as per Table 5-2=	8	
Average Daily Flow (ADF)=	8.25	*m³/day*
Peak Daily Flow (PDF)=	0.582	*L/sec*
Peak Wet Weather Flow (PWWF)=	**0.773**	*L/sec*

Hospital - Night day facilitiy (24h operaion)
As this is more a care facility this number will be able to reduce to 1.6x per bed

Catchment Area (Hospital - Night day facilitiy (24h operaion))=	1.00	*Ha*
Number of Beds in Hospital	72	*Beds*
Population Equivalent as per Table 5-3=	1.6	*person per bed*
	120.0	*persons*
Wastewater Peaking factor as per Table 5-2=	3.5	
Average Daily Flow (ADF)=	26.250	*m³/day*
Peak Daily Flow (PDF)=	0.998	*L/sec*
Peak Wet Weather Flow (PWWF)=	**1.189**	*L/sec*

Summary			
Item	**PDF**	**PWWF**	***m³/day***
Villas	3.35l/s	6.03l/s	101.3
Facilities	0.58l/s	0.77l/s	8.25
Hospital	1.00l/s	1.19l/s	26.250
	4.93l/s	**7.99l/s**	**135.8m³/day**

Maven BOP	Job Number J00606	Sheet 2	Rev A
Job Title: Eldonwood RV, Station Road, Matamata Calc Title: Wastewater Demand Calculations:	Author SB	Date 16/04/2025	Checked NP

Colebrook white

v =	0.000001141	m²/s
Ks (uPVC) =	1.50	mm
g =	9.807	m/s²

PWW Flow	D Pipe dia (D)	J Gradient (J)	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
7.987	0.15	0.55	11.44	0.65	OK
7.987	0.225	0.40	28.76	0.72	OK

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From: Salma Rayan <salma@innoflow.co.nz>
Sent: Wednesday, 27 November 2024 3:23 pm
To: Stoffel Bakkes <StoffelB@maven.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Stoffel,

As discussed, see below budget estimate for a wastewater system based on a gravity sewer inlet (and associated higher wet weather peak flow rates).

Obviously we will refine and confirm all prices as part of detailed design. For the pump station, you will have to provide us the instantaneous flows for us to confirm the design, however, for pricing sake we have assumed 4.2L/s as our peak flows (as we have done at Tamahere & Matamata retirement village for Sanderson group)

Note that we can install the system in stages, but have provided full stage pricing as requested.

For ease, I've provided a table comparing the two options. Prices are excluding GST.

Option	1 Prelos (low pressure system) to AdvanTex WWTP and land application field **Based on: 75,575 L/day**	2 Gravity sewer, pump station AdvanTex WWTP and land application field **Based on: 120,920 L/day**
Inclusion	• 3 x grease traps • 3 x aged care facility pumped septic tanks • 27 x shared residential pumped septic tanks • 1.5km of low pressure sewer • Wastewater treatment plant • 15,115 sqm of dripline irrigation	• 3 x grease traps • Pump station • Wastewater treatment plant • 24,184 sqm of dripline irrigation
Capex	$1.67 million	$1.88 million* *(gravity sewer not included. Allow an amount for this. Last time we did something similar, gravity sewer ~ $1 million, bringing potential cost to $2.88 million for this option)
	$12,000	$15,000

Opex (annual). Preventative maintenance, effluent sample collection, remote monitoring		

Design parameters for gravity sewer option is shown below.

Links to pricing schedules for each option are as follows

- Option 1 (low pressure system WWTS): Ashbourn Retirement Village WWTP Pricing Schedule 20.11.24.pdf
- Option 2 (gravity sewer and conventional pump station WWTS): 2. Ashbourn Retirement Village AX1300 WWTP Pricing Schedule 27.11.24.pdf

Design Parameters

Daily Flows

Source	Number	Occupancy allowance	Total occupancy (pax)	Flow allowance (L/p/day)	Total (L/day)
Villas	218	1.6	349	165	57,585
Aged care hospital	1	72	72	220	15,840
Nurses			4	50	200
Staff			30	50	1,500
Visitors			30	15	450
				Peak dry weather flow (L/day)	75,575
				I&I Factor with Gravity Sewer	1.6
				Peak wet weather flow (L/day)	120,920

Influent Parameters
BOD_5: 490 mg/L
TSS: 550 mg/L
TKN: 77 mg/L

Target Effluent Quality
$cBOD_5$: 15 mg/L
TSS: 15 mg/L
Faecal Coliforms: 200 cfu/100mL

Land Application System
Method: Pressure compensating drip irrigation

Design loading rate: 5 L/sqm
Primary land application area required: 24,184 sqm

Wastewater System Components

Pre and primary treatment

- 3 x 10m^3 grease trap
- Pump station

Secondary and tertiary wastewater treatment

- 12 x 25m^3 septic tank
- 6 x 25m^3 pre-anoxic tank with effluent return pump
- 5 x 25m^3 (stage 1) recirculation tank with dosing pumps
- 10 x (stage 1) AX100 packed bed reactor pods
- 2 x 25m^3 (stage 2) recirculation tank with dosing pumps
- 3 x (stage 2) AX10 packed bed reactor pods
- 5 x 25m^3 treated effluent tank with irrigation pump
- 3 x pulse effluent flow meters
- 1 x UV disinfection unit
- 1 x TCOM

Land Treatment System

- 100m treated effluent rising main
- 2 x 6 sector sequencing valve
- 24,184 lineal meters of pressure compensating dripline irrigation (18 x 1,343 sqm sectors, laid at 1m centres)

Kind Regards

Salma Rayan
Technical Business Development Manager

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From: Stoffel Bakkes <StoffelB@maven.co.nz>
Sent: Wednesday, November 27, 2024 11:19 AM
To: Salma Rayan <salma@innoflow.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Salma

Can you please provide an official quote for the gravity system?
Maven will provide the gravity network to the pump station if Innoflow can take care of the pump station/ pump and the rest of the system.
At this stage, the pipes come in at 2.5 – 3m below EGL, this is the current worst-case hand calc.

Can you also give us a budget for the O&M for both sites per year?

Kind regards

Stoffel Bakkes
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Sent: Friday, 22 November 2024 10:10 am
To: Salma Rayan <salma@innoflow.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Based on the prelos (pumped septic)

From: Salma Rayan <salma@innoflow.co.nz>
Sent: Friday, 22 November 2024 10:08 am
To: Stoffel Bakkes <StoffelB@maven.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: Re: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Based on use of Prelos (pumped septic) or gravity sewer?

Salma Rayan
Technical Business Development Manager

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Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Salma

The O&M for this site, what will be the expected cost per year?
How often do the grinder pumps need to be replaced and what warranty on the pumps?

Cheers

Stoffel Bakkes
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Sent: Thursday, 21 November 2024 11:49 am
To: Stoffel Bakkes <StoffelB@maven.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Stoffel,

The 6,000 L tanks is 2.67m in dia. Obviously will be underground. They can be installed under footpaths so long as there is access, and a self supporting slab on top (to avoid any load on the tank as they are not trafficable).

Are you available at 3pm today to go over the proposal?

Cheers

Salma Rayan
Technical Business Development Manager

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Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Salma

Thank you for the information.

As the site bit constrained in space, what will be the estimated size of footprint size of the pre-treatment septic tank?

We will have a chat with the client and come back if we need any additional information.

Cheers

Stoffel Bakkes
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Sent: Thursday, 21 November 2024 11:23 am
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Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Stoffel,

If you don't have shared primary tanks, then

- Primary treatment tanks at plant
- Wastewater treatment plant and land application system will be sized to be 1.6 x bigger to account for peak wet weather flows
- High level cost difference + $500,000 + GST plus added cost of gravity sewer and wet well

I'll have to spend some time designing this to confirm the cost above, but this is high level

Cheers

Salma Rayan
Technical Business Development Manager

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wastewater specialists

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From: Stoffel Bakkes <StoffelB@maven.co.nz>
Sent: Thursday, November 21, 2024 11:19 AM
To: Salma Rayan <salma@innoflow.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Salma

If we don't have a primary treatment, on a high level what will be the estimated cost?

We will provide gravity flow into a wet well where it will be pumped into your treatment.

Cheers

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To: Stoffel Bakkes <StoffelB@maven.co.nz>
Cc: Matthew Kerse <MatthewK@maven.co.nz>; Shanan Mowatt <ShananM@maven.co.nz>; Dean Morris <DeanM@maven.co.nz>; Brent Hawthorn <brent@innoflow.co.nz>
Subject: RE: J606 MDL - Hemmings Station Rd (Ashbourn retirement village)

Hi Stoffel and team,

Was the below what you are after?

Also, here is a set of drawings to visualise the system components.

Combined- Ashbourn Retirement Village Concept WWTP.pdf

Shout if you have any questions.

Cheers

Salma Rayan
Technical Business Development Manager

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Maven BOP		Job Number J00606	Sheet 1	Rev A
Job Title	Ashbourne Retirement Village, Matamata	Author	Date	Checked
Calc Title	Water Demand Calculations	SB	24/06/2025	NP

Water Catchment

As per RITS Standard 6.2.3:

Pop. Density	2	people per villa
Demand	260	litres/person/day

Demand Rates

Average Demand =	260	litres/person/day
Peak Demand (5x) =	1300	litres/person/day

Population	Dwellings	People	Occupancy
Proposed Dwellings	220	2.0	440
Demand	Persons	Rate (L/p/day)	Flow (L/s)
Average Water Demand	440	260	1.32
Peak Demand	Persons	Rate (L/p/day)	Flow (L/s)
Peak Water Demand	440	1300	**6.62**

Additional commercial usage

Facilities - Consider wet retail

15l per m² 1500m²

Avg Flow = 22500l/day = 0.26l/s

Peak flow 2.5x = **0.65l/s**

Hospital - Night day facilitiy (24h operaion)

Number of beds = 72

630Litres per bed per day

Avg Flow = 45360l/day = 0.53l/s

Peak flow 2.5x = **1.31l/s**

Summary		
Item	**Avg Flow**	**Peak flow**
Villas	1.32l/s	6.62l/s
Facilities	0.26l/s	0.65l/s
Hospital	0.53l/s	1.31l/s
	2.11l/s	**8.58l/s**

Fire Demand - NZS 4509:2008

Villas	FW 2
Facilities	FW 4
Agecare	FW 5

Age Care Hospital and facilities will need their own sprinkler design, that can be connected into the main network

Where structures are fitted with compliant fire sprinkler systems, the required water supply classification is no greater than FW2. NZS 4541 requires the fire sprinkler flows to be delivered concurrently with a flow of 1500 L/min (25 L/s) from the nearest fire hydrants at the pressure determined as part of the sprinkler system design and flow tests. By default a flow test should therefore be available that takes into account the effect of reduced pressure due to consumer demand.

Ref : https://promising-sparkle-d7f0c0cfc9.media.strapiapp.com/cop_water_chapter_8648e958c8.

Table 6.1.b - Other facility design occupancy allowances

Other facility types		*Design water flow allowance*
Hospitals	*Day facility (treatment facilities, wards)*	*320 Litres per bed per day*
	Night and day facility (24-hour operation)	*630 Litres per bed per day*
	Staff	*50 litres per employee per day*
Child day-care	*Children*	*45 Litres per child per day*
	Staff	*50 Litres per employee per day*
School (day students)	*Primary school*	*20 Litres per student per day*
	Secondary school	*25 Litres per student per day*
	Staff	*50 Litres per employee per day*
School (boarding)	*Secondary school*	*160 Litres per student per day*
Student accommodation		*160 Litres per person per day*
Hotels and motels	*Guests*	*200 Litres per room per day*
	Staff	*50 Litres per employee per day*
Community halls and churches and/or facilities with intermittent use		*12 Litres per seat per day*

Note:

For activities where a large number of people can be expected to use multiple water fixtures simultaneously e.g. community halls and conference halls, the Peaking Factor shall be based on the number of water fixtures / appliances, as per NZS 3500.2 Plumbing and Drainage: Part 2: Sanitary plumbing and drainage.

Water consumption allowances in this table include general irrigation (but not specific irrigation systems) and grounds upkeep.

Table 6.1.c – Wet and dry commercial assumed design allowances

Commercial activity type	*Design water flow allowance*
Dry retail (Note 1) (where kitchen/toilets are not normally made available to customers)	*1 person per 50m² net floor area at 65 litres per person per day.*
Office buildings and dry retail where toilet facilities, etc. are provided to customers.	*1 person per 15m² net floor area at 65 litres per person per day.*
Wet retail (Note 2): Food and or beverage retail/preparation e.g. coffee shop, restaurant, bar, butcher, fresh fruit and vegetable retail.	*15 litres per day per net m² of floor area (including kitchen and dining areas).*

Table notes:

1. *Dry retail is where water is normally only used by staff for their own personal food preparation / toileting needs. Examples include: clothes shop, hardware retail.*
2. *Wet retail is where water is used to prepare food product for customers. Examples include: café, lunch bar, restaurant, butchery, fresh fruit and vegetable, food court-bar and supermarkets.*
3. *Assuming no significant irrigation.*

Important:

Net floor area is the total floor area of the building (exclude any open land areas),, less non-productive areas, such as:
lobbies; lifts; machine rooms; electrical services; stairwells; fire escapes; corridors and other passages used in common with other occupiers; car parking areas; etc. If net area is unknown, and the type of buildings are unknown, it can be assumed that the Net floor area is = 80% of the gross floor area of the building.

As a guide to how activities will be assessed, commercial washing activities such as car / boat washing activities, etc. would be regarded as a "wet-industry" and not as a commercial - wet retail, as the water is being used as a part of a process (washing). Large-scale food-processing (i.e. for supply to commercial customers, as opposed to on-site retail customers) would be regarded as an industrial type activity. Preparation / manufacture of non-food based products, is also regarded as an industrial activity. Industry design flows are detailed in the section below.

Demand and pipe sizing

Usign NZS 3500 Clause 3.2.3, Table 3.2.3 to calculate the overall network pressure and pipe size.

218 Villas + 2 Nurse accommodation

Q = 801l/min For all 218 Villas + 2 Nurse accommodation

NOTE 2 Determination of PSD for dwellings exceeding the scope of this table may be estimated using the following equation:

$Q = 0.03\,n + 0.4554\,\sqrt{n}$

where

Q = flow rate, in litres per second

n = number of dwellings

Fire requirements

Villas	FW 2	2x FH	1500l/min	Combine FH Flow
Facilities	FW 2	2x FH	1500l/min	
Agecare	FW 2	2x FH	1500l/min	

Agecare Hospital and Facilities will have sprinklers installed to be able to use FW 2

Below avg demand, EPANET model provided more detail with the pattern demand

	Villas	Demand	Pipe size (ID)	Pipe Area	Velocity
Pump house	220	822l/min	169.9mm	0.023m²	0.60m/s
Stage 1	26	145l/min	106mm	0.009m²	0.27m/s
Stage 2	27	148l/min	106mm	0.009m²	0.28m/s
Stage 3	27	148l/min	106mm	0.009m²	0.28m/s
Stage 4	27	153l/min	106mm	0.009m²	0.29m/s
Stage 5	26	151l/min	106mm	0.009m²	0.28m/s
Stage 6	25	148l/min	106mm	0.009m²	0.28m/s
Stage 7	24	150l/min	106mm	0.009m²	0.28m/s
Stage 8	25	153l/min	106mm	0.009m²	0.29m/s
Stage 9	11	107l/min	106mm	0.009m²	0.20m/s
Stage 10	2	86l/min	106mm	0.009m²	0.16m/s

When applying a 2x FH (2 x 750l/min) the 125mm OD HDPE has been size correctly for FW2

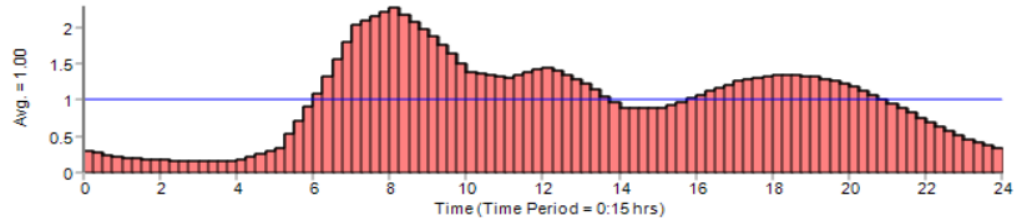
Maven BOP	Job Number J00606	Sheet 4	Rev A
Job Title: Ashbourne Retirement Village, Matamata Calc Title: Fire Water Demand Calculations	Author SB	Date 24/06/2025	Checked NP

Fire demand for FW2 - Villas

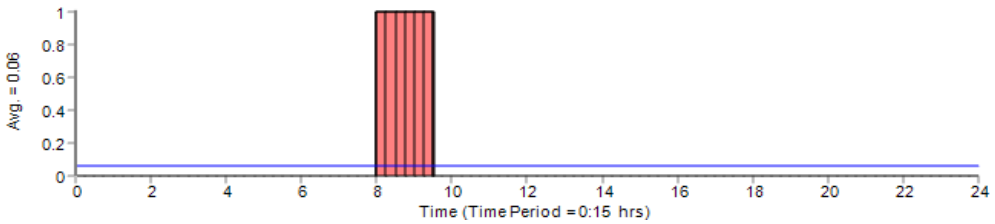
	Demand	Pipe size (ID)	Pipe Area	Velocity
Council	2301l/min	169.9mm	0.023m²	1.69m/s
Stage 1	1645l/min	106mm	0.009m²	3.10m/s
Stage 2	1648l/min	106mm	0.009m²	3.11m/s
Stage 3	1648l/min	106mm	0.009m²	3.11m/s
Stage 4	1653l/min	106mm	0.009m²	3.12m/s
Stage 5	1651l/min	106mm	0.009m²	3.11m/s
Stage 6	1648l/min	106mm	0.009m²	3.11m/s
Stage 7	1650l/min	106mm	0.009m²	3.11m/s
Stage 8	1653l/min	106mm	0.009m²	3.12m/s
Stage 9	1607l/min	106mm	0.009m²	3.03m/s

Fire demand for FW2 - Age care Hospital and facilities
Age Care Hospital and facilities will need their own sprinkler design, that can be connected into the main network
Network to adhere to minimum pressure per FH of 100kPA @ 750l/min
Allow 2x FH at 750l/min per FH and 1x 750l/min sprinklers
Alternatively 1x FH (750l/min) + 1500l/min sprinklers

Domestic Pattern demand will be include in the EPANET model



Fire Pattern demand will be include in the EPANET model, 60min



PE100 Pipe Dimensions

Standard AS/NZS 4130

	PN10 SDR 17					PN12.5 SDR 13.6			
Nominal Size	Mean OD	Mean Bore	T Min	T Max	Mass kg/m	Mean Bore	T Min	T Max	Mass kg/m
20	20.2	16.7	1.6	1.9	0.096	16.7	1.6	1.9	0.096
25	25.2	21.7	1.6	1.9	0.122	21.1	1.9	2.2	0.142
32	32.2	28.1	1.9	2.2	0.184	27.0	2.4	2.8	0.230
40	40.2	35.0	2.4	2.8	0.292	33.8	3.0	3.4	0.353
50	50.3	43.9	3.0	3.4	0.450	42.4	3.7	4.2	0.546
63	63.3	55.2	3.8	4.3	0.716	53.3	4.7	5.3	0.870
75	75.4	65.8	4.5	5.1	1.011	63.7	5.5	6.2	1.214
90	90.5	79.0	5.4	6.1	1.454	76.5	6.6	7.4	1.744
110	110.5	96.5	6.6	7.4	2.162	93.3	8.1	9.1	2.615
125	125.6	109.9	7.4	8.3	2.759	106.1	9.2	10.3	3.371
140	140.7	123.1	8.3	9.3	3.464	118.9	10.3	11.5	4.223
160	160.8	140.7	9.5	10.6	4.522	135.9	11.8	13.1	5.512
180	180.9	158.3	10.7	11.9	5.720	152.8	13.3	14.8	6.996
200	200.9	175.8	11.9	13.2	7.055	169.9	14.7	16.3	8.577
225	226.1	197.8	13.4	14.9	8.951	191.1	16.6	18.4	10.895
250	251.2	220.0	14.8	16.4	10.969	212.4	18.4	20.4	13.421

RITS

6.1.3 Level of Service

6.1.3.1 **On Demand Water Supply Area**

The design of the network shall conform to the Code of Practice for Fire Fighting Water Supplies (SNZ PAS 4509), and shall be such that a water supply connection can be provided for each lot.

The water supply network shall achieve the following standards:

a) The residual pressure and flow at point of supply to residential lots shall be a minimum of 200 kPa (20m) and 25 L/min. Some specific areas may require a higher Level of Service – check with the relevant Council.

b) The minimum fire supply service level shall be FW2 for residential areas and FW3 for all other areas. Some specific areas may require a higher level of service.

c) To protect level of service of new subdivisions, no more than 150 residential Lots shall be serviced, at any point from a single ended 150mm diameter watermain (unless water modelling proves that DN100 will be sufficient, but then no more than 40 residential lots). Connectivity of the water network is to be confirmed prior to further lots being brought forward for 224(c) release.

For the purpose of pipeline design, the maximum static pressure at ground level for each lot shall be considered to be 1000 kPa. Therefore the design pressure range for specific pipeline design is 100 kPa to 1000 kPa (10-100m).

NZS 4404:2010

Table 6.2 – Empirical guide for principal main sizing

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

6.3.7 Flow velocities

In practice it is desirable to avoid unduly high or low flow velocities. Pipelines shall be designed for flow velocities within the range of 0.5 to 2.0 m/s. In special circumstances, velocities of up to 3.0 m/s may be acceptable.

For pumping mains an economic appraisal may be required to determine the most economical diameter of pumping main to minimise the combined capital and discounted pumping cost. The resulting velocity will normally lie in the range 0.8 m/s to 3.0 m/s.

The following factors shall be considered in determining flow velocity:

(a) Stagnation;

(b) Turbidity (large fluctuations in flow rates can dislodge the biological slime or stir up settled solids in pipelines);

(c) Pressure;

(d) Surge;

(e) Pumping facilities;

(f) Pressure reducing devices;

(g) Pipe lining materials.

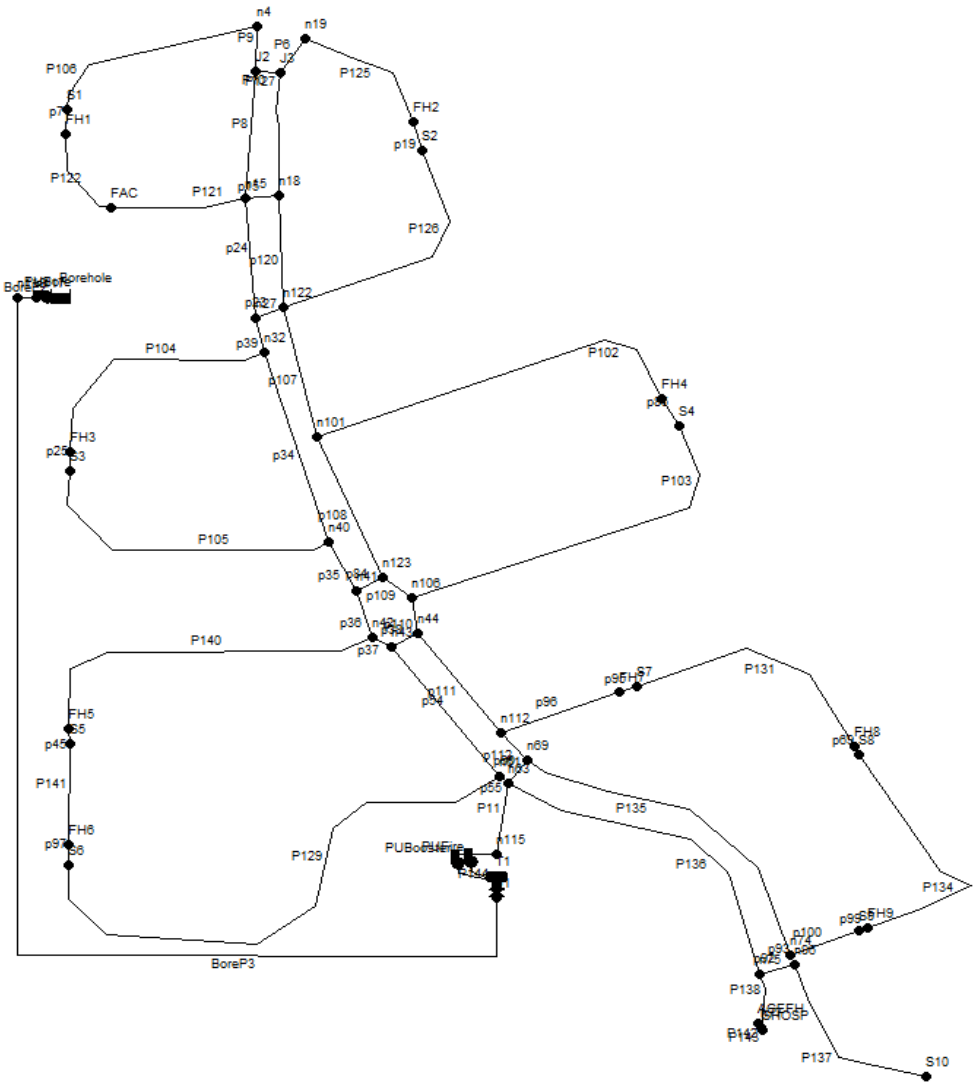
Following will be consider in the model
Borehole water, with a borehole pump to feed into tanks and ensure able to meet the demand
For water age, we consider using the RITS demand. The water age is less than 45hours
For pipe sizing we consider NZS 3500 with Fire demand

Maven BOP				Job Number J00606	Sheet 5	Rev A
Job Title	Ashbourne Retirement Village, Matamata			Author	Date	Checked
Calc Title	Water storage			SB	24/06/2025	NP

	Nr of Villas	Villas	Facility	Agecare	Water useage	Fire Demand	2x Day Water Tank size
Stage 1	25	13.0m³/day	7.5m³/day	0.0m³/day	20.5m³/day	90.0m³	131.m³
Stage 2	52	27.0m³/day	7.5m³/day	0.0m³/day	34.5m³/day		159.1m³
Stage 3	80	41.6m³/day	15.0m³/day	0.0m³/day	56.6m³/day		203.2m³
Stage 4	107	55.6m³/day	15.0m³/day	0.0m³/day	70.6m³/day		231.3m³
Stage 5	133	69.2m³/day	15.0m³/day	0.0m³/day	84.2m³/day		258.3m³
Stage 6	158	82.2m³/day	15.0m³/day	0.0m³/day	97.2m³/day		284.3m³
Stage 7	182	94.6m³/day	22.5m³/day	0.0m³/day	117.1m³/day		324.3m³
Stage 8	207	107.6m³/day	22.5m³/day	0.0m³/day	130.1m³/day		350.3m³
Stage 9	218	113.4m³/day	22.5m³/day	0.0m³/day	135.9m³/day		361.7m³
Stage 10	220	114.4m³/day	22.5m³/day	45.4m³/day	182.3m³/day		454.5m³

We will be using Heavy Duty Devan Tanks for water storage
Tansman tank can be consider in detail design

	Maven BOP	Job Number J00606	Sheet 6	Rev A
Job Title Calc Title	Ashbourne Retirement Village, Matamata EPANET Model	Author SB	Date 24/06/2025	Checked NP



EPANT V2.2

Pipe Roughness use 140

Material	Hazen-Williams C (unitless)	Darcy-Weisbach ε (millifeet)	Manning's n (unitless)
Cast Iron	130 - 140	0.85	0.012 - 0.015
Concrete or Concrete Lined	120 - 140	1.0 - 10	0.012 - 0.017
Galvanized Iron	120	0.5	0.015 - 0.017
Plastic	140 - 150	0.005	0.011 - 0.015
Steel	140 - 150	0.15	0.015 - 0.017
Vitrified Clay	110		0.013 - 0.015

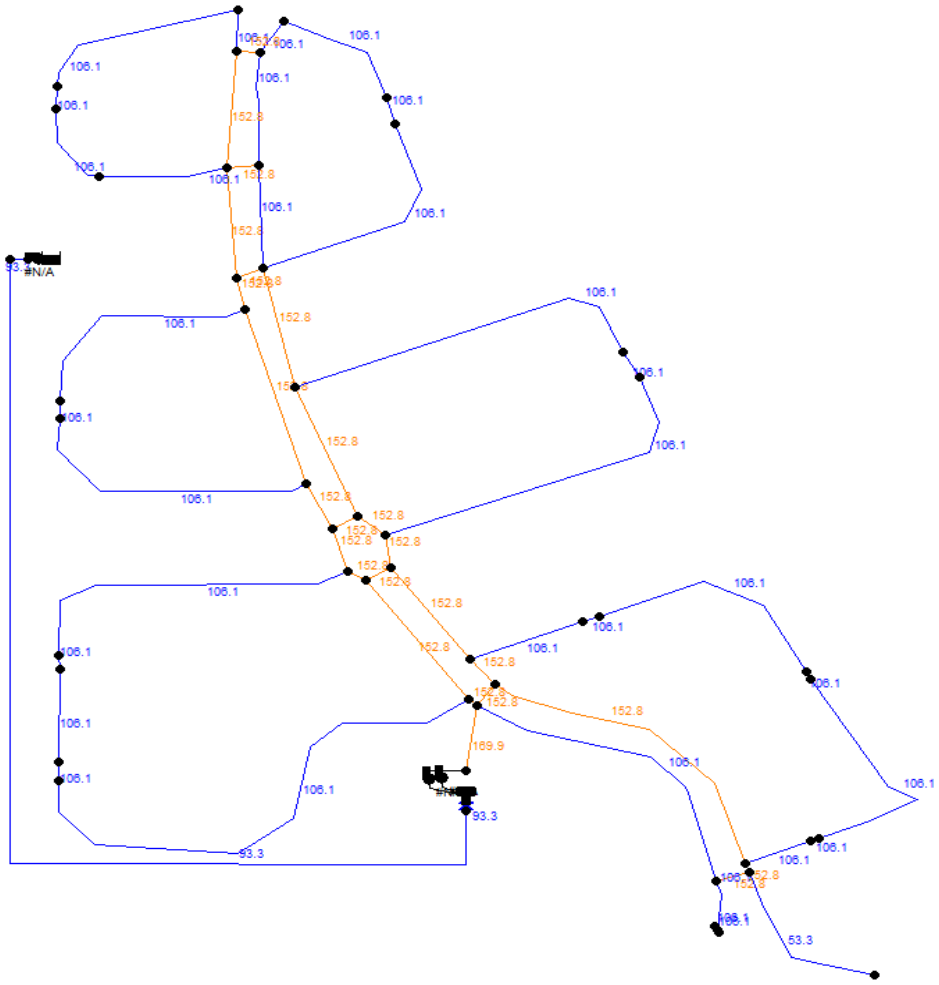
Minor Loss

Varies From 1.2 - 2.2

Valve or Fitting	Loss Coefficient
Globe valve, fully open	10.0
Angle valve, fully open	5.0
Swing check valve, fully open	2.5
Gate valve, fully open	0.2
Short-radius elbow	0.9
Medium-radius elbow	0.8
Long-radius elbow	0.6
45 degree elbow	0.4
Closed return bend	2.2
Standard tee −flow through run	0.6
Standard tee−flow through branch	1.8
Square entrance	0.5
Exit	1.0

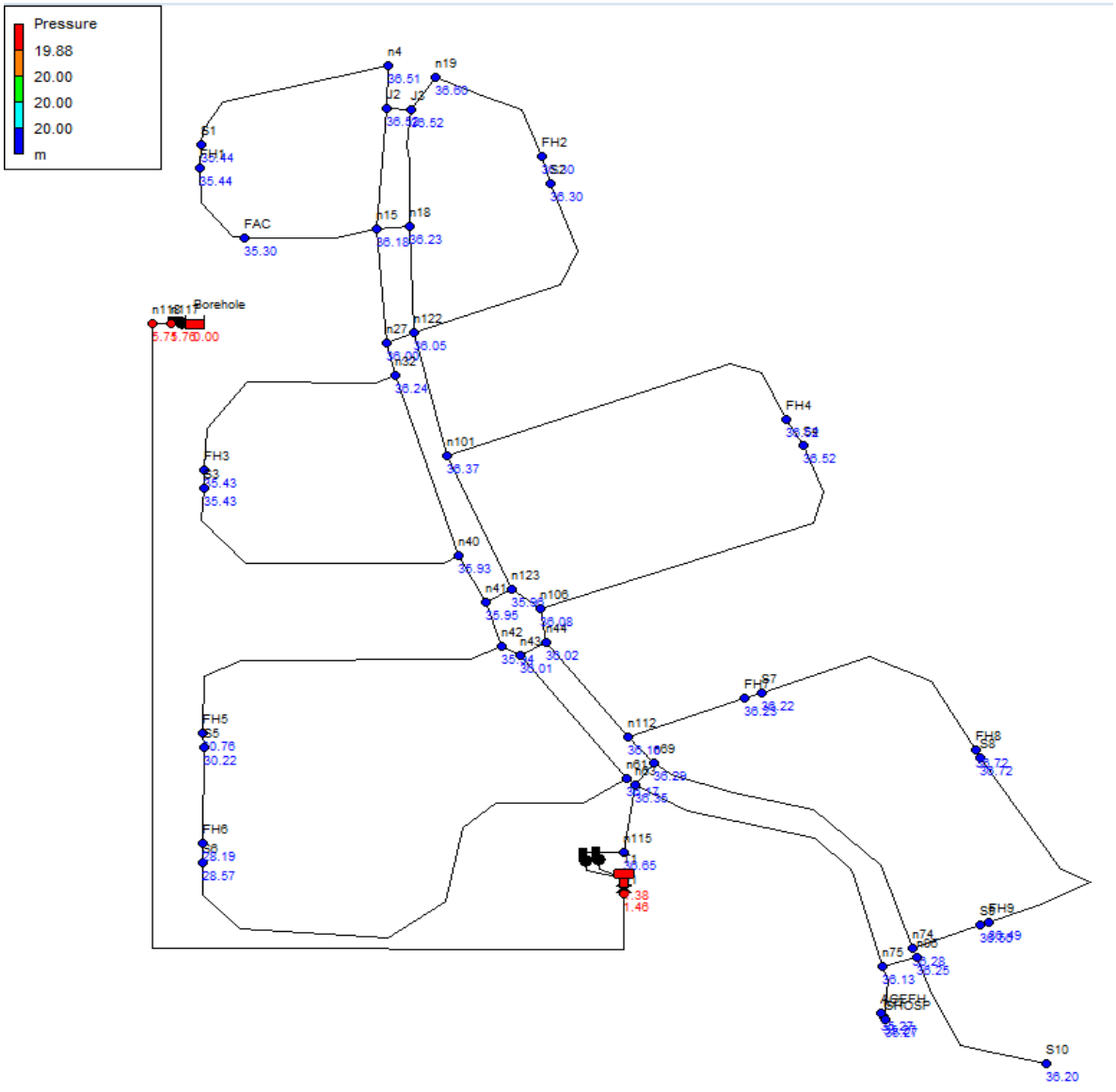
Maven BOP	Job Number J00606	Sheet 7	Rev A
Job Title: Ashbourne Retirement Village, Matamata Calc Title: EPANET Model : Pipe Size	Author SB	Date 24/06/2025	Checked NP

Pipe size



Maven BOP		Job Number J00606	Sheet 8	Rev A
Job Title	Ashbourne Retirement Village, Matamata	Author	Date	Checked
Calc Title	EPANET Model : Pressure Fire	SB	24/06/2025	NP

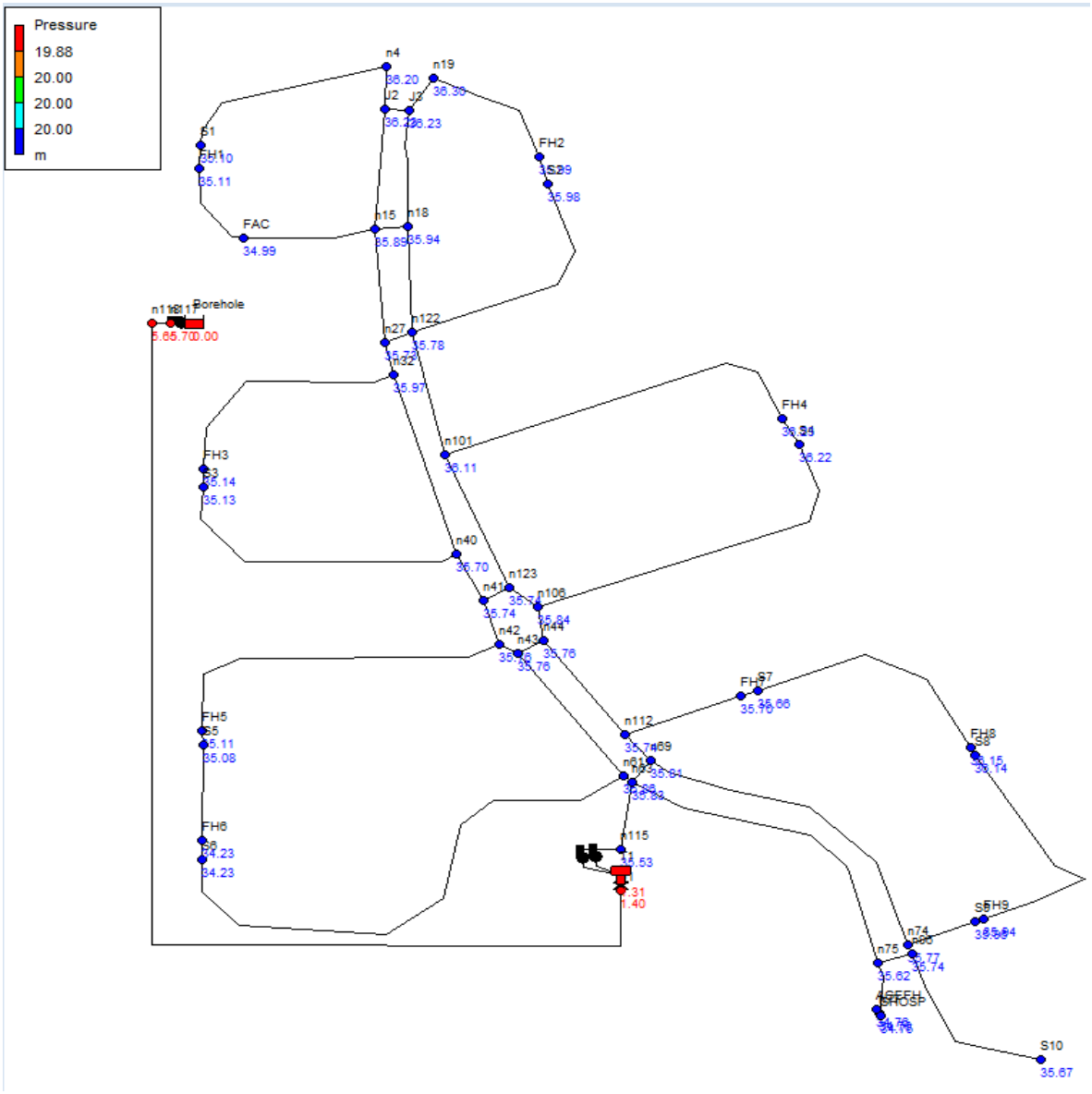
The model consider the worst pressure in the network
The model was considered for 2/3 domestic, facility and agecare with full fire,
refer to SNZ PAS 4509:2008



The lowest pressure will be if 2x FH be used in stage 6 + peak demand with domestic
28.57m head > 20m head domestic,

Maven BOP		Job Number J00606	Sheet 9	Rev A
Job Title	Ashbourne Retirement Village, Matamata	Author	Date	Checked
Calc Title	EPANET Model : Pressure Normal	SB	24/06/2025	NP

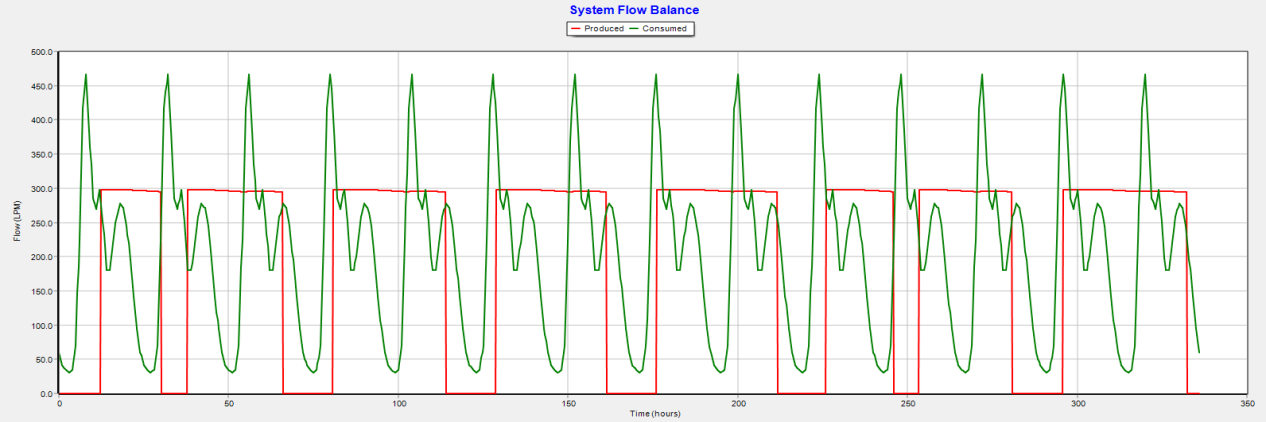
The model was considered only domestic, facility and agecare



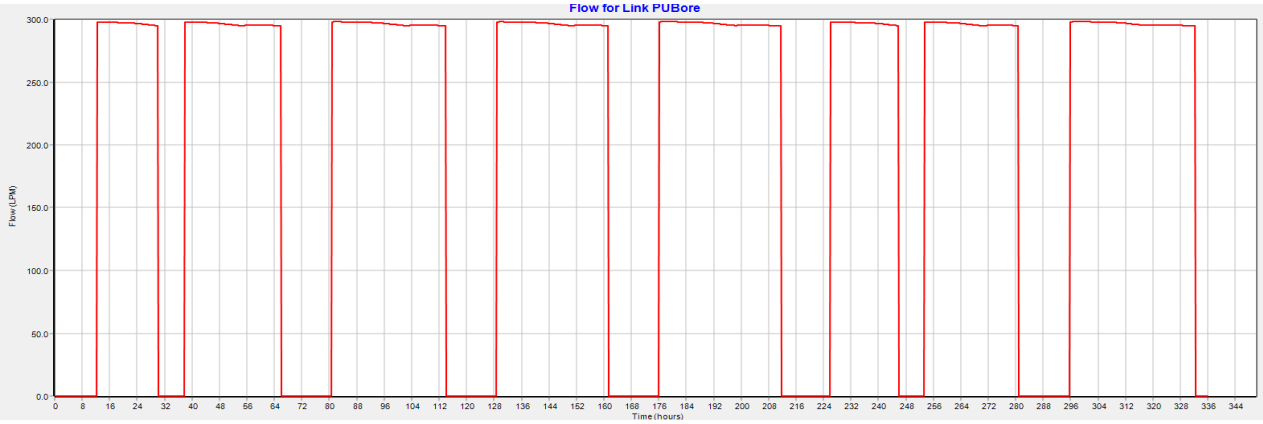
34.23m head > 20m head domestic,

	Maven BOP	Job Number J00606	Sheet 10	Rev A
Job Title	Ashbourne Retirement Village, Matamata	Author	Date	Checked
Calc Title	EPANET Model : Water age	SB	24/06/2025	NP

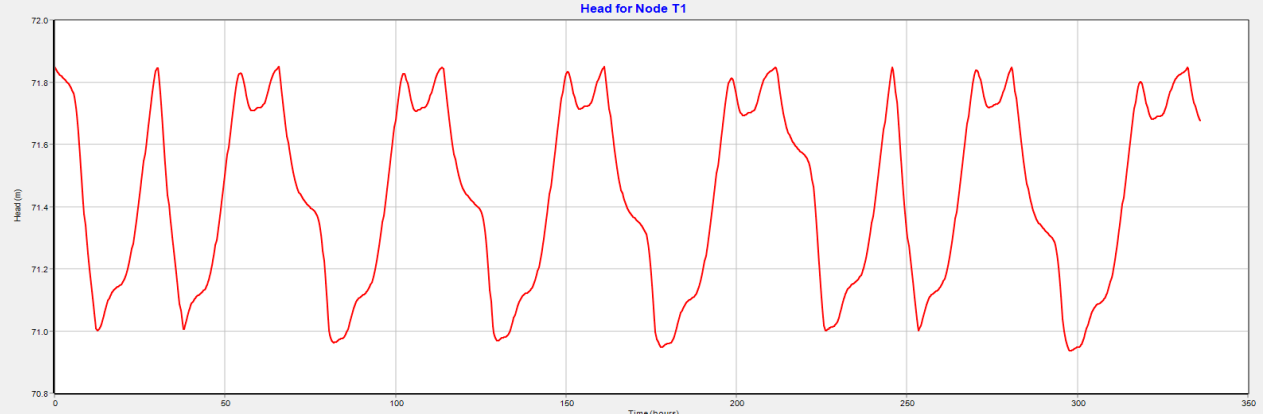
The water age was done over a 14 days to get an accurate water age
This model was using RITS model



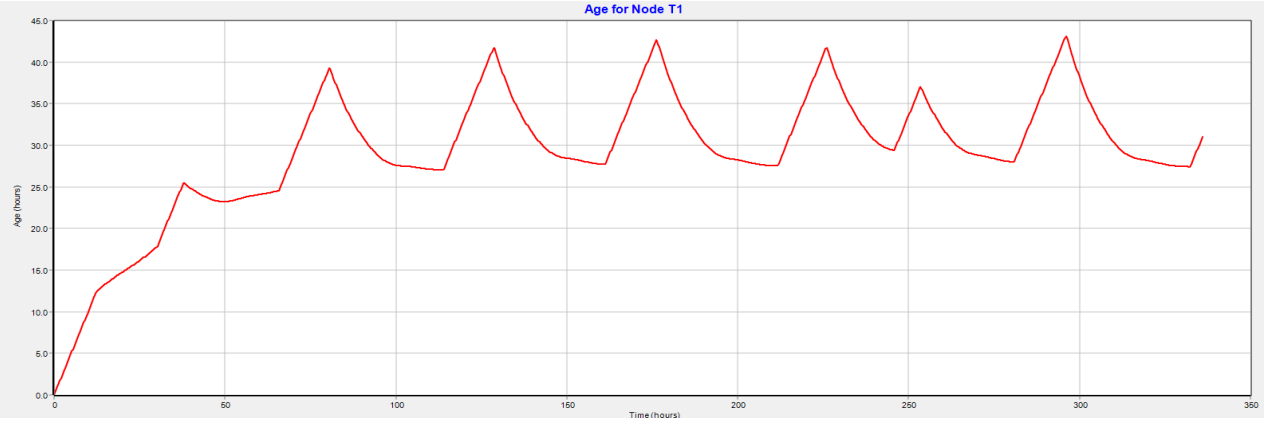
Borehole pump



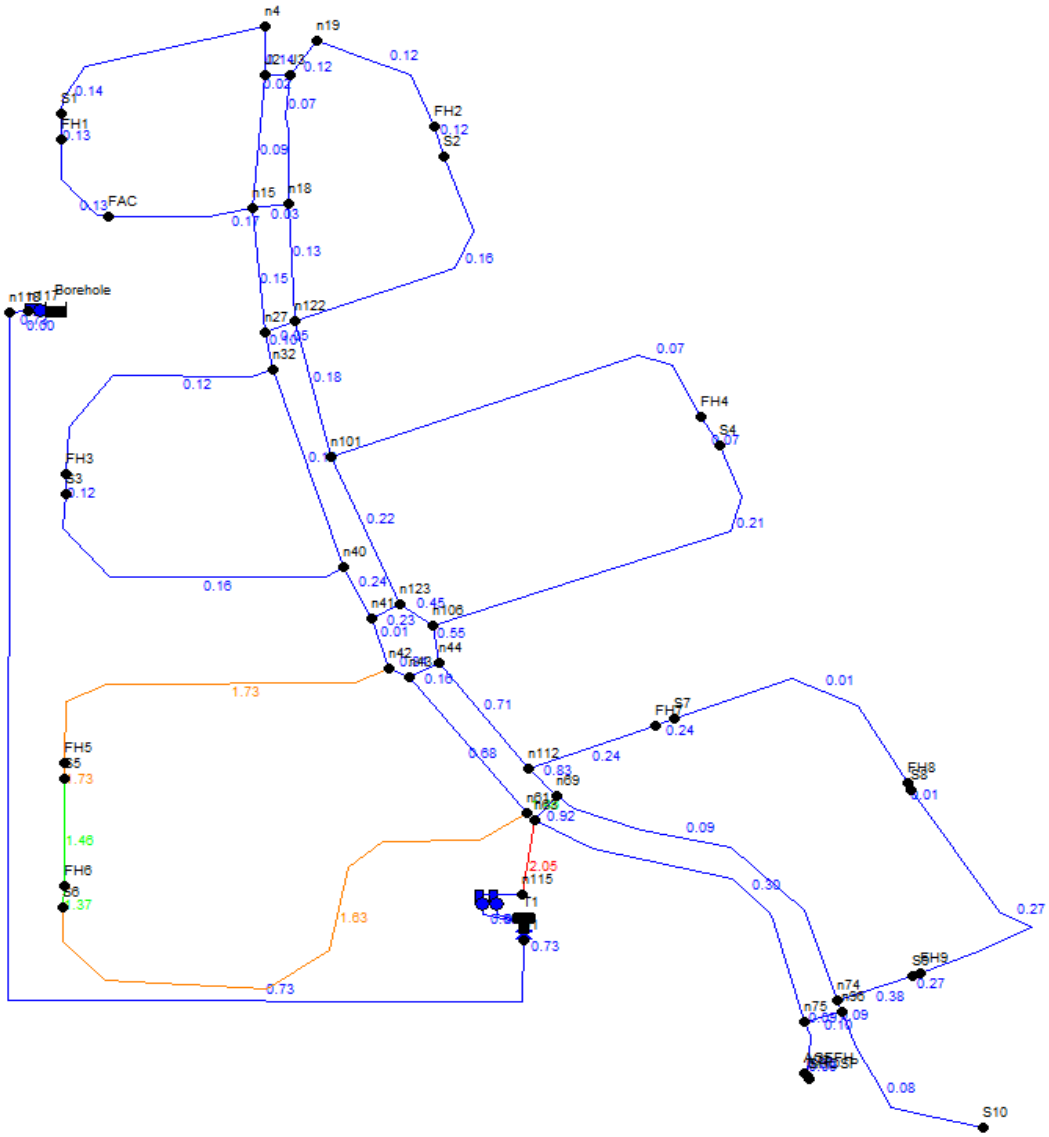
Tanks storage head



	Maven BOP	Job Number J00606	Sheet 11	Rev A
Job Title	Ashbourne Retirement Village, Matamata	Author	Date	Checked
Calc Title	EPANET Model : Water age	SB	24/06/2025	NP



Maven BOP	Job Number J00606	Sheet 12	Rev A
Job Title Calc Title Ashbourne Retirement Village, Matamata EPANET Model : Velocity	Author SB	Date 24/06/2025	Checked NP



Summary

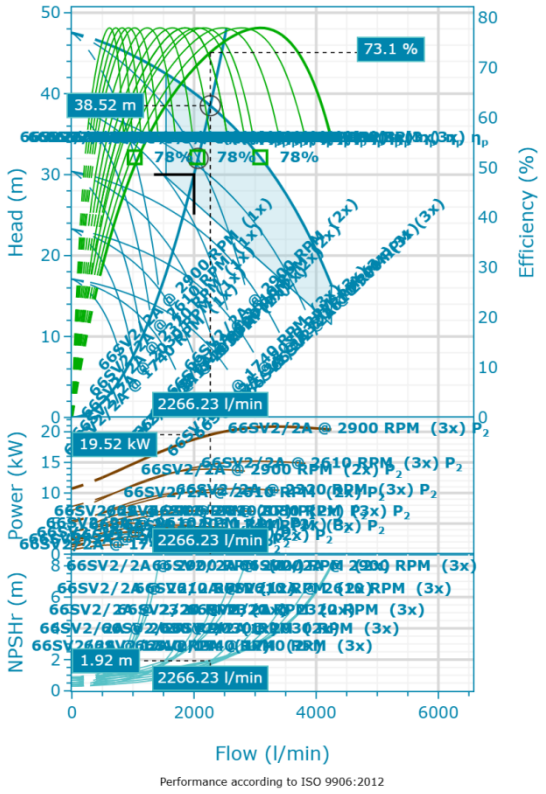
A comprehensive assessment of the council's water main has confirmed that boreholes and storage tanks have sufficient pressure to support the development up to Stage 10, including all associated fire flow requirements. The pipe network has been strategically designed and sized to achieve an optimal balance between economic efficiency and long-term scalability. This approach ensures that the system meets current demands while allowing for seamless future expansion. By implementing a well-planned and cost-effective water infrastructure, we are delivering a reliable and sustainable solution that supports the continued growth and resilience of the development.

xylem
Let's Solve Water

66SV2/2AG075T/D

Created On: 6/18/25

66SV2/2AG075T/D | Configuration Summary



Performance according to ISO 9906:2012

The Lowara e-SV vertical multistage pump is a highly reliable and technologically advanced multipurpose pump. It's capable of satisfying the needs of a wide variety of users and many different construction designs are available. The e-SV range feature models in eleven sizes with 1-3-5-10-15-22-33-46-66-92-125 m³/h nominal capacities.

PUMP

Installation	Pump Size
Complete Pump	66SV

MATERIALS

Pump Body Material	Impeller Material
Cast Iron	Stainless Steel (AISI 316L)

SEAL

Type of Seal	Rotating Face
Mechanical Seals	Silicon Carbide
Name	**Stationary Face**
Q1BEGG	Resin Impregnated Carbon
	Elastomers
	EPDM
	Springs
	AISI 316
	Metal Components
	AISI 316

STANDARD OPTIONS

PTC Sensor	Special Configuration
No	Please Select

MOTOR

Vendor	Power
Lowara PLM	7.5 kW
Frequency (Hz)	**Phase (~)**
50	3
Poles	**Voltage**
2	380-415/660-690 V
Efficiency	**Frame Size**
IE3	132 S

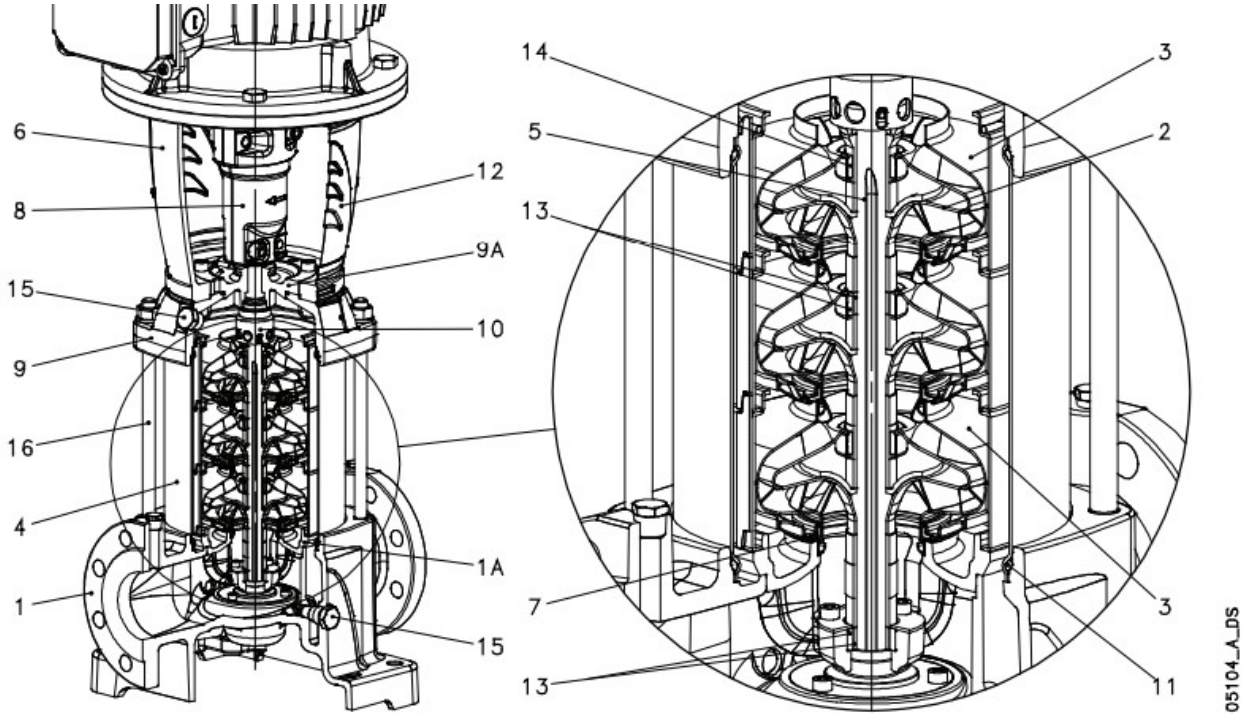
FLANGE

Flange

[G] = Round Flanges (AISI 304/Cast Iron)

Project:	Created By:	Created On:	Last Update:
66SV2/2AG075T/D	Niel Koegelenberg	6/18/25	-

66SV2/2AG075T/D | Product Details



Construction Materials

Pump body (1)
Cast iron / ASTM Class 35

Lower support (1A)
Cast iron / ASTM Class 35

Impeller (2)
Stainless steel / AISI 316L

Diffuser (3)
Stainless steel / AISI 304

Fill / Drain plugs (15)
Stainless steel / AISI 316

Tie rods (16)
Galvanized steel

Outer sleeve (4)
Stainless steel / AISI 304

Shaft (5)
Stainless steel / AISI 431

Adapter (6)
Cast Iron / ASTM Class 25

Wear ring (7)
Technopolymer PPS

Coupling (8)
Cast Iron / ASTM Class 25

Upper head (9)
Cast iron / ASTM Class 35

Seal housing (9A)
Cast iron / ASTM Class 35

Mechanical seal (10)
See Seal section

Elastomers (11)
See Seal section

Coupling protection (12)
Stainless steel / AISI 304

Shaft sleeve and bushing (13)
Tungsten carbide

Bushing for diffuser (14)
Carbon

Motor

Motor Name
PLM 132 B5 7.5 kW

Design
IM B5

Standard
IEC

Shaft Diameter
38 mm

L Shaft
80 mm

Phase
3

Rated power
7.5 kW

Service Factor
1

Voltage
380-415/660-690 V

Speed
2,920 rpm

IE Class
IE3

Enclosure
IP 55

Efficiency (%)
90.6

cos phi
0.85

Rated Current
14.1-8.16 A

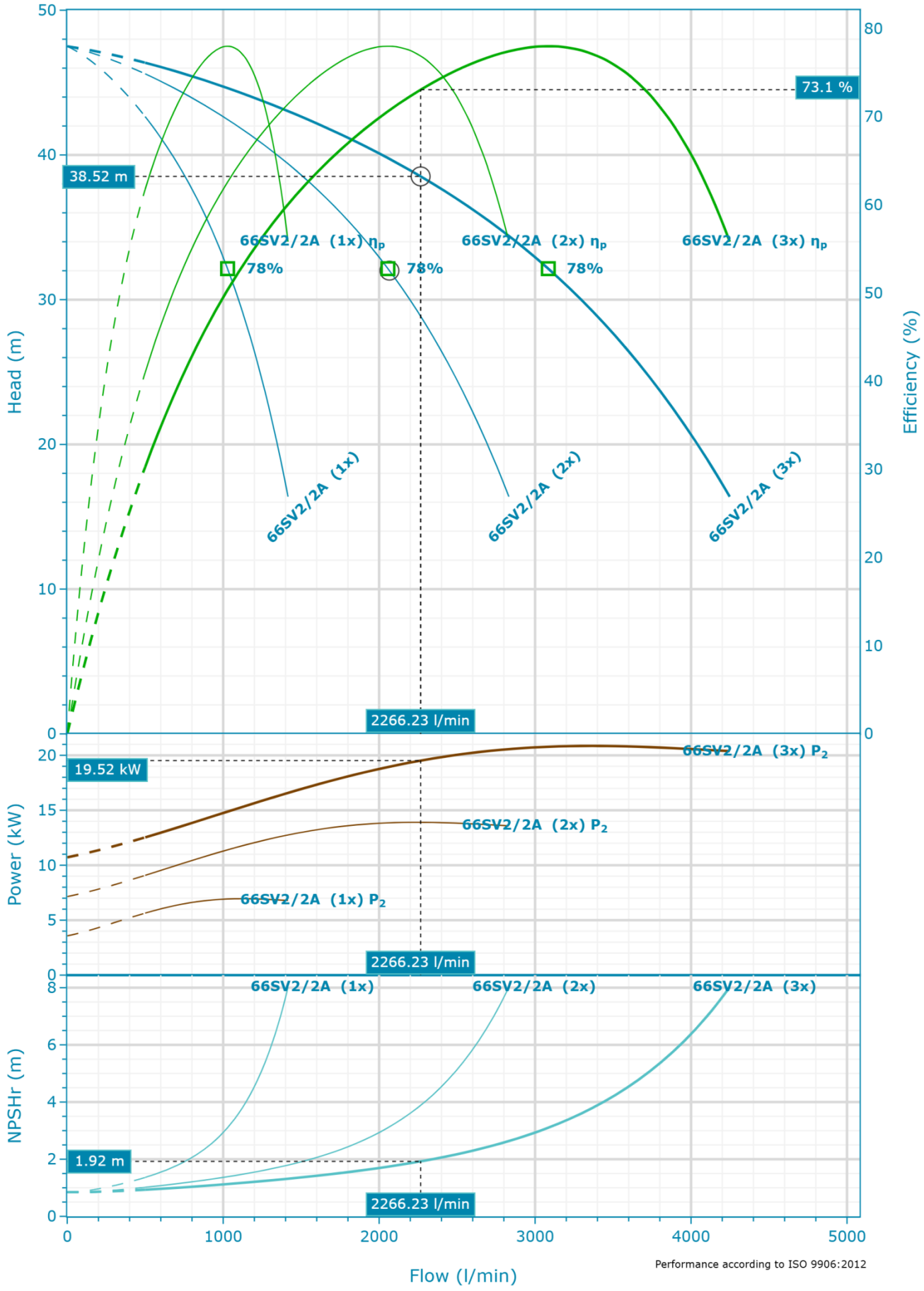
Frame Size
132 S

ICL
F

Start Mode
Star-delta

Motor Vendor
PLM

66SV2/2AG075T/D | Hydraulic Data & Performance Curve



Project:	Created By:	Created On:	Last Update:
66SV2/2AG075T/D	Niel Koegelenberg	6/18/25	-

Selection

Series e-SV	Pump Flow 1,000.00 l/min
Name 66SV2/2A 2900rpm	Pump Head 30.00 m
Stages 2	Acceptance Grade Manufacturer's Standard
Frequency 50 Hz	System Type Parallel Pumps
Impeller Diameters 2x 149mm	Operating Pumps 3
Total Flow 2,000.00 l/min	Standby Pumps No Standby Pump
Total Head 30.00 m	

Fluid

Fluid Type Water	Density 1,000 kg/m³
Fluid Temperature 4 °C	Dynamic Viscosity 0.001567 Pa·s
Specific Gravity 1	Fluid Vapor Pressure 8.135 mbar

Design Point - Single Pump

Flow (1x) 755.41 l/min	NPSHr (1x) 1.92 m
Head (1x) 38.52 m	Flow To BEP Ratio (1x) 73.5 %
Pump Efficiency (1x) 73.06 %	
Shaft power (P2) (1x) 6.51 kW	

Design Point - System

Flow 2,266.23 l/min	NPSHR 1.92 m
Head 38.52 m	Flow To BEP Ratio 73.5 %
Pump Efficiency (ηp) 73.06 %	
Shaft power (P2) 19.52 kW	

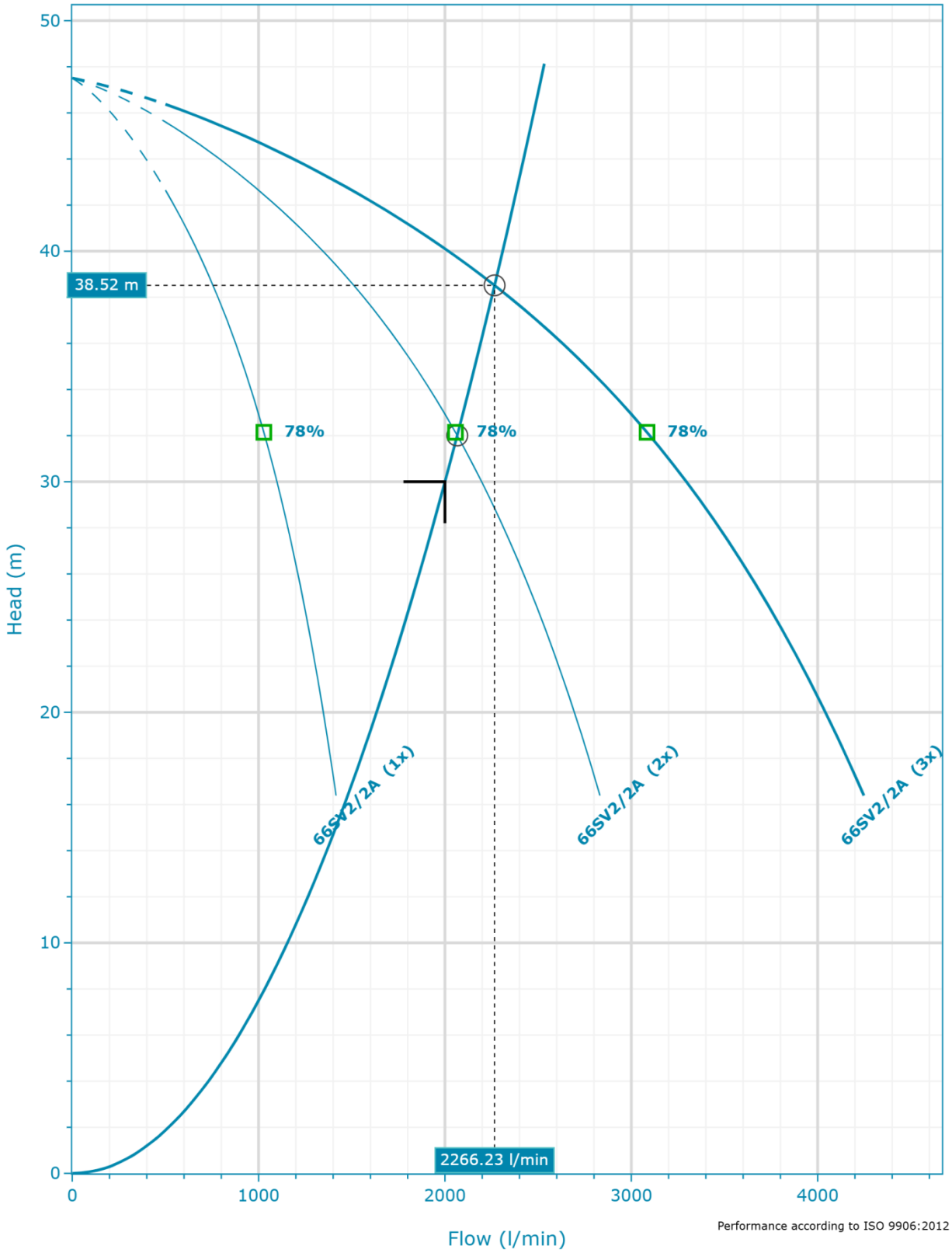
Design Curve - Single Pump

Rated Speed 2,900 RPM	BEP (1x) 78 %
Min Flow (1x) 500 l/min	BEP Flow (1x) 1,028.2 l/min
Max Flow (1x) 1,416 l/min	BEP Head (1x) 32.14 m
H@QMin (1x) 42.65 m	Max Operating Pressure (1x) 4,652.38 mbar
H@QMax (1x) 16.39 m	Max P2 (1x) 6.95 kW

Design Curve - System

Rated Speed 2,900 RPM	BEP 78 %
Min Flow 500 l/min	BEP Flow 3,084.6 l/min
Max Flow 4,248 l/min	BEP Head 32.14 m
H@QMin 46.37 m	Max Operating Pressure 4,652.38 mbar
H@QMax 16.39 m	Max P2 20.86 kW

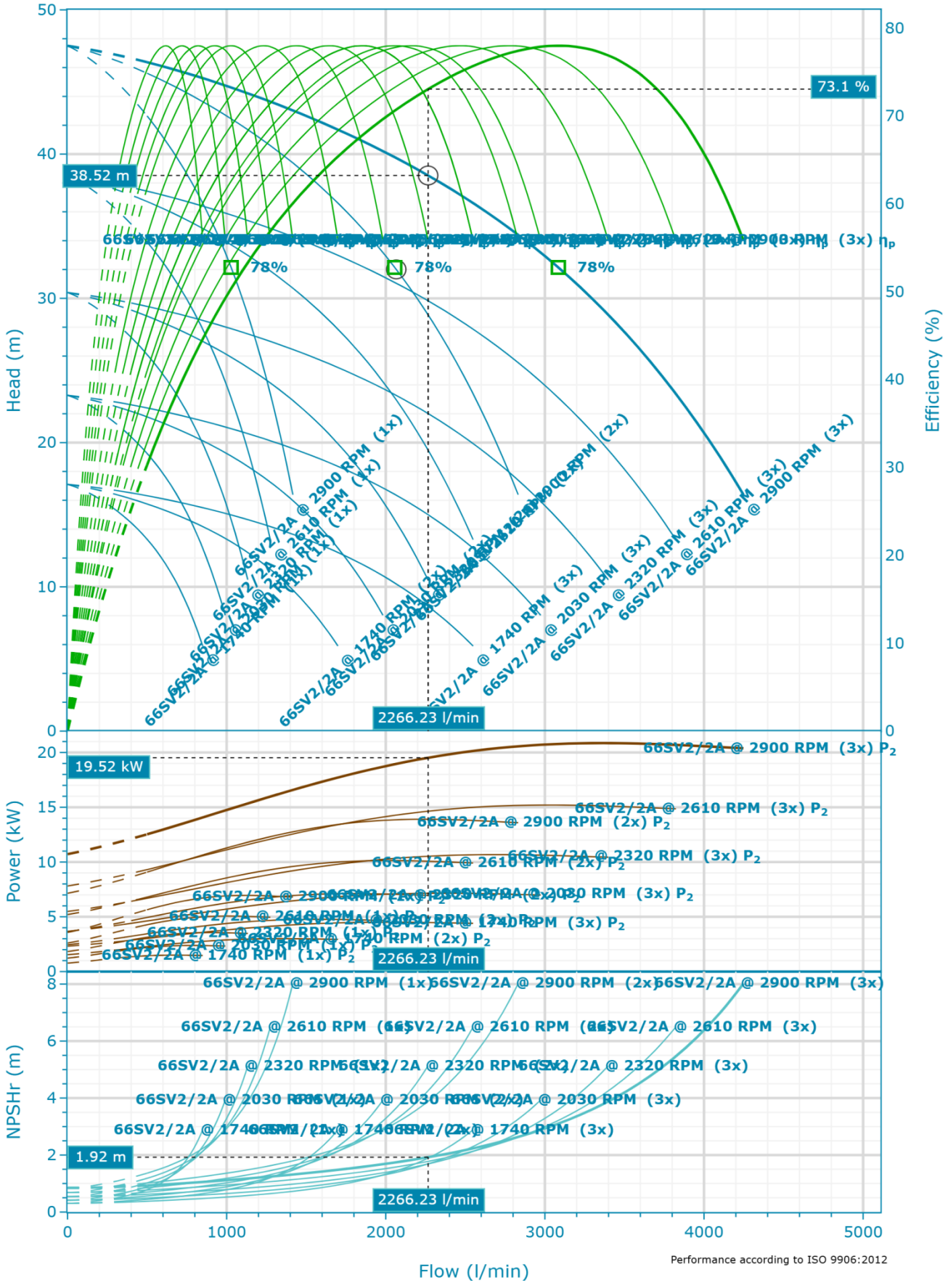
66SV2/2AG075T/D | Duty Analysis



Name	Q (1x) [l/min]	H (1x) [m]	P2 (1x) [kW]	Q [l/min]	H [m]	P2 [kW]	ηp [%]	SE [kWh/m³]	NPSHr [m]
DP @ 1x	755.41	38.52	6.51	2,266.23	38.52	19.52	73.06	0	1.92
DP @ 2x	755.41	38.52	6.51	2,266.23	38.52	19.52	73.06	0	1.92
DP @ 3x	755.41	38.52	6.51	2,266.23	38.52	19.52	73.06	0	1.92

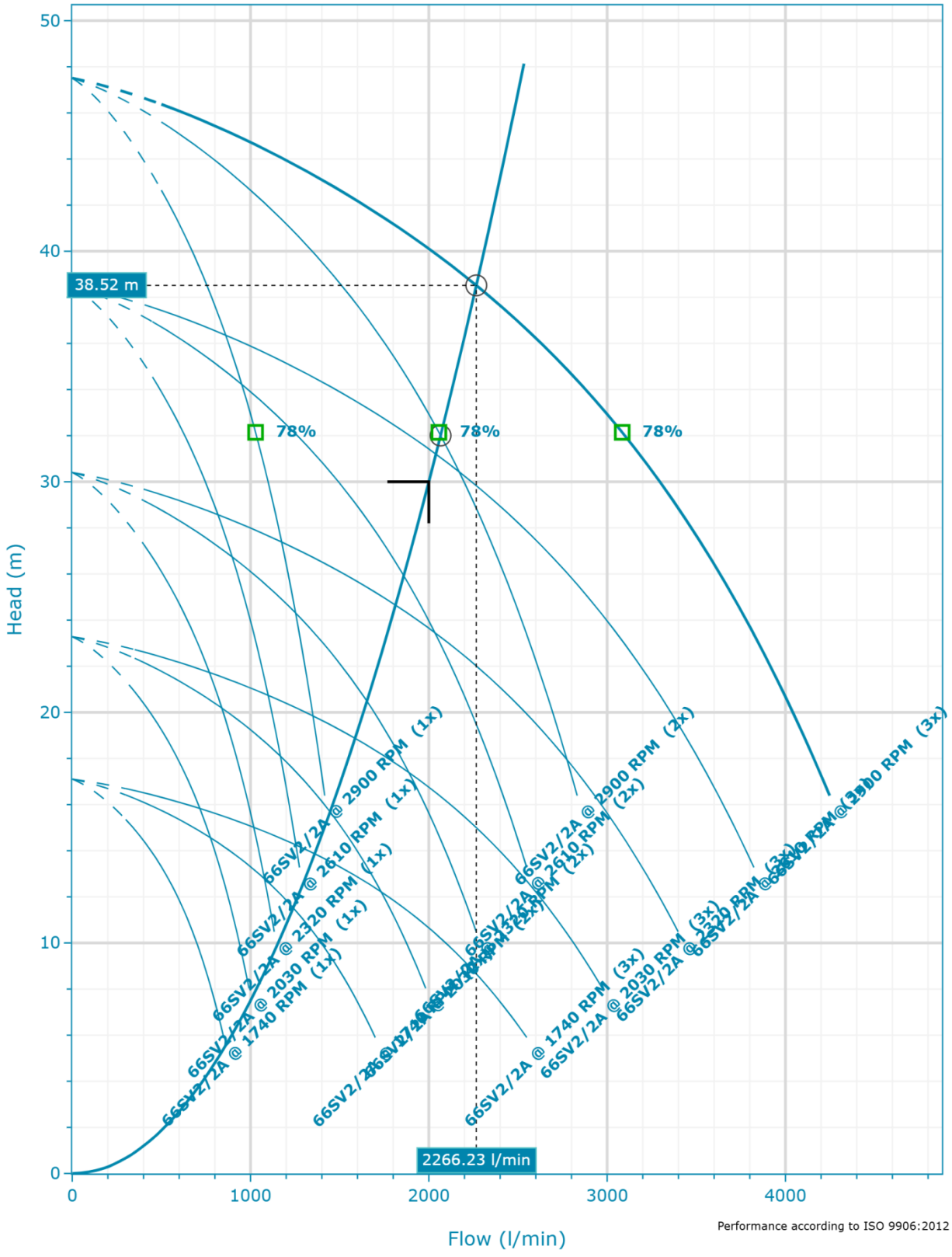
Project:	Created By:	Created On:	Last Update:
66SV2/2AG075T/D	Niel Koegelenberg	6/18/25	-

66SV2/2AG075T/D | Variable Speed Curve



Project:	Created By:	Created On:	Last Update:
66SV2/2AG075T/D	Niel Koegelenberg	6/18/25	-

66SV2/2AG075T/D | Variable Speed Analysis



Name	Speed	Q (1x) [l/min]	H (1x) [m]	P2 (1x) [kW]	Q [l/min]	H [m]	P2 [kW]	ηp [%]	SE [kWh/m³]	NPSHr [m]
DP @ 1x	1,740 RPM	453.25	13.87	1.41	1,359.74	13.87	4.22	73.06	0	0.69
DP @ 1x	2,030 RPM	528.79	18.87	2.23	1,586.36	18.87	6.7	73.06	0	0.94
DP @ 1x	2,320 RPM	604.33	24.65	3.33	1,812.99	24.65	9.99	73.06	0	1.23
DP @ 1x	2,610 RPM	679.87	31.2	4.74	2,039.61	31.2	14.23	73.06	0	1.56

Project:	Created By:	Created On:	Last Update:
66SV2/2AG075T/D	Niel Koegelenberg	6/18/25	-

DP @ 1x	2,900 RPM	755.41	38.52	6.51	2,266.23	38.52	19.52	73.06	0	1.92
DP @ 2x	1,740 RPM	453.25	13.87	1.41	1,359.74	13.87	4.22	73.06	0	0.69
DP @ 2x	2,030 RPM	528.79	18.87	2.23	1,586.36	18.87	6.7	73.06	0	0.94
DP @ 2x	2,320 RPM	604.33	24.65	3.33	1,812.99	24.65	9.99	73.06	0	1.23
DP @ 2x	2,610 RPM	679.87	31.2	4.74	2,039.61	31.2	14.23	73.06	0	1.56
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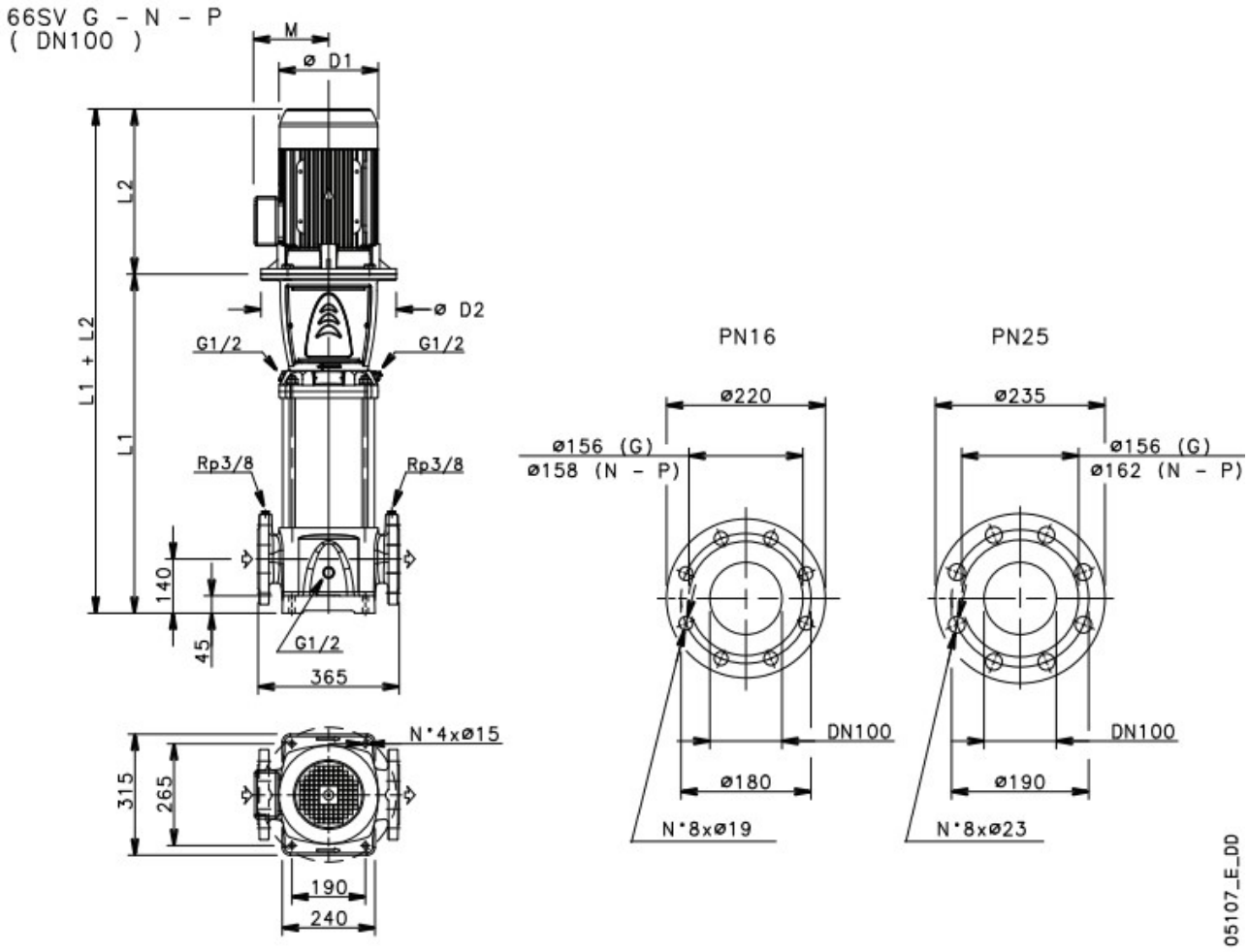
DP @ 3x	2,610 RPM	679.87	31.2	4.74	2,039.61	31.2	14.23	73.06	0	1.56
DP @ 3x	2,900 RPM	755.41	38.52	6.51	2,266.23	38.52	19.52	73.06	0	1.92

66SV2/2AG075T/D | Dimensional Data & Drawing



Dimensions

D1
256 mm

D2
300 mm

L1
664 mm

L2
367 mm

M
191 mm

Weight (Pump Only)
77 kg

Total Weight
133 kg

Company	Brown Brothers Engineers
Contact	Niel Koegelenberg
Phone No.	0273100851
Email	niel.koegelenberg@brownbros.co.nz

xylem
Let's Solve Water

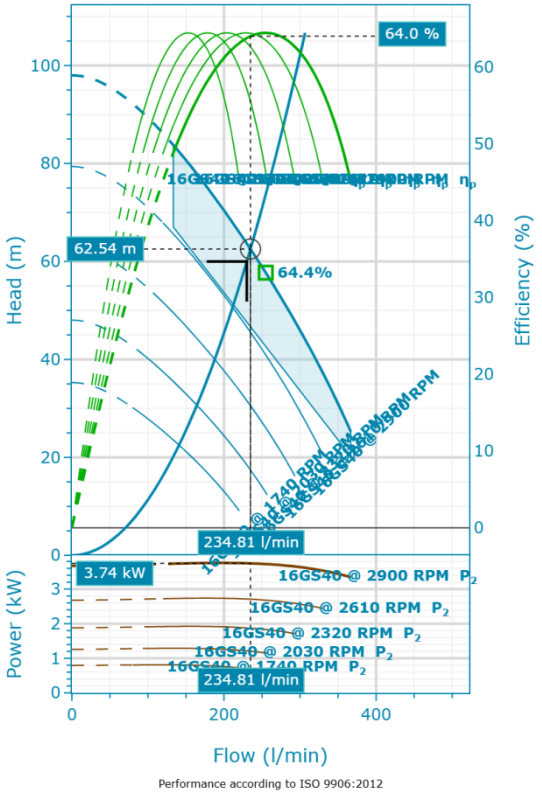
xylem
Let's Solve Water

16GS40T-L4C

Created On: 6/18/25

16GS40T-L4C | Configuration Summary

Submersible multistage centrifugal 4 inch pumps suitable for clean water. High content of AISI 304 stainless steel. The floating impeller design ensures an excellent resistance to wear



PUMP

Installation	Stages
Liquid End + Motor	21

MATERIALS

Construction

Stainless Steel

STANDARD OPTIONS

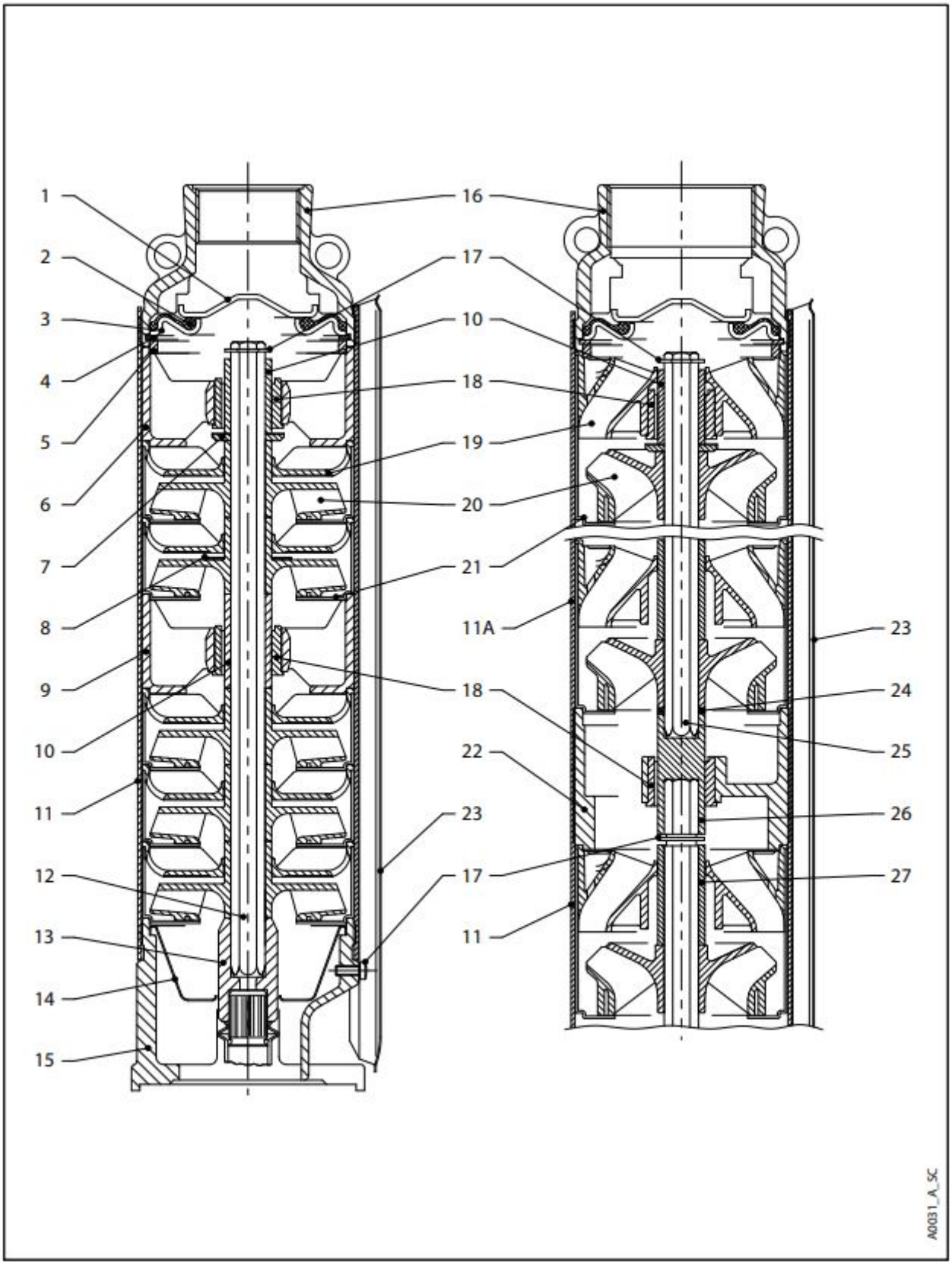
Cable Length

3 m

MOTOR

Frequency	Power
50	4 kW
Poles	**Phase (~)**
2	3
Motor Type	**Voltage**
Canned	220-240 V

16GS40T-L4C | Product Details



Construction Materials

Valve Cap (1)
Stainless steel / AISI 304

Valve Gasket (2)
NBR

Adapter Ring (5)
Technopolymer PPO

Upper Bush Bracket (6)
Technopolymer PPO

Intermediate Bush Bracket (9)
Technopolymer PPO

Shaft Sleeve (10)
Stainless steel / AISI 304

Pump Shaft (12)
Stainless steel / AISI 304

Coupling (13)
Stainless steel / AISI 304

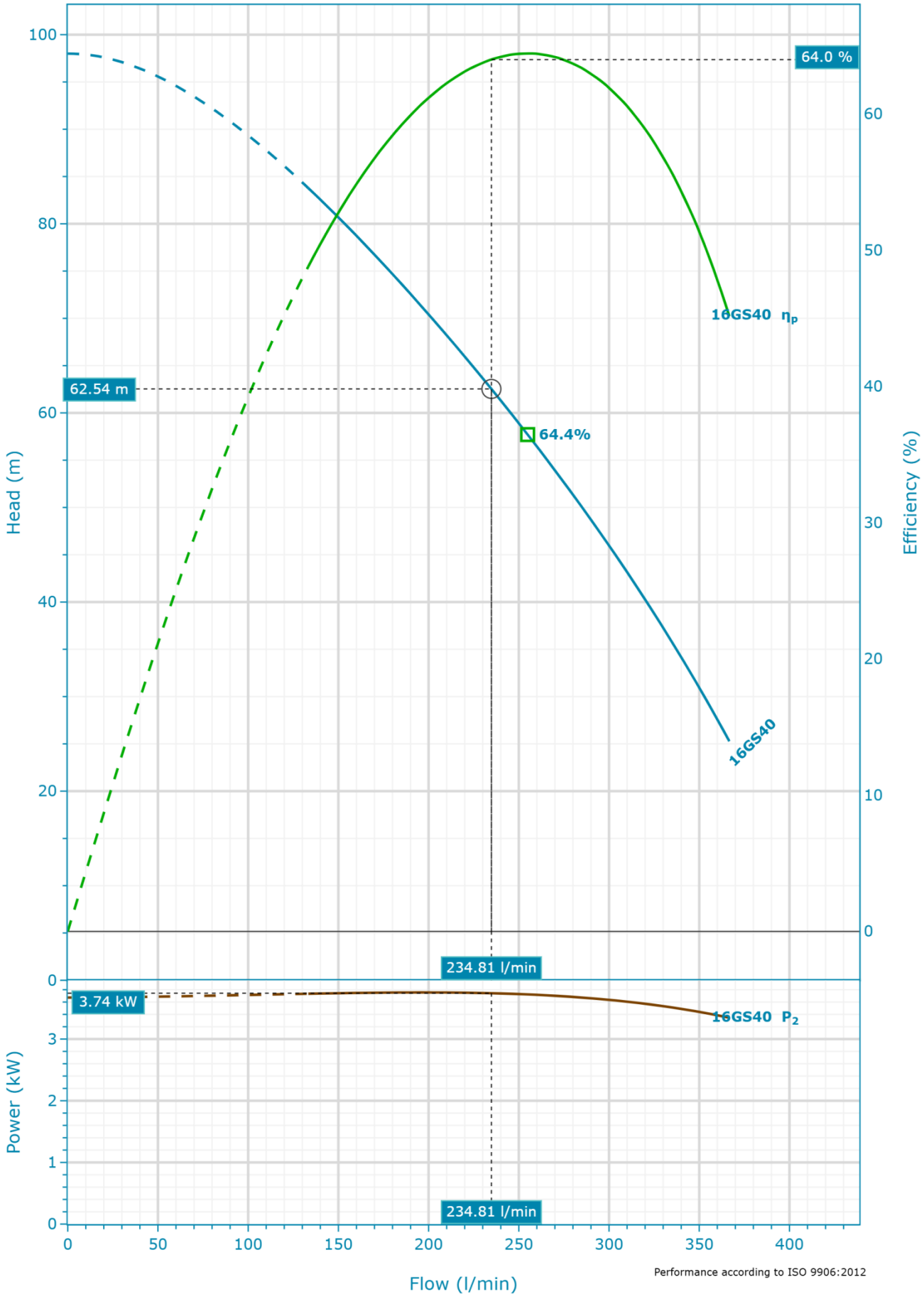
Project:	Created By:	Created On:	Last Update:
16GS40T-L4C	Niel Koegelenberg	6/18/25	-

Valve Flange (3) Stainless steel / AISI 304	Thrust Bearing (7) Stainless steel / AISI 304	Sleeve (11) Stainless steel / AISI 304	Strainer (14) Stainless steel / AISI 304
Valve Locking Ring (4) Stainless steel / AISI 302	Washer (8) Stainless steel / AISI 304	Upper Sleeve (11A) Stainless steel / AISI 304	Motor Adapter (15) Stainless steel / CF-8 ASTM A473
Discharge Head (16) Stainless steel / CF-8 ASTM A473	Impeller (20) Technopolymer PPO	Shim (24) Stainless steel / AISI 304	
Screws, Nuts, Washers (17) Stainless steel / AISI 316	Bowl (21) Stainless steel / AISI 304	Upper Pump Shaft (25) Stainless steel / AISI 304	
Bush (18) Technopolymer PU	Intermediate Bush Bracket (22) Stainless steel / CF-8 ASTM A473	Intermediate Coupling (26) Stainless steel / AISI 316	
Diffuser (19) Technopolymer PPO	Cable Guard (23) Stainless steel / AISI 304	Spacer (27) Stainless steel / AISI 304	

Motor

Motor Name L4C40T235	Rated power 4 kW	Service Factor 1	Speed 2,860 rpm
Phase 3	Enclosure IP 68	Voltage 220-240 V	Rated Current 16.9 A

16GS40T-L4C | Hydraulic Data & Performance Curve



Performance according to ISO 9906:2012

Project:	Created By:	Created On:	Last Update:
16GS40T-L4C	Niel Koegelenberg	6/18/25	-

Selection

Series e-GS	Pump Head 60.00 m
Name 16GS40 2900rpm	Acceptance Grade Manufacturer's Standard
Stages 21	System Type Single Pump
Frequency 50 Hz	Operating Pumps 1
Total Flow 230.00 l/min	Standby Pumps No Standby Pump
Total Head 60.00 m	
Pump Flow 230.00 l/min	

Fluid

Fluid Type Water	Density 1,000 kg/m³
Fluid Temperature 4 °C	Dynamic Viscosity 0.001567 Pa·s
Specific Gravity 1	Fluid Vapor Pressure 8.135 mbar

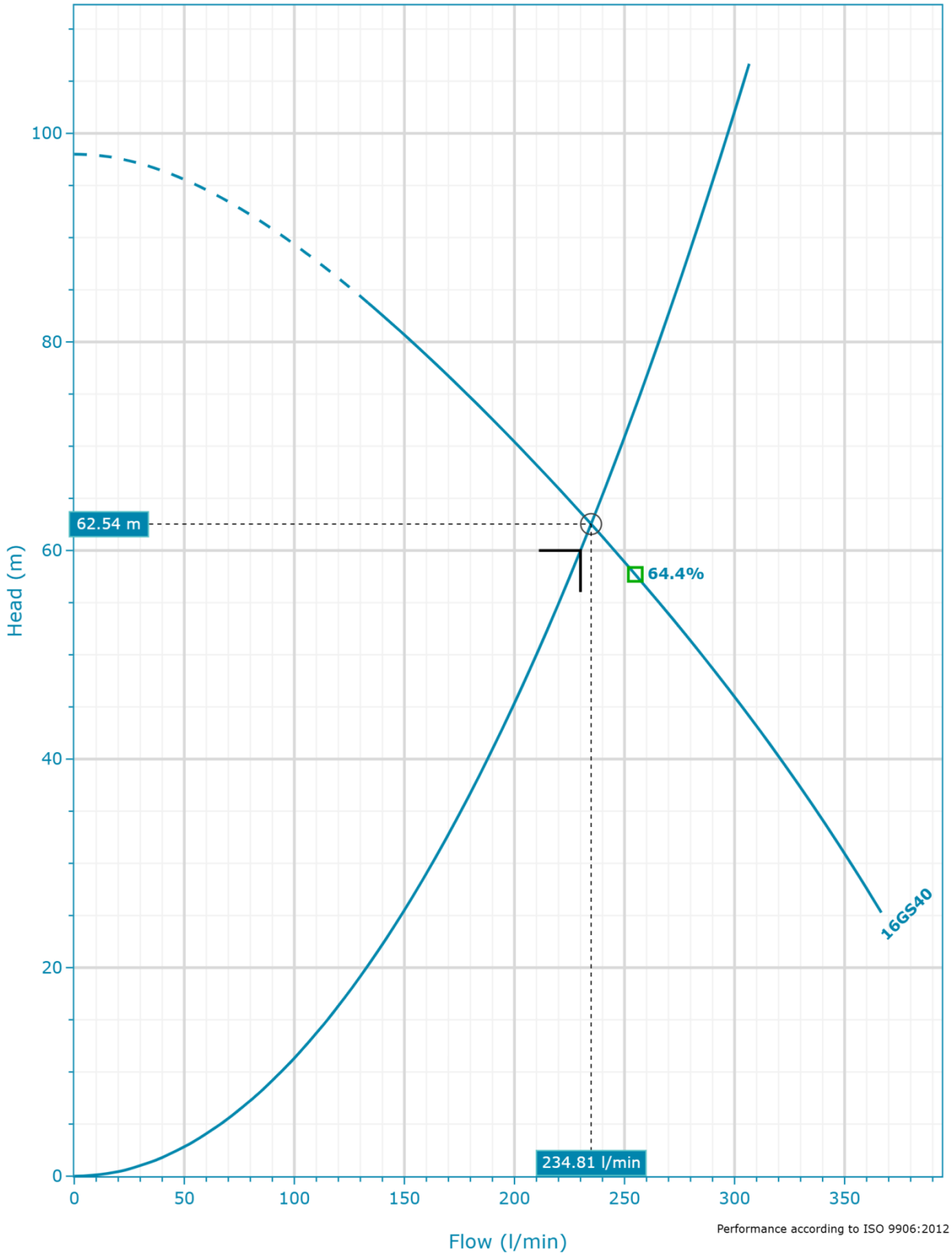
Design Point

Flow 234.81 l/min	
Head 62.54 m	
Pump Efficiency (ηp) 63.99 %	
Shaft power (P2) 3.74 kW	
Flow To BEP Ratio 92.1 %	

Design Curve

Rated Speed 2,900 RPM	BEP 64.4 %
Min Flow 133.33 l/min	BEP Flow 254.89 l/min
Max Flow 366.67 l/min	BEP Head 57.71 m
H@QMin 83.78 m	Max Operating Pressure 9,596.64 mbar
H@QMax 25.28 m	Max P2 3.76 kW

16GS40T-L4C | Duty Analysis



Name	Q (1x) [l/min]	H (1x) [m]	P2 (1x) [kW]	Q [l/min]	H [m]	P2 [kW]	ηp [%]	SE [kWh/m³]	NPSHr [m]
DP @ 1x	234.81	62.54	3.74	234.81	62.54	3.74	63.99	0	0

xylem
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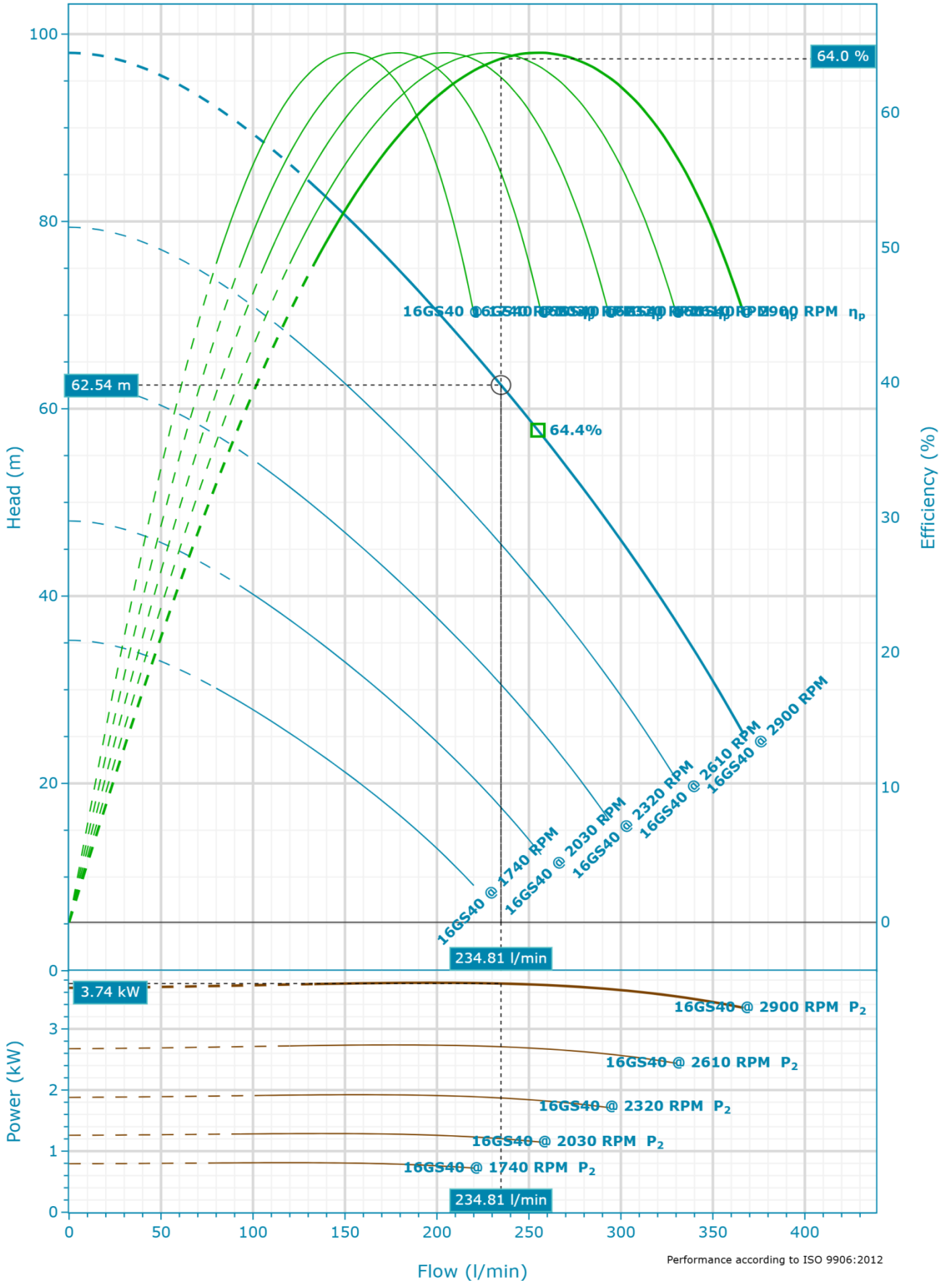
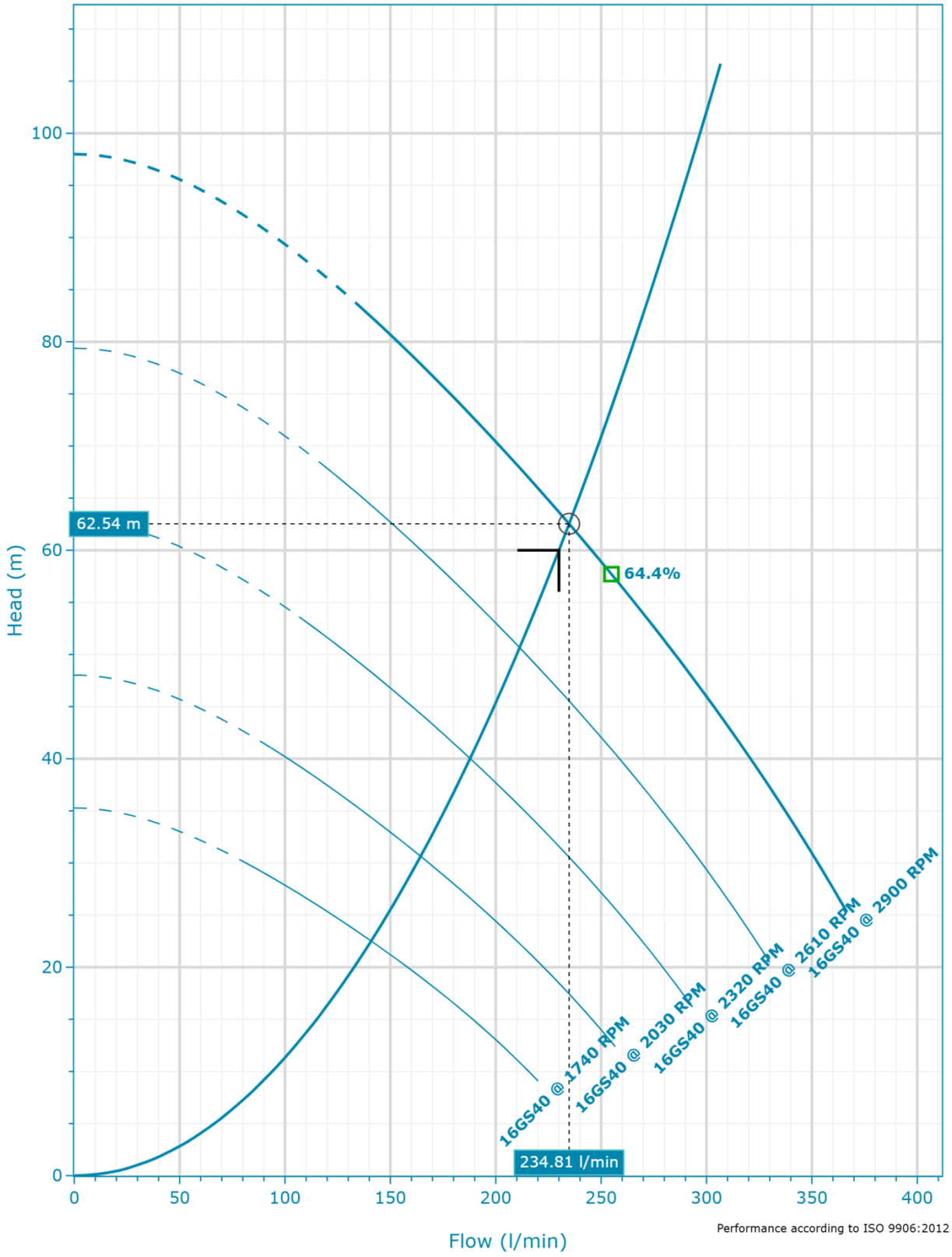
LOWARA
a xylem brand

16GS40T-L4C | Variable Speed Curve



Project:	Created By:	Created On:	Last Update:
16GS40T-L4C	Niel Koegelenberg	6/18/25	-

16GS40T-L4C | Variable Speed Analysis

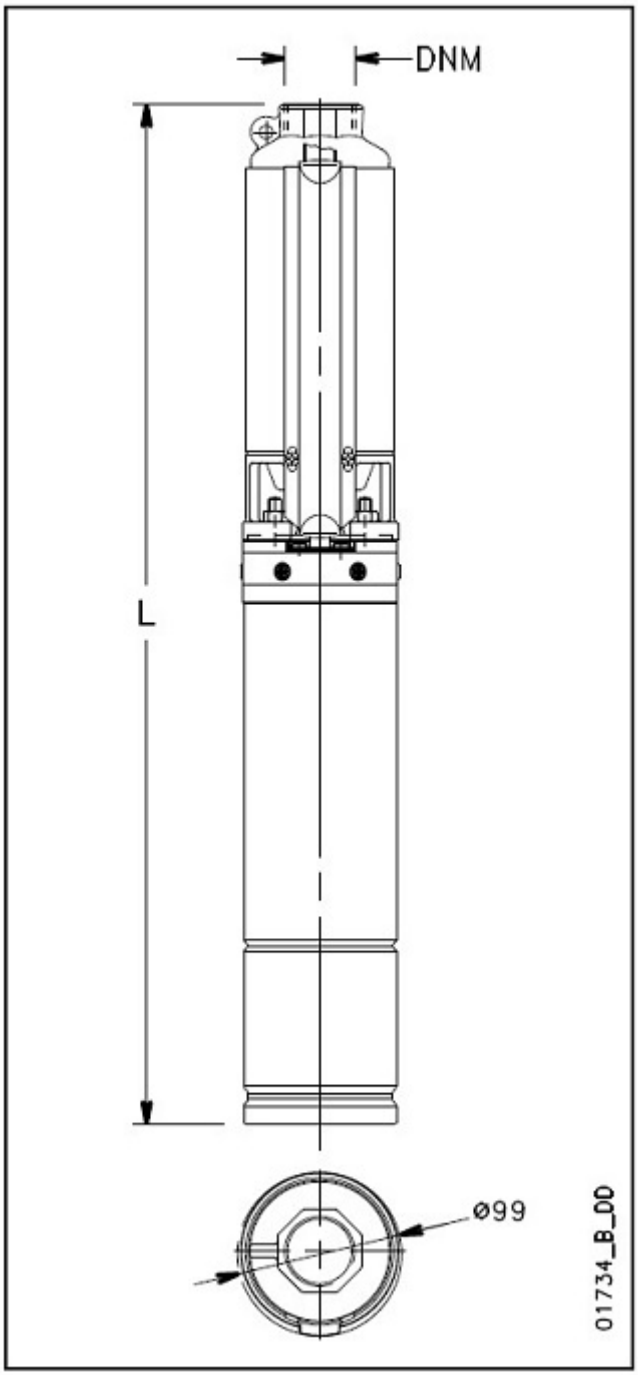


Name	Speed	Q (1x) [l/min]	H (1x) [m]	P2 (1x) [kW]	Q [l/min]	H [m]	P2 [kW]	ηp [%]	SE [kWh/m³]	NPSHr [m]
DP @ 1x	1,740 RPM	140.89	22.51	0.81	140.89	22.51	0.81	63.99	0	0
DP @ 1x	2,030 RPM	164.37	30.64	1.28	164.37	30.64	1.28	63.99	0	0
DP @ 1x	2,320 RPM	187.85	40.02	1.92	187.85	40.02	1.92	63.99	0	0
DP @ 1x	2,610 RPM	211.33	50.65	2.73	211.33	50.65	2.73	63.99	0	0

Project:	Created By:	Created On:	Last Update:
16GS40T-L4C	Niel Koegelenberg	6/18/25	-

DP @ 1x	2,900 RPM	234.81	62.54	3.74	234.81	62.54	3.74	63.99	0	0

16GS40T-L4C | Dimensional Data & Drawing



Dimensions

L
2,233 mm

DNM (Rp/R/DN)
Rp 2"

Total Weight
38.2 kg

Company	Brown Brothers Engineers
Contact	Niel Koegelenberg
Phone No.	0273100851
Email	niel.koegelenberg@brownbros.co.nz

xylem
Let's Solve Water

Installation & Maintenance Guide

Devan Water Tanks

Please read these guidelines before installation begins.

Failure to properly prepare and install your tank correctly or continue with ongoing maintenance will void your warranty.

V1.1

CONTENTS

Devan Water Tanks. Made in New Zealand for New Zealand Conditions!

In order to gain maximum benefit from your Devan water tank, we have outlined the following instructions for installation and setup. Please read all these instructions carefully before installing your tank. The tank warranty will be void if the installation instructions are not adhered to.

DELIVERY OF YOUR DEVAN TANK

Devan water tanks are delivered by road to your gate. Transportation to the actual site and installation is the risk and responsibility of the purchaser. Where there is easy and suitable road access, our drivers may agree to off-load closer to the installation site, however this will be at the purchaser's risk. On arrival please make sure that somebody is available to help our drivers off-load your tank.

Our drivers will phone the person nominated at the time of order on the morning of delivery to confirm details. They will advise an approximate delivery time. If the driver is unable to get hold of the nominated contact person, the tank will be off-loaded at the most convenient location at the site and it will be the purchasers responsibility to relocate the tank at their risk and responsibility.

If you have special access issues, please make sure these are made known either to the Devan sales team or to the driver. Examples of such issues include truck only access in tight spaces, farm gate entry as opposed to main driveway or tanker track entry or no wet weather access.

FOUNDATION AND LOCATION

A full Devan tank is extremely heavy (up to 30 tonnes). Be thoughtful in selecting your tank location.

When installing the Devan tank, choose a firm and level area that is free from any projections. Elevated locations must have a solid floor and be strong enough to withstand wind loads in conjunction with the weight of a full tank.

A level foundation is required for tanks 5,000 litres and larger. Concrete, quarry fines (<7mm), pumice and sand are all suitable.

Sand is the recommended option. The sand base needs to be 100mm deep, 500mm greater than the tank diameter and most importantly, free from any sharp objects or projections such as rocks, roots or stones.

The sand base must be retained at all times. Pipe tank overflow well clear of the sand base to ensure overflowing water does not aid erosion.

In high wind areas such as hilltops, the Devan tank can be secured to the ground using all four lifting lugs. Do not overtighten the tie-downs or damage will result.

Devan water tanks are not designed for in-ground installation but can be buried up to 500mm and back filled with clean fill. If further depth is required tanks must not be buried any further than a maximum of 1000mm below ground level keeping a free space of at least 500mm around the tank. This space should have drainage installed and the gap filled with bark so it is not a trap hazard for small animals or children.

Devan tanks can be recessed into banks or similar, providing the tank is not backfilled against and there is free space of at least 500mm around the tank.

Do not install water tanks over buried pipes, cables or any other utility connections which may require servicing or maintenance.

Do not install water tanks over underground structures such as cellars, septic tanks, sewage canals, etc.

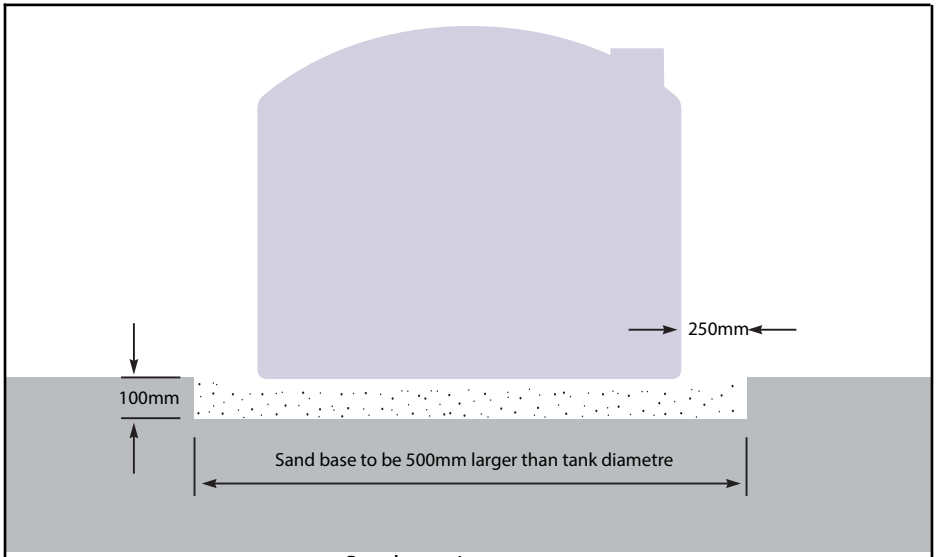
Do not install water tanks where they could pose a potential hazard to life or property. eg under foundations or within a building.

FOUNDATION AND LOCATION - CONTINUED

In areas prone to rabbit or other burrowing animals it is advisable to bury wire mesh to a depth of at least 600mm in a narrow trench around the foundation parameter.

In areas where livestock have access to the tank, the area surrounding the tank should be fenced to a minimum of 1.0 metre from the tank, to avoid any damage to the tank wall or outlet fittings.

Where the tank needs to be lifted into place, all four lifting eyes must be used in doing so. The lifting eyes are not rated sufficiently to be used with any water in the tank.



Sand requirements

30,000L	1.4m3
25,000L	1m3
15,000L	1m3
10,000L	0.75m3
5,000L	0.50m3

BOTTOM OUTLET PLUMBING GUIDELINES

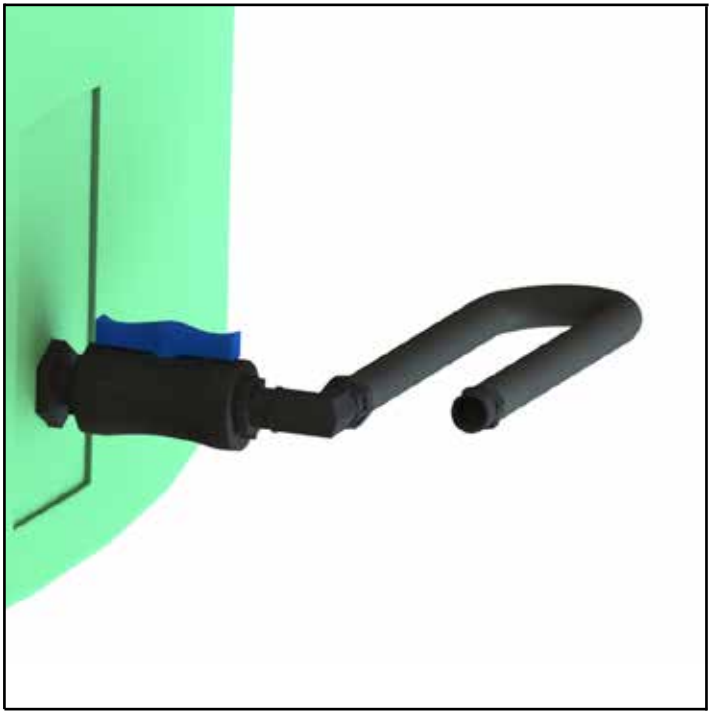
Bungs are screwed in loosley for transport only. If used permanently, please remove the bung and Teflon tape the threads and screw back in. Do not overtighten the bungs if they are to be refitted. This procedure must be completed before filling the tank.

Because polyethylene water tanks expand when full, plumbing to the tank must be flexible. Tanks will expand 30 to 40mm from new when filled for the first time. Tanks will contiune to expand up to 100mm over their life span.

All plumbing attached to the bottom of the tank must be done correctly with all base connections flexible and free from stress. Plumbing kits are recommended and are available from Devan in 25mm, 32mm and 50mm sizes.

Polyethylene pipe does not constitute flexible plumbing. Flexi-hose needs to be used to provide sufficient flexibility.

No extra penetrations are to be cut into the walls of the tank without written approval of the manufacturer. Doing so will seriously affect the structural integrity of the tank and could lead to premature failure.

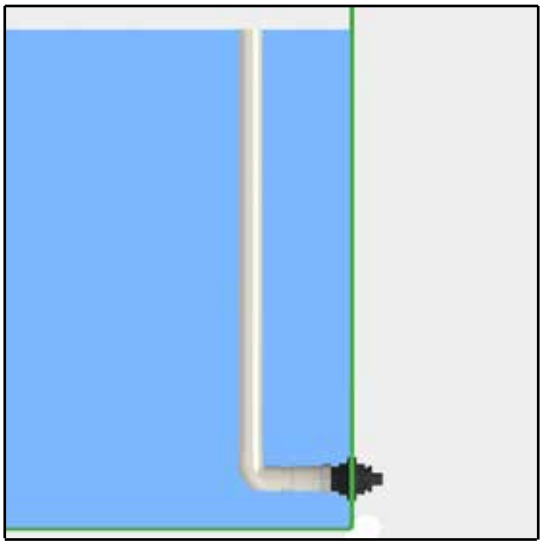


25mm Plumbing Kit - TAKPL25

BOTTOM OUTLET PLUMBING GUIDELINES - CONTINUED

There are specially designed mounting areas on the wall of the tank for outlet plumbing with brass fittings moulded-in for extra plumbing strength. These fittings are pre-drilled and tapped ready for use. These moulded-in fittings are raised off the bottom of the tank to prevent sludge pick-up and to retain sufficient weight (up to approx. one tonne in large tanks) making the tank more stable in exposed areas.

It is not recommended to install tank fittings anywhere else in the tank wall as this will create a stressed point in the tank structure and void the warranty. If an outlet fitting is required at a specific level, connect an internal vertical pipe to the desired level from the inside of the provided wall mounted outlet. These Restricted height outlets are available for purchase from Devan.



25mm Restricted Height outlet - RO25

All pipe fittings larger than 25mm must be supported independently to minimise stress on base. Please use only appropriate PVC or polyethylene fittings and make sure that all joints are flexibale and are well sealed and watertight with no light penetration.

Where a bottom outlet fitting of over 50mm is required it is strongly recommended that the tank be upgraded to heavy duty or extra heavy duty to accommodate the high-use nature of the application. If a larger fitting is installed in a standard tank it will void the warranty.

Any aftermarket fittings installed in the tank wall or base will void warranty.

TOP PLUMBING

Connecting to the dome

There are specially designed mounting areas on the dome of the tank, for inlet and overflow plumbing. We recommend the use of Universal seals® with all top plumbing and care should be taken when drilling the corresponding hole size. Proper hole saws must be used.

Universal seals® are available from Devan (25mm to 100mm).
The overflow should be piped away from the foundation to avoid erosion.

Overflows

An overflow must be installed in all instances to let excess water out of the tank. This is also important if the tank is filled from a float valve in case it sticks open.

A 'Hockey stick' shaped overflow will not provide sufficient out flow in instances of heavy rain and failure to allow could lead to the tank dome eventually vacuuming in.

Ninety degree overflow and vent pipe work is essential.

Rainwater Tank - example

TOP PLUMBING - CONTINUED

Venting

It is essential that you have more than adequate overflow and air venting for your operating conditions. Air and water must be able to exit the tank at the combined maximum rate that it can enter. If the tank is not sufficiently vented it will inevitably suck in the dome of the tank which will cause the tank to fail prematurely.

For high flow situations such as a wash down tank at a cowshed an appropriate size vent must be installed in the dome.

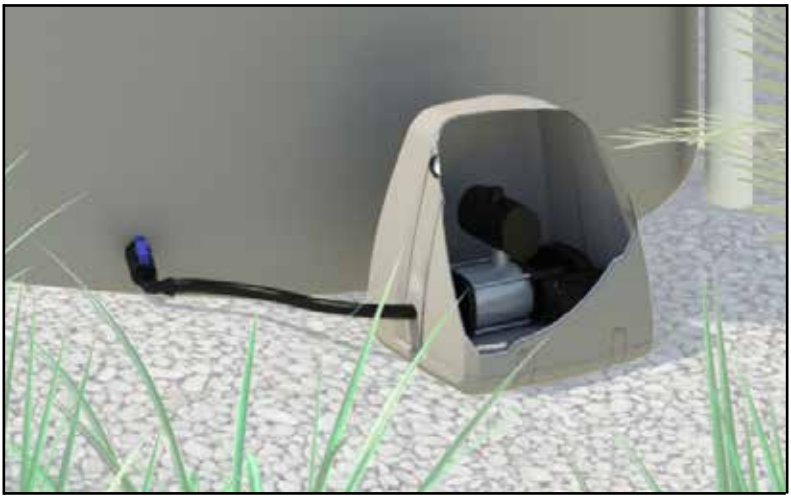
Venting options are available from Devan.

100mm Overflow vent kit- TAKOV100

WATER PUMP INSTALLATION

Do not directly install water pumps to the side of your water tank. The water pump and its motor must be self-supported on its own mount and connected to the tank via flexible hose to isolate any vibration or movement by the pumping unit itself. The tank outlet areas and their fittings must not be stressed by the weight of the water pump, motor or plumbing.

Remember to allow more than adequate overflow and venting when water pumps are used. Air and water must be able to enter or escape the tank at the same rate the water is being pumped in or out. Use the top plumbing areas when attaching overflow or vent plumbing to your water tank.



25mm Plumbing kit with Pump and Cover

WARRANTY POLICY

Your Devan product has been manufactured to the highest standards utilising advanced technology and production procedures. Devan Plastics Limited ("Devan") offers a warranty to the original purchaser that their products to be free of defects in workmanship or materials for the period defined in Appendix A, provided the provisions detailed below have been complied with.

A third party manufacturers' warranty applies to all other components used in the manufacture of Devan products. Third party manufacturer's warrant their products are free from defects in material and workmanship at the time of shipment and will make good, by repair or at its option replacement, any defects which occur during the warrantable period as defined in Appendix A provided the provisions below have been complied with.

Necessary provisions

In order for a warranty claim to be accepted by Devan or a third party manufacturer the following provisions must be met:

1) The equipment was correctly installed and in proper use as was intended by the manufacturer in accordance with the Installation and operating instructions supplied, and generally accepted code of practice or national standard/s.

2) The warranty period (as defined in Appendix A) from the date of invoice to the end user has not lapsed.

3) The claim for goods under warranty arises solely from faulty material or manufacturers' workmanship.

4) The customer or agent of the customer must return goods under warranty (where appropriate), stating the date and place of purchase promptly and within the product warranty period.

5) No repairs must be entered into by anybody other than a specified distributor or repairer as agreed and appointed by Devan.

6) Devan must be given a reasonable opportunity to inspect the tank and, if deemed necessary by Devan to have an independent engineering or other expert analysis of the cause of failure carried out.

Exclusions

Both the Devan warranty and third party manufacturer's warranty do not cover the following exclusions:

WARRANTY - CONTINUED

1) Except where otherwise stated by law, the manufacturer shall not be under liability for any injury, damage, or loss, including consequential damage or loss resulting from the use of its products, or resulting from defects therein. This may specifically refer to the cost of but not limited to lifting, installation, electrical or plumbing requirements.

2) Damage caused by abnormal operating conditions, war, violence, cataclysm, or any force majeure.

3) Damage caused by the equipment being used for an application for which it is not manufactured or recommended by the original manufacturer or Devan.

4) Damage caused by sand or abrasive materials, corrosion due to salt water, hazardous liquids, electrolytic action, and liquid temperatures beyond the recommended range, cavitation, and improper power supply voltage or outages.

5) Attempted repair, dismantling or any other tampering with any component of the system without the prior written approval of Devan will void any warranty.

6) If the Devan product or third party component has not been maintained in accordance with Devan.

7) Ingress of water or insect infestation to electrical components due to post-manufacture electrical penetrations not being appropriately protected.

8) Incorrect installation or negligent practices of the installer of the product.

9) Tank colour that may change or fade over time.

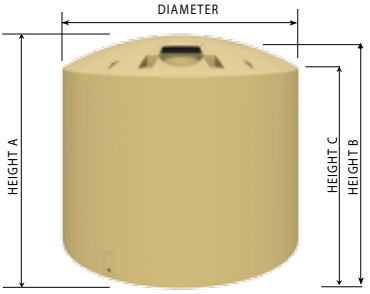
10) Any transport, insurance and freight costs.

This warranty does not exclude any condition or warranty implied by the Consumer Guarantees Act 1993, Fair Trading Act 1986, and the Commerce Act 1986 and is in addition to any rights the purchaser may have at law.

Appendix A - Product warranty periods

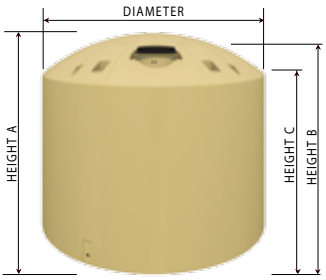
Product	Warranty Period
Water tanks (residential)	20 years
Water tanks (commercial)	10 years
Water tanks (custom made outlets - > 100mm)	1 year
Molasses tanks	10 years
Septic tanks	15 years
WWTS vessels	15 years
Grease traps	10 years
Flout tank	10 years
Detention/retention tanks	15 years
Drums	1 year
Refuse bins	1 year
Industrial bins	1 year
Third party components (WWTS)	1 year
Third party components (other)	1 year
Grundfos pumps	2 years

WATER TANK DIMENSIONS



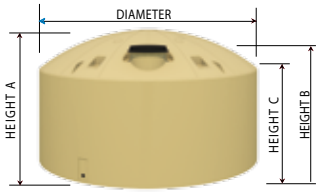
TT30 - 30,000 Litres

DIAMETER: 3.7 metres
HEIGHT A: 3.1 metres
HEIGHT B: 2.9 metres
HEIGHT C: 2.7 metres
WEIGHT: 475 kg
MANWAY: 435mm
OUTLETS: 2 x 50mm
THREAD: Brass BSP



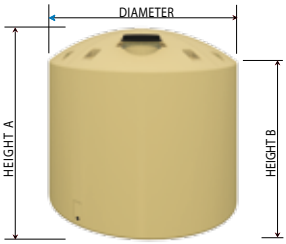
TT25 - 25,000 Litres

DIAMETER: 3.5 metres
HEIGHT A: 3.0 metres
HEIGHT B: 2.8 metres
HEIGHT C: 2.5 metres
WEIGHT: 375 kg
MANWAY: 435mm
OUTLETS: 2 x 50mm
THREAD: Brass BSP



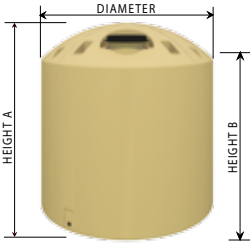
TT15 - 15,000 Litres - NORTH ISLAND

DIAMETER: 3.5 metres
HEIGHT A: 2.0 metres
HEIGHT B: 1.8 metres
HEIGHT C: 1.6 meters
WEIGHT: 250kg
MANWAY: 435mm
OUTLETS: 2 x 50mm
THREAD: Brass BSP



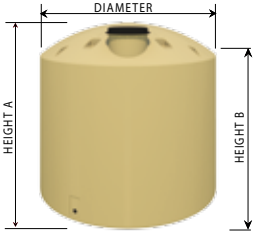
TT15 - 15,000 Litres - SOUTH ISLAND

DIAMETER: 2.9 metres
HEIGHT A: 2.6 metres
HEIGHT B: 2.2 metres
WEIGHT: 275 kg
MANWAY: 435mm
OUTLETS: 2 x 50mm
THREAD: Brass BSP



TT10 - 10,000 Litres - NORTH ISLAND

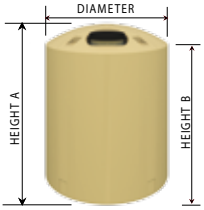
DIAMETER: 2.5 metres
HEIGHT A: 2.6 metres
HEIGHT B: 2.2 metres
WEIGHT: 225 kg
MANWAY: 435mm
OUTLETS: 2 x 50mm
THREAD: Brass BSP



TT10 - 10,000 Litres - SOUTH ISLAND

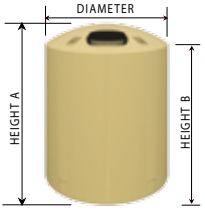
DIAMETER: 2.6 metres
HEIGHT A: 2.4 metres
HEIGHT B: 2.1 metres
WEIGHT: 225 kg
MANWAY: 435mm
OUTLETS: 2 x 50mm
THREAD: Brass BSP

WATER TANK DIMENSIONS - CONTINUED



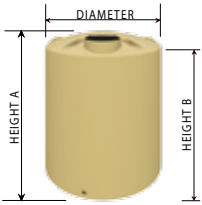
TT05 - 5,500 Litres - NORTH ISLAND

DIAMETER: 1.9 metres
HEIGHT A: 2.3 metres
HEIGHT B: 2.0 metres
WEIGHT: 112.5 kg
MANWAY: 435mm
OUTLETS: 1 x 50mm
THREAD: Brass BSP



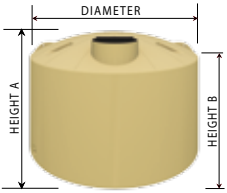
TT05 - 5,000 Litres - SOUTH ISLAND

DIAMETER: 1.9 metres
HEIGHT A: 1.9 metres
HEIGHT B: 1.8 metres
WEIGHT: 100 kg
MANWAY: 435mm
OUTLETS: 1 x 50mm
THREAD: Brass BSP



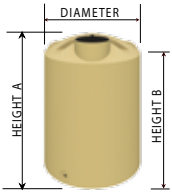
TT04 - 4,000 Litres

DIAMETER: 1.7 metres
HEIGHT A: 1.9 metres
HEIGHT B: 1.8 metres
WEIGHT: 75 kg
MANWAY: 383mm
OUTLETS: 1 x 50mm
THREAD: Brass BSP



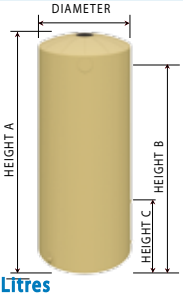
TT03 - 3,500 Litres

DIAMETER: 2.0 metres
HEIGHT A: 1.3 metres
HEIGHT B: 1.1 metres
WEIGHT: 75 kg
MANWAY: 383mm
OUTLETS: 1 x 50mm
THREAD: Brass BSP



TT02 - 2,000 Litres

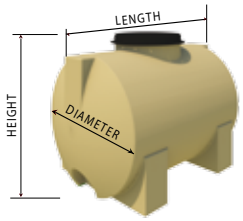
DIAMETER: 1.4 metres
HEIGHT A: 1.8 metres
HEIGHT B: 1.6 metres
WEIGHT: 50 kg
MANWAY: 383mm
OUTLETS: 1 x 50mm
THREAD: Brass BSP



TT01 - 1,000 Litres

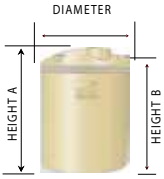
DIAMETER: 0.87 metres
HEIGHT A: 2.0 metres
HEIGHT B: 1.8 metres
HEIGHT C: 0.4 metres
WEIGHT: 35 kg
MANWAY: 150mm
OUTLETS: 2x50mm & 2x16mm
THREAD: Brass BSP

WATER TANK DIMENSIONS - CONTINUED



TT007 - 750 Litres

LENGTH: 1.3 metres
HEIGHT: 1.0 metres
DIAMETER: 0.9 metres
WEIGHT: 30 kg
MANWAY: 435mm



TT006 - 600 Litres

DIAMETER: 0.86 metres
HEIGHT A: 1.2 metres
HEIGHT B: 1.1 metres
WEIGHT: 20 kg
MANWAY: 190mm
OUTLET: 1 x 50mm
THREAD: Brass BSP

CLEANING AND MAINTENANCE

Depending on the cleanliness of your water source, your water tank should be cleaned on a regular basis.

What can end up in my water?
Algae growth is a common occurrence in water tanks. Devan water tanks are manufactured to strict quality tolerances, meaning that no light can penetrate the tank which will eliminate any algae growth, as algae need light to exist. Sometimes the nature of an installation can change this whereby an installer may cut oversized holes for inlets or overflows/venting. Blocking up any points for light to enter the tank will reduce or eliminate algae growth in the tank.

External debris are a much more visible source of contamination that will either float on the top of the water, of form sediment on the bottom of the tank. Such contaminants will consist of leaf litter, bird droppings, dead insects and even animals. This debris will build up on the bottom of your tank and require removal periodically.

Cleaning frequency
Devan recommend that you clean your tank out at least annually; however it is important to inspect your water tank on a quarterly basis to assess the level of contamination. A quality installation with the right pretreatment accessories could mean your tank remains in immaculate condition for a number of years before requiring cleaning. Cleaning of your tank will either take a bunch of your time or money and so the less frequently you need to clean it, the better. If you are noticing the rapid build up of sediment on the bottom of your tank, investigate the options for pre-treatment.

Devan tanks have outlet locations positioned up off the bottom of the tank which means you are not drawing off the contaminated water at the bottom of the tank for your day to day consumption. This is a precautionary measure only and should not be relied upon to prevent organic material entering your water supply.

Tank cleaning options

Professional contractors
The Yellow Pages and other online sources will provide the details of people providing 'Water Tank Services'.

Depending on your proximity to the nearest service provider, this is not a terribly expensive exercise with reports of $200-$300 plus the cost of a tank of water, which varies dramatically around the country.

CLEANING AND MAINTENANCE - CONTINUED

Although a self clean (described below) is a relatively straight forward exercise, it can be very time consuming, while a contractor will have it done in a couple of hours.

Do it yourself

Warning: If you will be getting into the tank to clean it, make sure there is adequate ventilation, and you have another person present at all times in case something should go wrong. Working in confined spaces is dangerous and should not be attempted by an individual working alone.

Draining the tank down to the last 1-2 thousand litres through the spare outlet will concentrate all contaminants into the bottom of the tank. The quickest and easiest way to then remove the concentrated contaminants is to hire a wet vacuum system or pump and stir up all the debris with a soft broom, which will then be sucked out by the vacuum or pump.

Siphoning off sediments may also be done using an inverted funnel (described below) or pool vacuum cleaner, by dragging it along the bottom of the tank.

1) Start with a piece of flexible plastic tubing long enough to reach into your tank. Then fix an ordinary kitchen funnel to one end.

2) Fill the tube with water from a garden hose, making sure there are no air spaces present and the funnel is partially filled.

3) Block up the open end with a watertight seal and hold the funnel end vertical so the water stays contained in the tube.

4) If you are unable to enter the tank, attach the funnel to a long pole that you can manoeuvre through the tank opening.

5) When ready, plunge the funnel end into the tank water, then position the outside end in bucket and remove the stopper.

6) Water should begin to flow out the tank into the bucket, and you can now suck up any accumulated debris on the tank floor.

Devan would like to credit Gisborne District Council for some written content and the pictorial siphon instructions, and the Ministry of Health for some written content.

Attach stamp

Devan Plastics Limited
PO Box 2602
Tauranga 3140

FOLD

WARRANTY REGISTRATION

Thank you for purchasing your tank from Devan, please take the time to fill out the warranty registration form. You can complete this online under 'warranty registration' or complete the form below and post it in.

Name .....

Address .....

.....

.....

.....

Phone .....

Email .....

Product Purchased .....

Serial or Sales Number .....

Installer (if used) .....

Description of tank use (stock water, home supply, molasses etc)

.....

.....

Check List

- ☐ Base outlets flexibly plumbed
- ☐ Overflow installed (larger than inflow)
- ☐ Base fill clean and level
- ☐ Tank vented correctly
- ☐ Depth of burial not exceeded

CUT

APPENDIX C – INTERGRATED TRANSPORTATION ASSESSMENT

ASHBOURNE DEVELOPMENT

Integrated Transportation Assessment

17 April 2025

commute
TRANSPORTATION CONSULTANTS

PROJECT	Ashbourne Development
REPORT TITLE	Integrated Transportation Assessment
DOCUMENT REFERENCE	Ashbourne ITA
DATE	17 April 2025

REPORT STATUS	PREPARED BY	REVIEWED BY	APPROVED BY
Draft Report	Hollie Yukich	Michelle Seymour	Leo Hills

4 Leek Street, Newmarket PO Box 128259, Remuera 1541, Auckland
Ph. 09 869 2825 | www.commute.kiwi

Table of Contents

1 Introduction

Commute Transportation Consultants (Commute) has been engaged by Unity Developments to prepare an Integrated Transport Assessment (ITA) for a Fast Track Proposal to provide for a comprehensive development proposal in Matamata (referred to as Ashbourne).

The proposal seeks to provide a multiuse development with four key precincts providing for a range activities including residential dwellings, a retirement village, small commercial hub and two areas of solar farms.

Included in this development are the following activities:

- 518 residential dwellings,
- A 0.75ha area of commercial activities,
- A retirement village of approximately 218 units and 71 care beds; and
- Approximately 27 ha of solar farm activities in two areas.

The site includes a number of development stages, and various activities proposed to be progressively provided on the site as part of a comprehensive development plan.

2 Existing Environment

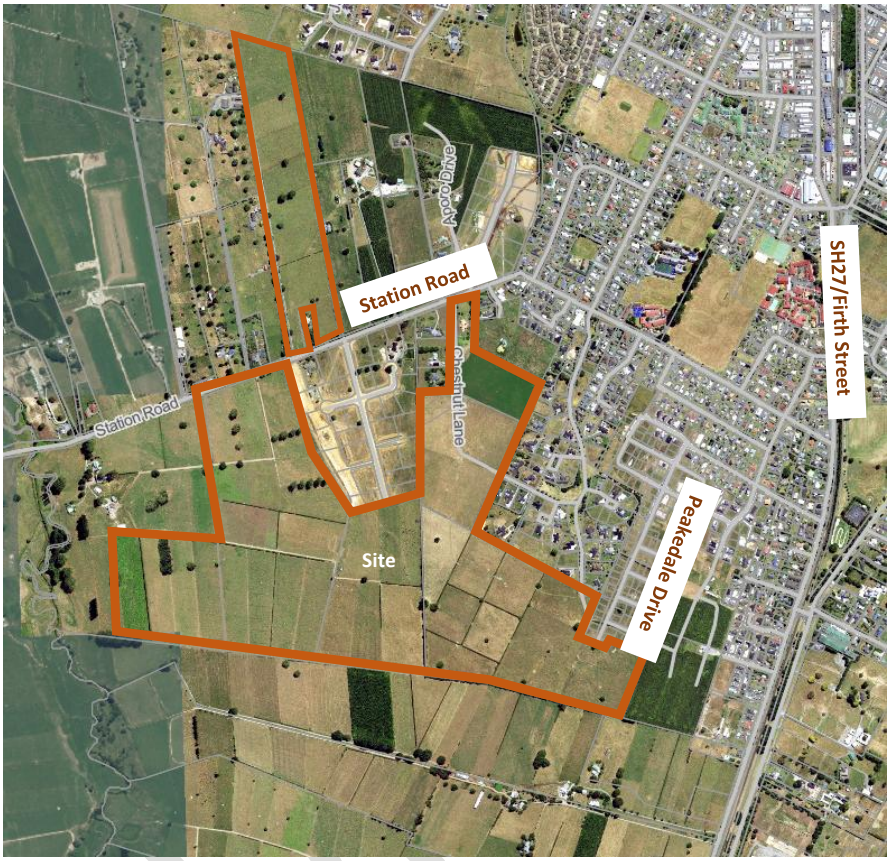
2.1 Development Location

Matamata is located in central Waikato, within the Matamata - Piako District. It is approximately two hours from Auckland, 55 mins from Hamilton, 45 mins from Tauranga and 55 mins from Rotorua.

Within Matamata, the site is located 2.5km to the west of the town centre (as a straight line, from the centre of the site), and is located adjacent to Station Road. The site connects to recently completed subdivisions to the east at Peakedale Drive.

Figure 2-1 shows the location of the site within Matamata.

Figure 2-1: Site Location and Context



As shown above, the surrounding area includes a mix of rural farmland and recently developed residential properties.

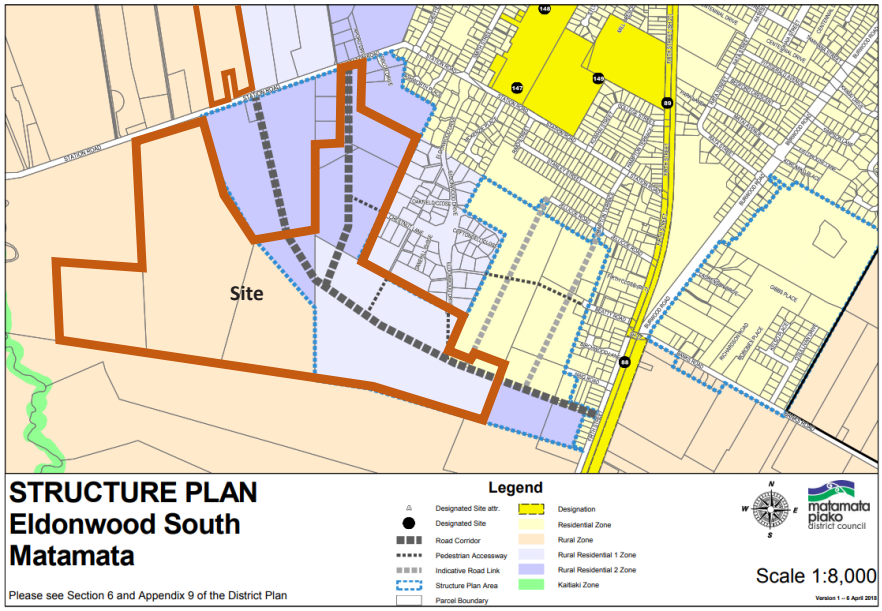
The site is proposed to have three connections to the existing road network, with two new intersections on Station Road and a connection to Peakedale Drive in the south.

2.2 Eldonwood Structure Plan

The site of the development proposal overlaps with the Eldonwood Structure Plan as shown in the Matamata Piako District Plan. This Structure Plan is shown below in Figure 2-2. As shown, there is a general expectation that the area immediately adjacent to the existing residential areas, will shift to rural residential, with road corridor spine travelling from SH27 through to Station Road.

The site is currently zoned a mix of Rural Residential 1, Rural Residential 2 and Rural zone.

Figure 2-2: Structure Plan: Eldonwood



3 Existing Transport Data

3.1 Existing Road Layout

The proposed development is located to the southwest of the current urban area of Matamata. The site adjoins the existing road network at several key locations, including Station Road via new road connections in two locations and Peakedale Road at the existing terminus.

3.1.1 Station Road

Station Road is classified as a Collector Road within the Matamata Piako District Plan (MPDP)[1]. The existing road reserve is 20.0 m wide, with a sealed width of 7.0 m, accommodating one traffic lane in each direction. Adjacent to the site, there are no footpaths or cycle provisions on Station Road, which is commensurate with the existing rural nature of the corridor.

Station Road has a posted speed limit of 50 km per hour at the most eastern extent, increasing to 80km per hour at Odium Drive, and increasing to 100km per hour at 200 Station Road.

Station Road in proximity to the intersection of Highgrove Avenue currently carries in the region of 620[2] vehicles per day (five-day ADT).

. . . . . .

[1] Section 9.1.1

[2] Tube Traffic counts completed week of 18 March 2024.

Figure 3-1: Station Road looking east

Figure 3-2: Station Road looking west

3.1.2 Firth Street

Firth Street is classified as a State Highway in the Matamata Piako District Plan (SH27). The corridor is approximately 21.5m wide with a 12.5m carriageway. A 1.5m footpath is provided on the western side, and a railway line is located on the eastern side of the corridor. The corridor includes two traffic lanes, and a flush median which provides for right turn bays along the corridor.

The posted speed limit varies on this corridor, with the speed in the vicinity of the site ranging from 50km/hr to 100km/hr as per the following:

- 50km/hr north of Jellicoe Road
- 70km/hr between Jellicoe Road and 229 Firth Street
- 100km/hr south of 229 Firth Street

Figure 3-3: Firth Street (SH27) looking north

3.1.3 Peakedale Drive

Peakedale Road, is not identified within the Matamata Piako District Plan as a significant, arterial or collector road and is therefore classified as a local road. This corridor is approximately 20m wide, with a sealed carriageway of approximately 10m. The road also provides for 1.5m wide footpaths on both sides.

Figure 3-4: Peakedale Drive looking south

3.2 Traffic Volumes

Intersection counts have been completed for the several key intersections including:

- Intersection of Jellicoe Road and Firth Street (SH27)

- This intersection is currently give way controlled, with priority to Firth Street, and a flush median and right turn bay provided on Firth Street.

- Intersection of Station Road and Firth Street (SH27)
  - This intersection is currently stop controlled with priority to Firth Street, and a flush median and right turn bay provided on Firth Street.

Intersections counts were completed on 14 March 2024 and are summarised in the figures below.

Figure 3-5: Turning Movement Vehicle volumes at Station Road and Firth Street (SH27)

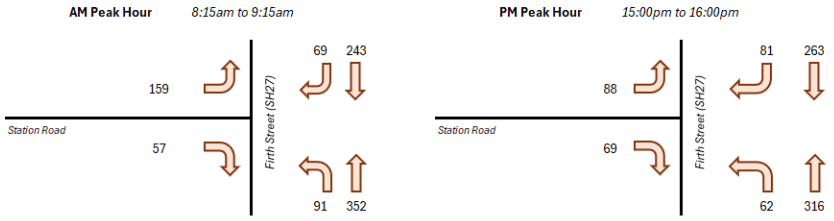
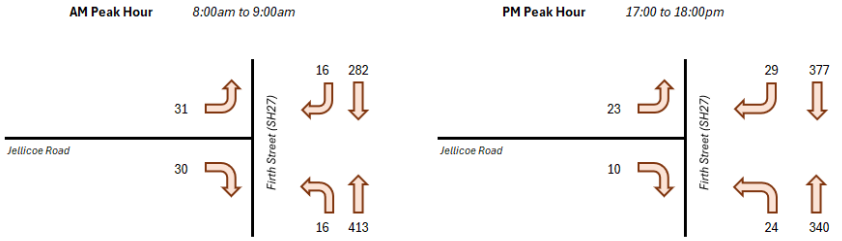


Figure 3-6: Turning Movement Vehicle Volumes at Jellicoe Road and Firth Street (SH27)



As shown above the peak hour of the Station Road and Firth Street intersection occurs slightly later than the Jellicoe Street intersection, and in the case of the afternoon peak this occurs much earlier. This is likely due to the closer proximity of Station Road to two schools, including Firth Primary School and Matamata College. The overall peak hours of the network nearby were found to be 8:00-9:00AM and 3:00-4:00PM.

3.3 Existing Intersection Performance

The existing performance of the intersections of Firth Street with Station Road and Firth Street with Jellicoe Road have been modelling utilising SIDRA. The movement summary for these intersections in the morning peak and evening peak are shown in the figures below. As can be seen, both intersections currently operate well with limited delay.

Figure 3-7: Morning Peak Period - Station Road and Firth Street (08:15 – 09:15)

MOVEMENT SUMMARY

Site: 101 [AM Peak Station Road and Firth Street (SH27) (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth Street (SH27)														
1	L2	91	3	96	3.3	0.259	4.7	LOS A	0.0	0.0	0.00	0.11	0.00	48.7
2	T1	352	47	371	13.4	0.259	0.1	LOS A	0.0	0.0	0.00	0.11	0.00	49.2
Approach		443	50	466	11.3	0.259	1.0	NA	0.0	0.0	0.00	0.11	0.00	49.1
North: Firth Street (SH27)														
8	T1	243	40	256	16.5	0.146	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
9	R2	69	2	73	2.9	0.068	6.6	LOS A	0.3	2.0	0.50	0.67	0.50	45.0
Approach		312	42	328	13.5	0.146	1.5	NA	0.3	2.0	0.11	0.15	0.11	48.8
West: Station Road														
10	L2	159	8	167	5.0	0.310	6.7	LOS A	1.4	10.5	0.57	0.77	0.64	44.2
12	R2	57	6	60	10.5	0.310	14.7	LOS B	1.4	10.5	0.57	0.77	0.64	43.7
Approach		216	14	227	6.5	0.310	8.8	LOS A	1.4	10.5	0.57	0.77	0.64	44.1
All Vehicles		971	106	1022	10.9	0.310	2.9	NA	1.4	10.5	0.16	0.27	0.18	47.8

Figure 3-8: Afternoon Peak Period - Station Road and Firth Street (15:00 – 16:00)

MOVEMENT SUMMARY

Site: 101 [PM Peak Station Road and Firth Street (SH27) (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth Street (SH27)														
1	L2	62	3	65	4.8	0.220	4.7	LOS A	0.0	0.0	0.00	0.09	0.00	48.1
2	T1	316	38	333	12.0	0.220	0.1	LOS A	0.0	0.0	0.00	0.09	0.00	49.4
Approach		378	41	398	10.8	0.220	0.8	NA	0.0	0.0	0.00	0.09	0.00	49.1
North: Firth Street (SH27)														
8	T1	263	35	277	13.3	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
9	R2	81	7	85	8.6	0.077	6.4	LOS A	0.3	2.4	0.47	0.64	0.47	44.6
Approach		344	42	362	12.2	0.154	1.5	NA	0.3	2.4	0.11	0.15	0.11	48.6
West: Station Road														
10	L2	88	6	93	6.8	0.272	6.4	LOS A	1.2	8.7	0.61	0.77	0.67	43.0
12	R2	69	8	73	11.6	0.272	14.4	LOS B	1.2	8.7	0.61	0.77	0.67	42.8
Approach		157	14	165	8.9	0.272	10.0	LOS A	1.2	8.7	0.61	0.77	0.67	42.9
All Vehicles		879	97	925	11.0	0.272	2.7	NA	1.2	8.7	0.15	0.23	0.16	47.7

Figure 3-9: Morning Peak Period - Jellicoe Road and Firth Street (08:00 – 09:00)

MOVEMENT SUMMARY

Site: 101 [AM Peak Jellicoe Road and Firth Street (SH27) (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth Street (SH27)														
1	L2	15	2	16	13.3	0.249	4.8	LOS A	0.0	0.0	0.00	0.02	0.00	48.3
2	T1	413	47	435	11.4	0.249	0.1	LOS A	0.0	0.0	0.00	0.02	0.00	49.8
Approach		428	49	451	11.4	0.249	0.2	NA	0.0	0.0	0.00	0.02	0.00	49.7
North: Firth Street (SH27)														
8	T1	282	48	297	17.0	0.169	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
9	R2	16	0	17	0.0	0.015	6.3	LOS A	0.1	0.4	0.48	0.60	0.48	44.8
Approach		298	48	314	16.1	0.169	0.4	NA	0.1	0.4	0.03	0.03	0.03	49.6
West: Jellicoe Road														
10	L2	31	0	33	0.0	0.107	6.3	LOS A	0.4	2.7	0.59	0.76	0.59	43.4
12	R2	30	0	32	0.0	0.107	12.1	LOS B	0.4	2.7	0.59	0.76	0.59	43.4
Approach		61	0	64	0.0	0.107	9.2	LOS A	0.4	2.7	0.59	0.76	0.59	43.4
All Vehicles		787	97	828	12.3	0.249	1.0	NA	0.4	2.7	0.06	0.08	0.06	49.1

Figure 3-10: Afternoon Peak Period - Jellicoe Road and Firth Street (17:00 – 18:00)

MOVEMENT SUMMARY

Site: 101 [PM Peak Jellicoe Road and Firth Street (SH27) (Site Folder: General)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Firth Street (SH27)														
1	L2	24	2	25	8.3	0.210	4.7	LOS A	0.0	0.0	0.00	0.04	0.00	48.3
2	T1	340	35	358	10.3	0.210	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	49.7
Approach		364	37	383	10.2	0.210	0.4	NA	0.0	0.0	0.00	0.04	0.00	49.6
North: Firth Street (SH27)														
8	T1	347	17	365	4.9	0.193	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
9	R2	29	0	31	0.0	0.025	5.9	LOS A	0.1	0.7	0.44	0.59	0.44	44.9
Approach		376	17	396	4.5	0.193	0.5	NA	0.1	0.7	0.03	0.05	0.03	49.5
West: Jellicoe Road														
10	L2	23	0	24	0.0	0.049	5.9	LOS A	0.2	1.3	0.52	0.65	0.52	44.1
12	R2	10	1	11	10.0	0.049	12.9	LOS B	0.2	1.3	0.52	0.65	0.52	43.9
Approach		33	1	35	3.0	0.049	8.0	LOS A	0.2	1.3	0.52	0.65	0.52	44.0
All Vehicles		773	55	814	7.1	0.210	0.8	NA	0.2	1.3	0.04	0.07	0.04	49.3

3.4 Accessibility

3.4.1 Private Vehicles

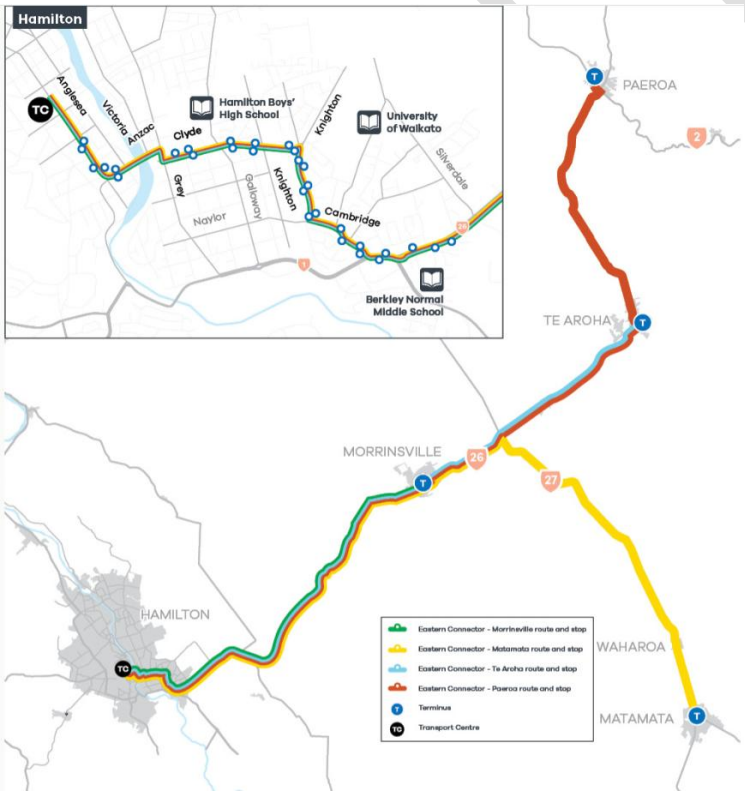
The proposed development area is well located in terms of connections to the roading network. Matamata is located at the intersection of State Highway 24 and State Highway 27, and the proposed plan change connects to Station Road, which in turn connects to SH27.

At a wider level, Ashbourne is located approximately 45mins to an hour to several regional centres, including Hamilton, Tauranga and Rotorua.

3.4.2 Public Transport

There is limited local Matamata bus services, although there are several buses linking to Hamilton and Morrinsville. As shown below in Figure 3-11, the Eastern Connector (in yellow), travels to Hamilton from Matamata on weekdays, with an internal loop through the Matamata town centre.

Figure 3-11: Bus Service between Matamata and Hamilton



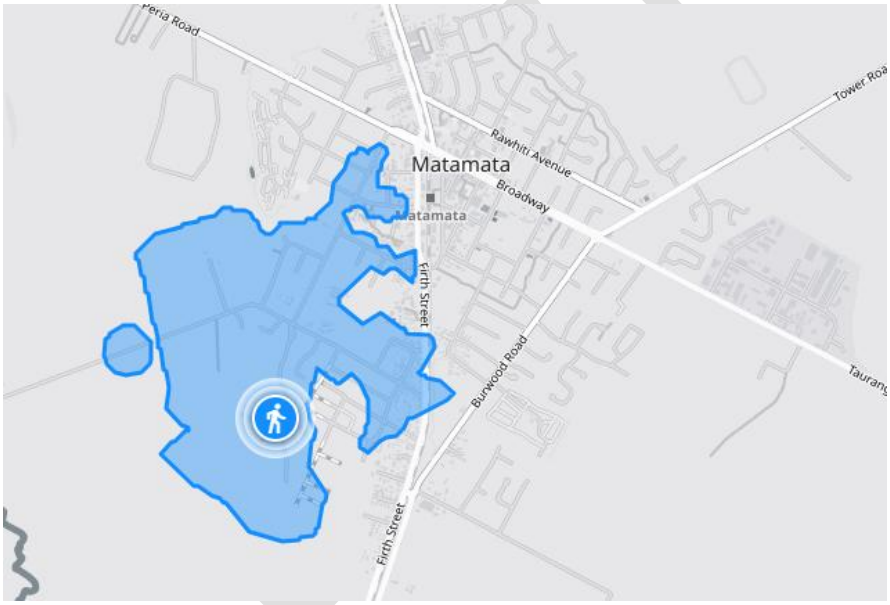
3.4.3 Walking

Using a practical walking distance of 1.5 kilometres and the 15th percentile walking speed of a typical fit, healthy adult of 1.2 m/s, gives a journey time of approximately 20 minutes. This is generally in line with New Zealand data in the Pedestrian Planning and Design Guide, which states that for walking trips, half are more than 10 minutes and 18% are more than 20 minutes. The primary catchment area for pedestrians has therefore been based on a 1.5km walking distance from the site as shown in Figure 3-12 below.

As can be seen from the centre of the Plan Change area (currently rural) a 20min walk will be slightly short of the Matamata centre. It is noteworthy however that as development progresses additional connections will be provided improving permeability for walking in these areas.

Within 20mins walk is Firth Primary School, Matamata Intermediate School and Matamata College. Within 25mins walk is the Matamata urban centre and associated community facilities.

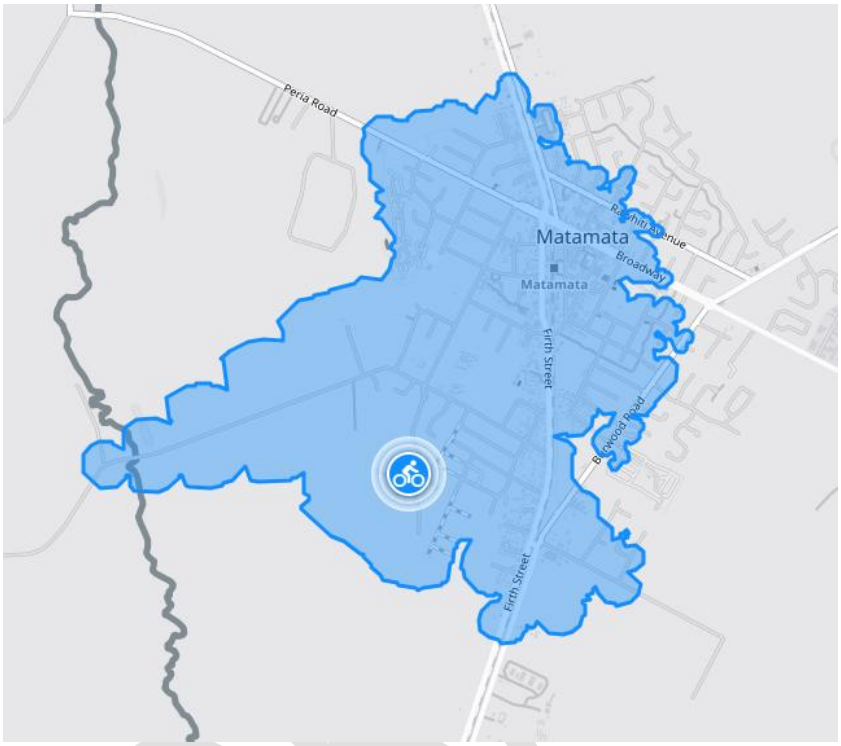
Figure 3-12: Walking Catchment



3.4.4 Cycling

Based on NZTA's Research Report 426, the average cycling trip length is approximately 3 kilometres. Based on a cycle speed of 20km/hr, Figure 3-13 shows an indicative cycling catchment for the site. As shown, the majority of Matamata is able to be reached by bike within approximately 10mins (ie within 3km).

Figure 3-13: Cycle Catchment



3.5 Road Safety Assessment

An assessment of the surrounding area's safety record has been carried out using the Waka Kotahi CAS database, for the five-year period between 2019 and 2023 plus any crashes entered into the system for 2024. The search included all reported crashes on Station Road and at the intersections of Jellicoe Road with Firth Street and Station Road with Firth Street. A total of 4 crashes were reported within the search criteria, including

- Car turning right from Firth Street to Station Road, hit by an oncoming cyclist (Minor Injury)
- Car on Firth Street lost control turning right, driver under instruction (No injury)
- Truck on Jellicoe Street hit car undertaking driveway manoeuvre (No injury)
- Car on Station Road lost control, car travelling over speed limit (No injury)

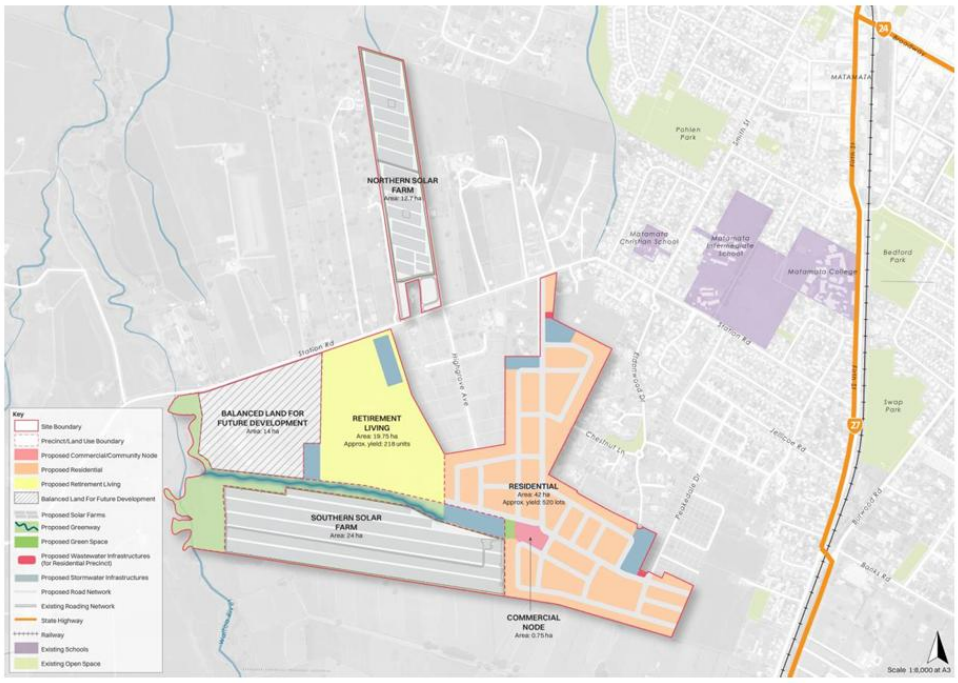
Based on the above, no definitive patterns or safety concerns are identifiable, and as such no road safety matters related to the proposed development have been identified.

4 Proposed Development

Ashbourne is a multi-use development that includes four key precincts:

- A new residential community, comprising 518 new residential units with a variety of densities, a green space and a commercial node;
- The commercial node is proposed to include the following activities
  - Childcare facility with an overall site of 500m^2 (capacity of approximately 100 children);
  - Café/Restaurants of approximately 150m^2;
  - Dairy/Convenience store approximately 300m^2; and
  - Shops/Retail approximately 900m^2.
- A multi-functional greenway that connects the neighbourhood centre and commercial node to the Waitoa River on the site's western boundary with an active-mode pathway along the length;
- A retirement living core, comprising of 218 units, an aged care service and supporting facilities that will be provided across a staged development; and
- Two solar farms which will provide a sustainable energy resource onsite, with the potential to integrate into the wider electricity network to generate energy outside of the immediate development.

Figure 4-1: Ashbourne Development Master Plan



4.1 Proposed Staging

Given the size of the development proposal, the development is proposed to be implemented in stages. Each separate development area within the full development proposal will be subject to a standalone staging, with the implementation of the retirement village, the residential components and the solar farms to be progressed independently.

4.1.1 Residential and Commercial Staging

The residential and commercial stages are proposed to be delivered in eight stages, that progress from the Peakedale Road end of the development, through to a connection at Station Road in the North.

Figure 4-2: Residential and Commercial Development Staging

4.1.2 Retirement Village Staging

As shown in Figure 4-3 below the Retirement Village is proposed to be developed from north to south in ten incremental stages. The timing of the stages will be largely dependent on market demands.

Figure 4-3: Proposed Retirement Village Staging

4.1.3 Solar Farm Staging

The Solar Farms are proposed to be developed in two stages, with the Northern Farm accessed from Station Farm being delivered first, and the Southern Farm being delivered second – with a longer term delivery horizon.

5 Trip Generation

In New Zealand, the RTA Guide is frequently used for assessing the traffic generating potential of residential developments. For residential dwellings such as those proposed, the RTA predicts 0.85 trips / dwelling for peak hour trips and 9.0 trips / dwelling for daily trips. Similarly, the RTA predicts a trip generation rate of 0.2 trips per dwelling in the evening peak for housing for aged and disabled persons. This rate has been adopted for the retirement village for both the AM and PM peak periods.

The RTA Guide is also used for assessing the traffic generating potential of commercial activities, and therefore was used for the childcare, café/restaurant, convenience store and dairy. With regard to the solar farm component of the development, once operational, this is estimated to generate in the vicinity of 4 trips per day based on the trip generation of other solar farms in New Zealand.

The total estimated traffic generation is summarised below in Table 5-1.

Table 5-1: Expected Traffic Generation

Activity	Quantity	Unit	RTA Rate	Internal Capture	Trips	
				AM and PM	AM	PM
Residential	518	Dwellings	0.85 trips per dwelling for peak hour	0	440	440
Solar Farm	2	Areas	2 trips per area in the peak hour	0	4	4
Retirement Village	218 71	Units Beds	0.2 trips per dwelling in the peak hour 0.15 trips per bed in the peak	0	55	55
Commercial Activities	150	Children	500m2 Childcare- Assume 100 Children, and 0.8 trips per child in the peak hour	80%	16	16
	150	m2	Café/Restaurant – 5 trips per 100m2	20%	6	6
	300	m2	Convenience Store/Dairy – 4.6 trips per 100m2	20%	11	11
	900	m2	Retail - 4.6 trips per 100m2	20%	33	33
Total					*565*	*565*

Internal capture has been included for the commercial activities, given the neighbourhood centre is located within the residential suburb. Generally, a 20% internal capture rate was adopted, with the exception of the childcare for which an 80% internal capture rate was adopted. The proposed childcare is anticipated to service the residents of the wider development and adjacent suburbs, and therefore these trips are likely to be via alternate modes (ie walking) or already captured in the residential trips.

These trips are assumed to split into inbound/outbound trips based on and these ratios are:

- 25/75 for the morning peak hour for residential
- 75/25 for the evening peak hour for residential
- 40/60 for the morning peak hour for retirement units

- 60/40 for the evening peak hour for retirement units
- 50/50 for both peak periods for commercial activities (due to the mixed use of activities, this is assumed to reflect the mixed activities)

This creates a total trip generation of the following

Figure 5-1: Traffic Generation by Direction

Activity	Trips	Morning Peak		Evening Peak	
		IN	OUT	IN	OUT
Residential	440	110	330	330	110
Retirement Village	55	22	33	22	33
Commercial Activities (including Solar Farm)	69	35	35	35	35
TOTAL	*565*	*167*	*398*	*167*	*398*

5.1 Traffic Distribution

Information from the census information[3] demonstrates that majority of trips related to school and employment in the peak hour are local trips. There is a number of external trips arriving at the area from the wider area (7%), but the vast majority of arrivals into Matamata, originate in Matamata (63%).

Based on this, the trip distribution has been completed with the majority of trips (90%) heading northeast, to connect with schools and employment opportunities. The remaining 10% are assumed to travel to the west or the south, with an equal distribution (5%) in each of these directions.

It is noted that the traffic expected from this application has been distributed based on the following assumptions:

- All retirement village trips were assumed to enter/exit the village via Station Road, noting that the intent is for the retirement village to be built from the north to the south.
- The retirement village trips with an origin/destination in the north/east were assumed to travel via Smith Street, noting the volume of retirement village trips are low (less than 50 peak hour trips).
- All other residential and commercial trips enter/exit the subdivision via Peakedale Drive. This aligns with the intended staging, where Stage 1 will be accessed via Peakedale Drive. Upon full buildout the spine road will allow vehicles to access the network directly onto Station Road, and therefore the assessment is conservative.
- The residential and commercial trips with an origin/destination in the north/east were all assumed to travel via Jellicoe Road and then Firth Street. Again, this is conservative acknowledging that some trips may travel via Smith Street.

The distribution of the trips across the network can be found in Appendix A.

[3] Commute Waka, 2018

5.2 Background Growth

Historic Census data has been reviewed to gain an understanding of residential growth in Matamata. The population of the Matamata-Piako District over the three most recent censuses dates[4] (for which data is available) is as follows:

- 2006 the population was 30,483
- 2013 the population was 31,536
- 2018 the population was 34,404

As such, over the 12-year period between 2006 and 2016, the population of the Matamata-Piako District increased by 3,921 people or 12.9%. This is equivalent to 1.1% growth per year.

A review of the average annual daily traffic (AADT) volumes on Firth Street (SH27) has also been undertaken to understand traffic growth. The NZTA site between College Street and Station Road was reviewed between 2019 and 2023 with the following average annual daily traffic volumes reported[5]:

- 2019 the AADT was 8,468
- 2020 the AADT was 8,000
- 2021 the AADT was 8,053
- 2022 the AADT was 7,867
- 2023 the AADT was 8,457

The drop in vehicle volumes on this corridor between 2019 and 2020 is likely a result of COVID-19. In 2020 and 2021 numerous lockdowns occurred as a result of the pandemic, and both regional and interregional vehicle movements were restricted.

The drop in vehicle movements between 2021 and 2022 is more difficult to explain, however it may have been a result of the SH27 upgrades near the Mangawhero Stream[6] which resulted in a section of the corridor being closed for 3 months. The detour route for these works still routed vehicles along Firth Street, however some trips may have diverted, and some trips may have not happened all together.

As such, over the 5-year period from 2019-2023 the vehicle movements on Firth Street fluctuated, however the volume did not grow.

Based on both the residential growth, and the nearby vehicle traffic growth, a conservative 1% annual growth rate has been applied to the existing network for a 10-year period. While the population has grown by 1.1%, the proposal will provide a large portion of the residential growth, and therefore a full additional 1% is already considered conservative.

[4] https://www.stats.govt.nz/tools/2018-census-place-summaries/matamata-piako-district
[5] https://experience.arcgis.com/experience/a09cd3ec9bdd4068b45c818a69601775#data_s=id%3AdataSource_1-192bc3bd297-layer-84%3A4878 , Site ID 02700075
[6] https://www.nzta.govt.nz/media-releases/sh27-south-of-matamata-detoured-10-january-to-14-april-2022/

5.3 Assessment of Traffic Effects

5.3.1 General Traffic Effects

Based on the access points available at Stage 1, the key existing wider network intersections include:

- Jellicoe Road / Firth Street (SH27) intersection
- Station Road / Firth Street (SH27) intersection

With regard to new intersections, two new intersections have been assumed on Station Road, referred to as:

- Spine Road/Station Road
- Retirement Village/Station Road

All intersections have been tested under the assumption of full build out, conservative network connections, and a background traffic increase of 10% on all existing movements. It is noted that the Spine Road has conservatively been assumed to not carry traffic, and therefore intersection modelling of this intersection has not been undertaken. Notwithstanding this, should 50% of the site trips use this access once it is provided (approximately 280 peak hour vehicle movements), the intersection could operate acceptably.

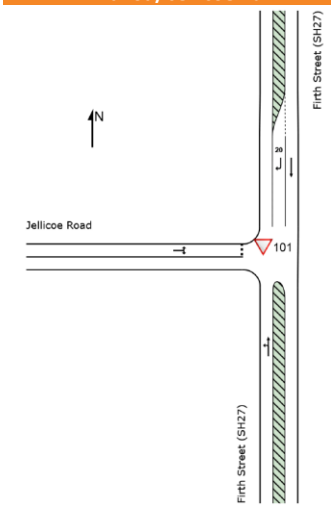
The default SIDRA parameters were generally retained, with the exception of the right turn gap acceptance out of the minor road at the Jellicoe Road / Firth Street intersection. The critical acceptance gap was reduced to 5 seconds and the follow-up headway was reduced to 3 seconds in accordance with Austroads[7]. The default gap acceptance parameters for the right turn out of the retirement village were conservatively retained given the higher speed environment on Station Road in this location as well as the road users accessing the network in this location.

The intersection layouts modelled are shown in Figure 5-2, and the performance of these intersections are summarised in the SIDRA results in Figure 5-3 to Figure 5-5.

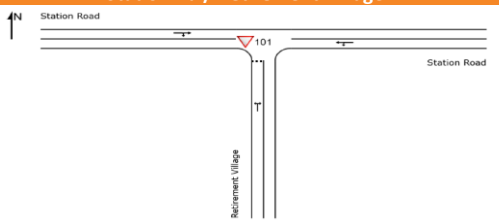
[7] Austroads Guide to Road Design Part 4A, Unsignalised and Signalised Intersections, Table 3.5: Critical acceptance gaps and follow-up headways

Figure 5-2: Intersection Layouts Modelled

Firth St / Jellicoe Rd



Station Rd / Retirement Village



It is noted that these intersections have been conservatively modelled without right hand turn bays, however given the speed environment, and in the case of the retirement village - older drivers, right hand turn bays have been proposed at both the intersection of Station Road and Spine Road and Station Road and the Retirement Village. The results as shown below can therefore be considered to be a "worst case" scenario, and the intersections will very likely perform better than reported.

Should the speed environment be reduced on Station Road to 50kph at a later date prior to the implementation of the proposed upgrades, the requirement for a right turn bay could be reevaluated.

Figure 5-3: SIDRA Movement Summary for Jellicoe Road / Firth Street Intersection in the AM Peak Hour

Site: 101 [AM Peak Jellicoe Road and Firth Street (SH27) (Site Folder: RG Assessment March 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Firth Street (SH27)															
1	L2	All MCs	26	1.0	26	1.0	0.266	4.6	LOS A	0.0	0.0	0.00	0.03	0.00	48.5
2	T1	All MCs	479	4.0	479	4.0	0.266	0.1	LOS A	0.0	0.0	0.00	0.03	0.00	49.7
Approach			505	3.8	505	3.8	0.266	0.3	NA	0.0	0.0	0.00	0.03	0.00	49.6
North: Firth Street (SH27)															
8	T1	All MCs	328	4.0	328	4.0	0.173	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
9	R2	All MCs	156	1.0	156	1.0	0.148	6.8	LOS A	0.6	4.5	0.53	0.71	0.53	44.5
Approach			484	3.0	484	3.0	0.173	2.2	NA	0.6	4.5	0.17	0.23	0.17	48.0
West: Jellicoe Road															
10	L2	All MCs	383	1.0	383	1.0	0.539	9.0	LOS A	3.8	26.7	0.68	0.96	1.08	42.9
12	R2	All MCs	54	1.0	54	1.0	0.539	19.8	LOS C	3.8	26.7	0.68	0.96	1.08	42.8
Approach			437	1.0	437	1.0	0.539	10.3	LOS B	3.8	26.7	0.68	0.96	1.08	42.9
All Vehicles			1426	2.7	1426	2.7	0.539	4.0	NA	3.8	26.7	0.27	0.38	0.39	46.8

Figure 5-4: SIDRA Movement Summary for Jellicoe Road / Firth Street Intersection in the PM Peak Hour

Site: 101 [PM Peak Jellicoe Road and Firth Street (SH27) (Site Folder: RG Assessment March 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Firth Street (SH27)															
1	L2	All MCs	42	1.0	42	1.0	0.240	4.6	LOS A	0.0	0.0	0.00	0.05	0.00	48.4
2	T1	All MCs	414	4.0	414	4.0	0.240	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	49.6
Approach			456	3.7	456	3.7	0.240	0.5	NA	0.0	0.0	0.00	0.05	0.00	49.5
North: Firth Street (SH27)															
8	T1	All MCs	349	4.0	349	4.0	0.184	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
9	R2	All MCs	378	1.0	378	1.0	0.338	7.1	LOS A	1.9	13.1	0.57	0.74	0.63	44.3
Approach			727	2.4	727	2.4	0.338	3.7	NA	1.9	13.1	0.30	0.38	0.33	46.9
West: Jellicoe Road															
10	L2	All MCs	161	1.0	161	1.0	0.361	7.3	LOS A	1.8	12.4	0.67	0.85	0.85	42.6
12	R2	All MCs	58	1.0	58	1.0	0.361	20.7	LOS C	1.8	12.4	0.67	0.85	0.85	42.5
Approach			219	1.0	219	1.0	0.361	10.9	LOS B	1.8	12.4	0.67	0.85	0.85	42.6
All Vehicles			1402	2.6	1402	2.6	0.361	3.8	NA	1.9	13.1	0.26	0.35	0.30	46.9

Site: 101 [AM Peak Station Road and Retirement Village (Site Folder: RG Assessment March 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Retirement Village															
1	L2	All MCs	1	1.0	1	1.0	0.023	4.7	LOS A	0.1	0.5	0.18	0.53	0.18	45.6
3	R2	All MCs	26	1.0	26	1.0	0.023	4.9	LOS A	0.1	0.5	0.18	0.53	0.18	45.4
Approach			27	1.0	27	1.0	0.023	4.9	LOS A	0.1	0.5	0.18	0.53	0.18	45.4
East: Station Road															
4	L2	All MCs	18	1.0	18	1.0	0.036	4.6	LOS A	0.0	0.0	0.00	0.14	0.00	48.0
5	T1	All MCs	51	1.0	51	1.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	49.2
Approach			68	1.0	68	1.0	0.036	1.2	NA	0.0	0.0	0.00	0.14	0.00	48.9
West: Station Road															
11	T1	All MCs	56	1.0	56	1.0	0.030	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	49.9
12	R2	All MCs	1	1.0	1	1.0	0.030	4.6	LOS A	0.0	0.1	0.01	0.01	0.01	48.4
Approach			57	1.0	57	1.0	0.030	0.1	NA	0.0	0.1	0.01	0.01	0.01	49.9
All Vehicles			153	1.0	153	1.0	0.036	1.5	NA	0.1	0.5	0.04	0.16	0.04	48.6

Figure 5-5: SIDRA Movement Summary for Station Road / Retirement Village Intersection in the PM Peak Hour

Site: 101 [AM Peak Station Road and Retirement Village (Site Folder: RG Assessment March 2025)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Retirement Village															
1	L2	All MCs	1	1.0	1	1.0	0.023	4.7	LOS A	0.1	0.5	0.18	0.53	0.18	45.6
3	R2	All MCs	26	1.0	26	1.0	0.023	4.9	LOS A	0.1	0.5	0.18	0.53	0.18	45.4
Approach			27	1.0	27	1.0	0.023	4.9	LOS A	0.1	0.5	0.18	0.53	0.18	45.4
East: Station Road															
4	L2	All MCs	18	1.0	18	1.0	0.036	4.6	LOS A	0.0	0.0	0.00	0.14	0.00	48.0
5	T1	All MCs	51	1.0	51	1.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.14	0.00	49.2
Approach			68	1.0	68	1.0	0.036	1.2	NA	0.0	0.0	0.00	0.14	0.00	48.9
West: Station Road															
11	T1	All MCs	56	1.0	56	1.0	0.030	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	49.9
12	R2	All MCs	1	1.0	1	1.0	0.030	4.6	LOS A	0.0	0.1	0.01	0.01	0.01	48.4
Approach			57	1.0	57	1.0	0.030	0.1	NA	0.0	0.1	0.01	0.01	0.01	49.9
All Vehicles			153	1.0	153	1.0	0.036	1.5	NA	0.1	0.5	0.04	0.16	0.04	48.6

As shown in Figure 5-3 and Figure 5-4, the SIDRA model shows all movements at the intersection of Jellicoe Street and Firth Street operating at LOS C or better. The average delay experienced by a vehicle is 4 seconds in

both peak periods, with the intersection having remaining capacity available with a V/C ratio of 0.54-0.36 in the AM and PM peak hour respectively. As such, this intersection is considered to operate well within the industry desired performance thresholds.

The retirement village access is shown to operate well within the industry desired performance thresholds, as per the output summaries shown in **Error! Reference source not found.** and Figure 5-5. All movements operate at LOS A with an overall average delay less than 2 seconds.

5.3.2 Structure Plan Roading Assessment

The Eldonwood Structure Plan requires a specific infrastructure to be provided to support development, and also identifies specific corridors which require assessment. Assessment against the Eldonwood Structure Plan rules is provided in Table 5-2 and

Table 5-3.

Table 5-2: Rule 9.2.2 Additional Performance Standards for subdivision or development

Criteria	Assessment
(i) Any subdivision or development within the Structure Plan area shall provide for a collector road between Firth Street and Station Road with two links provided to Station Road.	One public connection is proposed to Station Road, as well as a private connection to Station Road within the retirement village. A second public connection to Station Road is not considered to be required, with the Peakedale Drive and the new Station Road connection providing sufficient capacity for the proposal. Pedestrian connectivity is provided to both Highgrove Avenue and Eldonwood Drive.
(ii) A minimum number of two roading links shall be provided between the collector road and Jellicoe Street.	The northern portions of these link roads are constructed, being Peakedale Drive and Hampton Terrace. The proposal includes extending Peakedale Drive to the southern extent of the Structure Plan Area. The southern portion of Hampton Terrace is not within the subject site and therefore beyond this application, however east-west connections to the Lot to the east are proposed in order to allow for future connectivity.
(iii) Pedestrian/cycle linkages shall be provided between the collector road, the existing Eldonwood subdivision and Firth Street.	Pedestrian footpaths, of at least 1.8m width, are provided on both sides of all new roads. Furthermore, a 2.5m wide shared path is proposed between Station Road and the southeastern boundary.

Table 5-3: Rule 9.2.4 Infrastructure and Servicing Schedule

Road	Assessment of Effect
Station Road East	From a traffic perspective this corridor can accommodate the additional traffic. The following upgrades are proposed to urbanise the corridor and improve the safety of the corridor: • Right turn bay at the new spine road access. To be provided when the Station Road connection is constructed. • Pedestrian footpath along the site frontage • Kerb and channel along the site frontage From the Spine Road to the Retirement Village access • A bridle path along the southern side of Station connecting to the Retirement Village retaining a rural standard
Hampton Terrace	The proposal does not connect directly to Hampton Terrace. As such, the effects of the proposal on Hampton Terrace are considered minimal.
Smith Street	From a traffic perspective this corridor can accommodate the additional traffic. Smith Street already provides pedestrian footpaths on both sides with kerbs and channels.
Haig Road	The proposal does not connect directly to Hampton Terrace. As such, there are no effects of the proposal on Haig Road.
Intersection Upgrades	As above, the intersections can operate acceptably in their current form. Right turn bays are already provided on Firth Street and therefore no upgrades are recommended at these intersections.
Additional Widening of Collector Road	Some widening has been proposed on Station Road at the intersection of Spine Road and the Retirement Village access to enable the formation of a right turn bay.

6 Future Network Connections

It is proposed that the roads within the retirement village will all be private roads. All other roads are to be vested and will be public roads.

External access to the proposal is proposed via two new intersections onto Station Road as well as an extension to Peakedale Drive. Allowance has also been made for two future east-west roading connections to the east of the residential subdivision at the eastern end of Road 1 and Road 16.

6.1 Proposed Roading Cross Sections

The proposed internal road network has been designed with consideration to the Regional Infrastructure Technical Specification (RITS) document and the Matamata-Piako District Council Development Manual 2010 (MPDCDM).

It is noted that the site is generally flat, and as such the proposed gradients all fall within the 14% maximum grade permitted by the MPDCDM.

6.1.1 Residential and Commercial Roading Network

The proposed residential and commercial activities will be serviced via a network of 16 new public roads that will be vested to Council. Road 1 and Road 7 will act as local collector roads and have a 20m road reserve, with the rest proposed to be local roads and having an 18m road reserve. The cross section of these roads is shown below.

The cross-sectional requirements of new roads are detailed in Table 3.1 of the MPDCDM. Those relevant to the proposal are summarised in Table 5 below.

It is noted that the site is currently zoned Rural and Rural Residential, however the proposed application is for an urban environment rather than a rural environment. Rural road cross-sections in Table 3.1 are typically suited to speed environments of 100km/hr and provide no kerbside parking, pedestrian or cyclist facilities, with metal shoulders and swales. Use of an urban cross-section for the proposed subdivision is considered more appropriate given the proposed density, location and layout. Posted speeds of 50 km/hr are expected.

Table 6-1: Cross Section requirements Matamata- Piako District Council MPDCDM (Table 3.1)

Road Type	Du's / vpd served	Road reserve	Carriageway width (excl. parking)	Footpaths	Parking
Rural and Rural Residential Zone					
Local Road	>25 or 48-350 vpd	20m	6m	n/a	n/a
Collector Road	250 – 1,500 vpd		6-7m		
Residential Zones					
Local Road (cul-de-sac)	7-25 du or 56-200 vpd	18m	3.5m	1.5m one side	2.5m one side
Local Road (residential)	>25 du or 200 – 1,000 vpd	20m	4-6m	1.5m both sides	2.5m both sides
Sub collector (residential)	800 – 1,200 vpd		7m		

6.1.1.1 Road 1 and 7 Cross-section

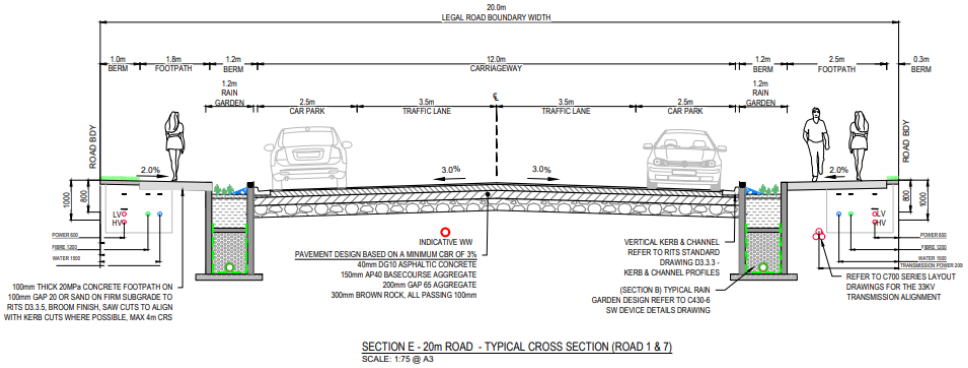
Road 1 provides the main access from Station Road into the site, with Road 7 providing the main southern entrance from Road 1 to the retirement village. Based on the definitions in Table 3.1 of the MPDCDM, Road 1 is anticipated to act as a sub collector road and Road 7 as a local road.

The Road 1 and Road 7 cross-section will consist of:

- 20m road reserve
- two x 3.5m traffic lanes;
- 1.8m wide footpath on one side of the carriageway and 2.5m on the other side of the carriageway
- 2.5m wide on both sides of the carriageway for the use of either parallel parking or berm build outs.

Figure 6-1 shows the proposed Road 1 and Road 7 cross-section.

Figure 6-1: Proposed Road 1 and 7 cross-section



This meets the road reserve, carriageway and parking dimensional requirements of the MPDCDM and exceeds the pedestrian requirements, thus is considered acceptable.

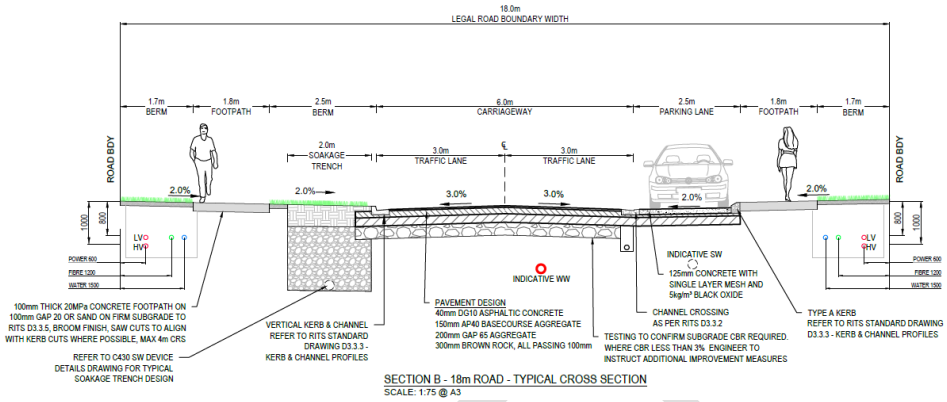
6.1.1.2 Other road cross-sections

All other road cross-sections within the residential and commercial aspects of the site will consist of:

- 18m road reserve
- two x 3.0m traffic lanes;
- 1.8m wide footpath on both sides of the carriageway; and
- 2.5m wide provision on both sides of the carriageway to be used as either kerb buildouts near intersections or parallel parking.

Figure 6-2 shows the proposed cross-section.

Figure 6-2: All other residential and commercial aspect road cross-sections



This meets the carriageway, parking and pedestrian requirements of the MPDCDM. It does not meet the overall road reserve width requirements of the MPDCDM (20m required versus 18m proposed). To accommodate this, a reduced overall berm width is proposed. This will not impact the parking or movement of vehicles or pedestrians, as such from a traffic and transport perspective this reduced reserve width is considered acceptable.

6.1.2 Retirement Village Roading Network

The proposed retirement village will be serviced via a network of 6-7m wide private roads. An overview of these roads is shown below

Figure 6-3: Proposed Roading Layout of Retirement Village

The cross section of these roads is shown below.

- Road 1 and Road 9: 7.0 m carriageway, with a 2.0 m berm and a 1.5 m footpath
- Roads 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13 and Road 15: 6.0m carriageway, no dedicated footpath
- Road 14 - 5.0 m carriageway with no dedicated footpath.

Figure 6-4: Cross Section for Road 1

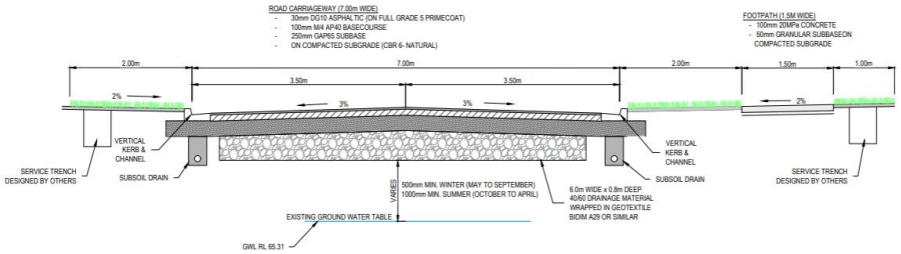


Figure 6-5: Cross Section for Roads 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13 and Road 15

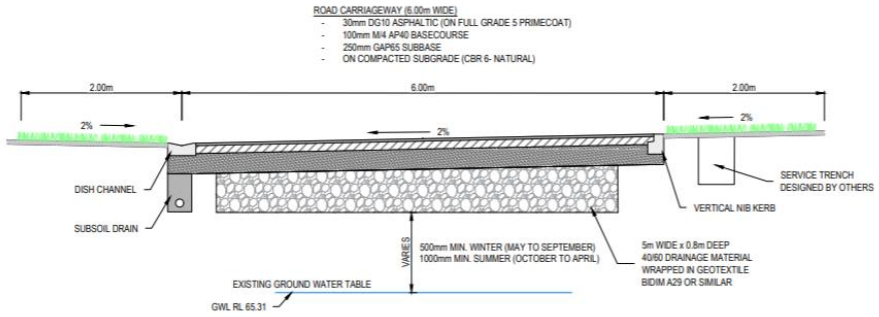
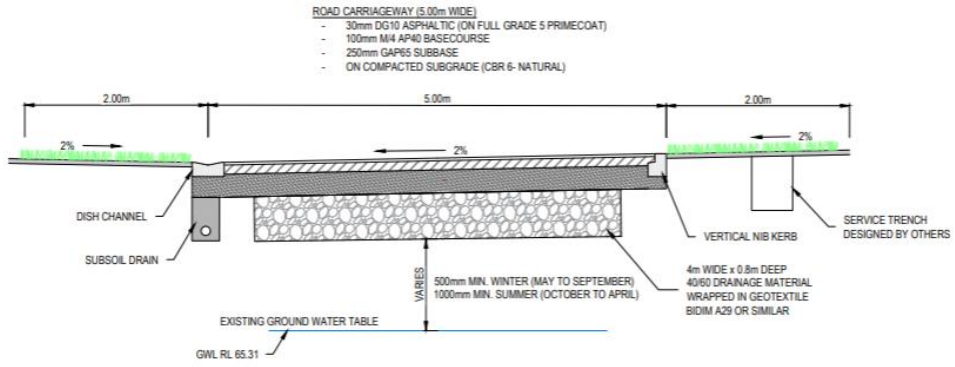


Figure 6-6: Cross Section for Road 14



The proposed cross sections of these roads will provide for a low-speed road environment, and given the low vehicle movements typically experienced within a retirement village setting, they will be appropriate for the intended use.

6.2 Intersections

All intersections have been designed to accommodate an 11.5m truck as per the RITS.

Within the residential component, those intersections with Road 1 can accommodate an 11.5m truck within the lane on Road 1, with an allowance for some crossing of the centreline on the minor road when turning into it.

All minor intersections in both the residential subdivision and retirement village require an 11.5m truck to cross the centreline. Whilst the 11.5m truck does not stay wholly within the lane as it turns into the minor roads this is considered acceptable as this will only occur once a week for the purpose of waste collection, vehicle speeds and volumes will be low at the minor intersections and this enables a much tighter intersection to be constructed, reducing pedestrian crossing distances and promoting slow vehicle navigation speeds.

6.2.1 External Intersections

Two new external intersections are proposed on Station Road, one would be 40m west of Aporo Drive and provide access to a new public road (Road 1) serving the residential, commercial and solar farms aspects of the proposal. The other would provide access to a new private road within the retirement village and be located 335m west of Highgrove Avenue. The location and layout of these can be seen in Figure 6-7 and Figure 6-8.
Both intersections are proposed to provide right turn bays to facilitate safe turning movements. No specific cycle provision is provided, but pedestrian paths will be provided on the southern side of Station Road between the proposed new Road 1 intersection and the existing pedestrian path which currently ends on Station Road near Sheffield Street. Tracking for these intersections is shown in Appendix B.

Figure 6-7: Proposed New Residential intersection

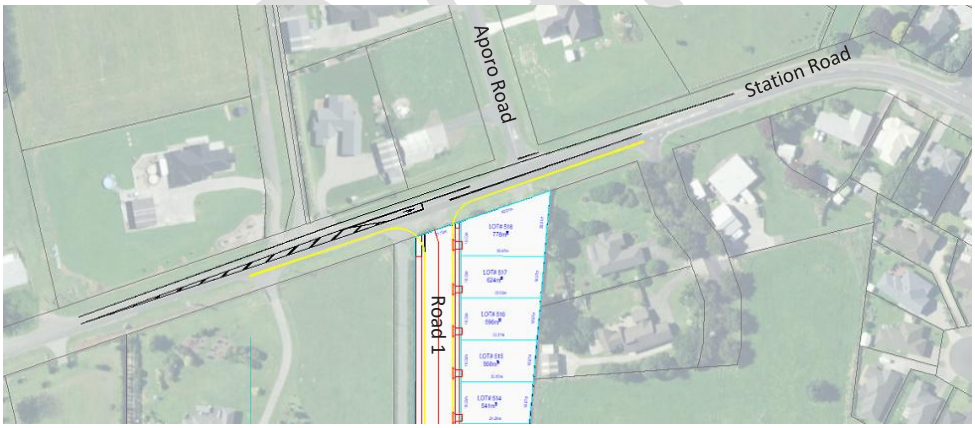
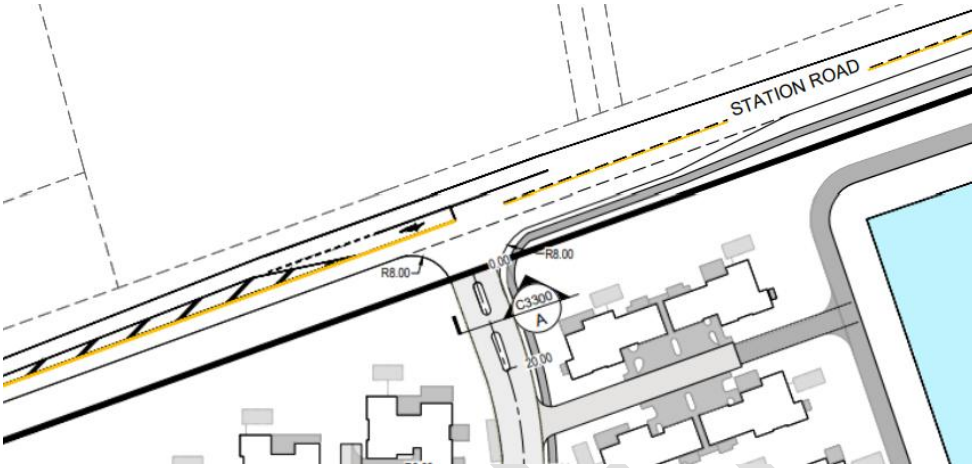


Figure 6-8: Proposed New Retirement Village intersection



6.2.1.1 Intersection Spacing

Section 3.7.1 a) of the MPDCDM gives minimum intersection spacing standards for intersections on opposite sides of the road in Residential and Rural Residential zones. For an 80 km/hr operating speed on collector / local roads this requires a spacing of 30m.

The proposed Road 1 intersection will be some xxm from the nearby Aporo Road intersection and the Retirement Village centre intersection will be 335m from Highgrove Avenue, thus both intersections meet this.

6.2.1.2 Proximity to vehicle crossings

Section 3.12.3 Table 3C of the MPDCDM gives minimum separation distances between rural vehicle crossings and intersections (such as those already on Station Road in the vicinity of the site).

For Station Road, which has a posted speed of 80 km/hr this is 45m when measured from the centre of the intersection to the centre of the vehicle crossing. Intersection spacing standards for intersections on opposite sides of the road in Residential and Rural Residential zones require that for an 80 km/hr operating speed on collector / local roads this requires a spacing of 30m.

For the proposed new retirement village intersection, the nearest existing vehicle crossings are 180m to the east and 490m to the west thus complies with this.

For the proposed new Road 1 intersection the nearest vehicle crossing are xx to the east and xx to the west thus does not comply with this. As discussed below, due to the existing topography, the intersection location excellent sight distance in both directions. Furthermore, the intersection is not the sole entrance to the development, with the southern portion of the development expected to reach the surrounding network via Peakedale Road. The intersection has also been located as far from the existing vehicle crossing as is practicable to maximise available distance, while still providing a core spine road in accordance with the indicative Structure plan. As such the intersection location to the vehicle crossing is considered acceptable.

Commented [MS1]: Need confirmation of where the intersection ends up. Still unlikely to comply.

Table 3B shows the minimum vehicle crossing separation standards. For a local road with an 85th percentile operating speed of 50 km/h, the MPDCDM states that one crossing is permitted per title irrespective of spacing, and 15.0 metres minimum spacing for second or multiple entrances.

It is proposed each dwelling has no more than one vehicle crossing, and therefore all dwellings comply with the MPDCDM.

6.2.1.3 Intersection Sight distance

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (Austroads Part 4A) provides sight distance requirements at intersections. In regard to the local roads, for a design speed of 80 kph and with a reaction time of 2 seconds a safe intersection sight distance (SISD) of 181 m is required. In addition, an approach sight distance (ASD) of 114m is required. The MPDCDM requires a minimum sight distance of 175m for an 80km/hr operating speed environment.

Given the existing topography, available SISD for both the retirement village access and the residential access is in excess of 181m required. The available site distance from the proposed Spine Road intersection to the east is the shortest available (190m) and is shown below in Figure 6-9.

Figure 6-9: Available Sight Distance to the East – Proposed Spine Road

6.2.2 Internal intersections

Internally a total of 29 intersections are proposed within the public roading aspect of the proposal. Of these six will be formed as cross-roads intersections and 23 as T-intersections. All intersections will be priority controlled.

Within the private roading network in the retirement village a total of 11 intersections are proposed with the main road through the site. Of these eight will be formed as T-intersections and three as roundabouts. These have been designed with a minimum radius of 6.0m. These will also contribute to creating a slower speed environment.

6.2.2.1 Intersection Spacings

Internally within the residential subdivision where the operating speed is expected to be between 50 and 60 km/hr a spacing of 60m is required for intersections on the same side of the road and 30m for intersections on opposite sides of the road. It is proposed that all intersections on the same side of the road as each other will have a spacing of 70m or greater and all intersections on opposite sides of the road will have a spacing of 45m or greater.

Some of the roading intersections within the retirement village do not meet the spacing requirements of the MPDCDM. This is considered acceptable as all retirement village roads are proposed to be private and low speed. Users will be familiar with these, and traffic volumes will be significantly lower due to the absence of no public through traffic.

6.2.2.2 Intersection Sight Distance

Residential Development
Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (Austroads Part 4A) provides sight distance requirements at intersections. In regard to the local roads, for a design speed of 40 - 50 kph and with a reaction time of 2 seconds a safe intersection sight distance (SISD) of 73m - 97m is required. In addition, an approach sight distance (ASD) of 40 - 50m is required.

All of the intersections have been assessed for available sight distance, and due to the curve in the road, following do not provide sufficient sight distances. It is recommended that traffic calming be investigated at detailed design around the commercial centre on Road 1 to encourage lower speeds, both to improves sight distance and improve walking outcomes around the centre.

Location	Direction	Available SISD	Comment
Intersection of Road 1 and Road 7	Looking south from Road 7 along Road 1	75m	Recommend that street furniture and landscaping in front the commercial area is below 0.8m
Intersection of Road 1 and Road 10	Looking north from Road 10	50m	Recommend that traffic calming is investigated about the commercial centre to encourage a slower speed environment.

Retirement Village
The speed environment within the Retirement Village is proposed to be 20kph. This will be managed via appropriate speed signage and enforced by management of the Retirement Village. This would require a SISD of approximately 15m[8]. This is readily available at all intersections within the Retirement Village.

6.2.2.3 Intersection Design for Future Consideration

The following future design iterations are recommended at detailed design to improve intersection layouts

- Intersection Road 1 and Road 9 – investigate opportunities to align closer to 90 degrees
- Intersection of Road 14 and Road 10 – investigate opportunities to provide a standard T intersection.

6.3 Proposed Pedestrian Connections

Pedestrian connections have been provided through the development. All publicly vested roads will have footpaths on both sides, and pram crossings will be provided at all intersections.

6.3.1 Residential and Commercial

As mentioned above all publicly vested roads are proposed to be provided with 1.8m footpaths on both sides of the road. In addition to this, dedicated pedestrian connections within the residential area have been provided in the following locations:

- From Road 5 to Highgrove Avenue
- From Road 5 to Eldonwood Drive in two locations
- From Road 14 along the proposed Greenway

6.3.2 Retirement Village

Overall, it is intended that the roading network within the village is retained in private ownership. A pedestrian network within the village is proposed and connections from residences to the facilities, and to the neighbouring commercial centre have been provided. Pedestrian connections to the greenway facility have also been provided – enabling recreational walking for residents.

All driveway access that runs to the main road through the site has been developed to have a pedestrian connection provided to maximise walkability within the site and minimise “dead ends” for pedestrians.

6.4 Vehicle tracking

As detailed above, vehicle tracking has been completed for the proposed road network to demonstrate that an appropriate design has been provided. This tracking has been completed utilising 90 percentile car and a 90 percentile truck as per the MPDC Development Manual Figure 3A and 3B. This vehicle tracking is shown in Appendix X.

[8] Based on Austroads Part 4a, 20km/hr speed, 0% grade, reaction time of 2 seconds.

7 Access

7.1.1 Crossing Separation

Table 3-B of the MPDCDM shows the minimum vehicle crossing separation standards. For a local road with an 85th percentile operating speed of 50 km/h, the MPDCDM states that one crossing is permitted per title irrespective of spacing, and 15.0 metres minimum spacing for second or multiple entrances.

It is proposed each dwelling has no more than one vehicle crossing, and therefore all dwellings comply with the MPDC DM.

7.1.2 Crossing Distances from Intersections

Table 3-C of the MPDCDM shows the minimum separation between vehicle crossings and intersections. For a road with an 85th percentile operating speed of 50 km/h, the MPDCDM states that 20 metres of separation is required (as measured from the centreline of the intersecting road).

33 of the proposed 39 vehicle crossings comply with the MPDCDM, meaning that a total of 6 vehicle crossings do not comply with the minimum separation distance. These vehicle crossing locations are considered to be acceptable in this instance due to the following:

- The low-speed environment expected within the proposed development;
- The estimated low traffic volumes along the internal roads of the proposed development; and
- The available sight lines between vehicles exiting these crossings and vehicles likely to be within each intersection.

It is noted that the minimum separation between vehicle crossings within the development and McGowan Street is approximately 24.1 metres, meaning that the non-complying vehicle crossings within the development are only located within internal intersections.

7.1.3 Crossing Design

MPDC DG 308 shows the vehicle crossing design for all urban vehicle crossings. The proposed vehicle crossing designs comply with these designs in the urban areas.

The northern solar farm will be designed to meet Drawing DG 307 as a rural crossing on a District Road.

7.1.4 Crossing Site Distances

Vehicle crossing site distances have been assessed for all residential lots. All vehicle crossings provide sufficient sight distances, of at least 28m as per Table 3A of the MPDC DM - with the exception of Lot 123. It is recommended that the vehicle crossing be moved in order to achieve the compliant sight distance.

8 Parking

The following assessments have been undertaken against the Matamata-Piako District Plan, specifically Part B, Section 9.1: Roading of the Matamata-Piako District Council District Plan. Part B, Section 9.1.4 outlines the on-site parking requirements for residential developments. This states that:

"Every person who proposes to erect, re-erect, construct or substantially reconstruct, alter or add to a building on a site or who changes the use of any land or building, shall provide suitable areas for the parking of vehicles as required below, except for within the urban areas of the Towns of Matamata, Morrinsville and Te Aroha which include all landuse within the Residential, Business and Industrial Zones."

As the site falls within the rural areas of the town of Matamata minimum parking provisions apply.

8.1 Residential Parking

8.1.1 District Plan Parking Requirements

The MPDP requires that two parking spaces per dwelling are provided.

Residential parking is proposed to be contained on site for each dwelling. With the sites ranging in size from 350m2 to 800m2, there is sufficient on-site space to provide for parking a variety of ways to meet the MPDP requirements.

With regard to the smaller lots, concept plans have been developed to demonstrate how onsite parking will be provided for these dwellings. These can be found in the suite of application documents, and an example is shown below in Figure 8-1.

Figure 8-1: Indicative House Layout and Parking Provision on 350m2 lot

8.2 Commercial Parking

8.2.1 District Plan Parking Requirements

The parking requirements for the commercial parking area are shown below in Table 8-1.

Table 8-1: Matamata Piako District Plan Parking Requirements

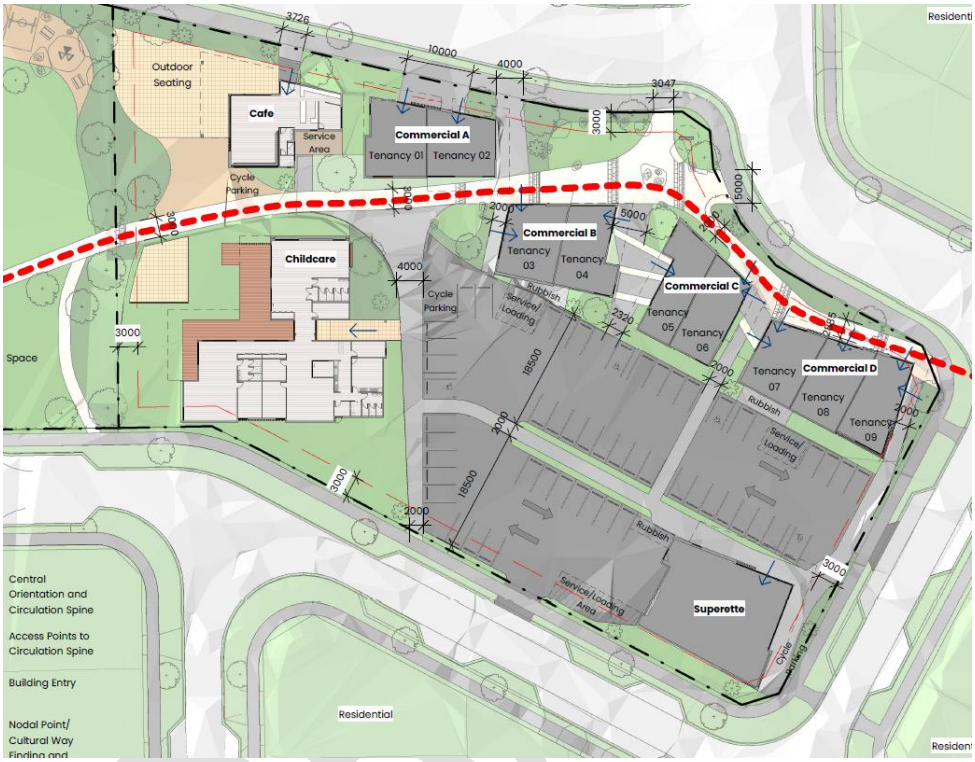
Activity	Proposed GFA / size	MPDP Parking Provision Rate	MPDP Requirement
Childcare	500 m2 100 students Assume staff ratio (1:10)	1 per four children, 2 per 3 staff	32
Café/Restaurant	150 m2	1 per 10m2	15
Dairy/Convenience	300 m2	1 per 40m2	8
Shops/Retail	920 m2	1 per 40m2	23
Total			**78**

In addition, the NZ Building Code / NZS 4121:2001 document, requires that at least two mobility spaces are provided for the first 50 parking spaces, with an additional mobility space to be provided for each additional 50 spaces (or part of).

8.2.2 Proposed Parking Provision

The commercial node is proposed to be supported by a central parking area, accessed from Road 10 and Road 14. This parking area will contain 51 parking spaces, with three loading spaces (two for van deliveries and one for an 8m truck) and four accessible spaces.

Figure 8-2: Proposed commercial parking layout



8.2.3 Parking Shortfall Assessment

The proposed parking provision results in a parking shortfall of 27 spaces. As per 9.1.4(iii) in the MPDP an assessment of this parking shortfall follows.

The parking area is proposed to be a large, shared parking area, which with the variety of adjacent uses, and complementary peak parking demands, this results in an opportunity for a more efficient parking provision. An assessment of the parking demands based on typical peak time of day demands is summarised below in Table 8-2.

Table 8-2: Peak Parking Demands Based on Shared Utilisation

		Peak Parking Demand based on Joint Demands							
Activity	**MPDP**	**AM Peak**		**Midday**		**Saturday**		**Evening**	
		Demand	**Spaces**	**Demand**	**Spaces**	**Demand**	**Spaces**	**Demand**	**Spaces**
Childcare	32	100%	32	25%	8	0%	0	60%	19
Café/ Restaurant	15	25%	4	80%	12	100%	15	75%	11

Dairy/ Convenience	8	75%	6	100%	8	100%	7.5	25%	2
Shops/Retail	23	25%	6	80%	18	100%	22.5	75%	17
Total Demand			**48**		**45**		**45**		**49**

As seen, overall estimated parking demands are highest in the evening peak, with estimated parking demands at 49 parking spaces.

In addition to this parking provision, on street parking is provided on Road 7, which can assist in the event of isolated parking demands in excess of the provision of 51 parking spaces.

8.2.4 Parking Dimensions

All parking spaces are proposed to be 2.6m wide by 4.9m long with a minimum of 7.7m manoeuvring aisle width.

MPDC Development Manual 2010 requires that 90-degree parking spaces for short term parking have a stall width of 2.6m, a stall depth of 4.9 (including kerb overhang) and a manoeuvring depth of 7.7m. As such all parking spaces comply with this requirement.

Mobility spaces have a total width of 3.6m, made up of a 2.5m space with 1.1m mobility strip. These dimensions meet the requirements of NZS 4404, and the MPDC Development Manual requirements.

8.3 On Street Parking

In addition to the on-site parking, on street parking will be available on all of the road network. The provision on each road is dependant on the location of vehicle crossings and the provision of rain gardens.

8.4 Retirement Village

8.4.1 District Plan Parking Requirements

The parking requirements for the commercial parking area are shown below in Table 8-3.

Table 8-3: Retirement Village District Plan Parking requirements

Activity	Proposed no./ size	MPDP Parking Provision Rate	MPDP Requirement
Villas	218	2 / dwelling	436
Aged care hospital	71 beds 18 employees No ambulance spaces	Visitor parking - 1 space / ten beds, plus 1 space / two employees, plus 1 space / ambulance	7 36 1
Aged Care Total			**44 spaces**

In addition, the NZ Building Code / NZS 4121:2001 document, requires that for the hospital component at least two mobility spaces are provided for the first 50 parking spaces, with an additional mobility space to be provided for each additional 50 spaces (or part of).

8.4.2 Proposed Parking Provision

All villas will be provided with a minimum of two parking spaces, typically with additional provision for visitor parking on site in front of garages.

The aged care hospital is proposed to be supported by some 41 parking spaces accessed from private Road 9.. This parking area will contain 39 spaces for staff and visitors, 1 ambulance spaces and 2 mobility spaces.

A parking provision of 41 parking spaces is a slight shortfall against the parking requirements of the MPDC.

In addition to the parking spaces above, parking spaces for larger vehicles such as campers has also been provided and can be access from Road 6 within the Village. This parking areas can also be utilised as overflow parking in exceptional circumstances.

Additional visitor parking is also available throughout the site (20 spaces) and located outside the facilities building (29 spaces).

The Aged Care parking shortfall is considered acceptable given:

- The Village is intended to operate as an integrated development and there is availability of additional parking on throughout the site and
- Aged care parking demands are expected to be slightly less than that required by the MPDC. Parking demands are expected to be region on 1 parking space per three beds for staff – 24 staff spaces, and 1 space per four beds for visitors – 18 visitor spaces.
- Staff shower and changing facilities are provided within the Aged Care facility to also encourage walking and cycling to work.
- A pick up/drop off area and the loading space adjacent to the building can both be utilised by ambulances in the event of an emergency.

8.4.3 Parking Dimensions

As mentioned above, parking dimensions are required to have a stall width of 2.6m, a stall depth of 4.9 (including kerb overhang) and a manoeuvring depth of 7.7m.

The proposed parking spaces within the Aged Care parking area are 2.7m wide, with a stall depth of 5m, and a manoeuvring depth of 8.0m. These comply with the MPDC requirements.

The proposed parking spaces at the facilities building are 2.7m wide, with a stall depth of 5.0m, and a manoeuvring depth of 8.0m. These comply with the MPDC requirements.

The other visitor parking spaces located throughout the site are 3.0m, with a stall depth of 5.0m, and a manoeuvring depth of 12m. These comply with the MPDC requirements.

8.5 Loading

8.5.1 Residential

There are no specific loading requirements in the MPDCDM. On street rubbish and recycling collection is proposed through the residential development. Vehicle tracking of an 11.5m truck has been undertaken to demonstrate circulation through the residential development. This tracking is provided in Appendix B.

8.5.2 Commercial

The commercial area is proposed to be supported by three loading bays, all located onsite within the shared parking area. No reverse movements on to the road network are required. Tracking of these areas has been completed and is provided in Appendix B.

Figure 8-3: Loading areas in commercial area

8.5.3 Retirement Village

The retirement village has been designed to accommodate an 11.5m truck to enable public rubbish collections to be facilitated. Rubbish collection points will be provided for residents at the end of the shared driveways, and rubbish collection trucks will not be required to travel on these parts of the internal network. As such a route that does not require reverse movements can be provided.

Servicing for the Aged Care is via dedicated loading space.

Vehicle tracking has been provided in Appendix B.

9 Integration with Policy and other Frameworks

9.1 Government Policy Statement on Transport (GPS 2024)

The Government Policy Statement on Transport (GPS 2024) sets four strategic priorities for Transport. These priorities include:

- Economic Growth and Productivity
- Increased Maintenance and Resilience
- Safety
- Value for Money

The Government's main priority is to boost economic growth through efficient land transport investment, enabling faster, safer movement and better access to housing land. The proposal provides increased housing options for Matamata, enabling growth while leveraging from the existing roading network. Assessment of the road network, demonstrates that the increased housing supply can be provided, with negligible impact on the efficiency of the surrounding road network. As such, it is considered that the proposed development is well aligned with the GPS for transport.

9.2 Waikato Regional Land Transport Plan (RLTP 2024 - 2054)

The strategic objectives of the 2024 Waikato RLTP are summarised in below. As shown, the proposed development is well aligned with these objectives.

Figure 9-1: Waikato RLTP Objectives

Objective	How the proposal meets the Objectives
Climate change–an environmentally sustainable, energy efficient and low-carbon transport system that delivers emissions reductions and enhances communities long-term resilience to the effects of climate change.	The proposal includes a solar farm to generate clean, renewable energy and reduce reliance on carbon-based sources. A walkable layout encourages short trips by active modes, supported by a local retail centre that reduces the need for vehicle travel.
Resilience– an efficient and resilient land transport system that ensures communities have route security and access to essential services.	The development features a connected street network with multiple access points, providing alternative routes and improving network resilience. It also allows for future connections to adjacent developments, supporting long-term growth and accessibility.
Growth and economic development– an integrated transport system that supports compact urban form and planned future growth; AND an efficient and resilient strategic corridor network that advances regional economic and social wellbeing	Located next to the existing urban area, the development provides direct links to Matamata town centre and regional transport corridors. It includes a mix of housing types, including a large retirement and aged care facility, supporting diverse housing needs and long-term social wellbeing.
Accessibility and transport options an integrated transport system that provides transport options for differing community access and mobility needs	A comprehensive network of footpaths, shared paths, and recreational trails supports walking and cycling, ensuring accessible transport choices for residents of all ages and abilities
Safety– a safe, accessible transport system in the Waikato region where no one is killed or seriously injured.	The development has been designed to prioritise safety and provides facilities for pedestrians and a shared path on the Spine Road, reducing the risk of serious injuries

9.3 Matamata-Piako District Plan objectives, policies and rules.

The following table provides an assessment of the proposal against the Transportation Objectives of the Matamata Piako District Plan: Part 3.8 Transportation. As shown, the proposed development is consistent with the objectives of Part 3.8.

Table 4: Assessment of Development Proposal against MPDC Transport Objectives

Objective	
O1: The strategic importance of significant transport infrastructure is recognised	The proposed development recognises the importance of strategic transport connections, with all access points designed to connect via existing intersections or new upgraded intersections that preserve through-movement along key corridors.
O2: A safe, efficient, integrated, and environmentally sustainable transport network that ensures our social, economic, and cultural wellbeing.	The development layout prioritises efficiency and connectivity, offering multiple access points and supporting logical extensions to the wider network over time. Active transport modes are encouraged through the provision of footpaths, shared paths, and a recreational trail, reducing car dependency and supporting environmental sustainability. The inclusion of a solar farm contributes to low-carbon energy use within the development, aligning with broader climate goals.
O3: The avoidance, remediation or mitigation of the adverse effects of transportation.	Assessments completed within this ITA has identified that the existing infrastructure can accommodate the expected traffic generation without adverse effects.
O4: To ensure that those activities that place demands on the roading network contribute fairly to any works considered necessary to meet those demands.	The development proposal includes new intersections where the roading network interfaces with Station Road. From the intersection with the Spine Road through to the existing urban area, an urban footpath will be provided.
O5: To protect residential amenity from the effects of excessive traffic generation.	Appropriate vehicle crossings and sufficient parking supply has been proposed for all parts of the development.
O6: To maximise safety and convenience for pedestrians and vehicular traffic on all sites.	The roading network has been developed to provide an efficient layout with high levels of connectivity. There are safe options for pedestrians to connect to the existing urban area, or to utilise the commercial centre.
O7: Provision for parking and loading is adequate to ensure the safety and efficiency of the road network, without stifling development or leading to inefficient use of land.	Assessment of parking and loading demands in this ITA has confirmed that an appropriate level of parking has been provided in an efficient manner that enables optimised land development.
O8: To encourage the provision of alternative transportation networks where it is clearly demonstrated that the provision of such networks	Footpaths and a shared path, and a recreational path through greenway have been provided to encourage local trips by active modes. A footpath

will positively benefit and enhance the environment and community which they serve.	will be provided on Station Road to connect with the existing footpath facilities.

9.4 Structure Plan Requirements

An assessment of the Structure Plan requirements has been provided in Section 5.3.2

10 Construction Traffic

The development site is currently rural residential, and while detailed earth works calculations have not yet been undertaken, the site is expected to be generally balanced in terms of cut and fill.

As is typical with a development of this scale, it is recommended that should consent be approved, a Construction Traffic Management Plan (CTMP) should be required as a condition of consent. A draft CTMP has been completed below and should be developed further and updated for each stage of works.

Based on experience of constructing similar projects and bearing in mind capacity within the existing road network, with the appropriate Construction Traffic Management Plan in place and the below measures implemented, it is considered that construction activities can be managed to ensure any generated traffic effects are appropriately mitigated.

10.1 Draft CTMP

10.1.1 Site Access

Site Access for all stages of work will be confirmed via a CTMP. This will confirm:

- Details of site access/egress over the entire construction period and any limitations on truck movements.
- All egress points should be positioned to achieve appropriate sight distances.

Specific details related to the below activities shall also be provided.

Retirement Village

Site Access to the Retirement Village in Stage 1 is expected to be via Station Road in the same location as the long-term development access. For subsequent stages, heavy vehicle access to the site will be to the west of the property boundary, via the balance lot to maintain safety for residents.

No sight line impediments have been identified, however temporary vehicle access will need to be sought and approved by MPDC.

Residential Development
Site access to the Residential Development for the initial stage will be via Peakedale Road. A supplementary haulage route will be provided at the location of the proposed Spine Road intersection which has suitable sight distance provisions.

Solar Farm Development

Site access to the Northern Solar Farm will be via Station Road. Vehicles will require sufficient turning space so that all egress movements from the site are in a forward-facing direction.

Site access to the Southern Solar Farm will be via either the balance lot to the north of the development, or via the existing new road network. This is dependent on staging. Confirmation of this access location will be confirmed in the final CTMP.

10.1.2 Site Parking

The development proposal is significant with a significant land area available. All workers and subcontractor parking shall be provided for on site.

10.1.3 Truck Routes

Truck routes will use Strategic Corridors including SH27 as much as practicable. Connections to these routes will be via the shortest route.

10.1.4 Construction hours

Construction hours are expected to generally be in the region of 7am – 7pm Monday to Saturday.

Due to the proximity of the site to several schools, non-movement hours to and from the site between 8am and 9am, and 3pm to 3.30pm are recommended.

Future consideration of the proposed day care operating hours and potential truck movement timings may be necessary depending on implementation staging.

11 Infrastructure Assessment and Implementation Plan

The proposed development is largely offline from the surrounding road network; however, several infrastructure improvements are proposed as part of the development and are summarised below.

Table 5: Implementation Plan

Proposed Upgrade	Responsibility	Final Owner	Trigger
New roading network to serve residential development	Developer	Matamata Piako District Council	Staged delivery coordinated with residential development
New Roading network to serve retirement village	Developer	Retirement Village Operator	As development occurs
New intersection with Station Road and Proposed Residential area	Developer	Matamata Piako District Council	Final development stage
Upgraded southern side of Station Road between existing urban edge and Spine Road intersection, including footpath	Developer	Matamata Piako District Council	Intersection of Spine Road and Station Road
New intersection to access Retirement Village on Station Road	Developer	Matamata Piako District Council	As development occurs
Rural Footpath to be provided on Station Road from new access with Retirement Village to proposed intersection on Station Road with new Spine Road on southern side of the corridor.	Developer	Matamata Piako District Council	Intersection of the retirement village access with Station Road.

12 Consultation

Consultation has been undertaken with MPDC and NZTA during the preparation of this application.

This included providing MPDC providing feedback on the referral memo prepared to support this Fast Track application. This feedback included commentary on the requirement for a Broad ITA in accordance with the MPDC District Plan. This commentary has been incorporated into this report.

Consultation with NZTA confirmed that no concerns were raised with the proposed development

13 Conclusions

The proposal seeks to provide a multiuse development with four key precincts providing for a range activities including residential dwellings, a retirement village, small commercial hub and two areas of solar farms.

Included in this development are the following activities:

- 518 residential dwellings,
- A 0.75ha area of commercial activities,
- A retirement village of approximately 218 units and 71 care beds; and
- Approximately 27 ha of solar farm activities in two areas.

This assessment has considered the transport effects of the development and following this assessment finds:

- The site is reasonably well located from a walking and cycling perspective, and within 25mins walk is the town centre and local schooling options;
- No traffic safety issues have been identified near the proposed development. Given the local residential nature of the surrounding roads, the proposed development is considered unlikely to exacerbate the road safety in any way both during construction and once the development is completed;
- The key intersection anticipated to be used by residents to access the wider area and road network is Jellicoe and Firth Street until such time that a new intersection is provided on Station Road. Intersection modelling shows that this intersection will be able to accommodate the additional trips generated by the proposed residential development;
- The internal road layout and cross-sections largely comply with MPDC DM standards and are considered be appropriate. Where there are deviations from these standards, it is considered that these do not result in operational or safety effects on the road network;
- All Vehicle tracking shown in Attachment B is considered acceptable;
- All proposed intersections have been reviewed in relation to the relevant sight distance requirements are appropriate to ensure a safe and efficient roading environment. The intersection of Road 1 and Road 7 and Road 1 and Road 10 do not meet the required standards. It is recommended that street furniture and vegetation be avoided at these intersections, and that traffic calming be investigated at detailed design.
- The driveway locations are considered appropriate and meet sight distance requirements with the exception of Lot 123. It is recommended that the vehicle crossing for this lot be moved in order to achieve the compliant sight distance.
- All waste is expected to be accommodated on-street via public collection;
- The effects relating to construction are temporary and the site is well positioned for safe and efficient access for construction vehicles;
- A CTMP as described in Section 10 should be a condition of consent.
- Crossing sight distance requirements for proposed pram crossings are checked through engineering approval stage.
- K-values of the proposed roads are rechecked at EPA stage to comply with the above Austroads requirements.
- Vehicle tracking is checked again at the EPA stage to ensure compliance.

Overall, there is no reason to preclude acceptance of the proposal as currently intended, subject to the recommendations made above. Accordingly, it is concluded that there are no traffic engineering or transportation planning reasons that would preclude the development of the subject site as proposed.

Appendix A: Trip Distribution

Appendix B: Vehicle Tracking

APPENDIX D – INNOFLOW WWTP CONCEPT DESIGN

ASHBOURNE RETIREMENT VILLAGE

ON-SITE WASTEWATER TREATMENT PLANT SPECIFICATION REPORT

Report prepared for:	**Maven Associates Limited**
Report prepared by:	**Agnes Chackochan, Innoflow Technologies NZ Ltd**
Innoflow Project Number:	**7760**
Date:	**7th November 2025**

innoflow wastewater specialists

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1.0 INTRODUCTION

This report, prepared by Innoflow Technologies NZ Ltd (Innoflow) present the technical specification for the proposed Two Stages system AdvanTex (AX1000 +AX300) wastewater system and Subsurface Pressure Compensating Drip Lines as land application system proposed to service Ashbourne Retirement Village.

The design report will include design details and specifications for the following key components:

- Peak Wastewater Production and Design Parameters
- Secondary and Tertiary Treatment process
- Sludge Production
- Power Consumption

2.0 DESIGN PARAMETERS

The AdvanTex AX1300 Wastewater Treatment Plant has been designed based on influent strength and daily flow stipulated below.

***Table 1** - Daily Wastewater Production*

Design Flows	Units	Total Flow
Peak Daily Flow (I&I = 1.6)	m³/d	120.6 m³/day
Average Daily Flow	m³/d	66 m³/day

***Note**: The average flow was calculated considering the occupancy given by Engineers (Table 2) and the Peak flow is considering the Wet Weather Factor 1.6*

***Table 2** - Occupancy Total by Engineers*

Villas		
Occupancy	People	349
Flow Allowance	L/Person/Day	165
Number of Dwellings		218
Care Rooms		
Occupancy	People	72
Flow Allowance	L/Person/Day	220
Staff		
Occupancy	People	30
Flow Allowance	L/Person/Day	50
Visitors		
Occupancy	People	30
Flow Allowance	L/Person/Day	15

2.1 Design Influent Parameters & Required Effluent Quality

2.1.1 Design Influent Parameters

Influent wastewater generated from the site shall be domestic strength in nature, with the following combined maximum influent strengths.

***Table 3** - Design Influent Strength*

Raw Wastewater Strength		
BOD_5	mg/L	492
TSS	mg/L	550
TKN	mg/L	77
NH_3	mg/L	45
TP	mg/L	19
Alkalinity as $CaCO_3$	mg/L	-

As a result of these design influent parameters, the recirculating textile packed bed reactor treatment plant has been specifically designed to achieve a wastewater quality that meets the compliance requirements.

2.1.2 Design Effluent Quality

The following tables describe the anticipated effluent quality from the proposed treatment plant.

***Table 4** - Effluent Quality*

Final Effluent Quality (*less than*)		
$cBOD_5$	mg/L	15
TSS	mg/L	15
TN	KgN/Ha/Yr	-
NH_3	mg/L	-
TP	mg/L	-
FC	cfu/100 mL	200

3.0 TOXICITY

The assumption has been made that the influent strength detailed in the table above is domestic in nature and does not contain concentrations of toxic substances that may adversely affect the performance of the biological processes required for the system to operate, these typically include but are not limited to.

Table 5a & 5b *- List of toxic compounds not to discharge into the treatment plant.*
Note: This is not a complete list, other harmful compounds are likely to exist that will adversely affect the performance of the plant.

Toxic Compound(s)	Example	Result
Heavy Metals	Copper, Nickel, Zinc, Cadmium, Chromium	Stop ammonia oxidation (reversible)
Metal-binding compounds[1]	Sodium Sulfide	Stop ammonia oxidation (reversible)
Bind heme and proteins[1]	Ethyl xanthate (mining industry)	Stop ammonia oxidation; cell death
Hydrazine (H_2N_2)1	Rocket fuel	Stop ammonia oxidation
Chlorination		Cell death
Uncouplers of oxidative phosphorylation and inhibitors of electron transport[1]	DNP (2, 4-Dinitrophenol) MCCP (m-Chlorocarbonyl-cyanize phenylhydrazone)	Cell death
Short-chain alcohols and amines[1]	Methanol, Ethanol, n-butanol	Cell death
Phenol[2]		Stop ammonia oxidation; cell death
Nitrous oxide (N_2O)[1]	Aerosol propellants	Stop ammonia oxidation
High levels of nitrite (NO_{2^-})		Stop ammonia oxidation
Quaternary amines	Disinfectant, surfactant, fabric softeners, shampoo	Cell death
UV light[3]		Stop ammonia oxidation

1. Hooper and Terry (1973) J. Bact. 115 (2) : 480-485
2. (1999) Water SA 25 (2): 167
3. (1985) J. Biochem. 226: 499-507

Toxic Compound(s)		Concentration resulting in 50% inhibition (mg/L)
L-Histidine		0.5
Thiosemicarbazide		0.9
Nitrourea	***	1
Allylthiourea		1.2
8-Quinolinol		1.5
L-Arginine		1.7
L-Valine		1.8
Diethyldithiocarbamate		2
L-Threonine		3.6

L-Lysine		4
Quinacrine	***	5
Diphenylthiocarbazone		7.5
L-Methionine		9
o-Phenanthroline		9
Phenazine methosulfate		10
Dicyclohexylcarb-diimide		10
2-Chloro-6-trichloromethyl-pyridine		11
Ethyl xanthate		12
Dipryidyl		16
2,4-Dinitrophenol	**	37
3-Aminotriazole		70
Aminoguanidine	**	74
Methanol	*	160
Dichlorophenolinde-phenol		250
Hydrazide		300
Methylamine		310
Trimethylamine		590
Tetremethylammonium Chloride		2200
Ethanol		4100
Acetone	*	8100
N-Butanol	*	8200
Aminoehtanol		12000
Ethyl Acetate	*	18000
N-Propanol	*	20000

* Included in the list of significant chemicals
** Inhibitors of both NH_3 and NO_2 oxidation
*** Inhibitors of NO_2 oxidation
All others inhibit NH_3 oxidation

4.0 WASTEWATER TREATMENT PLANT DESIGN

4.1 System Overview

The AX1300 Wastewater Treatment System consists of advanced secondary with tertiary treatment to the incoming influent generated from the facilities at Ashbourne Retirement Village. The wastewater strength generated is primarily residential from the Retirement Village units and care facilities. It is proposed to install an "Orenco Systems Inc." Wastewater Treatment Plant designed and supplied by Innoflow Technologies NZ Ltd. The system shall be comprised of the following components:

- 1 x Pump station Wet Well (3000mm ID)
- 3 x 70m³ Septic Tanks (210,000 L)
- 2 x 70m³ Pre-Anoxic Tanks (140,000 L)
- 2 x 70m³ Recirculation Tank Stage 1 (140,000 L)
- 10 x AX100 Packed Bed Reactors Stage 1
- 2 x 25m³ Recirculation Tank Stage 2 (50,000 L)
- 3 x AX100 Packed Bed Reactors Stage 2
- 2 x 70m³ Treated Effluent Storage Tank (140,000 L)
- Effluent Discharge Water Meters
- TCOM Control Panel
- UV disinfection Unit
- 24,184 m^2 Subsurface Pressure Compensating Driplines.

5.0 PUMP STATION

The wastewater project includes a pump station where all the waste coming from the dwellings and the care facilities is collected and pumped to the wastewater treatment Plant for secondary treatment.

***Table 6** - Pump Station Specification*

Wet well Manhole Manufacturer	Hynds
Number of Manhole	1
Dimensions (mm)	Height: 5225 mm Internal Diameter: 3008 mm
Pump Manufacturer	Flygt-Xylem
Pump Model	2 x NX6020-181-02.2kW DP N80S
kW	2.2 kW
Voltage	415 V
Amperage	3.9 A
Hz	50 Hz
Flow Rate at TDH	Approximately 4.23 L/sec @ 15.6 m
Inlet Diameter	110 mm
Outlet Diameter	80 mm
Insulation Class	H
Float Arrangement	Top Float: HLA/ Timer Override Middle Float: Timer Operate Bottom Float: LLA/RO

6.0 PRIMARY TREATMENT

To provide primary treatment of the wastewater, proposed system includes the following.

- 3 x 70m³ Septic Tanks (210,000 L)
- 2 x 70m³ Pre-Anoxic Tanks (140,000 L)

6.1 Septic Tank

3 x 70m³ septic tanks are proposed to provide primary treatment of the wastewater. The combined volume in these tanks is 210m³ and offers over 2.5 days hydraulic retention at ADW flows, sufficient for efficient settlement of solids and scum and anaerobic digestion. Approximately 50% of influent BOD5 are expected to be removed through these tanks. Four Biotube effluent filters are proposed at the outlet of the final septic tank to screen solids greater than 3mm in diameter and the media enhances primary treatment by a film growth on the filter.

6.1.1 Biotube Effluent Filter

The Biotube® Filter technology dramatically reduces the total suspended solids (TSS) exiting the tank (average 30ppm TSS) as well as protecting the down-line components. Effluent from the relatively clear zone of each tank, between the scum and sludge layers, enters the filter housing through influent holes to an annular space between the housing and a computer designed non-clog mesh screen. Particles larger than 3 mm are screened out and retained for further treatment (in fact biological growths on the screen filter out even smaller particles).

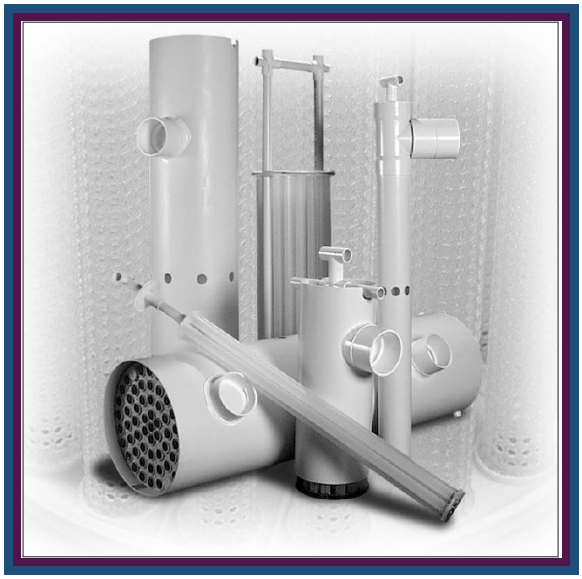


Figure 1 - Orenco's Biotube® effluent filter range

The effluent filter can also modulate and buffer the flows within the tank, important in preventing surging and re-entrainment of solids. The effluent filters are very low maintenance, having a large surface area.

The selection of an appropriate effluent filter for primary treatment is based on several factors. Of most importance is the ability of the effluent filter to remove solids to protect the downstream components of the wastewater treatment system in a consistent and predictable way. As well as determining screen area based on cleaning frequency, the outlet effluent filter should is designed to prevent gross solids leaving the septic tank and should be designed to draw effluent only from the clear zone.

Table 7 - Septic Tank Specification

Tank Manufacturer	Ross Tanks
Number of Tanks	3
Tank Volume	70 m³
Dimensions (mm)	Overall Diameter: 6000 mm Height: 2900 mm
Total Volume	210 m³
Hydraulic Retention Time @ Peak	>1.5 days
Biotube Filters	4 x FT1554-36-14.0
Riser Models	4 x RR24-18 610mm x 450mm PVC Ribbed Access Risers 5 x RR30-18 760mm x 450mm Fiberglass Access Risers
Lid Model	4 x FL24G 610mm Dia Fiberglass lids and bolts 5 x FL30G 610mm Dia Fiberglass lids and

6.2 Pre-Anoxic Tank

2 x 70,000 L concrete tanks are proposed as pre-anoxic tanks at the treatment plant. Along with the Septic tanks, the pre-anoxic tank provides hydraulic retention time for sufficient primary treatment.

Table 8 - Pre-Anoxic Tank Specification

Tank Manufacturer	Ross Tanks
Number of Tanks	2
Tank Volume	70 m³
Dimensions (mm)	Overall Diameter: 6000 mm Height: 2900 mm
Total Volume	140 m³
Hydraulic Retention Time @ Peak	>1 day
Riser Models	2 x RF24-18 610mm x 450mm PVC Ribbed Access Risers 2 x RF18-18 450mm x 450mm PVC Ribbed Access Risers
Lid Model	2 x FLD24G 610mm Dia Fiberglass lids and bolts 2 x FLD18G 450mm Dia Fiberglass lids and bolts

7.0 SECONDARY TREATMENT

Secondary treatment of effluent is proposed to be achieved by use of a series of AdvanTex® recirculating textile packed bed reactors (rtPBR). Recirculating packed bed reactors are now recognised as one of the most stable treatment processes available, able to produce a consistently high-quality effluent, even under widely fluctuating loads and wastewater strengths.

7.1 Stage 1 Recirculation Tank - Stage 1 and 2

2 x 70m³ (Stage 1) and 2 x 25m³ (Stage 2) recirculation tanks dose the stage 1 AX1000 and stage 2 AX300 packed bed reactors respectively. The recirculation tanks ensure that the packed bed reactor receives a continuous source of oxygen and food during periods of little or no flow, ensuring that the micro-organisms are maintained at peak condition, and ready to receive shock or varying loads.

An MM6- FRP splitter valve which is installed in stage 1 recirculation tank ensuring a recirculation ratio of 4:1 (i.e. 80% of effluent is recirculated over the packed bed reactors, and 20% of the polished flow is split to the Stage 2 recirculation tank) while an MM4- FRP splitter valve installed in stage 2 recirculation tank ensures a recirculation ratio of 2:1 (i.e. 50% of effluent is recirculated over the packed bed reactors, and 50% of the polished flow is split to the treated effluent tank)

Flow inducer towers are installed in these tanks to house each pumping assembly, allowing easy maintenance of pumps and floats. Three 24-volt mercury float level switches installed in the tank monitor the water level and control the recirculation pump operation. By using timer-controlled dosing, we can buffer incoming and recycle flows and uniformly apply effluent to the packed bed reactors.

All the three float switches contain mechanical switches usually open and close in the UP position. The operating range is around 3mm. They are signal-rated floats and do not switch the pumps directly, but rather the low current signals switch motor contactors at the control panel, which in turn switch the high current pump motors. They are classified by the manufacturer as Type "P" floats.

6 x PF(50Hz)752034 (75-gallon pumps, 2 hp) and 2 x PF(50Hz)501012 (50-gallon pumps, 1 hp) are considered to dose effluent over the stage 1 packed bed reactors while 2 x PF(50Hz)752034 (75-gallon pumps, 2 hp) pumps are proposed to dose stage 2 packed bed reactors.

By returning a portion the filtrate in the stage 1 recirculation tank to the pre-anoxic tank, nitrogen removal is enhanced by providing more available alkalinity for ammonification. It may be possible that alkalinity in the natural influent stream is insufficient, and supplemental alkalinity is required in the form of chemical dosing. At this stage, we have assumed the natural influent stream has sufficient alkalinity. The filtrate return pump proposed for this function is a single-phase PF(50Hz)500712 pump rated at 0.75 hp.

***Table 9** - Recirculation Tank (Stage 1 and 2) Specification*

Tank Manufacturer	Ross Tanks & Bowers and sons
Number of Tanks - Stage 1 **Number of Tanks - Stage 2**	2 x 70m^3 2 x 25m^3
Dimensions (mm) – Stage 1 **Dimensions (mm) – Stage 2**	Overall Diameter: 6000 mm Height: 2900 mm Overall Diameter: 3740 mm Height: 2640 mm
Pump Manufacturer	Orenco
Recirculation Pump Model – Stage 1 **Recirculation Pump Model – Stage 2**	6 x PF(50Hz)752034 1 x PF(50Hz)501012 2 x PF(50Hz)752034
Filtrate Pump Model	1 x PF(50Hz)500712
Hp	Recirculation Pumps (Stage 1): 2 Hp (1.49 kW) & 1 Hp (0.75kW) Recirculation Pumps (Stage 1): 2 Hp (1.49 kW) Filtrate Return Pump: 0.75 Hp (0.56 kW)
Voltage	Recirculation Pumps (Stage 1): 380 V & 220V Recirculation Pumps (Stage 2): 380 V

	Filtrate Return Pump: 220 V
Amperage	Recirculation Pumps (Stage 1): 4.0 A and 7.4 A Recirculation Pumps (Stage 2): 4.0 A Filtrate Return Pump: 6.4 A
Hz	50 Hz
Flow Rate at TDH	Recirculation Pumps (Stage 1): approximately 4.8 L/sec @ 15 m & Approximately 3.0 L/sec @ 15 m Recirculation Pumps (Stage 2): approximately 4.8 L/sec @ 15 m & Filtrate Return Pump: approximately 3.25 L/sec @ 10 m
Outlet Diameter	Recirculation Pumps: 50 mm Filtrate Return Pump: 50 mm
Motor Protection	IP68
Float Arrangement	Top Float: HLA Middle Float: Timer Override Bottom Float: LLA/RO
Riser Models (Stage 1) **Riser Models (Stage 2)**	3 x RF3018 760mm x 450mm Fiberglass Access Risers 2 x RR1818 450mm x 450mm PVC Ribbed Access Risers 1 x RF3018 760mm x 450mm Fiberglass Access Riser 1 x RR2418 610mm x 450mm PVC Ribbed Access Riser 2 x RR1818 450mm x 450mm PVC Ribbed Access Risers
Lid Model (Stage 1) **Lid Model (Stage 1)**	3 x FL30G 610mm Dia Fiberglass lids and bolts 2 x FL18G 450mm Dia Fiberglass lids and bolts 1 x FL30G 610mm Dia Fiberglass lids and bolts 1 x FL24G 610mm Dia Fiberglass lid and bolts 2 x FL18G 450mm Dia Fiberglass lids and bolts

7.2 Recirculation Packed Bed Reactor – Stage 1 and 2

Effluent from the Stage 1 and Stage 2 recirculation tanks will be sent to 10 x AX100 and 3 x AX100 packed bed reactors respectively to provide the secondary treatment. In total these pods provide 1,300 ft^2 or 120.8 m^2 of textile. Based on the influent parameters stipulated in the technical specification section of this report (2.0 Design Parameters), the number of AX100 packed bed reactor pods proposed is based on the most conservative assessment of hydraulic and organic loading (primary treated, assuming 50% of BOD is removed in the septic tank), as shown below.

1. **Based on Organic Loading (Flow of 75.58 m^3/day):**
   245.5 mg/L x 75.58 m^3/day x 0.001 x 10.7 = 992 sqft required → AX1000
   0.2 kg BOD5/m^2/day

2. **Based on Hydraulic Loading (Flow of 75.58 m^3/day):**
   75.58 m^3/day x 10.7 = 808.71 sqft required → AX800
   1m^3/m^3/day

The packed bed reactor (PBR) is a mature treatment process modified and improved steadily over the last 50 years. The processes are well understood and based on established, robust theory. Traditionally a PBR is a bed

of coarse sand or fine gravel that is intermittently dosed. The wastewater drains through the bed and is treated by the same physical, chemical and biological processes that operate in a soil dispersal field. This technology's "modern" version incorporates recirculation, enhanced pre-treatment, steady-state hydraulic loading, frequent dosing, uniform distribution and substitution of the granular media with a textile medium.

Over the last 30 years Orenco Systems Incorporated (OSI) has enhanced the recirculating packed bed reactor technologies to provide consistent and reliable treatment solutions for small to medium wastewater flows. Their findings and data are used extensively in America's leading textbook on decentralised wastewater systems (refer to: Crites & Tchobanoglous; 1998 and S. M. Parten; 2010). Orenco's products are consistently represented around the world at conferences on decentralised wastewater management and on-site wastewater treatment systems.

The AdvanTex rtPBR is essentially a bed of highly specialised textile nestled in a pre-made pod to which the effluent is uniformly dosed through a pressure distribution system using a timer-controlled dosing. These small precise doses at multiple point sources across the reactor bed ensure thin film application of the effluent maximising retention times within the reactor for renovation.

This unique complex fibre structure of the textile media has an immense surface area for biomass colonization, (up to 5 times greater than sand) and a much greater void space (~3 times higher than sand) to ensure free flow of oxygen through the media interstices. Its high field moisture capacity ensures long, intimate, contact times therefore providing maximum treatment capacities.

Figure 2 - Picture of AdvanTex AX100 Packed Bed Reactors

***Table 10** - Packed Bed Reactor Specification*

Manufacturer	Orenco Systems Inc.
Model	AdvanTex AX100
Number of Tanks	10 (Stage 1) 3 (Stage 2)

Number of Spray Nozzles per Pod	8
Ventilation Fan Model	CF1818
Number of Fans	2
Phase	Single
Voltage	230V
Amperage	1.8A
Hz	50Hz
Operation	Continuous
RPM	2900/min
Maximum Power Consumption	0.06 kW

7.3 Fresh Air Ventilation & Odour Control

Each unit contains a fresh air inlet point, designed to allow air ventilation throughout the hanging textile. Venting each unit involves drawing fresh air through the inlet at the end of each pod, through the textile sheets, and out through an activated carbon filter/fan. The fan used to circulate the fresh air is a small 60 watt "ducting type" fan, designed for continuous operation.

To maintain a steady state in each pod, the fan will operate continuously. It should be noted that the fan is not designed to provide an artificially high population of microbes inside the AdvanTex® pods. Since the fan is small, the airflow is only slight and simply required to prevent stagnant conditions.

The carbon filter, ventilation fan and heater will be housed inside a green fibreglass enclosure installed at the same height as the AdvanTex® pods.

Odours do not generally permeate from a recirculating packed bed reactor unless there is a serious issue. To help control and scrub any air that is forced out of the plant, carbon filters are included on access lids to allow the balancing and diffusion of air as water levels rise and fall within the tanks.

7.4 Treated Effluent Storage Tank and Metering

2 x 70m³ treated effluent storage tanks are proposed. These tanks provide buffering to the land treatment system and emergency storage at peak flow rates. Discharge pumps will be installed in this tank which is suitably sized for the land application field (specifications below). A water meter will be installed in the pumped outlet of the tank.

***Table 11** - Treated Effluent Tank Specification*

Tank Manufacturer	Ross Tanks
Number of Tanks	2
Tank Volume	70m³
Dimensions (mm)	Overall Diameter: 6000 mm Height: 2900 mm
Total Volume	140 m³
Discharge Pump Model	Grundfos SP14-8 (or similar)
Number of Pumps	2

kW	2.2 kW
Voltage	230 V
Amperage	14 A
Hz	50 Hz
Flow Rate need to Pressurise Drip	Approximately 1.5 L/sec
Outlet Diameter	32 mm
Motor	EN 1.4301
Float Arrangement	Top Float: HLA/TO Middle Float: Timer Operate Bottom Float: LLA/RO
Riser Models	2 x RF1818 PVC Ribbed Access Riser 1 x RF2418 PVC Ribbed Access Riser 1 x RF3018 Fiberglass Access Riser
Lid Model	2 x FL18G 450mm Dia Fiberglass lids and bolts 1 x FL24G 610mm Dia Fiberglass lids and bolts 1 x FL30G 760mm Dia Fiberglass lids and bolts

8.0 TERTIARY TREATMENT

8.1 UV Disinfection

We propose to supply and install an UV Guard S440 disinfection unit which is expected to reduce the E.Coli to less than 200 cfu/100mL and the unit will be installed in the control shed. UV energy, predominantly at 254 nm wavelength has the unique ability to destroy most micro-organisms that are exposed to this light. The ultraviolet rays penetrate the outer membrane of the bacteria, virus, yeast, mould or algae and destroys the DNA that allow the organism to replicate. There is no possibility of receiving water contamination due to overdosing and it is not affected by pH changes. The rtPBR is an ideal secondary treatment system prior to UV disinfection. When used in conjunction with the rtPBR very high levels of pathogen removal can occur.

***Table 12** - UV System Specification*

Design Flow	5.025 m^3/h
Number of lamps	1
Protection Class (UV Reactor)	IP 54
Flanges sizes	DN 76
Reactor Length	1450 mm
Operating Pressure	10 Bar
Protection Class (UV control cabinet)	IP 54
Supply Voltage	240 V
Frequency	50-60Hz
Power consumption	455 W

9.0 CONTROLS AND TELEMETRY

9.1 Telemetry Control Panel

An Orenco Systems Inc TCOM control panel will be supplied to control the Wastewater Treatment Plant. The control panel is purpose built to attend to the functions and requirements of the specific Wastewater Treatment Plant.

As well as general operations of the plant such as pump run times, fan run, water meter readings and monitoring of sensors, the panel allows for automatic call-out to a server during alarm conditions or when the panel detects trends that could lead to system failure. It can maintain logs for system conditions and events, such as Pump Run Time, Pump Cycles, and Alarm Conditions and Downloadable logs into a *.dif or ASCII format for simple conversion to common spreadsheet or word processor programs. Please refer to attachments for samples of reports that can be generated through Hyper Terminal and downloaded to a spreadsheet program.

The Control panel can be set to run in three options- Manual, Off or Automatic. In Automatic, the programmed settings control the on/off time of the nominated pump. Set to off, it will turn off the nominated pump, or set in manual, it will allow the nominated pump to run whilst the manual switch is engaged.

9.2 Loss of Power

All components will cease to operate until power restores – the system is designed with a minimum of 24 hours emergency storage so in the unlikely event of an extended power cut the system can store incoming flows. Once power restores the system will operate as normal and if in a high level will alerts the users and the system accelerate its processing speed via the override timer functions until water levels are back in a normal operating level.

9.3 Networking Protocols

Ethernet (permits peer-to-peer communications, up to 16 peers)

- Modbus (permits our controller to serve as master or slave)
    a. When "master," permits connection to off-the-shelf Non-proprietary devices that support Modbus protocols. Can control and monitor up to 32 slaves.
    b. When "slave," permits connection to and communication with Modbus masters.

An IBM compatible interface is standard and Iterm™ or hyper terminal will interface with the panel enabling the backup for programming and data downloads.

9.4 Telemetry

Telemetry is a technology that allows the remote measurement and reporting of information. Innoflow Technologies NZ Limited provides its telemetry through Digital Telemetry, who are a company specialising in the provision of wireless telemetry services for your remote equipment. They connect to our remote, unattended equipment wirelessly using proven Siemens wireless controllers and modems connected to their network of management servers, through which customers can securely access their equipment using RS232/serial, digital I/O, analogue input or current loop (4-20mA) from any Internet connection in the world.

10.0 LAND APPLICATION SYSTEM

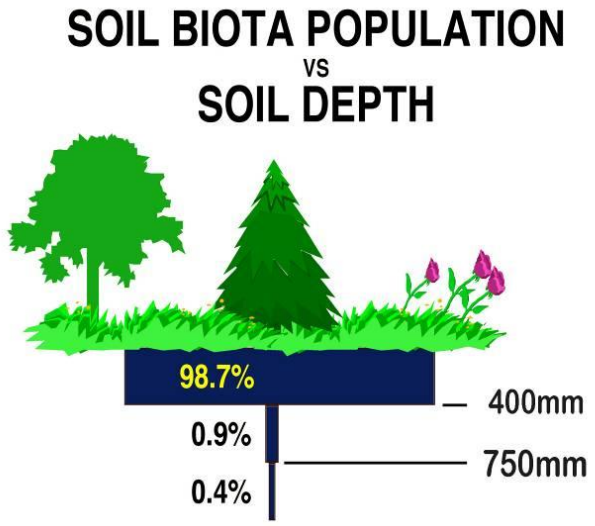
Based on the information provided, a soil loading rate of 5 mm/day has been applied. It is proposed to irrigate highly treated effluent to 24,184 m^2 of sub-surface pressure compensating drip irrigation lines, as summarised in the figure below.

The effluent from the AdvanTex® packed bed reactor system is treated to an enhanced secondary level and has quite different properties and environmental effects compared to wastewater which has received primary (septic tank) treatment only. Specifically, whereas application of septic tank effluent to the ground will result in long-term clogging of the soil, application of the highly treated packed bed reactor effluent will produce no reduction in soakage capacity of the soil even in the long-term.

Design Parameters:

Qpeak (design)	=	120.92 LPD
Soil Loading Rate	=	5.0 mm/day
Land Treatment Area	=	24,184 m²
Number of Zones	=	1
Number of Sectors	=	6
Sector Sequencing	=	Electric Actuating Ball Valves
Sector Size	=	4030 m²
Emitter flow rate	=	1.6 L/hr
Emitter spacing	=	0.5 m
Dripline spacing	=	1.0 m
Sector flow rate	=	12,900 L/hr
Pump Duty	=	3.6 L/sec @ 25 m TDH

Figure 3 - Land Application Design Specification



This method of dispersal offers a unique flexibility allowing installation in areas of least value, such as median strips, road verges, landscaped areas, or steep hillside slopes.

The use of drip irrigation within the "A" soil horizon maximises the potential for evapo-transpiration in addition to ground soakage. The growth of the plants in the area will be promoted with the application of water and nutrients. The application of the treated effluent directly into the biologically active topsoil layer ensures that complete treatment of the effluent occurs. The effluent from the treatment plant is collected and buffered in a treated effluent tank and then pumped to the dispersal area under timer control. The effluent is dispersed in a series of irrigation lines laid below the ground throughout the dispersal area installed on a 1m x 0.5m grid. TNL valves and air release valves must be installed at appropriate points in the system.

The advantages of the irrigation system are:

- Low areal loading rates to minimise the potential for ground saturation.
- Sectored distribution and small frequent even distribution.
- Evapo-transpiration is maximised.
- Final renovation through the soil is maximised by use of large areas for better assimilation by soil, bacteria and vegetation.
- Ideally suited over uneven terrain.
- It is cost effective, reliable and very low maintenance.

***Table 13** - Land Application Summary*

Peak Design Flow	Soil Loading Rate	Primary Area Required	Number of Zones/Sectors	Sector Size	Dripline spacing	Emitter spacing
120,920 L/day	5 L/mm^2/day	24,184 m^2	1 zone/6 sectors	4030 m^2	1m	0.5 m

10.1 Summary of Components

10.1.1 Electric Actuator Valve

6 Electric Actuator valves are proposed to dose treated effluent to the six disposal field sectors of 24,184 m^2 land treatment area. The electric actuator valves are useful for distributing effluent to multiple sectors.

These valves work by converting electrical energy into mechanical motion to control the valve. An electric motor receives an electric signal and rotates a shaft. This motion open, closes and partially adjusts the valve to regulate the flow.

The actuator valve will be installed in the discharge line and inside the control shed.

10.1.2 Header pipe

Treated effluent pumped from the treatment plant will be conveyed to the land application system via a buried 63mm OD polyethylene pipe. This proposed pipe will be rated to a maximum pressure 9.3 bar. The pipe will be laid in a chain trenched or excavated trench at a minimum depth of 600 mm. The pipe will be bedded with the material excavated from the trench. Each header will be installed with a combination air valve. The drip irrigation laterals will be connected to the header lines using a tapping barb.

10.1.3 Tube Non-Leakage Valves

Tube Non-Leakage Valves (DNL) will be installed at the beginning of each drip line lateral. These in-line valves have a self-locking mechanism to prevent the upper drip lines and header pipes from draining into the lower lines when the pump stops, and pressure drops.

- Closing Pressure - 0.4 bar
- Operating Pressure - 1.0 bar
- Check Valve - 0.3 bar

10.1.4 Pressure Compensating Drip lines

Netafim pressure compensating drip irrigation lines will be used to evenly distribute effluent over the entire land application areas of both sites. The drip line proposed is Bioline AS XR with a drip emitter every 500 mm designed to consistently discharge 1.6 litres per hour. These emitters are pressure compensating up to 35 m, which means the entire sector must be pressurised before any discharge and when discharge occurs, all emitters discharge together.

10.1.5 Manual Flushing Valves & Boxes

Flushing taps will be fitted to the terminal ends of all drip line laterals and marked with a durable valve box. The taps are used to manually flush any build-up inside the pipe on an annual basis in accordance with the manufacturer's instructions.

***Table 14** - Land Application System Specification*

Dispersal Type	Pressure Compensating Drip Irrigation – Subsurface
Disposal Field Sequencing	Electric Actuator ball Valves
Number of Valves	6
Peak Design Flow	120,920 L/day
Soil Loading Rate	5 L/sqm
Primary Land Application Field Size	24,184 m²
Total Lineal Meter Required	24,184 lineal meters
Sectors Area	6 x 4030 m² Sectors.
Drip Line Manufacturer	Netafim
Drip Line Diameter	16.2 mm OD
Max Operating Pressure (Drip Line)	10-35 m
Lateral Spacing	1 m
Emitter Spacing	0.5m
Dripper Flow Rate	1.6 L/h
Total Number of drippers	48,368
Number of drippers per sector	8,060
Flow Required to Pressurise each Sector	12,900 L/hr
Header Pipe	63mm OD pipe PE100 SDR17 (PN10)
Header Pipe Material	Medium Density Polyethylene
Max Operating Pressure (Header)	9.3 bar

11.0 OPERATION & MAINTENANCE

Maintenance of key components shall be carried out every three months. We propose to use S3 Limited a wholly owned subsidiary of Innoflow Technologies Limited to carry out the required maintenance. Emergency call outs shall be carried out shall be handled by S3. Sample collection, packaging, and submission to the laboratory shall be carried out by the local environmental sampling agency, if required. It is expected that grounds maintenance shall be carried out by others. Below is a table showing the required checks at each service.

Table 15 - O&M Tasks

Component	Maintenance Frequency
Pump Station	
Visually inspect tank/riser/lid integrity	1 x per 3 months
Check operation & clean all pumps	1 x per 3 months
Clean & check operation of all control floats/ level sensors	1 x per 3 months
Visually inspect operation of Odour control	1 x per 3 months
Septic Tanks	
Visually inspect tank/riser/lid integrity	1 x per 3 months
Inspect and clean tank effluent filter	1 x per 3 months
Check sludge and scum accumulation	1 x per 3 months
Pre-Anoxic Tanks	
Check operation & clean all pumps	1 x per 3 months
Clean & check operation of all control floats	1 x per 3 months
Visually inspect tank/riser/lid integrity	1 x per 3 months
Visually inspect operation of odour control	1 x per 3 months
Recirculation Tanks & AdvanTex Recirculating Packed Bed Reactors	
Inspect flow pattern of pod spray nozzles	1 x per 3 months
Inspect integrity of pod lids/lid hardware	1 x per 3 months
Flush pod distribution laterals	1 x per 3 months
Complete sludge/scum testing of each tank	1 x per 3 months
Check operation & clean all pumps	1 x per 3 months
Clean & check operation of all control floats	1 x per 3 months
Check operation of fan & ventilation systems (vents etc.)	1 x per 3 months
Check splitter valve operation	1 x per 3 months
Verify timer operation settings (advise from Innoflow engineer)	1 x per 3 months
Check outlet pipe work to downstream components	1 x per 3 months
Treated effluent tanks & water meter	
Inspect tank levels and integrity including access risers etc.	1 x per 3 months
Inspect and clean treated effluent tank floats and alarms	1 x per 3 months
Inspect and clean treated effluent tank pump	1 x per 3 months
Measure and log biomass level in treated effluent tank	1 x per 3 months
Ensure water meter operation, ensure pulse signals to TCOM panel	1 x per 3 months
TCOM control panel	
Check enclosure integrity & for any moisture	1 x per 3 months
Visually check all electrical components for signs of fatigue or failure (burning/melting etc)	1 x per 3 months
Ensure communications	1 x per 3 months

Land application system	
Inspect, clean & assure operation of sequencing valves	1 x per 6 months
Flush distribution laterals	1 x per 1 year
Reporting	
Forward maintenance inspection summary to client	1 x per 3 months

12.0 RISK MANAGEMENT CONTINGENCIES

Power Failure

In the event of total power outage, the treatment plant provides over 24 hours storage above the high-level alarm. In the extremely unlikely situation that power outages exceed this duration. The generation of wastewater is likely to be considerably reduced during periods of power outage also, further increasing the storage duration within the system. Normal operation of the system automatically occurs when power is restored.

Alarm activation

All pumps in the treatment plant are linked to an audio/visual alarm indication at the control panel. The system is also monitored remotely by the operator to ensure rapid reaction time in case of system issues.
Provision has been made for the following events to trigger alarms:

- Liquid high level in any tank
- Liquid low level in any tank
- Fan Fails
- Recirculation Pump Fail
- Treated Effluent Pump Fail

Should an alarm activate, the service company will respond within 24 hours to prevent any potential detrimental environmental effect that may result from the fault. The effluent will be either pumped out to the land disposal system or pumped out and disposed to off-site discharge.

Pump Failure

Mechanical failure of pumps within the treatment plant will result in high-level alarms being triggered. Please refer to Alarm Activation procedures below.
All tanks within the treatment plant have at least 24-hours emergency storage above the high level, which is sufficient time for the pump to be replaced.

Effluent breakout at the land application area

In the event of breakout within the land application system the treatment plant discharge pump can be turned off for up to 24 hours while the cause of the breakout is identified. Service personnel will visually inspect the land application area and remedy any identifiable fault. In the extremely unlikely situation that remedial action exceeds this duration individual septic tanks can be pumped out as required.
Where no fault can be found, an investigation should be undertaken by an experienced wastewater consultant to identify the cause of breakout. Findings from the investigation shall be immediately implemented and the fault remedied.

13.0 TROUBLESHOOTING

The following troubleshooting chart describes most of the common problems found in treatment systems. This simple table should be used to diagnose any alarm from the wastewater treatment plant. There are several situations which could cause an alarm situation. The first thing is to determine whether it is a high level or a low-level situation:

PROBLEM	CAUSE	SOLUTION
Infrequent short duration alarms	Unexpectedly high inflow (toilet running constantly, tap left on, flooding over gully traps in very high rainfall)	Occasional excessive water usage will not affect the system; the alarm simply alerts the user of an unusual event. The alarm can be silenced by pushing the red indicator light on the front of the panel
Frequent short duration alarms	Water usage beyond what the system is designed to handle. Programmable Timer not set properly to handle acceptable daily flow. Float Switches set incorrectly.	Reduce water usage - check for leaking plumbing fittings such as faucets and toilets. Check for infiltration into tanks. Contact Service Provider to have timer re-calibrated. Contact Service Provider to reset float levels.
Short duration alarms only during storms or wet weather	Infiltration from leaking tanks, plumbing or broken sewer connection	Call Installer to remedy leaks. Call drainlayer to fix broken pipe
Continuous high-	Pump Failure	Repair or replace pump

water alarms	Float Failure Splitter valve stuck down Bottom float failure Tank leak Broken inlet pipe allowing groundwater infiltration Top float stuck on Gate valve closed	Replace failed float Plunge splitter valve ball float This should only cause intermittent alarms as the pump will begin to run constantly when the top float is raised Infiltration into tank - repair leak - also check risers Check seal around inlet tee also and around electrical conduit Broken seal on Pod (infiltration) Broken pipework on Pod (infiltration) Check for water in splice box, check for faulty float Check handle is in line with discharge assembly, open if closed
Continuous low-level alarms	Pump siphoning Hole in tank Screen clogged Tank leak Bottom float stuck up	Install anti-siphon valve Repair hole Clean screen Exfiltration out of tank - repair leak Broken underdrain pipe (this is the return pipe to the tank from the AdvanTex® Pod) Check for water in splice box, check for faulty float

Odour

If the tank or textile filter smells like rotten eggs or cabbage:

- Check dissolved oxygen levels using a DO meter or DO wet test kit.
- Check filter surface for evidence of clogging.
- Check that the pump is working.
- Check that ventilation is occurring at the pod
- Check that the recirculation ratio isn't too low; increase if too low.
- Check that influent strength isn't too high (check AdvanTex Design Criteria).
- Check to ensure hydraulic retention time isn't too high.

- Check to ensure recirculation ratio isn't too high.
- Check to see if influent flows are below normal.

Biotube® filter clogging

If a visual inspection of the Biotube® filter for biomass build-up shows the need for cleaning more often than quarterly, try the following:

- Verify the pump isn't running too long
- Ensure the recirculation ratio isn't too high.
- Verify normal DO levels; if high, reduce recirculation ratio.
- Check for below normal influent flows.
- Check influent Grease & Oil and TSS; if excessive, a review of component sizes may be required.

14.0 CONTINGENCY PLAN

EXCEEDING PERMITTED VOLUMES

The following checks and recommended actions are to be completed in the event recorded flows exceed the permitted volume;

1. Metered flows exceed the maximum permitted discharge volume
    - Confirm water meter calibration and check that both water meter data generally align (note the incoming water meter may differ slightly that then outlet water meter given the lead time of treatment process expected through the plant. This lead time however should not be any greater than 48 hours).

    - Investigate infiltration – wastewater treatment plant
        i. Broken pipes
        ii. Lid Seals
        iii. Stormwater discharge onto treatment plant area
        iv. Pipework connections/riser connections and electrical connections at treatment plant tanks

2. Wastewater Flow Exceeds the Design Flow
        i. Determine if excess flows are intermittent or consistent.
        ii. Where excess flow is intermittent, investigate buffering the excess and discharging on days where flows are less than the consented peak flow.

iii. If excess flow is constant, then consider extension of land disposal system into the Reserve Land Disposal Area.
iv. Investigate if additional wastewater treatment is required to comply with the treated effluent requirement.
v. Apply to Council for consent to utilise part or all of the reserve land disposal area.

EFFLUENT BREAKOUT/SURFACE RUNOFF FROM THE TREATMENT & LAND DISPOSAL SYSTEM

i. Investigate land disposal system integrity for the following maintenance issues.
ii. Disconnected laterals
iii. Broken pipes
iv. Flush tap failure.
v. Sequencing valve operation.
vi. Confirm actual irrigation rate is within design.

UNEVEN LOADING OVER LAND APPLICATION AREA

The following checks and recommended actions are to be completed in the event uneven loading is found across the land application areas:

vii. Ensure sequencing valves operate to load each irrigation sector sequentially.
viii. Ensure pumps operating correctly.
ix. Ensure timer dosing of land disposal field operates within specified on/off present times.

EFFLUENT QUALITY NOT COMPLYING WITH TARGETS

Should samples show that either BOD or TSS are in breach of the target treatment levels, the service provider should report any breach as soon as possible to council and arrange for a follow up sample to be taken within 7 days. During this time the treatment plant should be investigated – primarily focusing on treatment plant process recommendations detailed in this document.

- Check influent, BOD, TSS and TKN results
- Check the temperature

15.0 COMPONENT LIFE EXPECTANCY AND WARRANTIES

Below is a summary of the proposed component lift expectancy.

***Table 16** - Component lift expectancy*

Recirculating packed bed reactor textile filters	>50 years
Recirculating packed bed reactor pod	>50 years
Concrete tanks	>50 years
Recirculating packed bed reactor pod lids	>35 years
Recirculation tank splitter valve	>25 years
Orenco systems inc. Step pumps	>25 years
Control panel mother board	>25 years
Biotube effluent filter	>25 years
Recirculating packed bed reactor pod lid struts	>20 years
Pvc and pe pipework and fittings	>20 years
Pump discharge assemblies	>20 years
Pulse water meters	>20 years
Control panel	>20 years
Orenco systems inc. Treated effluent pumps	>15 years
General electrical components	>15 years
Pvc access riser and fibreglass lids	>10 years
Orenco systems inc. Recirculation pumps	>10 years
Float switches	>10 years
Active carbon fan vents	> 5 years

16.0 STATEMENT OF LIMITATIONS

This report has been prepared for the sole benefit of Terras Consultants as our client with respect to the brief for the presently proposed development on behalf of and is to be used in design by his appointed Consultants to support Discharge Consent and Building Consent applications to Council. The design parameters, including but not limited to; occupancy, peak and average flows, soil loading rates and available land stipulated in this report have been determined and/or supplied to Innoflow by the client. Innoflow does not hold any obligation regarding verifying the accuracy of the information provided. The reliance by other parties on the information or opinions contained in the report shall, without prior review and agreement in writing, be at such party's sole risk.

Proposed Wastewater Treatment Scheme

Asbourne Retirement Village

Reference No. 7760

Drawing List

No.	Drawing Title
	Site Plan
01	Site Plan - Overall (TBC)
02	Site Plan - WWTP
03	Site Plan - LTA
	Pump Station
08	Pump Station Lid Detail
09	Pump Station - Detail
	Wastewater Treatment Plant
10	WWTP Plan
11	Tank Cross Section
	Disposal Fields
12	Land Treatment Area - Detail
13	Land Treatment Area - Layout

Design Flows

Input Design Parameters		
Qaverage	m^3	**75.58**
Qpeak (I&I= 1.6)	m^3	**120.92**
Villas		
Occupancy	People	349
Flow Allowance	L/Person/Day	165
Number of Dwellings		218
Nurses		
Occupancy	People	4
Flow Allowance	L/Person/Day	50
Care Rooms		
Occupancy	People	72
Flow Allowance	L/Person/Day	220
Staff		
Occupancy	People	30
Flow Allowance	L/Person/Day	50
Visitors		
Occupancy	People	30
Flow Allowance	L/Person/Day	15

Note 1 - Occupancy totals from Engineer

Design Basis

Ashbourne Retirement Village is located on Station Road, Matamata. The wastewater scheme shall comprise a gravity sewer an pump station reticulation network to an AdvanTex WWTP. Treated effluent shall be discharged via a sub-surface drip irrigation system. Wastewater generated from this facility is primarily residential from retirement village units and care facilities. All wastewater shall be domestic in nature.

System Description:

Collection System	= Conventional Gravity with 1 x PS
Biological Process 1	
Primary Treatment	= 3 x 70,000 L Septic Tanks
Pre-Anoxic	= 2 x 70,000 L Pre-Anoxic Tanks
Secondary Treatment	= 2 x 70,000 L Recirculation Tank
AdvanTex	= 10 x AX100 Packed Bed Filter
Biological Process 2	
Secondary Treatment	= 2 x 25,000 L Recirculation Tank
AdvanTex	= 3 x AX100 Packed Bed Filter
Treated Effluent Tank	= 2 x 70,000 L Treated Effluent Tank
Teritary Treatment	= UV Disinfection
TCOM Controls	
Land Treatment	= 24,184 m^2 subsurface pressure compensating drip

Design Raw Influent Strength

Raw Influent Strength		
BOD_5	mg/L	**491**
TSS	mg/L	**549**
TKN	mg/L	**77**
NH_3	mg/L	**45**
TP	mg/L	**19**
Alkalinity as $CaCO_3$	mg/L	-

Design Effluent Quality

Final Effluent Quality		
	(less than)	
$cBOD_5$	mg/L	15
TSS	mg/L	15
TN	kgN/Ha/Yr	-
NH_3	mg/L	-
TP	mg/L	-
FC	cfu/100 mL	200

Mains Power Supply:

415 VAC
3 phase power
50 Hz
Note: Mains Power by others. Plant motors are a combination of single phase and three phase.

Project Notes

1. An Operation & Maintenance Manual is to be provided by Innoflow.
2. All property/user occupants are to follow the operation and Maintenence/Homeowner Manual recommendations
3. Innoflow assume incoming wastes will not contain high concentrations of toxic substances that may adversely affect the performance of the biological processes required for the system to operate, these typically include but are not limited to:
   - Chlorine (pool and spa pool overflow)
   - Waste Dairy Products
   - Quaternary Ammonium Compounds (disinfectants, cleaning products)
   - Formaldehyde (disinfectant, chemical toilet treatment)
   - Dichlorobenzene (urinal tablets, sanitisers)
   - Petrochemicals (waste oil, diesel, turpentine etc)
   - Pharmaceuticals (drugs and or medicines)
6. In addition to the above, Water softener brine discharge is strongly prohibited from being discharged into the AdvanTex advanced treatment system. Failure to adhere to this policy will void manufacturers warranty.
7. All installations are to follow manufacturer's instructions and recommendations for tank installation and/or watertight testing.
8. Once a facility is placed into operation, the flows and waste strengths to the facility should be monitored. If flow or any of the influent waste strengths exceed those listed in the design parameters, measures should be taken to reduce these parameters to those listed on the plan set. Otherwise additional treatment capacity and plant expansion will be necessary.

Recommended RecirculationTimer Settings:

Stage 1
Recirc ratio 4:1 Qave, 3:1 Qpeak
R ON: 1.5 min
R OFF 2.15 min
R Ovr ON 1.5 min
R Ovr OFF 1.35 min

Stage 2
Recirc ratio 2:1 Qave, 1:1 Qpeak
R ON: 1.5 min
R OFF 4.6 min
R Ovr ON 1.5 min
R Ovr OFF 2.3 min

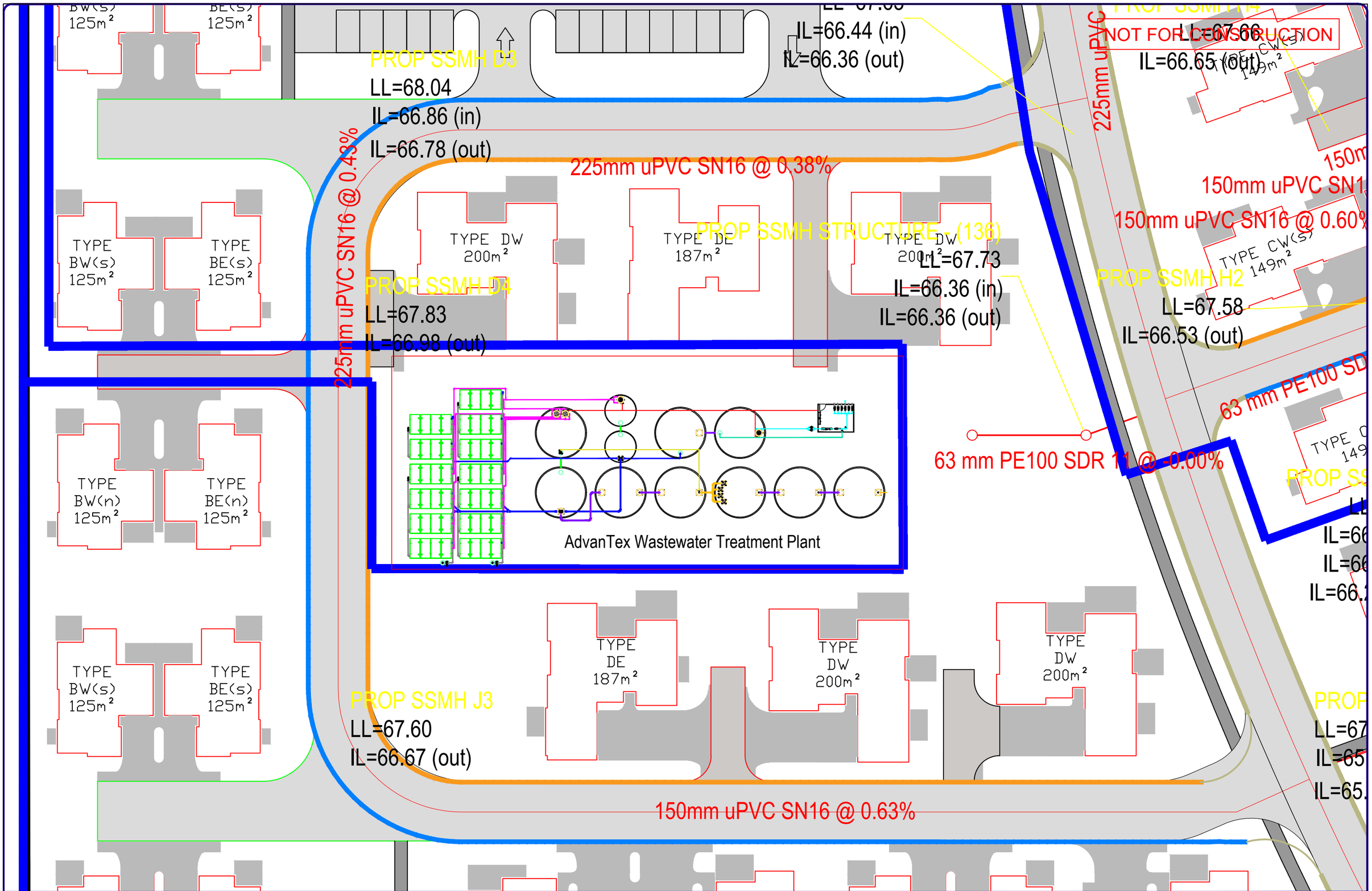
Recommended Filtrate ReturnTimer Settings:

FR ON: 5.0 min
FR OFF 13.10 min

Recommended Treated Effluent Timer Settings:

TET ON: 20.0 min
TET OFF: 25.0 min
TET Ovr OFF: 15.0 min

6th November 2025



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			SCALE 1 : 200 (A1)	APPROVED			TITLE Site Plan - WWTP	REVISION -
REV.	DESCRIPTION	DATE		CHECKED				
				DESIGNED				
				STATUS Design				

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SCALE BAR 1:500

Land Treatment Area
(24,184 m³)

ZONE SIX
4030m²

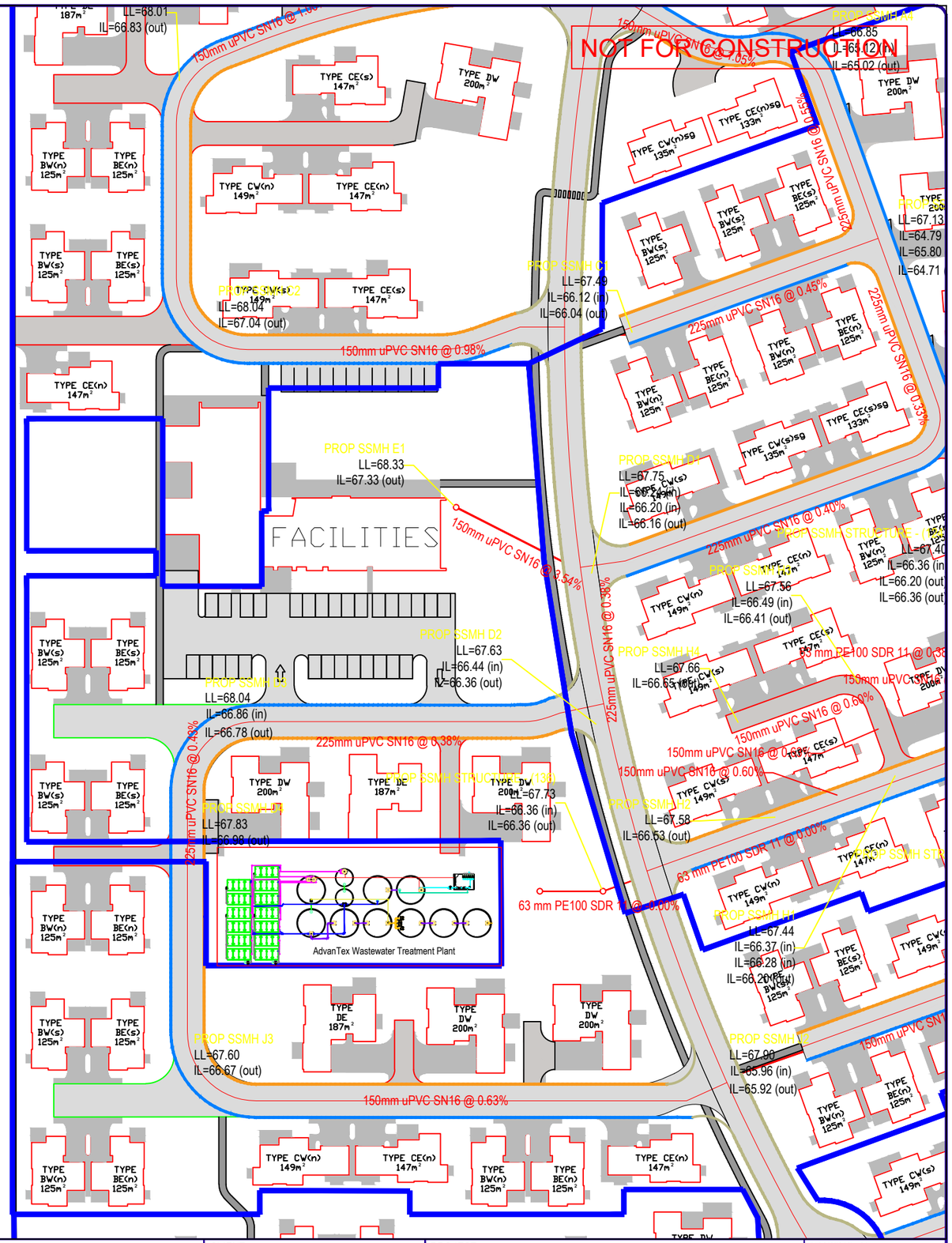
ZONE FIVE
4030m²
(100.75 m x 40 m)

ZONE FOUR
4030m²
(100.75 m x 40 m)

ZONE THREE
4030m²
(100.75 m x 40 m)

ZONE TWO
4030m²
(100.75 m x 40 m)

ZONE ONE
4030m²
(100.75 m x 40 m)



			DATE	© COPYRIGHT Innoflow Technologies NZ Ltd 2014		CLIENT	DRAWING No.
			6th Nov 2025	APPROVED		Maven	7760-03
			SCALE	CHECKED		PROJECT	REVISION
–	–	–	1 : 500 (A1)	DESIGNED		ASHBOURNE RETIREMENT VILLAGE	-
REV.	DESCRIPTION	DATE		STATUS		TITLE	
				Design		Site Plan - LTA	

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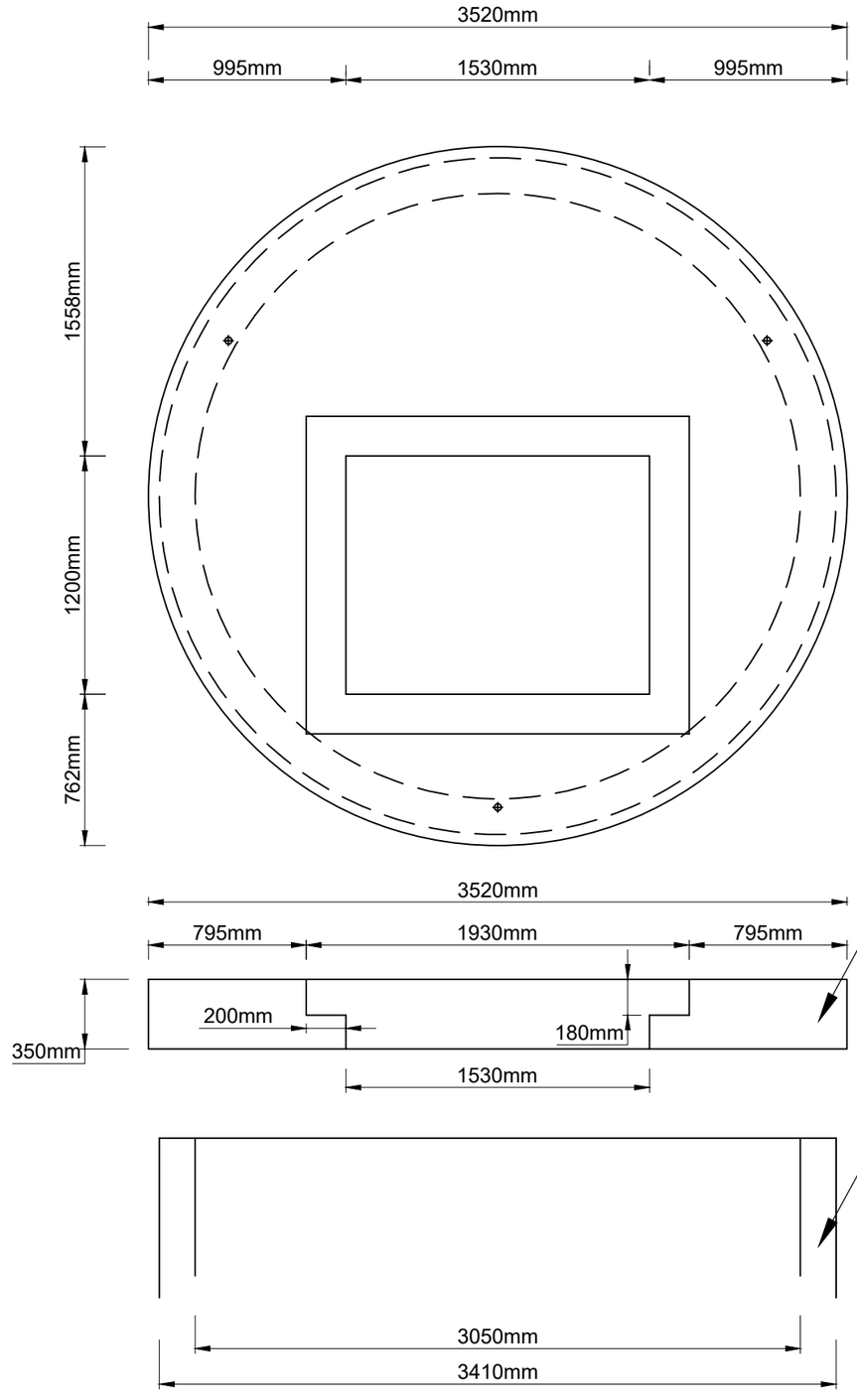

Pump Station Wet Well
3050 mm ID

REV.	DESCRIPTION	DATE
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DATE: 6th Nov 2025

SCALE: 1 : 15 (A1)

APPROVED		
CHECKED		
DESIGNED		

STATUS: Design

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CLIENT: Maven

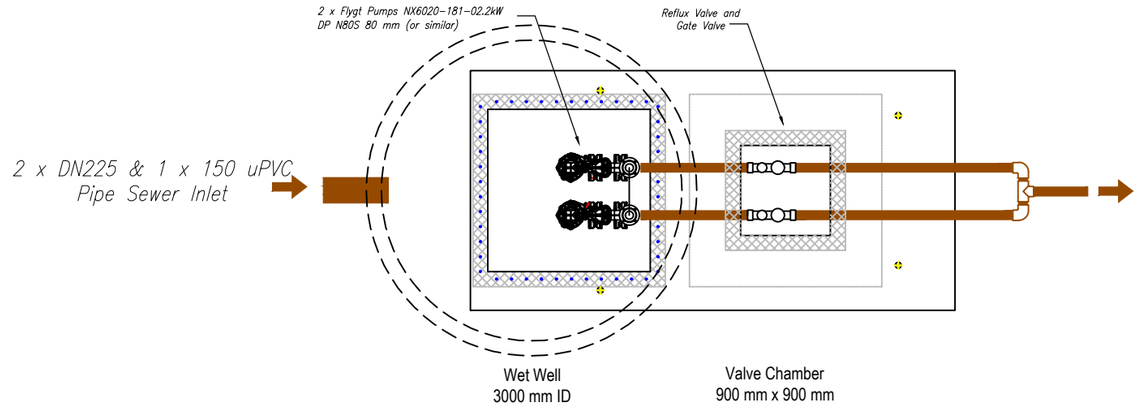
PROJECT: ASHBOURNE RETIREMENT VILLAGE

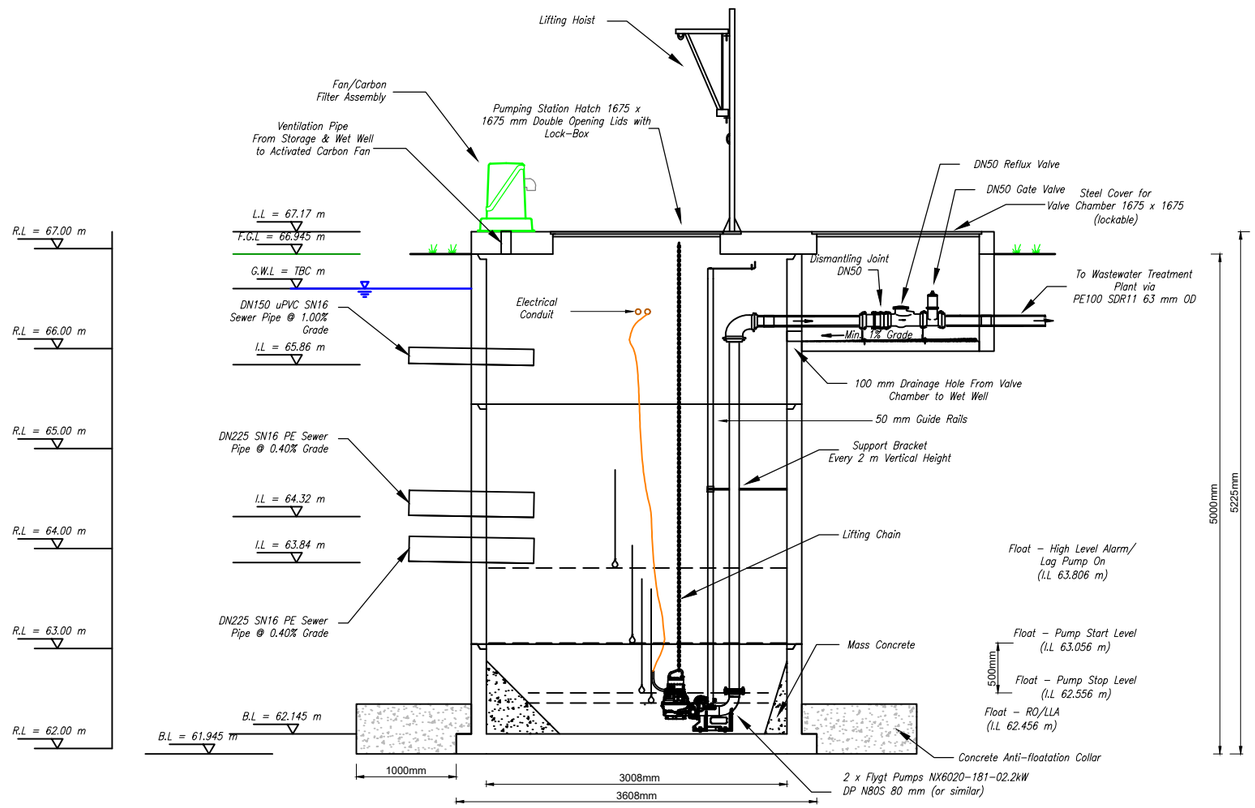
TITLE: Pump Station Manhole Lid Detail

DRAWING No.: 7760-8

REVISION: -

NOT FOR CONSTRUCTION





Pump Station Wet Well & Valve Chamber Details

SCALE BAR 1:30

REV.	DESCRIPTION	DATE
-	-	-

DATE 6th Nov 2025

SCALE 1 : 30 (A1)

APPROVED		
CHECKED		
DESIGNED		

STATUS Design

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CLIENT Maven

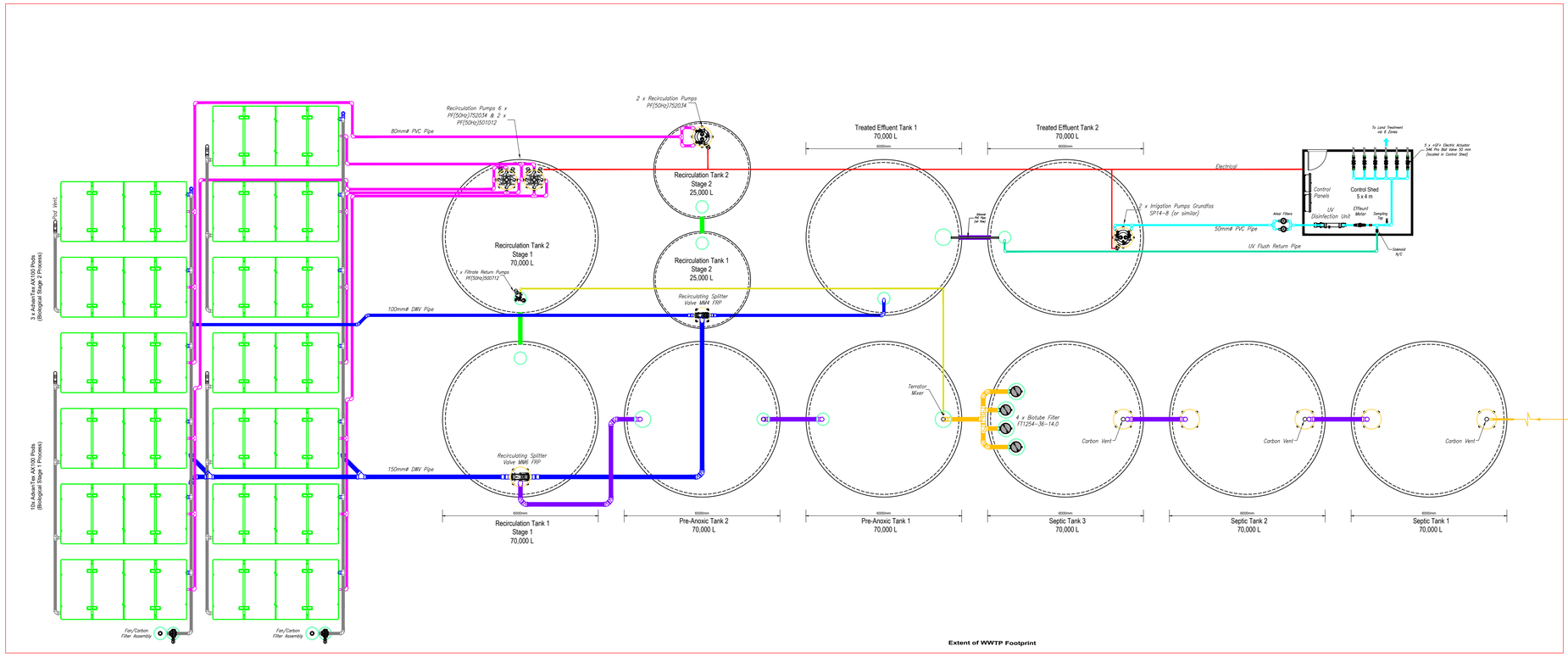
PROJECT ASHBOURNE RETIREMENT VILLAGE

DRAWING No. 7760-9

TITLE Pump Station Typical Detail

REVISION -

NOT FOR CONSTRUCTION



Plan

0 5 10 15 20

SCALE BAR 1:100

REV.	DESCRIPTION	DATE
–	–	–

DATE 11th Nov 2025

SCALE 1 : 100 (A1)

APPROVED		
CHECKED		
DESIGNED		

STATUS Design

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CLIENT Maven

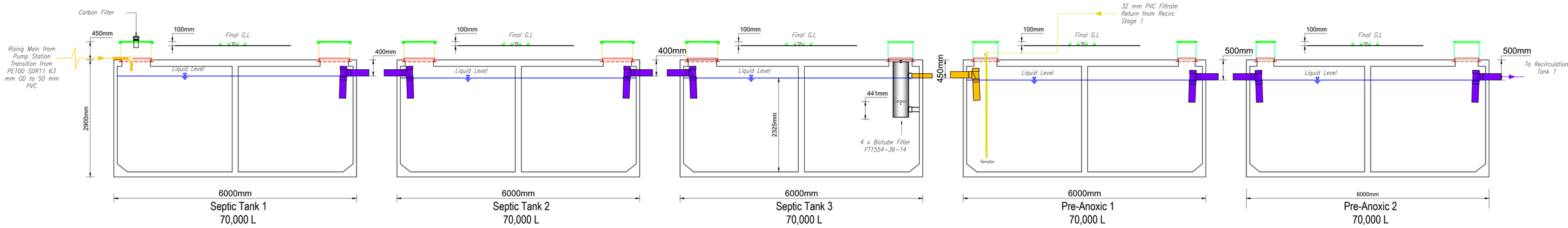
PROJECT ASHBOURNE RETIREMENT VILLAGE

TITLE AdvanTex Wastewater Treatment Plant Plan

DRAWING No. 7760-10

REVISION -

NOT FOR CONSTRUCTION

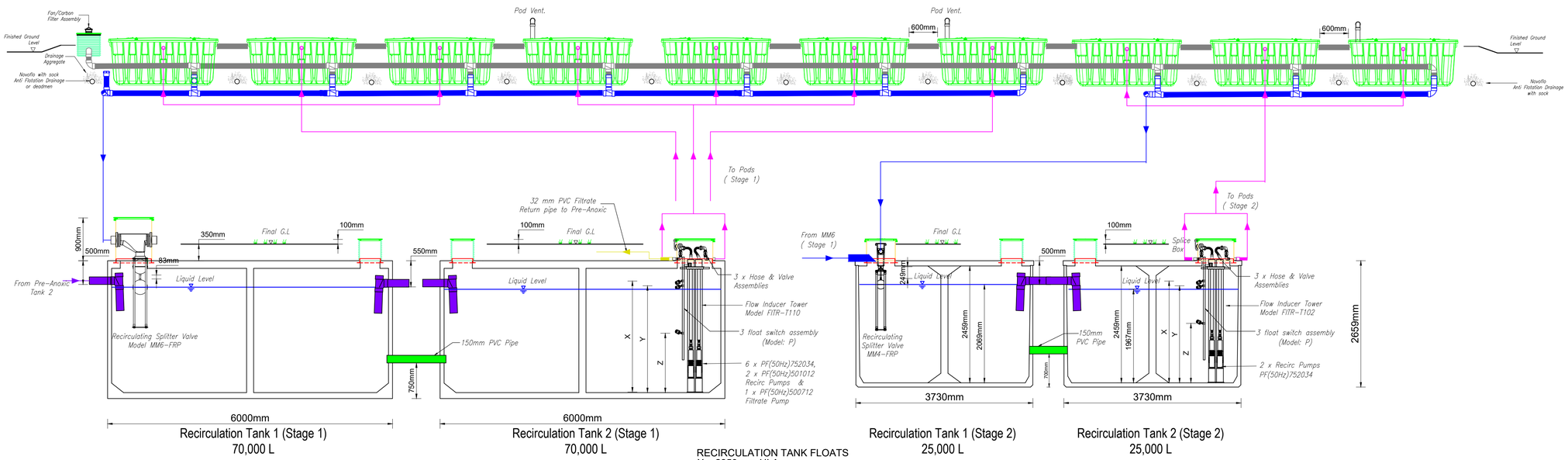


10 x AdvanTex AX100 Pods
(STAGE ONE PROCESS)

(ROW ONE OF SEVEN SHOWN)

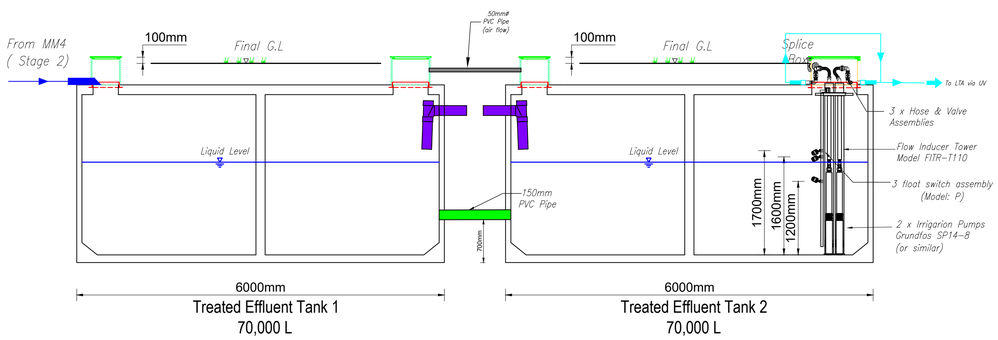
3 x AdvanTex AX100 Pods

(STAGE TWO PROCESS)



RECIRCULATION TANK FLOATS
X = 2350 mm HLA
Y = 2240 mm Timer Override
Z = 1250 mm LLA/RO

RECIRCULATION TANK FLOATS
X = 2150 mm HLA
Y = 2050 mm Timer Override
Z = 1250 mm LLA/RO



SCALE BAR 1:50

REV.	DESCRIPTION	DATE
–	–	–

DATE 12th Nov 2025

SCALE 1 : 50 A1)

APPROVED

CHECKED

DESIGNED

STATUS Design

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CLIENT Maven

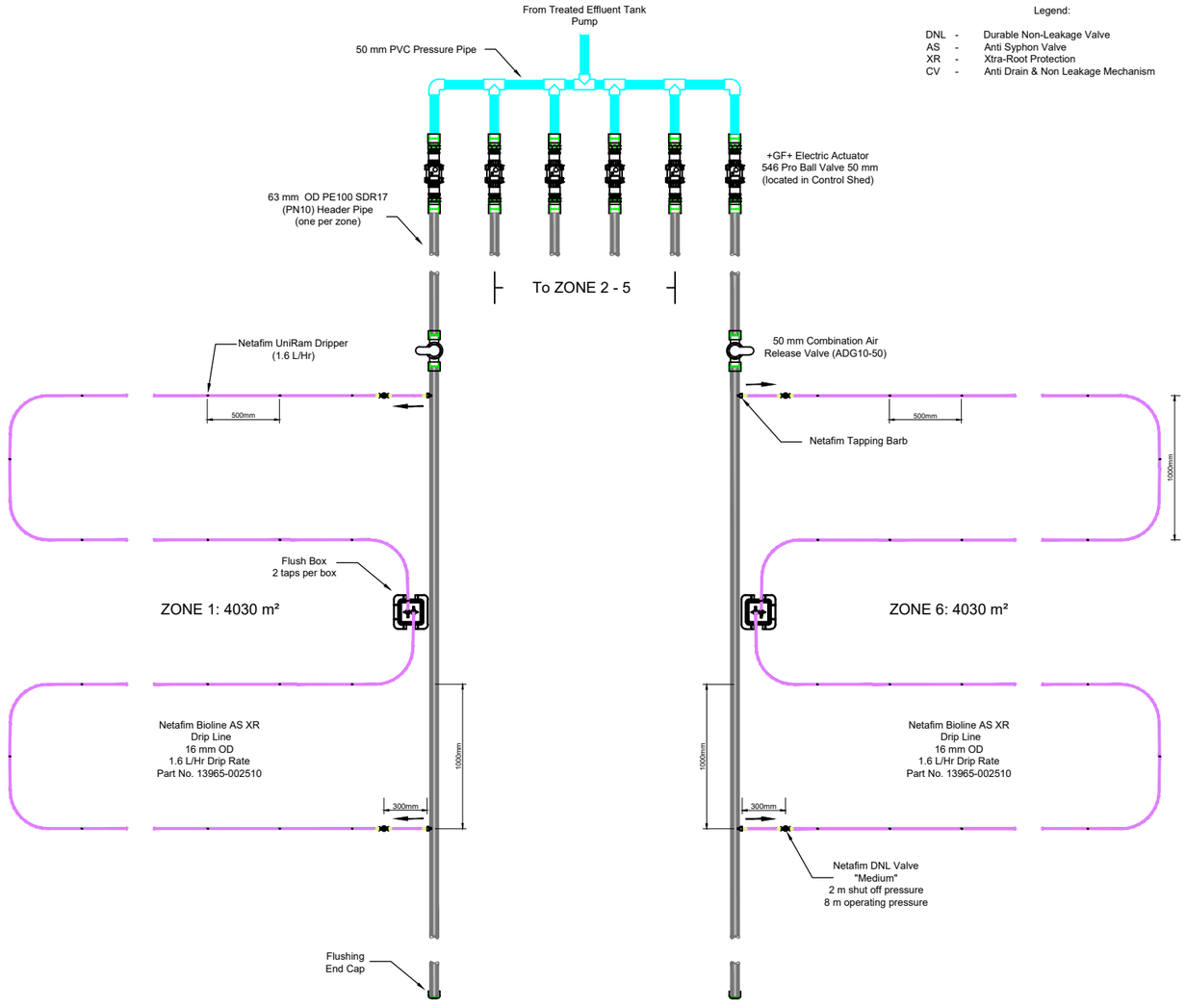
PROJECT ASHBOURNE RETIREMENT VILLAGE

TITLE AdvanTex Wastewater Treatment Plant Cross-Section

DRAWING No. 7760-11

REVISION -

NOT FOR CONSTRUCTION



Legend:

DNL	-	Durable Non-Leakage Valve
AS	-	Anti Syphon Valve
XR	-	Xtra-Root Protection
CV	-	Anti Drain & Non Leakage Mechanism

Design Parameters:

Qpeak (design)	=	120.92 LPD
Soil Loading Rate	=	5.0 mm/day
Land Treatment Area	=	24,184 m²
Number of Zones	=	1
Number of Sectors	=	6
Sector Sequencing	=	Electric Actuating Ball Valves
Sector Size	=	4030 m²
Emitter flow rate	=	1.6 L/hr
Emitter spacing	=	0.5 m
Dripline spacing	=	1.0 m
Sector flow rate	=	12,900 L/hr
Pump Duty	=	3.6 L/sec @ 25 m TDH

SCALE BAR 1:20

REV.	DESCRIPTION	DATE
-	-	-

DATE: 6th Nov 2025

SCALE: 1 : 20 (A1)

APPROVED		
CHECKED		
DESIGNED		

STATUS: Design

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CLIENT: Maven

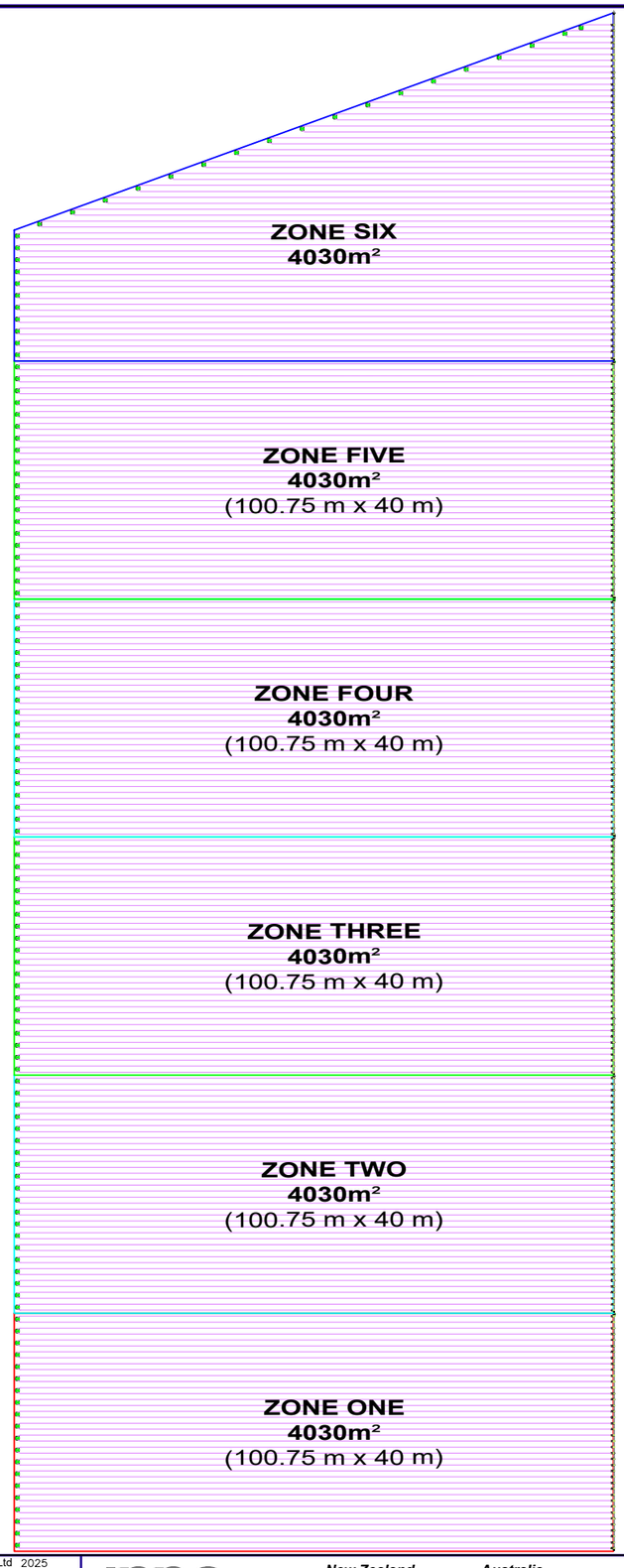
PROJECT: ASHBOURNE RETIREMENT VILLAGE

TITLE: Land Application Detail

DRAWING No.: 7760-12

REVISION: -

NOT FOR CONSTRUCTION



REV.	DESCRIPTION	DATE
–	–	–

DATE 6th Nov 2025

SCALE 1 : 500 (A1)

APPROVED		
CHECKED		
DESIGNED		

STATUS Design

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CLIENT Maven

PROJECT ASHBOURNE RETIREMENT VILLAGE

TITLE Pump Station Typical Detail

DRAWING No. 7760-13

REVISION -

AdvanTex® Treatment System

Limited Warranty
For Commercial and Municipal Applications

LIMITED WARRANTY

Commitment to Quality

Since 1981, Orenco Systems®, Incorporated (herein-after referred to as "Orenco"), has been known as a company that researches, designs, manufactures, and sells high-quality products. We see ourselves as more than a "business." We see ourselves as a company that makes the planet a cleaner, healthier place, a company that is *Changing the Way the World Does Wastewater.®*

Any wastewater treatment system can be affected by improper design, installation, lack of main-tenance, or system abuse. Although our products are carefully designed and constructed, it's still important to pay strict attention to system design and installation instructions and to follow through with intelligent usage and regular maintenance.

Limited Warranty Coverage

Subject to the exclusions, limitations, and conditions contained herein, Orenco warrants that all of its component products comprising an AdvanTex® Treatment System (consisting of all Orenco products between the inlet of the processing or recirculating tank and the outlet of the treatment unit, including the control panel, risers, and lids) will be free from defects in materials and workmanship for a period of three (3) years from the date of installation (the "Warranty Period").

If Orenco determines that a component it supplied as part of the AdvanTex Treatment System has failed because of a defect in materials or workman-ship, Orenco will repair or replace, at its discretion, the failed component.

Obtaining Warranty Service

To make a claim under this Limited Warranty, put your claim in writing and mail or deliver it to your Orenco Commercial and Municipal Wastewater Systems Dealer or Supplier ("Orenco's Representative"), who will process your claim. If for some reason Orenco's Representative is unavailable, or if you purchased your AdvanTex Treatment System directly from Orenco, mail your claim and a copy of this certificate to the following address:

Warranty Claims Department
Orenco Systems, Inc.
814 Airway Avenue
Sutherlin, Oregon 97479

Any warranty claim must be received no later than the expiration of the Warranty Period listed above.

If requested by Orenco, potentially defective com-ponents must be returned to Orenco's Sutherlin, Oregon facility through Orenco's Representative, if applicable, transportation prepaid.

Exclusive Remedy

The exclusive remedy for any claim under this Limited Warranty shall be the obligation of Orenco to repair or replace, at its discretion, any defective components. Labor is not covered under this Limited Warranty. Defects in materials or workmanship will be determined in good faith by Orenco upon receipt and inspection of a returned component. Compon-ents shall not be deemed to be defective if the failure, malfunction, or damage was caused by, or resulted from:

(a) the AdvanTex Treatment System not being designed properly for the application in accordance with Orenco's design criteria or not being constructed in accordance with said design;

(b) abuse, misuse, accident, or negligence;

(c) a lightning strike or other catastrophic event beyond the control of Orenco; or

(d) improper or incorrectly performed installation, maintenance, repair, or modification of the AdvanTex Treatment System.

In the event Orenco determines that a returned component is defective in materials or workman-ship and covered by this Limited Warranty, Orenco will credit or reimburse you for all reasonable transportation charges incurred in returning the component, and will be responsible for all transportation charges to return the repaired or replacement component to you. Such repaired or replacement component shall continue to be warranted under the Limited Warranty of the original purchase. In the event Orenco determines that a returned component is not defective in materials or workmanship, or is not covered by this Limited Warranty, Orenco may charge you a testing fee and all reasonable transportation charges required to return the component to you.

ORENCO SHALL NOT BE LIABLE FOR ANY LOSS, INJURY, OR DAMAGES TO PERSONS OR PROPERTY RESULTING FROM FAILURE OF, OR ANY DEFECT IN, THE ADVANTEX TREATMENT SYSTEM, OR FOR ANY TECHNICAL ASSISTANCE OR INFORMATION THAT ORENCO MAY HAVE PROVIDED TO THE OWNER. NOR SHALL ORENCO BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, OR INDIRECT DAMAGES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, PLANT DOWNTIME, FINES OR PENALTIES, OR LAWSUITS BY THIRD PARTIES AGAINST THE OWNER OR OPERATOR OF THE ADVANTEX TREATMENT SYSTEM. IN NO EVENT SHALL THE LIABILITY OF ORENCO UNDER THIS LIMITED WARRANTY EXCEED THE TOTAL INVOICED PRICE, EXCLUDING INSTALLATION AND/OR STARTUP COSTS, OF THE ADVANTEX TREATMENT SYSTEM.

Disclaimer

EXCEPT AS SPECIFIED IN THIS LIMITED WARRANTY, ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS, AND WARRANTIES INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, ACCURACY OF INFORMATIONAL CONTENT, OR THOSE ARISING FROM A COURSE OF DEALINGS, LAW, USAGE, OR TRADE PRACTICE, MAY ONLY BE CLAIMED DURING THE WARRANTY PERIOD, AND ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED TO THE EXTENT ALLOWED BY LAW THEREAFTER.

Exclusions and Limitations

This Limited Warranty shall be void if any of the following occur:

(a) construction or installation of the AdvanTex Treatment System is not performed by an Authorized Commercial Installer in accordance with Orenco's installation instructions;

(b) components not provided or approved by Orenco are used in the installation, main-tenance, or repair of the AdvanTex Treatment System;

(c) settings or operation of pumps, metering devices, effluent distribution components or other parts that can affect the integrity and proper functioning of the AdvanTex Treatment System are changed without authorization from Orenco, Orenco's Representative, or an Authorized Commercial Operator;

(d) the AdvanTex Treatment System's start-up is not overseen by Orenco or its designee; or

(e) the AdvanTex Treatment System is not maintained continuously under contract with an Authorized Commercial Operator, or is not operated or maintained according to the Operation and Maintenance Manual provided by Orenco.

Orenco® *Technical Data Sheet*

AdvanTex® AX100 Textile Filter

Applications

Orenco's AdvanTex® AX100 Treatment System is an innovative technology for onsite treatment of domestic-strength wastewater. The heart of the system is the AdvanTex Filter, a sturdy, watertight fiberglass basin filled with an engineered textile material. This lightweight, highly absorbent textile material treats a tremendous amount of wastewater in a small space. AX100 Treatment Systems are ideal for:

- New construction
- System upgrades and repairs
- Small sites
- Poor soils
- Pretreatment
- Nitrogen reduction
- Price-sensitive markets

For sizing, see AdvanTex® Design Criteria (NDA-ATX-COMM-1-PKG).

The heart of the AdvanTex® AX100 Treatment System is this sturdy, watertight fiberglass basin filled with an engineered textile material.

Features/Specifications

To specify this product, require the following:

- Wastewater treatment to better than secondary treatment standards
- Consistent treatment, even during peak flows
- Timer operation for flow monitoring, flow modulation, and surge control
- Fixed-film, engineered textile media, operated in an unsaturated condition
- Consistent media quality
- Low energy consumption
- Low maintenance requirements
- Complete pre-manufactured package, ready to install
- Watertight construction, corrosion-proof materials, and components
- Foam-core lid provides insulation value of R-6 (RSI-1.1)
- Quiet operation

Standard Model

AX100

Specifications**

Length, in. (mm)	191 (4851)
Width, in. (mm)	94 (2388)
Height, in. (mm)	42 (1067)
Area (footprint), ft^2 (m^2)	128 (11.9)
Dry Weight, lb (kg)	1616 (733)

* *Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556*

** *Nominal values provided. See AdvanTex® Treatment System drawings for exact dimensions.*

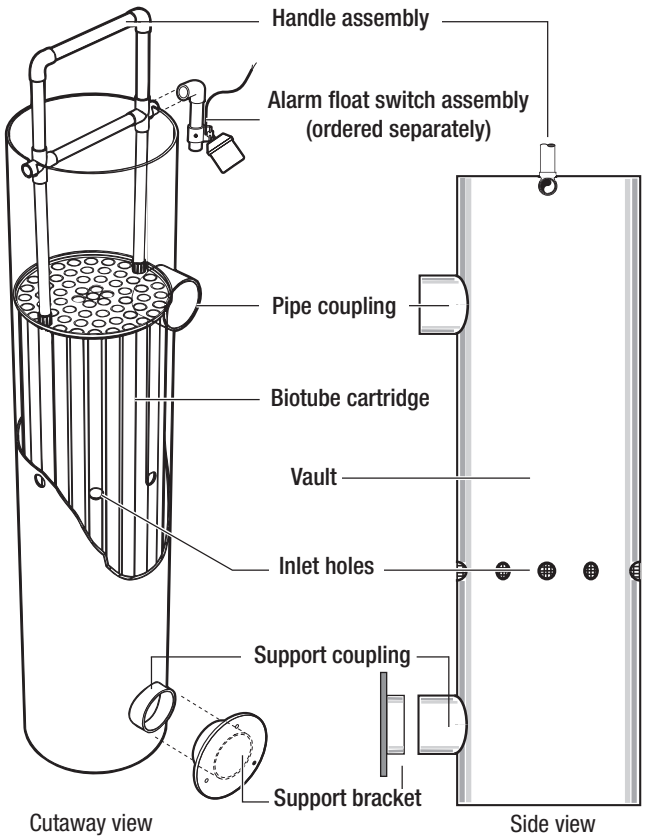
Biotube® FT-Series 8, 12, and 15in Effluent Filters

Applications

Orenco Biotube FT-Series 8, 12, and 15in Effluent Filters are designed to remove solids from effluent leaving commercial septic tanks. They can be used in new and existing tanks.

General

FT-Series 8, 12, and 15in Effluent Filters are used to improve the quality of effluent exiting a commercial septic tank. The Biotube cartridge fits snugly in the vault and is removable for maintenance, the handle assembly snaps into the notches in the top of the vault, and the tee handle can be extended for easy removal of the cartridge. A "base inlet" model (see p. 2) is available for low-profile tanks. An optional slide rail system, available on larger models, simplifies installation and provides tank access for servicing.



Standard Models

FT0854-36, FT0822-14B, FT1254-36, FT1554-36, FT1254-36AR

Product Code Diagrams

FT ☐ ☐☐ ☐☐ - 36 ☐

- Float switch bracket and slide rail options:
  - Blank = no options selected
  - A = float switch bracket installed
  - R = slide rail installed*
- 36in (914mm) cartridge height
- Housing height, in (mm):
  - 48 = 48 (1219) for 37-46in (940-1168mm) minimum liquid level
  - 54 = 54 (1372) for 47-63in (1194-1600mm) minimum liquid level
  - 60 = 60 (1524) for 64-84in (1626-2134mm) minimum liquid level
  - 66 = 66 (1676) for 85-112in (2159-2845mm) minimum liquid level
- Filter diameter, in (mm):
  - 08 = 08 (200)
  - 12 = 12 (300)
  - 15 = 15 (375)
- Filter mesh option, in (mm):
  - Blank = 1/8 (3)
  - P = 1/16 (1.6)
- Orenco® Biotube® FT-Series Effluent Filter

* For 12in and 15in (300mm and 375mm) only; use slide rail option when only one access is available for the filter chamber

Not all product code configurations may be available as standard products.

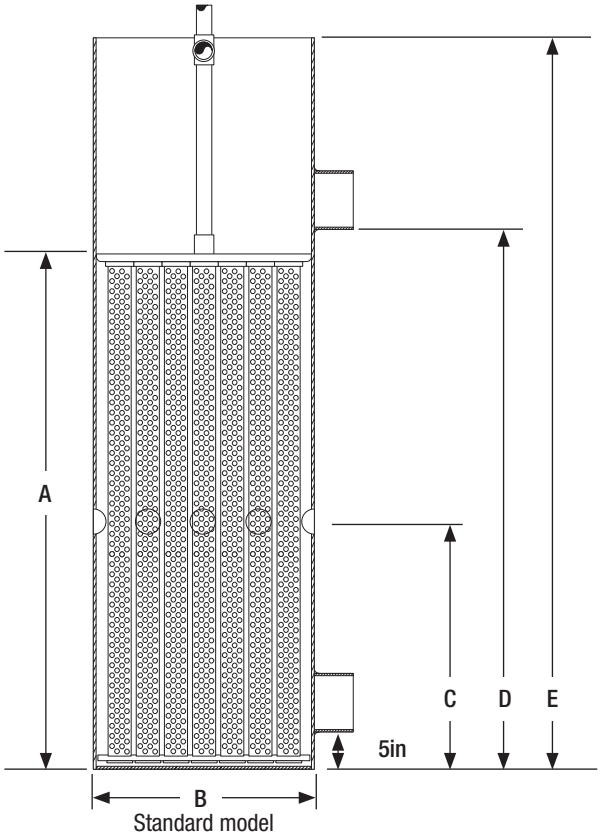
FT ☐ 08 22 - 14 B ☐☐

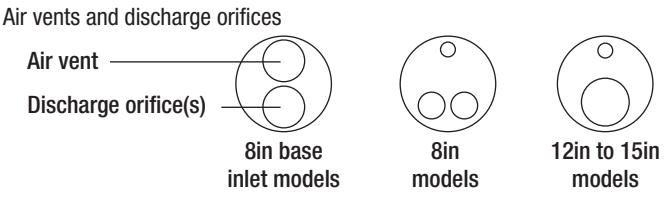
- Float switch bracket and overflow plate options:
  - Blank = no options selected
  - A = float switch elbow installed
  - FSO = overflow plate installed
- Base inlet model
- 14in (356mm) cartridge height
- 22in (558mm) filter housing height
- 8in (200mm) filter diameter
- Filter mesh option, in (mm):
  - Blank = 1/8 (3) filter mesh
  - P = 1/16 (1.6) filter mesh
- Orenco® Biotube® FT-Series Effluent Filter

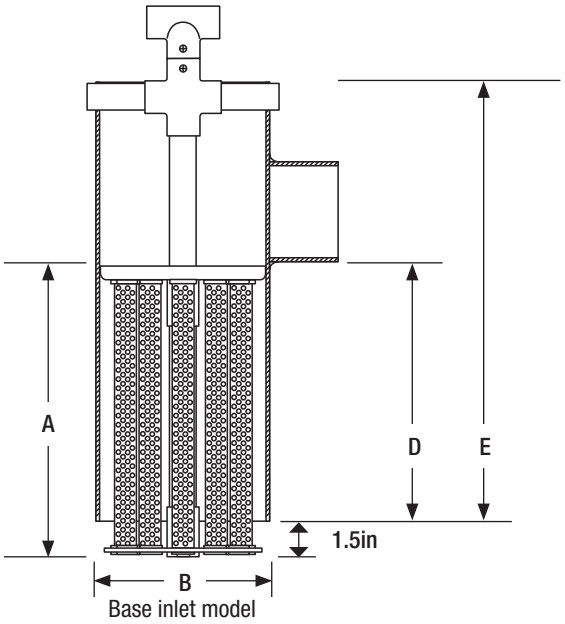
Not all product code configurations may be available as standard products.

Materials of Construction

Vault	PVC
Pipe coupling	PVC
Handle components	PVC
Support coupling and bracket (12in and 15in filters only)	PVC
Biotube cartridge	Polypropylene and polyethylene







Specifications

Model		FT0854-36	FT0822-14B	FT1254-36	FT1254-36AR	FT1554-36
A	Cartridge height, in (mm)	36 (914)	14 (356)	36 (914)	36 (914)	36 (914)
B	Nominal diameter, in (mm)	8 (200)	8 (200)	12 (300)	12 (300)	15 (375)
C	Inlet hole height*, in (mm)	22 (559)	n/a†	22 (559)	22 (559)	22 (559)
D	Vault base to invert height, in (mm)	38 (965)	13 (330)	38 (965)	38 (965)	38 (965)
E	Vault height, in (mm)	54 (1372)	22 (559)	54 (1372)	54 (1372)	54 (1372)
	Number of inlet holes	8	n/a	8	8	8
	Inlet hole diameter, in (mm)	1 3/8 (35)	n/a	1 3/8 (35)	1 3/8 (35)	1 3/8 (35)
	Number of discharge orifices	2	1	1	1	1
	Discharge orifice diameter, in (mm)	1 1/8 (29)	1 3/4 (44)	2 (51)	2 (51)	2 (51)
	Pipe coupling diameter, in (mm)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)
	Number of air vents	1	1	1	1	1
	Air vent diameter, in (mm)	3/4 (19)	1 3/4 (44)	3/4 (19)	3/4 (19)	3/4 (19)
	Filter surface area‡, ft^2 (m^2)	14.6 (1.36)	6 (0.56)	30 (2.79)	30 (2.79)	50.5 (4.69)
	Flow area**, ft^2 (m^2)	4.4 (0.41)	1.8 (0.17)	9 (0.84)	9 (0.84)	15.2 (1.41)

** Inlet hole height can vary depending on the configuration of the tank. Optimum hole height is 65-75% of the minimum liquid level.*

† No inlet holes required because influent enters between the vault base and the bottom of the filter cartridge.

‡ Filter surface area is defined as the total surface area of all individual Biotubes within the filter cartridge.

*** Flow area is defined as the total open area (area of the mesh openings) of all the individual Biotubes within the filter cartridge.*

Ultra-Rib-Style Access Risers

Applications

Ultra-Rib-Style Access Risers sold by Orenco provide access to septic tank openings and can be cast into the tops of concrete tanks, bonded in place, or bolted down using a riser-to-tank adapter. They can also be used as valve enclosures.

For safety, Orenco recommends every riser be equipped with an Orenco Tank Shield™ secondary safety barrier. See *Orenco Tank Shield Technical Data Sheet*, NTD-GOP-RSG-1.

General

Ultra-Rib-Style Access Risers are constructed of ribbed PVC pipe and are available in 12in (300mm), 18in (450mm), and 24in (600mm) diameters. They can be ordered in 3in (76mm) increments in lengths up to 13ft (3.96m) for 18in (450mm) diameter risers, and up to 14ft (4.27m) for 24in (600mm) diameter risers. Ultra-Rib-Style Riser Pipe is also available in truckload quantities. A complete line of Orenco pipe-cutting tools makes it easy to fabricate risers in your shop or in the field.

Materials of Construction

Ultra-rib-style pipe	PVC

Standard Models

RR12XX, RU18XX, RR24XX

Product Code Diagram

R □ □ □ + □ + □ + □

Riser, ultra-rib-style

Riser type:
R = 12in (300mm) and 24in (600mm) diameters
U = 18in (450mm) diameter
PU = Bulk ultra-rib-style pipe, 18in (450mm) and 24in (600mm) diameters

Riser diameter:
12 = 12in (300mm)
18 = 18in (450mm)
24 = 24in (600mm)

Riser height, 3in (76mm) increments standard

Connector/splice box option:
Blank = No grommet or splice box
CLK = Predrilled for ClickTight™
S = 1in (25mm) grommet installed
L = 1 1/4in (32mm) grommet installed
SX = Preinstalled hub for external splice box, minimum riser height 18in (457mm)
S1 = SB1 attached
S2 = SB2 attached
S3 = SB3 attached
S4 = SB4 attached
L5 = SB5 attached
L6 = SB6 attached
XS = Explosion-proof splice box for simplex pumps
XD = Explosion-proof splice box for duplex pumps
XT = Explosion-proof splice box for triplex pumps (Explosion-proof splice boxes are used in Class I Division 1 environments)

Discharge assembly or grommet option:
Blank = No discharge grommet
HD = Predrilled for HDA125 (hole only)
HDS = Simplex HDA plate installed
HDSLC = Simplex HDA plate w/line check installed
10 = 1in (25mm)
12 = 1 1/4in (32mm)
15 = 1 1/2in (38mm)
20 = 2in (51mm)

Orenco Tank Shield™ brackets:
Blank = No brackets
TSB = Brackets

Not all product code configurations may be available as standard products.

Specifications

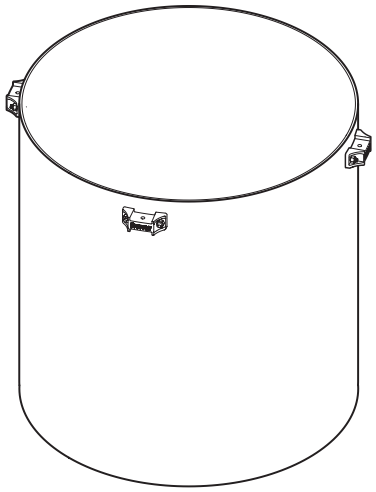
Model	RR12XX	RU18XX	RR24XX
Inner diameter, in (mm)	11.74 (298)	17.65 (448)	23.50 (597)
Wall thickness, excluding ribs, in (mm)	0.10 (3)	0.19 (5)	0.25 (6)
Outer diameter, including ribs, in (mm)	13.13 (334)	19.44 (494)	25.63 (651)
Weight, lbs/ft (kg/m)	5 (7.4)	11 (16.4)	19 (28.3)

FRP Access Risers

Applications

Orenco FRP (fiber-reinforced polymer) Access Risers are designed to provide watertight access to septic tanks and can also be used as valve enclosures. They can be installed on a concrete tank with Orenco tank adapters or bonded to a fiberglass or dicyclopentadiene (DCPD) tank.

RF24 and RF30 FRP access risers are designed for use with Orenco's FLD and FLL access lids. For safety, Orenco recommends every riser be equipped with an Orenco Tank Shield® secondary safety barrier. See *Orenco Tank Shield Technical Data Sheet,* NTD-GOP-RSG-1.



Orenco FRP Access Riser

Materials of Construction

Access riser	FRP
Bolt catches	Glass-filled nylon
Hardware	Stainless steel

Specifications

Model	RF24XX	RF30XX
Inside diameter, in (mm)	23 1/2 (597)	29 1/2 (749)
Weight, lb/ft (kg/m) for <8ft (2.4m)*	11 (16)	18 (27)

**Contact Orenco for the unit weight of longer risers.*

Riser Wall Thickness

Riser Length	RF24XX	RF30XX
≤6ft (1.8m)	3/16in (5mm)	5/16in (8mm)
>6ft (1.8m)	5/16in (8mm)	Custom

General

Orenco FRP Access Risers are lightweight, corrosion resistant, and extremely strong. Risers are available in 24in and 30in (600mm and 750mm) diameters, with heights available in 3in (76mm) increments. They have four bolt catches to secure access riser lids and are compatible with Orenco tank adapters. See *FRP Bulk Riser Pipe Technical Data Sheet,* NTD-GOP-PIP-1 for municipal or other projects requiring a large number of risers.

Standard Models

RF24XX, RF30XX

Product Code Diagram

RF ☐ ☐ ☐ + ☐ + ☐ + ☐ - ☐

Access riser option:
Blank = Standard
PRELOS = Prelos®

Orenco Tank Shield® brackets:
Blank = No brackets
TSB = Brackets

Discharge assembly or grommet option:
Blank = No discharge grommet
HD = Predrilled for HDA125 (simplex hole only)
HDS = Simplex HDA plate installed
HDSLC = Simplex HDA plate w/line check installed
HDD = Duplex HDA plate installed
HDDLC = Duplex HDA plate w/line check installed
10 = 1in (25mm) grommet
12 = 1 1/4in (32mm) grommet
15 = 1 1/2in (38mm) grommet
20 = 2in (51mm) grommet

Connector/splice box option:
Blank = No grommet or splice box
CLK = Predrilled for ClickTight™
S = 1in (25mm) grommet installed
L = 1 1/4in (32mm) grommet installed
S1 = SB1 attached
S2 = SB2 attached
S3 = SB3 attached
S4 = SB4 attached
L5 = SB5 attached
L6 = SB6 attached
SX = Preinstalled hub for external splice box; minimum riser height 18in (457mm)
XS = Explosion-proof splice box for simplex pumps
XD = Explosion-proof splice box for duplex pumps
XT = Explosion-proof splice box for triplex pumps (Explosion-proof splice boxes are used in Class I Division 1 environments)

Riser height, inches

Riser diameter, nominal, in (mm):
24 = 24 (600)
30 = 30 (750)

Orenco® FRP access riser

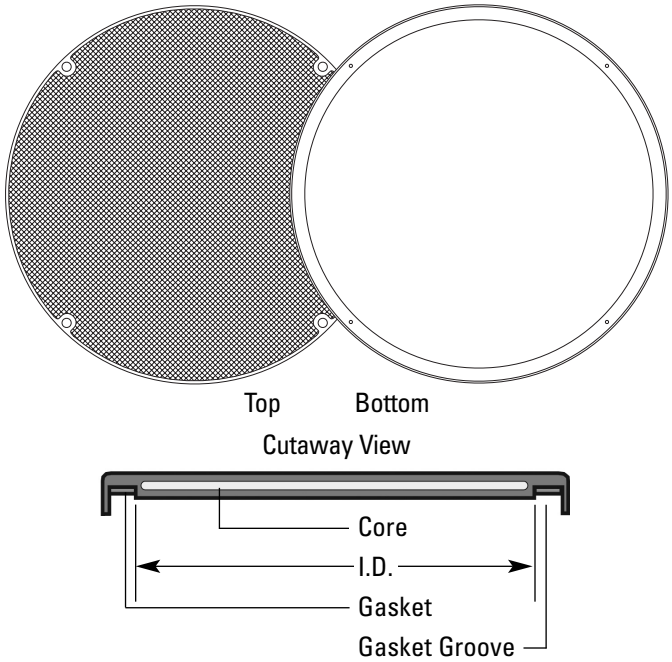
Not all product code configurations may be available as standard products.

Fiberglass Access Lids

Orenco Systems® Incorporated
800-348-9843

Applications

Orenco Fiberglass Access Lids are used as riser covers, pump basin covers, and access port covers. Lids fit Perma-Loc™, Ultra-Rib™, Kor Flo™, and Ultra-Corr™ pipe.



General

Orenco Fiberglass Access Lids are molded using fiberglass reinforced polyester resin encapsulating a wood or structural foam core. The finish is green or brown and the top surface is textured to provide a nonskid surface. Gasketed lids include a polyurethane or neoprene gasket. Lid comes with either two or four 5/16-in. stainless steel flathead socket cap screws and a hex key wrench. Orenco Fiberglass Access Lids are capable of supporting a 2500-lb (1134-kg) wheel load; however, they are not designed or recommended for vehicular traffic.

Standard Models

FL18G-4BU, FL21G, FL24G, FL24-4B, FL30G, FL36G, FL48G

Nomenclature

FL □□ □ - □ - □

Option:
Blank = green
B = brown
W = warning label (24" and 30" only)
C = custom logo
ATX = AdvanTex logo (24" only)

Attachment method:
Blank = 2-bolt-hole lid (30" diameter only)
4B = 4-bolt-hole lid (21", 24", and 36" diameter
4BU = 4-bolt-hole lid Ultra-Rib (18" and 24" diameter only)
8B = 8-bolt-hole lid (48" diameter only)

Options:
G = gasket
V = vent
CF = carbon filter
I2 = 2" insulation
I4 = 4" insulation

Lid diameter: 18", 21", 24", 30", 36", 48"

Fiberglass lid

Note: For a basin bottom with no bolt holes, specify FL18, FL21, FL24, or FL30. For a 48-inch lid with no holes to mount on a concrete riser, specify FL48G. Orenco can drill holes if locations are specified.

Materials of Construction

Fiberglass-reinforced polyester
Wood core (structural foam in FL36)
Neoprene or polyurethane gasket

Options Available

Feature	Model Code Adder	Optional/Standard
Air vent	V	Optional
Carbon filter[1]	CF	Optional
Lid insulation[2]	2 or 4	Optional

[1] *For more information on this option, refer to the Carbon Filters submittal data sheet, NSU-RLA-CF-1.*

[2] *Blue Styrofoam™; R-value per 2-in. (51-mm) increment is 10.*

Perma-Loc™ and Ultra-Rib™ are trademarks of IPEX, Inc. Kor Flo™ is a trademark of Royal Pipe Systems. Ultra Corr™ is a trademark of PW Eagle, Inc. Styrofoam™ is a trademark of Dow Chemical Company.

Specifications

	Model FL18	Model FL21	Model FL24	Model FL30	Model FL36	Model FL48
O.D.	20.25 in. (514 mm)	22.5 in. (572 mm)	26.25 in. (667 mm)	32.0 in. (813 mm)	39.625 in. (1006 mm)	53.875 in. (1368 mm)
Groove I.D.	17.5 in. (445 mm)	20.25 in. (514 mm)	23.25 in. (591 mm)	29.5 in. (749 mm)	35 in. (889 mm)	47.5 in. (1207 mm)
Avg. thickness	0.75 in. (19 mm)	0.75 in. (19 mm)	0.75 in. (19 mm)	1.0 in. (25 mm)	1.5 in. (38 mm)	1.5 in. (38 mm)
Weight	7.25 lb (3.3 kg)	9.75 lb (4.4 kg)	12.5 lb (5.7 kg)	21.5 lb (9.8 kg)	41 lb (18.6 kg)	103 lb (46.7 kg)

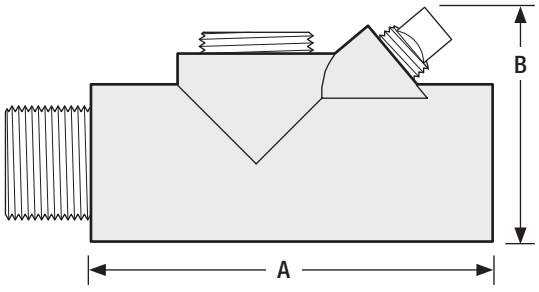
Technical Data Sheet

Conduit Seal Kits

Applications

Orenco's Conduit Seal Kits create a watertight, gastight seal between a conduit and a splice box that prevents the passage of liquids, vapors, or flames.

Conduit seal kit includes fitting, fiber, and cement



Conduit seal dimensions

General

Orenco's Conduit Seal Kits are available for ¾-inch (20-mm) and 1-inch (25-mm) conduit. Conduit Seal Kits include sealant, fiber filler, and instructions. UL listed.

Standard Models

SBCS075, SBCS100

Product Code Diagram

SBCS [ ]

- [ ] Conduit diameter:
  075 = 3/4 inch (20 mm)
  100 = 1 inch (25 mm)
- SBCS Conduit seal kit

Materials of Construction

Seal fitting	Almag 35 aluminum
Sealant	Fiber and water-soluble cement

Specifications

Dimensions

Model	SBCS075	SBCS100
A - Length, in. (mm)	3.50 (89)	4.25 (108)
B - Height, in. (mm)	2.25 (57)	2.50 (64)
Nominal diameter, in. (mm)	0.75 (20)	1.00 (25)

Orenco SYSTEMS

Technical Data Sheet

External Splice Box

Applications

The Orenco® External Splice Box attaches outside the access riser of an underground tank. It's engineered specifically for water and wastewater treatment systems and is especially suited for use in locations prone to high groundwater and other wet conditions. Its separate conduit hubs, large volume, and optional dividers make it useful for maintaining isolation of high- and low-voltage wires, where needed. It has four cord grips, which accommodate power cords for floats and pumps of 0.170 - 0.470 inches (4.3 - 11.9 mm) in diameter. Unused cord grips can be plugged watertight with the supplied cord grip plugs. Each External Splice Box includes a riser adapter designed to provide a watertight connection between the splice box and riser.

UL CERTIFIED SAFETY E237631

The External Splice Box is molded PVC.
It has a UL Type 6P listing for prolonged submergence.

General

To specify the Orenco External Splice Box for your installation, require the following:

- Watertightness for prolonged submergence per UL listing (Type 6P)
- Attachment external to access riser to allow inspection with no need to open the riser lid
- Volume of 126 in.^{3} (2065 cm^3) for easy wiring access and multiple wiring configurations
- Bottom entry, so conduit or direct-bury cable always remains below minimum burial depth
- UV-resistant rating for outdoor use
- Optional divider plates for isolating high- and low-voltage wires from separate conduits or direct-bury cable
- Included riser adapter to eliminate the need for a grommet

Standard Models

SBEX1-4, SBEX1-4-P

Product Code Diagram

SBEX1-4 - ☐

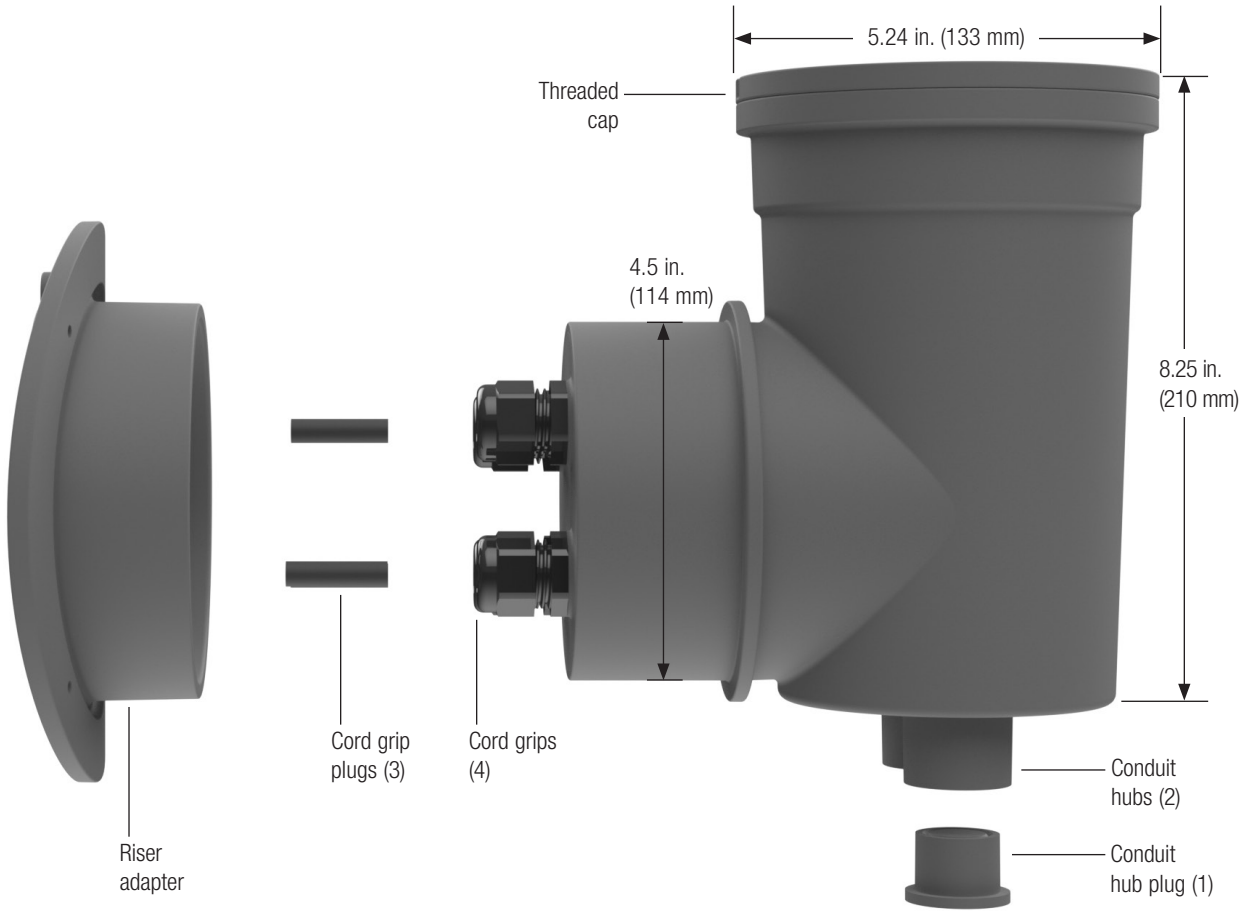
- ☐ = Blank = no divider plates; P = divider plates
- SBEX1-4 = External splice box

Physical Specifications

Volume	126 in.^{3} (2065 cm^3)
Cord grips	4
Cord grip plugs	3
Cord diameters accommodated	0.170-0.470 in. (4.3-11.9 mm)
Conduit hubs	2
Conduit hub plug	1
Conduit sizes accommodated	½ in. (with fitting or bell end) ¾ in. 1 in. (with coupling)
Dia. of hole into riser	5 in. (127 mm); hole-cutting template included

Materials of Construction

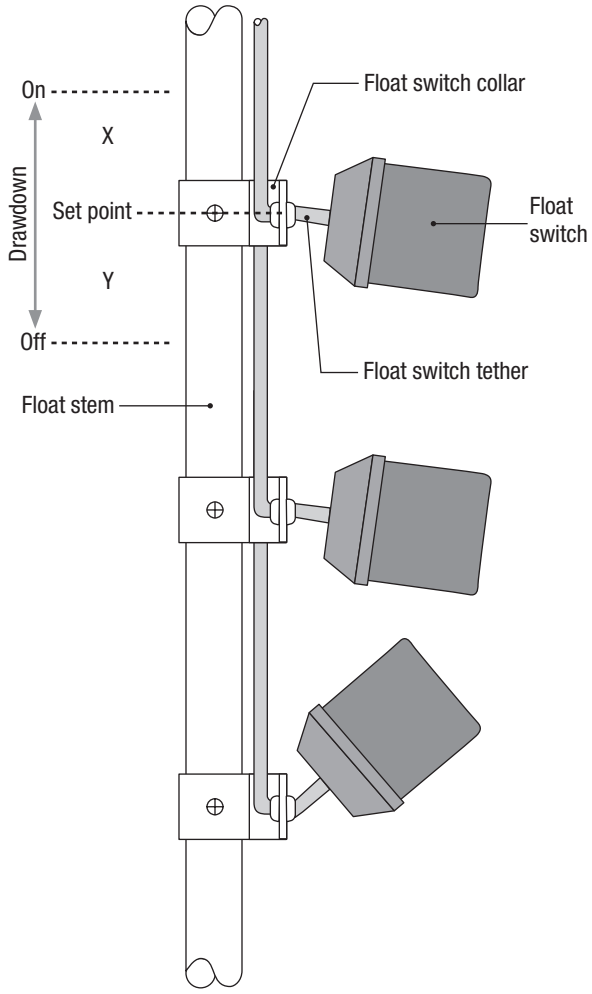
Splice box	PVC
Cord grips	Nylon
Cord grip plugs	EPDM rubber
O-rings	Buna rubber
Conduit hub plug	PVC
Riser adapter	ABS



Float Switch Assemblies

Applications

Float switches are used to signal liquid level positions for alarm and pump control applications. Orenco float switch assemblies can be mounted in pump vaults, effluent screens, pump basins, and risers.



"On" and "Off" positions shown describe normally open float switches; "On" and "Off" positions are reversed for normally closed float switches

General

All models except "J" are UL listed and CSA certified for use in water or sewage; "J" switches are a CSA-certified direct alternative to "P" switches. Non-mercury float switches (models B, C, J, N, and P) are used where components containing mercury are prohibited.

Float switches are typically ordered in assemblies that include one or more switches mounted on a 1in PVC float stem. ABS float collars are used to provide secure mounting that is easily adjustable.

Normally-open "P" float switches have a blue cap for easy identification; normally-closed "N" float switches have a red cap.

When ordering float switch assemblies, remember to list float switches from the top of the float stem down. An "MFPBN-" product code indicates one "P" switch at the top of the stem, one "B" in the middle of the stem, and one "N" switch at the bottom of the stem; an "MF2PN-" indicates "P" switches at the top and middle of the stem, and one "N" switch at the bottom of the stem.

Standard Models

B, C, G, J, N, P

Product Code Diagram

MF ☐ ☐☐ - ☐☐ - ☐

Cord length option:
Blank = 10ft (3m), standard
20 = 20ft (6m)
30 = 30ft (9m)
50 = 50ft (15m)

Application:
FS = field set
FTL = elbow-style (base-inlet filters only)
PB = pump basin
V = pump vault (standard float settings)
STEP = standard float switch settings for STEP
STEPRO = standard float switch settings for STEP with redundant off
SVCOM = standard float switch settings for VCOM simplex

Float stem length:
Blank = no float stem (float switches and float switch collars only)
19, 21, 27, 33, 37, 39, 45, 51, 57, 66 = stem length, inches
5, 11 = stem length, inches (for elbow-style float brackets)

Float switch models (listed in order from the top of the float stem down):
B, C, G, J*, N, P

Number of float switches (when using multiples of the same float switch model):
Blank = no multiples of the same float switch model

Float switch assembly

* CSA-certified, direct alternative to "P" float switch

Note: Not all product configurations are available as standard products

Signal- and Motor-Rated Float Switch Matrix

Model	State[1]	Type	IR[2]	Volts	Amps	hp	Tether	X	Y	Drawdown[3]
Signal-rated mechanical float switches[4] (for control switch applications)										
J[a]	Normally open	Mechanical	Yes	n/a	n/a	n/a	2.00in	2.00in	0.10in	2.10in
N[a]	Normally closed	Mechanical	Yes	n/a	n/a	n/a	2.00in	1.50in	0.50in	2.00in
P[a]	Normally open	Mechanical	Yes	n/a	n/a	n/a	2.00in	1.50in	0.50in	2.00in
Motor-rated float switches[4] (for pump switch applications)										
B	Normally open	Mechanical	No	120V	13A	1/2hp	2.00in[b]	2.50in	1.50in	4.00in
				240V	13A	1hp	3.00in	3.00in	1.50in	4.50in
							4.00in	3.25in	1.50in	4.75in
C	Normally open	Mechanical	No	120V	13A	1/2hp	2.00in	3.00in	2.50in	5.50in
				240V	15A	2hp	3.00in[b]	3.50in	3.00in	6.50in
							4.00in	4.00in	3.50in	7.50in
							5.00in	4.50in	4.00in	8.50in
							6.00in	5.25in	4.25in	9.50in
G	Normally open	Mercury	Yes	120V	15A	3/4hp	2.00in	1.50in	3.00in	4.50in
				240V	15A	2hp	3.00in[b]	1.75in	3.00in	4.75in
							4.00in	2.00in	3.50in	5.50in

[a] *Suitable for use with VCOM and MVP*

[b] *Standard tether length*

Notes

[1] *State: normally open or normally closed*

Float switches have an internal contact. The terms "normally open" (N/O) and "normally closed" (N/C) refer to the default state of the float switch contact. The default state refers to the contact positions in the float switch when it is resting (down). A normally open float switch has an open contact (off) in the down position, and a normally closed float switch has a closed contact (on) in the down position. Different panel functions require different types of float switches. Most applications require float switches that are normally open. One notable exception is the redundant off and low-level alarm function that requires a normally closed float switch, except with MVP and VCOM panels.

[2] *IR (intrinsically safe relay)*

This indicates that the float switch is approved for use with intrinsically safe, Class I, Division 1 applications, where reliable float switch operation with very low current is required.

[3] *Drawdown*

Drawdown (in inches) refers to the difference in liquid level between a float switch's activation and deactivation points. Drawdown can be altered by adjusting the tether length of the float switch cord. When selecting float switches, keep in mind that any float switch that can directly start and stop a pump (one that has no motor contactor in the control panel) should have a drawdown capability to avoid rapid cycling of the pump.

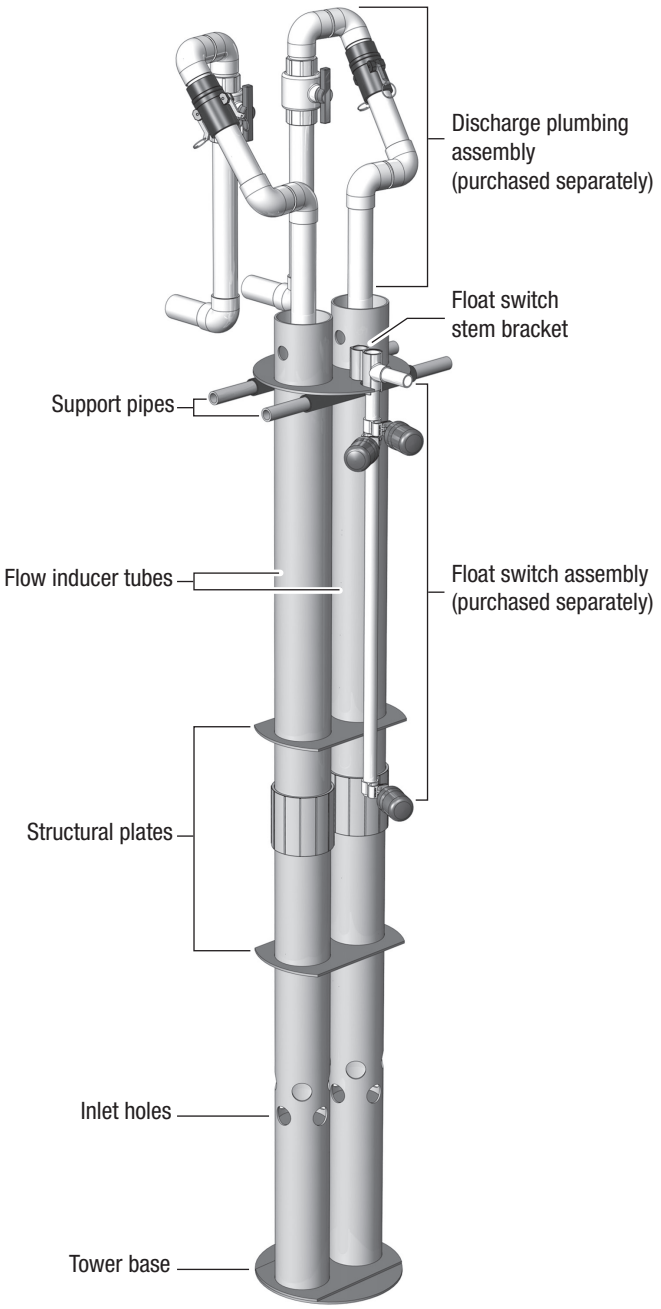
[4] *Signal-rated or motor-rated*

Every float switch has a maximum amount of current it can handle. Exceeding these limits may cause premature failure. Signal-rated or "control" float switches are used to activate pump control panels and alarms. Only low-amperage signals pass through these switches, hence the switch is "signal-rated." All Orenco panels that use motor contactors can use signal-rated float switches. In some systems, a float switch is used to directly start and stop a pump. In this application, the current running the pump passes through the switch as well, so the switch must be "motor-rated." In most instances, a motor-rated float switch can be used as a signal-rated float switch.

Flow Inducer Towers

Applications

Orenco's Flow Inducer Towers are designed for use in commercial/ municipal recirculation and final discharge tanks following secondary treatment, where filtration is not required. Flow inducer towers can be ordered to house from two to five of Orenco's 4in Submersible Effluent Pumps.



Orenco Flow Inducer Tower (duplex model shown)

General

The base of the flow inducer tower rests on the bottom of the tank and the top of the tower extends at least eight inches into the riser. For tanks with curved bottoms, an Orenco Vault Basin (VB1806-FRP) is necessary to create a flat surface on which the tower can rest. The pumps sit on raised fiberglass platforms inside of the 5in (127mm) diameter Class 125 flow inducer tubes.

A float switch bracket is attached to the tower to accommodate an Orenco Float Switch Assembly.

Standard Models

Recirculation Tank Models

FITR-D102, FITR-T102, FITR-D126, FITR-T126

Discharge Tank Models

FITD-D102, FITD-D126

Product Code Diagram

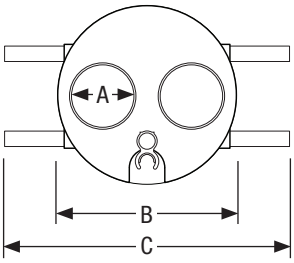
FIT ☐ - ☐ ☐

- Height, in (mm):
  - 102 = 102 (2590)
  - 126 = 126 (3200)
  - Or specify custom size
- Flow inducers:
  - D = duplex (houses two pumps)
  - T = triplex (houses three pumps)
  - Q = quad (houses four pumps)
  - P = pentad (houses five pumps)
- Tank type:
  - R = recirculation tank
  - D = discharge tank
- Flow Inducer Tower

Not all product code configurations may be available as standard products.

Materials of Construction

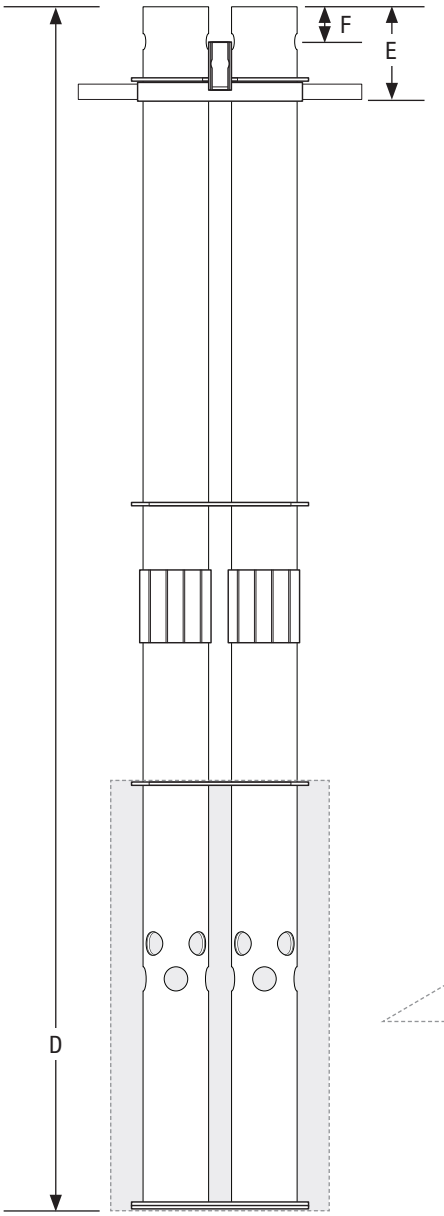
Support pipes	Schedule 80 PVC
Float switch bracket	PVC
Flow inducer tubes	PVC
Structural plates	Fiberglass
Tower base	Fiberglass



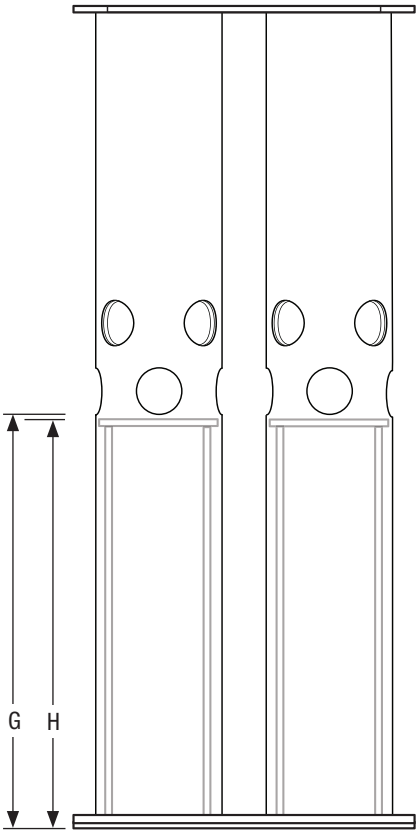
Flow inducer tower
(FITR-D102 shown), top view

Specifications

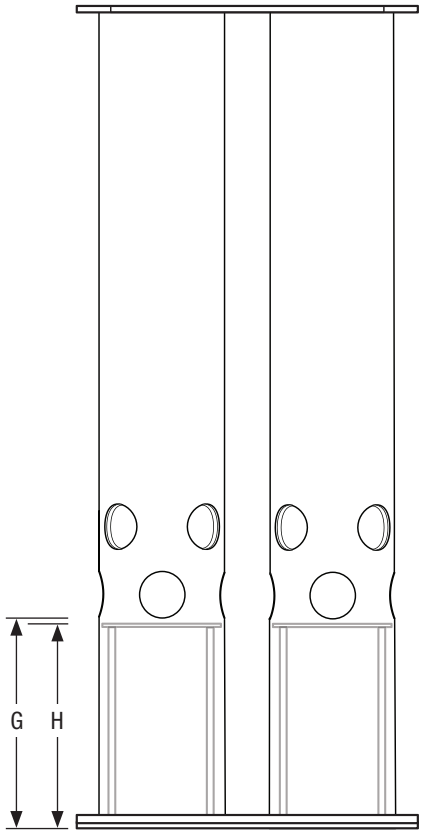
Tank Example Models		FITR-D102	FITR-T126	FITD-D102
A	Tube diameter, nominal, in (mm)	5 (125)	5 (125)	5 (125)
B	Structural plate diameter, in (mm)	15 (381)	15 (381)	15 (381)
C	Support pipe length, in (mm)	24 (610)	24 (610)	24 (610)
D	Tower height, in (mm)	102 (2591)	126 (3200)	102 (2591)
E	Support pipe height, in (mm)	8 (203)	8 (203)	8 (203)
F	Top of stem bracket, in (mm)	3 (76)	3 (76)	3 (76)
G	Inlet hole height, in (mm)	19.25 (489)	19.25 (489)	9.25 (235)
H	Pump plate height, in (mm)	19 (483)	19 (483)	9 (229)
	Inlet hole diameter, in (mm)	2 (50)	2 (50)	2 (50)
	Number of tubes	2	3	2
	Inlet holes per tube	8	8	8



Flow inducer tower
(FITR-D102 shown), side view



Flow inducer tower for recirculation tanks
(FITR-D102 shown), close up



Flow inducer tower for discharge tanks
(FITD-D102 shown), close up

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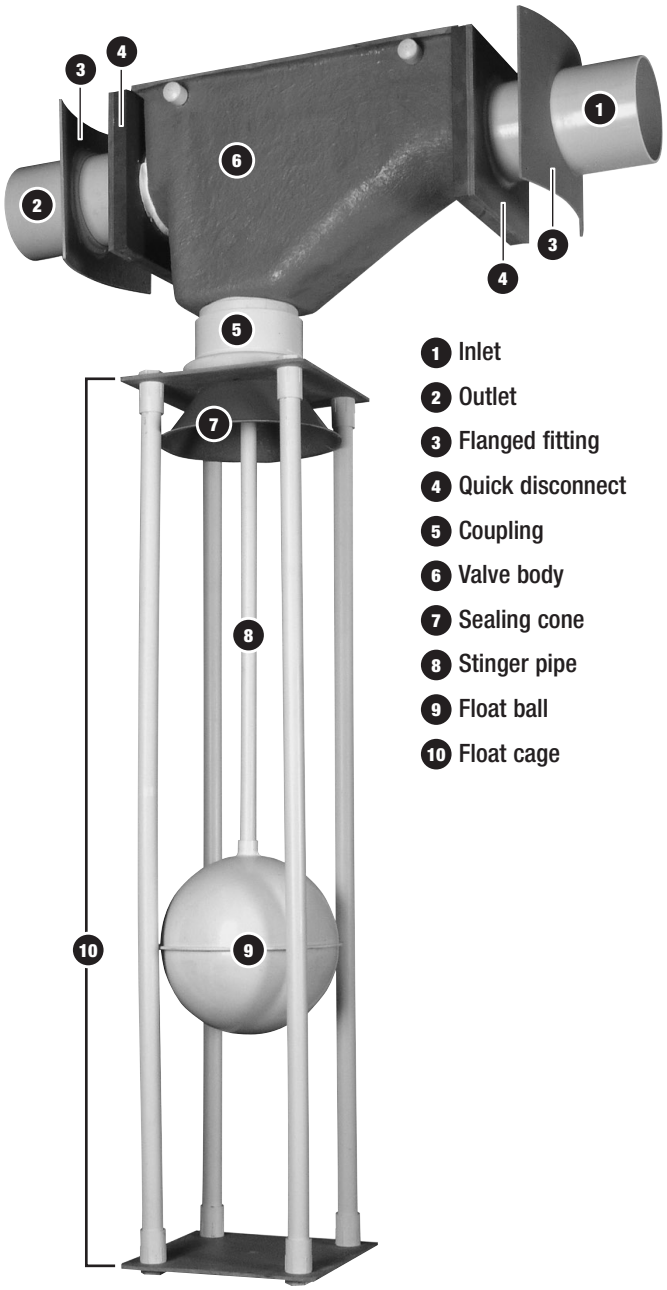
Orenco SYSTEMS

Technical Data Sheet

MM_-FRP Recirculating Ball Valve

Applications

The MM_-FRP Recirculating Ball Valve controls the circulation of filtrate from the AdvanTex pod to the recirculation tank. When the liquid in the tank rises to a predetermined maximum bypass level, the valve closes, diverting filtrate past the recirculation tank. When the liquid level is low, the valve remains open, allowing filtrate to return to the tank for recirculation. As the liquid level approaches the maximum bypass level, filtrate splits and flows both ways.



MM_FRP Recirculating Ball Valve (MM6-FRP shown)

Features

- Easy installation and removal
- Field-adjustable to maintain desired bypass level
- Corrosion-resistant construction
- Capacity for flows up to ...
  125 gpm (7.9 L/sec) for MM4-FRP
  225 gpm (14.2 L/sec) for MM6-FRP
- Design allows installation in ...
  24- or 30-in. (600- or 750-mm) access risers (MM4-FRP)
  30-in. (750-mm) access risers (MM6-FRP)

Standard Models

MM4-FRP, MM4-FRP-Field Cut, MM6-FRP, MM6-FRP-Field Cut

Materials of Construction

	MM4-FRP	MM6-FRP
Body and cone	Fiberglass-reinforced polyester (FRP)	Fiberglass-reinforced polyester (FRP)
Inlet and outlet	Sch. 40 PVC	Sch. 40 PVC
Float	Polyethylene	ABS
Float cage	FRP plates, PVC	FRP plates, PVC
Quick-disconnect mounting brackets	ABS	FRP, PVC
Latches	No latches	Stainless steel

Specifications

Approximate Dimensions, in. (mm)

	MM4-FRP	MM6-FRP
Total height	71 (1803)	77.5 (1968)
Float cage height	49 (1245)	57 (1448)
Stinger pipe length	23.0 (584)	31.5 (800)
Stinger pipe length (Field-cut option)*	36.0 (914)	40.0 (1016)
Distance between mounting brackets	17.4 (442)	25.4 (645)
Nominal inlet and outlet diameter	4 (100)	6 (150)

**Field-cut stinger pipes are shipped unassembled.*

Technical Data Sheet

AdvanTex® Vent Fan Assembly

Orenco Systems® Incorporated
800-348-9843

Applications

Orenco's AdvanTex® Vent Fan Assembly consists of a water-proof fiberglass enclosure with equipment for venting onsite wastewater treatment systems. One enclosure can hold a vent fan with carbon filter and an optional heater.

The vent fan is used in commercial-sized AdvanTex Treatment Systems to gently pull air through the textile media, ensuring that adequate oxygen is available for biological treatment. The carbon filter scrubs the air that the system exhausts. An optional heater can be added where climate requires heating of the air that enters the AdvanTex textile filter pods.

Standard Models

AXVFACF — AX above ground Vent Fan Assembly with LMF-3 Fan

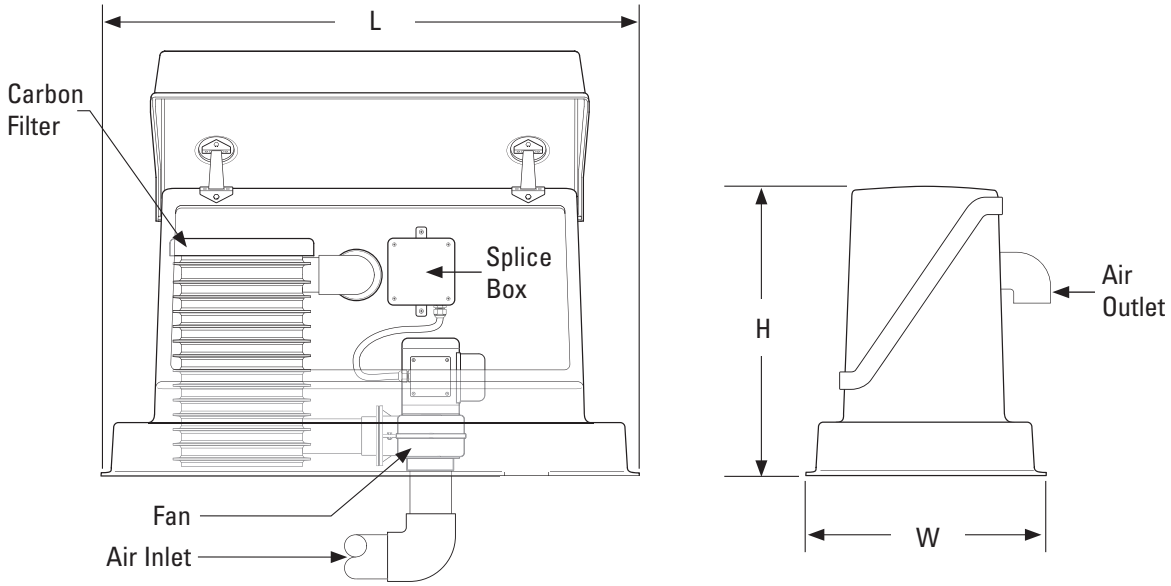
AXVFACF-HT — AX above ground Vent Fan Assembly with LMF-3 Fan and HT10 Heater

Enclosure

Physical Specifications

Materials of Construction	
Shell	Fiberglass-reinforced polyester (FRP)
Hardware	Stainless steel
Exterior finish	Green, textured, UV resistant
Straps	Nylon

Dimensions	
Length (L)	50 in. (1270 mm)
Width (W)	24 in. (610 mm)
Height (H)	30 in. (762 mm)
Volume	15.1 ft^3 (0.43 m^3)
Area (footprint)	8.3 ft^2 (0.77 m^2)



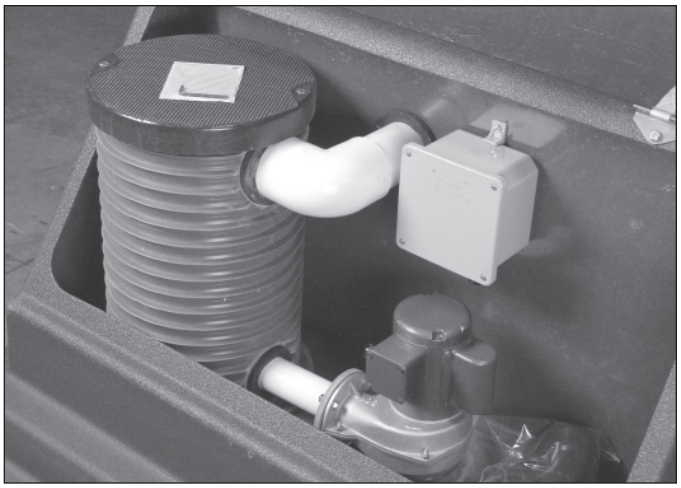
Fan

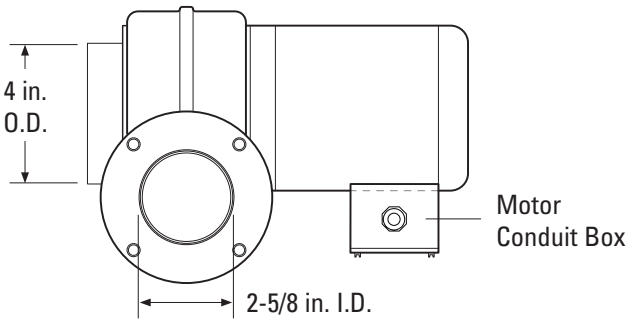
Physical Specifications

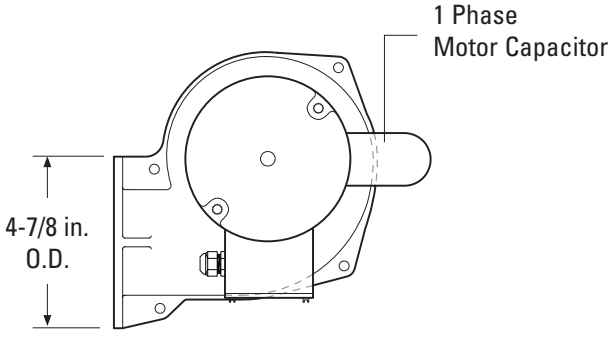
Dimensions	
Inlet O.D.	4 in. (100 mm)
Inlet nominal pipe size	4 in. (100 mm)
Outlet I.D.	2-5/8 in. (67 mm)
Outlet Flange O.D.	4-7/8 in. (124 mm)

Materials of Construction	
Housing	Aluminum
Wheel	Steel

Performance Data	60 Hz	50 Hz
Horsepower (kW)	0.08 (0.06 kW)	0.08 (0.06 kW)
Phase	1 phase	1 phase
Volts	115/230	110/220
Amperage	1.4 A/0.7 A	1.8 A/0.9 A
RPM	3400	2900
CFM at 0" H_2O static pressure	245	205
CFM at 0.4" H_2O static pressure	220	170
CFM at 0.8" H_2O static pressure	190	130
CFM at 1.5" H_2O static pressure	120	N/A

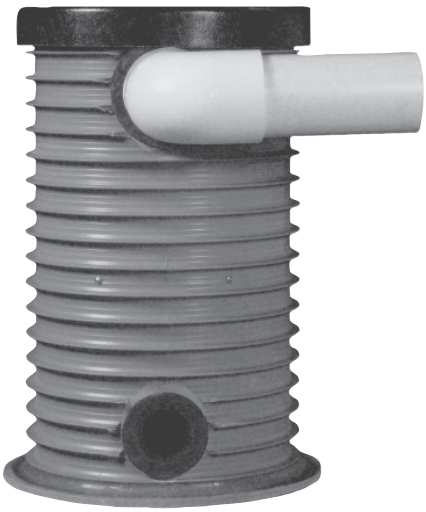






AdvanTex® Vent Fan Assembly (continued)

Carbon Filter Basin

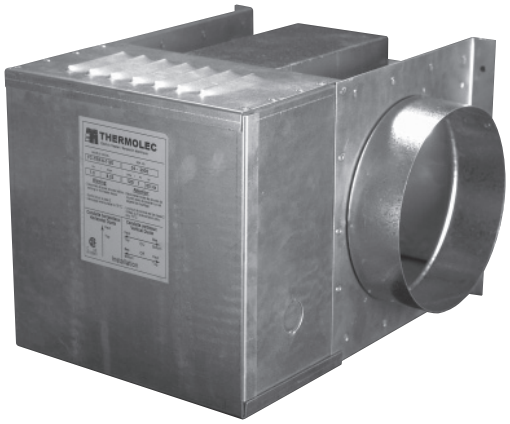


Physical Specifications

Dimensions	
Outlet diameter	Accepts nominal 3-in. PVC pipe
Inlet diameter	Accepts nominal 2-in. PVC pipe
Height	21.5 in. (546 mm)
Diameter	12 in. (305 mm)

Materials of Construction	
Housing	PVC
Bottom	Fiberglass-reinforced polyester (FRP)
Interior supports	Polypropylene grid and polyethylene screen
Support rings	PVC
Lid	Fiberglass
Fill material	Activated carbon

Heater (Optional)



Physical Specifications

Dimensions	
Outlet diameter	Fits nominal 3-in. Class 125 PVC pipe
Length (inlet to outlet)	11.75 in. (297 mm)
Width	11.25 in. (286 mm)
Depth	8.25 in. (210 mm)

Performance Data

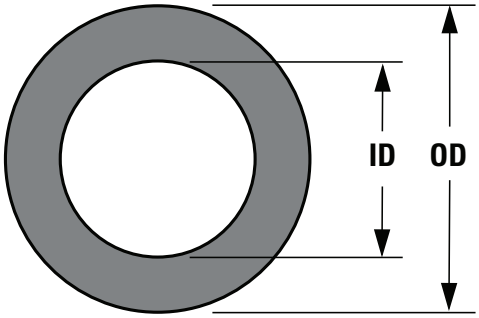
Watts	1000
Volts	120
Amps	8.3

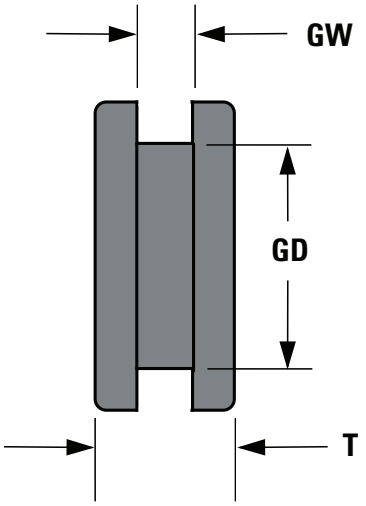
Technical Data Sheet

Pipe Grommets

Applications

Orenco® Pipe Grommets are used to provide a seal to prevent the passage of liquids through pipe penetrations.





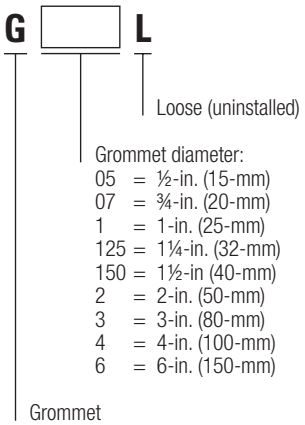
General

Orenco Pipe Grommets are constructed of corrosion-resistant rubber to provide long-lasting seals. Grommets conform to standard IPS sizes. Not all models conform exactly to the image shown.

Standard Models

G05L, G07L, G1L, G125L, G150L, G2L, G3L, G4L, G6L

Product Code Diagram



Material of Construction:

Grommet	EPDM synthetic rubber in accordance with MIL-STD-417, 60 durometer.

Specifications

Model	G05L	G07L	G1L	G125L	G150L	G2L	G3L	G4L	G6L
OD, in. (mm)	1 ¼ (30)	1 ½ (38)	1 ⅞ (48)	2 ⅛ (54)	2 ½ (64)	3 ⅞ (98)	5 (127)	6 (152)	8 ⅛ (210)
ID, in. (mm)	¾ (19)	1 (25)	1 ¼ (30)	1 ½ (38)	1 ¾ (44)	2 ⅛ (54)	3 ¼ (83)	4 3/16 (106)	6 11/16 (170)
GD, in. (mm)	1 (25)	1 ¼ (30)	1 5/8 (41)	1 ¾ (44)	2 ⅛ (54)	2 11/16 (68)	3 13/16 (97)	4 15/16 (125)	7 5/8 (193)
GW, in. (mm)	3/16 (5)	3/16 (5)	¼ (6)	¼ (6)	¼ (6)	5/16 (8)	5/16 (8)	¼ (6)	¼ (6)
T, in. (mm)	½ (13)	7/16 (11)	9/16 (14)	5/16 (8)	5/16 (8)	15/16 (24)	15/16 (24)	⅞ (22)	13/16 (21)
Holesaw size, in. (mm)	1 (25)	1 ¼ (30)	1 9/16 (40)	1 ¾ (44)	2 ⅛ (54)	2 ¾ (70)	3 ⅞ (98)	5 (127)	7 (178)

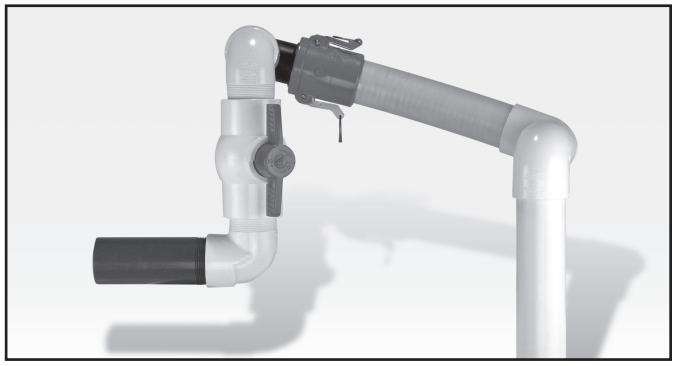
HV-Series Pump Discharge Assemblies

Applications

Orenco HV-Series Pump Discharge Assemblies convey effluent from a pump to the exterior of a riser or pump basin. They come in the following configurations:

- Field cut, for high-head discharge assemblies where field adjustment is likely necessary
- Drainback, for use with shallowly buried tanks and transport lines in cold climates
- High head, for use with submersible turbine effluent pumps
- Low head, for use with low-pressure effluent pumps

A cold weather kit is available for high-head configurations only, for use in deeply buried tanks and transport lines where cold weather is a concern. Additionally, an external flex extension is available for installations where tank settling may occur to avoid line breakage during settling. Orenco strongly recommends using an external flex extension if settling may occur.



High-head configuration with optional quick-disconnect installed

General

HV-Series pump discharge assemblies are corrosion resistant and adjustable for a proper fit. They are composed of PVC valves and flexible hose that simplify installation and maintenance. The flexible hose also dampens vibrations from the pump. Cam-style quick-disconnect fittings are available on all configurations. All parts are either solvent welded or threaded and sealed with PTFE paste. For the most accurate information on pairing Orenco's pumps to HV-Series pump discharge assemblies, use Orenco's PumpSelect™ software.

Standard Models

HV100BCX, HV125BCX, HV150BCX, HV200BCX

Product Code Diagrams

HV ☐ ☐ - ☐

- ☐ (last): Configuration options:
  - Blank = field cut (high-head style)
  - DB = drainback (always field cut)
  - H = high head
  - L = low head
- ☐ (middle): Component options:
  - AS = antisiphon
  - B = ball valve
  - C = check valve
  - FC = flow controller (1in NPS diameter only)
  - PR = high pressure
  - Q = quick disconnect
  - S = true-union ball check valve (1 1/2in NPS discharge only)
  - X = external flex hose
- ☐ (first): Discharge diameter, nominal pipe size (NPS):
  - 100 = 1in
  - 125 = 1 1/4in
  - 150 = 1 1/2in
  - 200 = 2in
- HV: HV-Series Pump Discharge Assembly

Not all product code configurations may be available as standard products.

HVCW ☐ **- KIT -** ☐

- ☐ (last): Drain hole options:
  - Blank = 1/8in (3.2mm) drain hole in elbow
  - NDH = no drain hole
- KIT: Kit
- ☐ (middle): Discharge diameter, nominal pipe size (NPS):
  - 100 = 1in
  - 125 = 1 1/4in
  - 150 = 1 1/2in
  - 200 = 2in
- HVCW: HV-Series Cold Weather Kit (only available for high-head pump discharge)

Not all product code configurations may be available as standard products.

HVX ☐ - ☐

- ☐ (last): Discharge connection, NPS:
  - Blank = same as discharge diameter
  - 100 = 1in
  - 125 = 1 1/4in
  - 150 = 1 1/2in
  - 200 = 2in
- ☐ (middle): Discharge diameter, nominal pipe size (NPS):
  - 100 = 1in
  - 125 = 1 1/4in
  - 150 = 1 1/2in
  - 200 = 2in
- HVX: HV-Series External Flex Extension

Not all product code configurations may be available as standard products.

1. **High-head configuration**
2. **High-head configuration with cold weather kit installed**
3. **High-head drainback configuration**
4. **Low-head configuration**
5. **Cold weather kit**
6. **External flex extension**

Materials of Construction*

External flex extension	PVC
Flexible hose	PVC
Flow control disc	Schedule 80 PVC
High-pressure flex hose	Special elastomer compound
Pipe and fittings	Schedule 40 PVC

** For information regarding materials of construction for unions and valves used in HV-Series pump discharge assemblies, see Unions and Valves for Orenco Products, NTD-GOP-VLV-1.*

Flexible Hose Thickness and Working Pressure at 73˚F (23˚C)*

Type	Nominal pipe size, in (mm)	Wall thickness, in (mm)	Working pressure, psi (bar)	Bursting pressure, psi (bar)
Standard and external	1 (25)	0.11 (2.8)	100 (7)	355 (24)
	1 1/4 (32)	0.13 (3.3)	80 (6)	250 (17)
	1 1/2 (40)	0.13 (3.3)	65 (4)	200 (14)
	2 (50)	0.16 (4.1)	60 (4)	175 (12)
High pressure	1 (25)	0.235 (6.0)	250 (17)	N/A
	1 1/4 (32)	0.24 (6.1)	250 (17)	N/A
	1 1/2 (40)	0.24 (6.1)	250 (17)	N/A
	2 (50)	0.22 (5.6)	200 (14)	N/A

**For information regarding working pressures of unions and valves used in HV-Series pump discharge assemblies, see Unions and Valves for Orenco Products, NTD-GOP-VLV-1.*

Orenco WATER

Technical Data Sheet

PF-Series Submersible Effluent Pumps: 50Hz, 100mm (4in)

Applications

Orenco's PF-Series 50Hz, 100mm (4in) Submersible Effluent Pumps are designed to transport screened effluent (with low TSS counts) from septic tanks or separate dosing tanks. All our pumps are constructed of lightweight, corrosion-resistant stainless steel and engineered plastics; all are field-serviceable and repairable with common tools.

These effluent pumps are used in a variety of applications, including pressurized drainfields, packed-bed filters, mounds, aerobic units, effluent irrigation, liquid-only (effluent) sewers, wetlands, lagoons, and more. These pumps are designed to be used with a Biotube® pump vault or after a secondary treatment system.

Powered by Franklin Electric

Features/Specifications

To specify this pump for your installation, require the following:

- Minimum 24-hour run-dry capability (liquid end) with no deterioration in pump life or performance
- 3mm (1⁄8in) bypass orifice to ensure flow recirculation for motor cooling and to prevent air bind
- Franklin Electric Super Stainless motor, rated for continuous use and frequent cycling
- TRI-SEAL™ floating impeller design on 0.6L/s and 1.9L/s (10gpm and 30gpm) models; floating stack design on 3.2L/s and 4.7L/s (50gpm and 75gpm) models
- Type SOOW 600V motor cable
- Torque locks (available for all pump models)
- Liquid-end repair kits (available for better long-term cost of ownership)

Standard Models

See the specifications chart on page 2 for a list of standard pumps.
For a complete list of available pumps, call Orenco.

Product Code Diagram

PF(50HZ) ☐ ☐ ☐ ☐ ☐ ☐ - ☐ - ☐

- ☐ (last): CLK = ClickTight™ compatible
- ☐ (Cord length, m (ft)): Blank = 3 (10) 20 = 6 (20)* 30 = 9 (30) 50 = 15 (50)
- ☐ (Check valve): Blank = no internal check valve; CV = internal check valve†
- ☐ (Voltage, nameplate): 2 = 220 4 = 380
- ☐ (Phase): 1 = single-phase 3 = three-phase
- ☐ (Kilowatts (hp)): 05 = 0.37 (½) 07 = 0.56 (¾) 10 = 0.75 (1) 15 = 1.12 (1½) 20 = 1.49 (2)
- ☐ (Nominal flow, L/s (gpm)): 10 = 0.6 (10) 30 = 1.9 (30) 50 = 3.2 (50) 75 = 4.7 (75)
- PF(50HZ): Pump, PF Series, 50Hz model

*6m cords are available only for single-phase pumps through 1.12kW
†Available with PF(50HZ)100512 only

Specifications

Pump Model	Design L/s (gpm)	Kilowatts (hp)	Phase	Nameplate voltage	Actual voltage	Design flow amps	Max amps	Discharge size and material [1]	Length mm (in) [2]	Min liquid level mm (in) [3]	Weight kg (lb)	Rated cycles per day
PF(50HZ)100512CV [7]	0.6 (10)	0.37 (0.50)	1	220	220-240	3.9	4.1	1¼in GFP	584 (23.0)	432 (17)	12 (26)	300
PF(50HZ)100532	0.6 (10)	0.37 (0.50)	3	220	220-240	1.8	1.8	1¼in GFP	584 (23.0)	432 (17)	12 (26)	300
PF(50HZ)100534	0.6 (10)	0.37 (0.50)	3	380	380-415	1.1	1.1	1¼in GFP	584 (23.0)	432 (17)	12 (26)	300
PF(50HZ)100712 [4, 5, 7]	0.6 (10)	0.56 (0.75)	1	220	220-240	6.2	6.2	1¼in GFP	658 (25.9)	432 (17)	14 (30)	300
PF(50HZ)100734 [4, 5]	0.6 (10)	0.56 (0.75)	3	380	380-415	1.6	1.6	1¼in GFP	658 (25.9)	432 (17)	14 (30)	300
PF(50HZ)101512 [5, 6]	0.6 (10)	1.12 (1.50)	1	220	220-240	10.5	11.4	1¼in SS	1003 (39.5)	559 (22)	2 (46)	100
PF(50HZ)300512 [7]	1.9 (30)	0.37 (0.50)	1	220	220-240	4.1	4.1	1¼in GFP	572 (22.5)	483 (19)	12 (26)	300
PF(50HZ)300532	1.9 (30)	0.37 (0.50)	3	220	220-240	1.8	1.8	1¼in GFP	572 (22.5)	483 (19)	12 (26)	300
PF(50HZ)300534	1.9 (30)	0.37 (0.50)	3	380	380-415	1.1	1.1	1¼in GFP	572 (22.5)	483 (19)	12 (26)	300
PF(50HZ)300712 [7]	1.9 (30)	0.56 (0.75)	1	220	220-240	6.1	6.1	1¼in GFP	630 (24.8)	483 (19)	13 (29)	300
PF(50HZ)301012 [7]	1.9 (30)	0.75 (1.00)	1	220	220-240	7.4	7.4	1¼in GFP	721 (28.4)	508 (20)	15 (32)	100
PF(50HZ)301512 [4, 5]	1.9 (30)	1.12 (1.50)	1	220	220-240	9.3	9.3	1¼in GFP	899 (35.4)	610 (24)	18 (40)	100
PF(50HZ)500512 [7]	3.2 (50)	0.37 (0.50)	1	220	220-240	4.0	4.0	2in SS	516 (20.3)	635 (25)	13 (29)	300
PF(50HZ)500712 [7]	3.2 (50)	0.56 (0.75)	1	220	220-240	6.3	6.4	2in SS	602 (23.7)	635 (25)	14 (30)	300
PF(50HZ)501012 [7]	3.2 (50)	0.75 (1.00)	1	220	220-240	7.3	7.4	2in SS	686 (27.0)	660 (26)	16 (35)	100
PF(50HZ)501034	3.2 (50)	0.75 (1.00)	3	380	380-415	2.1	2.1	2in SS	686 (27.0)	660 (26)	16 (35)	300
PF(50HZ)501512	3.2 (50)	1.12 (1.50)	1	220	220-240	9.1	9.1	2in SS	826 (32.5)	762 (30)	19 (42)	100
PF(50HZ)751012 [7]	4.7 (75)	0.75 (1.00)	1	220	220-240	7.3	7.3	2in SS	762 (30.0)	686 (27)	15 (32)	100
PF(50HZ)751032	4.7 (75)	0.75 (1.00)	3	220	220-240	3.5	3.5	2in SS	762 (30.0)	686 (27)	14 (30)	300
PF(50HZ)751034	4.7 (75)	0.75 (1.00)	3	380	380-415	2.1	2.1	2in SS	762 (30.0)	686 (27)	14 (30)	300
PF(50HZ)752034	4.7 (75)	1.49 (2.00)	3	380	380-415	4.0	4.0	2in SS	965 (38.0)	889 (35)	18.2 (40)	300

1 GFP = glass-filled polypropylene; SS = stainless steel. The 1¼in NPT GFP discharge is 2⅞in octagonal across flats; the 1¼in NPT SS discharge is 2⅛in octagonal across flats; and the 2in NPT SS discharge is 2⅞in hexagonal across flats. Discharge is female NPT threaded, US nominal size, to accommodate Orenco discharge hose and valve assemblies. Consult your Orenco Distributor about fittings to connect hose and valve assemblies to metric-sized piping.

2 Minimum liquid level is for single pumps when installed in an Orenco Biotube Pump Vault or Universal Flow Inducer. In other applications, minimum liquid level should be top of pump. Consult Orenco for more information.

3 Weight includes carton and 3m (10ft) cord.

4 High-pressure discharge assembly required.

5 Do not use cam-lock option (Q) on discharge assembly.

6 Custom discharge assembly required for these pumps. Contact Orenco.

7 ClickTight compatible.

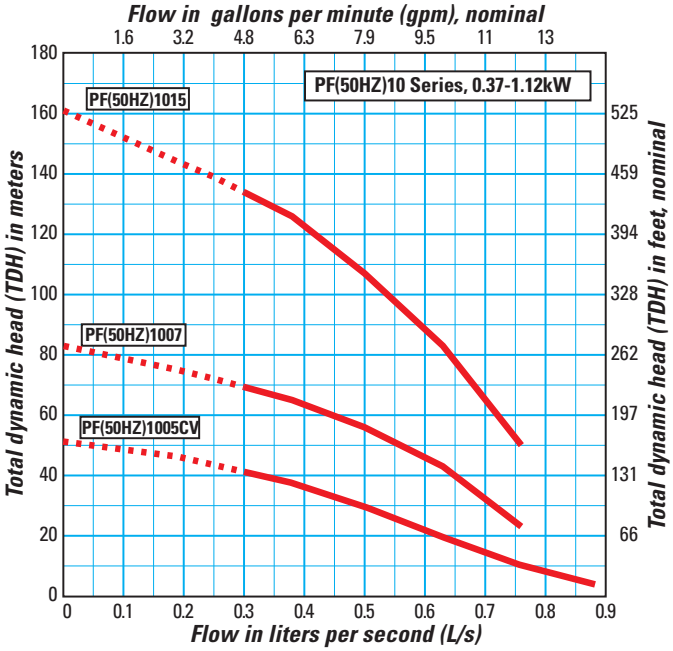
Materials of Construction

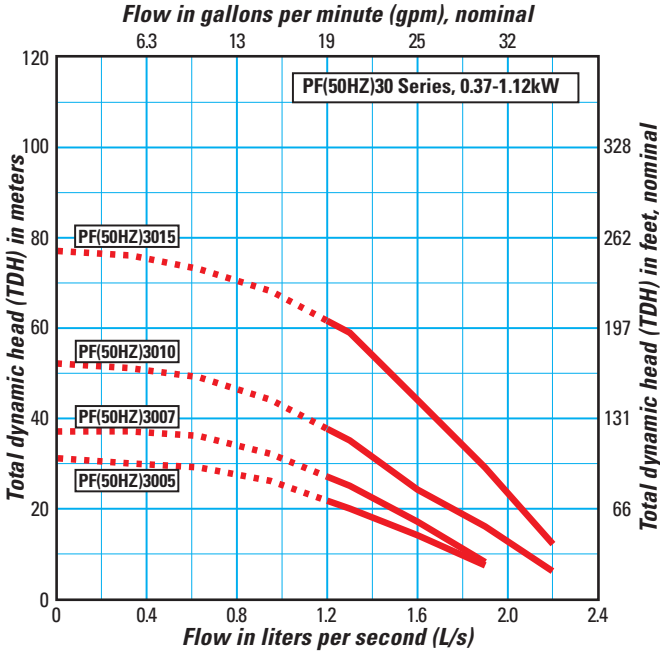
Discharge	Glass-filled polypropylene or stainless steel
Discharge bearing	Engineered thermoplastic (PEEK)
Diffusers	Glass-filled PPO (Noryl GFN3)
Impellers	Celcon® acetal copolymer on 0.6L/s and 1.9L/s models; 3.2L/s impellers are Noryl GFN3
Intake screen	Polypropylene
Suction connection	Stainless steel
Drive shaft	11mm (7/16in) hexagonal stainless steel, 300 series
Coupling	Sintered stainless steel, 300 series
Shell	Stainless steel, 300 series
Motor	Franklin motor exterior constructed of stainless steel. Motor filled with deionized water and propylene glycol for constant lubrication. Hermetically sealed motor housing ensures moisture-free windings. All thrust absorbed by Kingsbury-type thrust bearing. Rated for continuous duty. Single-phase motors and 220V, 3-phase motors equipped with surge arrestors for added security. Single-phase motors through 1.12kW (1.5hp) have built-in thermal overload protection, which trips at 95-105°C (203-221°F).

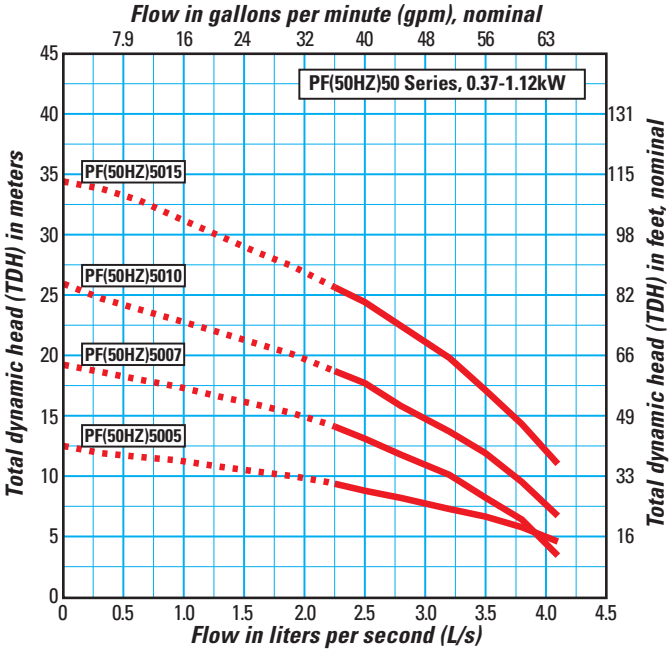
Using a Pump Curve

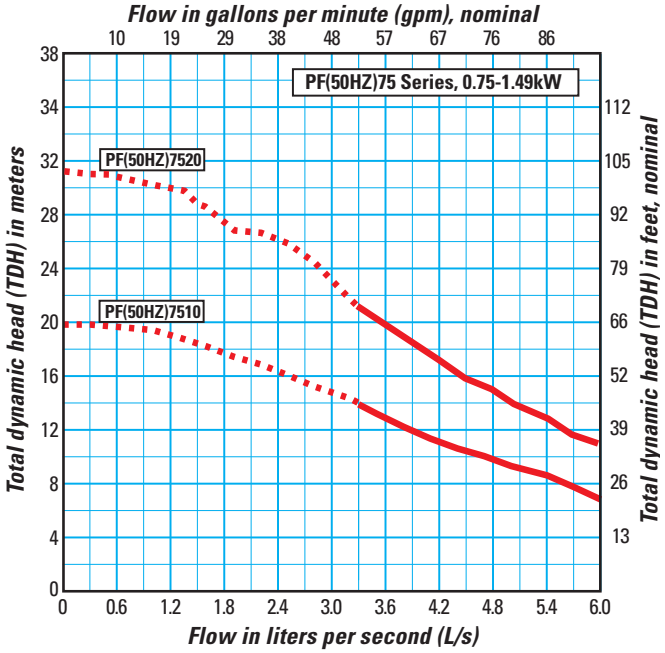
A pump curve helps you determine the best pump for your system. Pump curves show the relationship between flow (L/s or gpm) and pressure (TDH), providing a graphical representation of a pump's optimal performance range. Pumps perform best at their nominal flow rate. These graphs show optimal pump operation ranges with a solid line and show flow rates outside of these ranges with a dashed line. For the most accurate pump specification, use Orenco's PumpSelect™ software.

Pump Curves





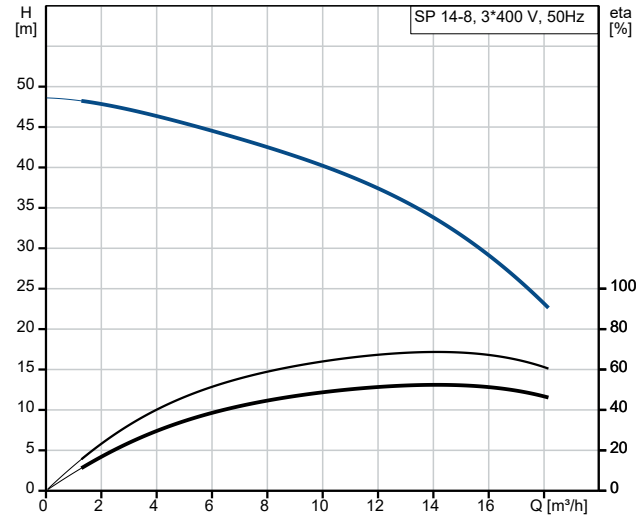




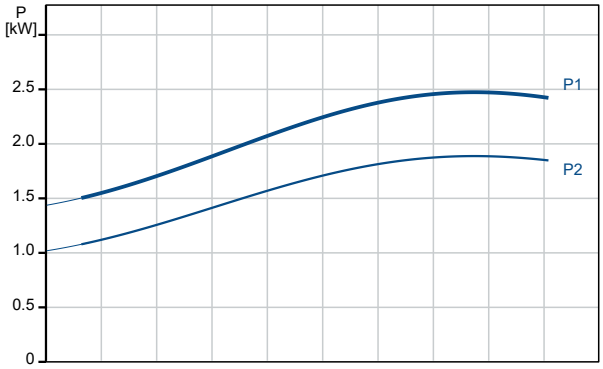
Company name:
Created by:
Phone:

Date: 09/05/2025

Description	Value
General information:	
Product name:	SP 14-8
Product No:	98826893
EAN number:	5712601959124
Price:	
Technical:	
Pump speed on which pump data are based:	2900 rpm
Rated flow:	14 m³/h
Rated head:	34.1 m
Stages:	8
Number of reduced-diameter impellers:	NONE
Shaft seal for motor:	LIPSEAL
Approvals:	CE,EAC,UKCA,SEPRO,MOROCCO
Approvals for drinking water:	ACS,DM174
Curve tolerance:	ISO9906:2012 3B
Model:	A
Motor version:	T40
Return valve:	YES
Materials:	
Pump:	Stainless steel
	EN 1.4301
	AISI 304
Impeller:	Stainless steel
	EN 1.4301
	AISI 304
Motor:	Stainless steel
	DIN W.-Nr. 1.4301
	AISI 304
Installation:	
Maximum ambient pressure:	15 bar
Maximum operating pressure:	15 bar
Maximum outlet pressure:	5 bar
Type of connection:	Rp
Size of connection:	2 inch
Motor diameter:	4 inch
Minimum borehole diameter:	105 mm
Liquid:	
Pumped liquid:	Water
Liquid temperature range:	-15 .. 40 °C
Max liquid t at 0.15 m/sec:	40 °C
Selected liquid temperature:	20 °C
Density:	998.2 kg/m³
Electrical data:	
Motor type:	MS402
Motor flange design:	NEMA
Rated power - P2:	2.2 kW
Power (P2) required by pump:	2.2 kW
Mains frequency:	50 Hz
Rated voltage:	3 x 380-400-415 V
Rated current:	5.50-5.50-5.70 A
Starting current:	440-460-470 %
Cos phi - power factor:	0.85-0.82-0.77
Rated speed:	2850-2860-2870 rpm
Start. method:	direct-on-line
Enclosure class (IEC 34-5):	IP68
Insulation class (IEC 85):	B



Pumped liquid = Water
Liquid temperature during operation = 20 °C
Density = 998.2 kg/m³



Company name:
Created by:
Phone:

Date: 09/05/2025

Description	Value
Built-in motor protection:	NONE
Thermal protec:	external
Built-in temp. transmitter:	no
Length of cable:	1.7 m
Power cable type:	FLAT
Motor No:	79192007
Cable number:	795750
Windings:	Enamelled
Others:	
Minimum efficiency index, MEI ≥:	0.50
Net weight:	22 kg
Gross weight:	23.7 kg
Shipping volume:	0.021 m³
Environmental approvals:	WEEE

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S-Series Specification Sheet

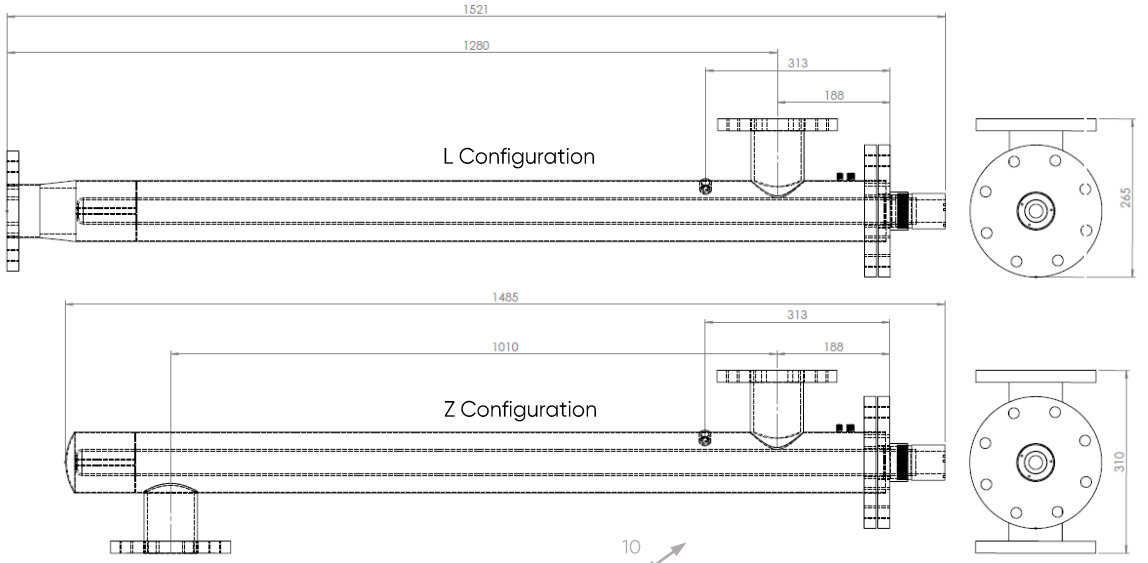
S440

Performance

Flow Rate @ 30mJ/cm²	45 m³/hr	UV dose calculated based on 95% UV Transmittance and lamp output at the end of life.
Flow Rate @ 40mJ/cm²	34 m³/hr	

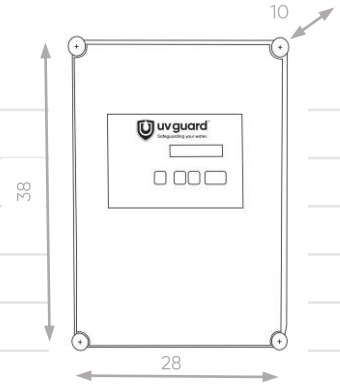
UV Reactor

Certification	Australian WaterMark Level 1
Material	316L Stainless Steel
Inlet and outlet connections	3" DIN EN1092-1 PN16
Inlet and outlet configurations	L or Z
Max pressure	10 bar (1000 kPa)
Weight when full	30 kg
IP rating	IP54
Lamp type	450W Low Pressure
Lamp life	16,000 hours
Max Operating Temperature	60 °C
Lamp view port	Yes
Options	Sanitary or threaded inlet and outlet connections



Controller

Material	Polycarbonate
Voltage (V/Hz)	240V, 50-60 Hz
Operating temperature range	5°C - 40°C
Power consumption	455W
Protection class	IP54
Standard features	Lamp on/off LEDs, digital lamp life timer, audible alarm
Options	Touchscreen HMI, powder coated steel and 304 stainless steel enclosures, models to suit international electrical outlets, UV intensity monitoring, 4-20mA UV intensity output, volt free alarm outputs, lamp safety interlock switch, remote on input, alternative controller communication.



Multi-Jet Water Meter

MT-KD-P

15-50 mm

- The BarMeter **MT-KD-P Multi-Jet Water Meter** was designed to measure potable water.
- Working principle: while water passes through the water meter, several water jets make the impeller rotate. The impeller's rotations are proportional to quantity of water passing through and magnetically transmitted to the register, in which the reading of the water meter takes place.
- Its solid and sturdy construction makes the BarMeter **MT-KD-P Multi-Jet Water Meter** suitable for various applications.
- The BarMeter **MT-KD-P Multi-Jet Water Meter** ensures high sensitivity and accurate registration throughout a wide flow range.

Characteristics and Advantages

- Hermetically vacuum-sealed register
- Magnetic transmission
- Magnetic shield, for external magnetic field protection
- High-flow accuracy and steady curve characteristics
- Solid and robust design
- High scratch resistant glass
- Internal strainer
- Minimum friction wear due to negligable impeller weight, bearing flushing and hard metals
- External calibration
- Rotating star for flow indication, electronic calibration on the test bench and leak detection
- Internal Check valve - Optional

Compliance with Standards

- ISO 4064 Class B

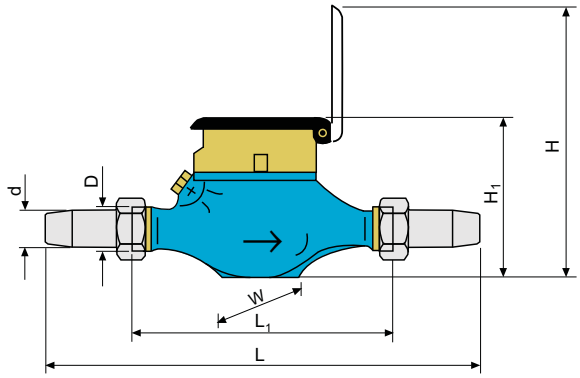
Multi-Jet Water Meter

MT-KD-P

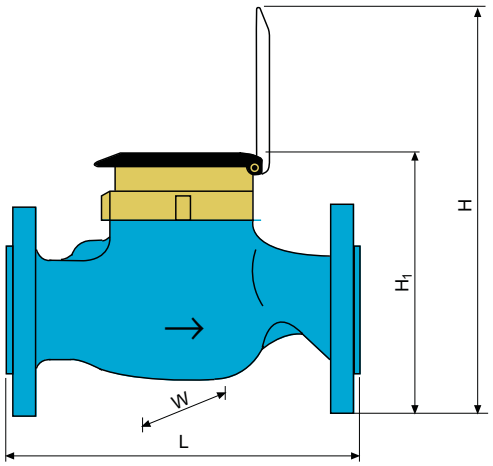
Operating Conditions

- Water temperature: up to 50°C
- Pressure rating: PN-10

Dimensions and Weights



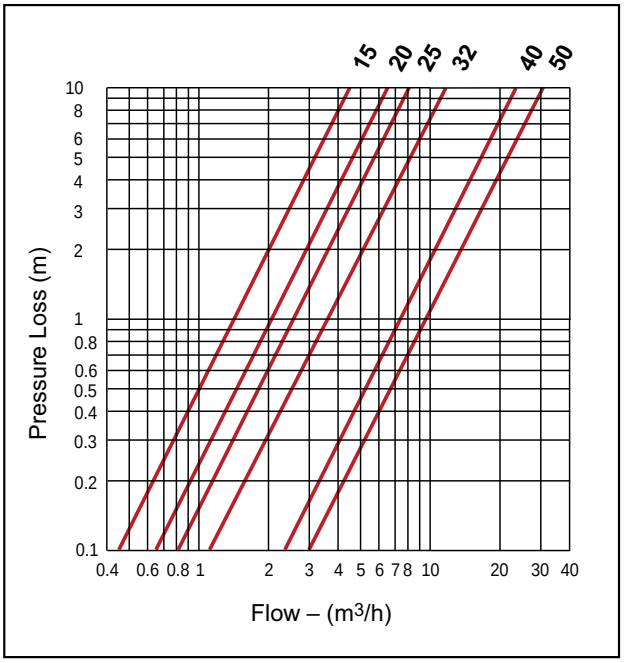
Threaded



Flanged

Nominal Size DN ∅	mm	15	20	25	32	40	50	50
	inch	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2"
Body thread (inch)	D	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/4"	Flanged
Connectors thread (inch)	d	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	–
Length (mm)	L	259/284	284/322	306/376/389	376	435	504	280
	L_1	165/190	190/228	190/260/273	260	300	350	–
Width (mm)	W	98	98	103	103	126	130	165
Height (mm)	H	200	200	200	225	260	290	270
Height (mm)	H_1	115	115	115	128	136	161	180
Weight without connectors (kg)		1.4/1.5	1.5/1.7	1.8/2.8/2.8	2.8	4.5	6.5	13.0
Weight with connectors (kg)		1.6/1.7	1.8/2.0	2.4/3.4/3.4	3.6	5.5	8.3	–

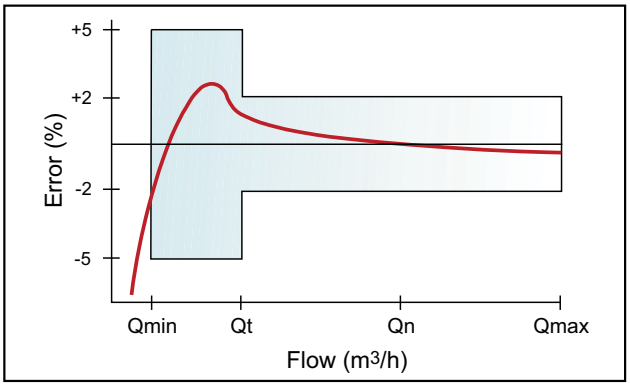
Pressure Loss Curve



Metrological Data

Nominal Size DN ∅	mm	15	20	25	32	40	50
	inch	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Qn – Nominal Flow	m3/h	1.5	2.5	3.5	6	10	15
Qmax – Max. Flow	m3/h	3	5	7	12	20	30
Qt – Transitional Flow	m3/h	0.12	0.20	0.28	0.48	0.80	3.0
Qmin – Min. Flow	l/h	30	50	70	120	200	450

Accuracy Curve



Multi-Jet Water Meter

MT-KD-P

MT-KD-P Water Meter with Reed Switch Option

- The need to keep water sources under constant control, even where it is difficult to reach and read the water meter, has created a demand for systems that are capable of transmitting data to external data outlets, such as remote reading or control systems.
- The Special Version MT-KD-P Water Meter can be equipped with a Reed Switch Pulser which may be connected to remote reading systems. The Reed Switch Pulser sends out electric signals per a preset water quantity.
- The Special Version MT-KD-P comes in several model variations, which indicate different pulse rates. To choose the variation best suited to your needs, please consult the table below.

MT-KD-P with Reed-switch

Data Output Options

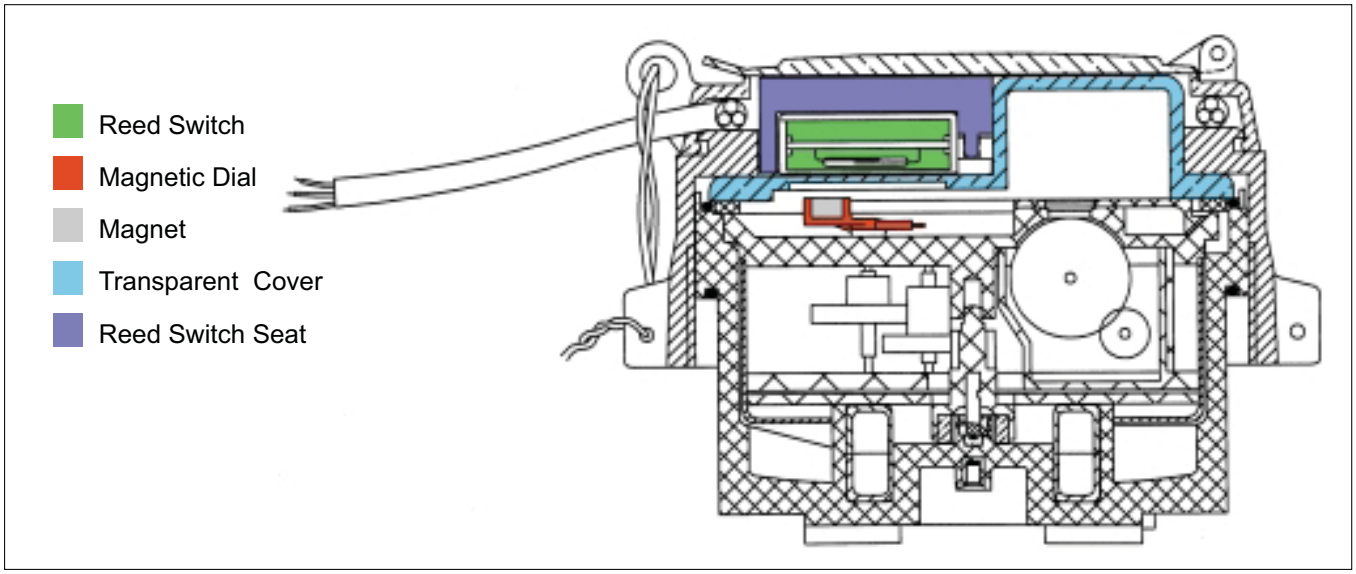
Reed Switch Pulse	1 Pulse for each			
Nominal Size DN	1 Liter	10 Liter	100 Liter	1000 Liter
15 mm – 1/2"	X	X	X	
20 mm – 3/4"	X	X	X	
25 mm – 1"	X	X	X	
32 mm – 1 1/4"	X	X	X	
40 mm – 1 1/2"		X	X	X
50 mm – 2"		X	X	X
Order Codes	S5	S4	S3	S2

For pulse preparation add Y/ to code.
For example, pulse preparation for 10 liters: **Y/S4**

Reed-switch Electric Data

- Switching voltage: 100 VAC/DC
- Switching current: 0.5 A max.

Register for the Out-put Option



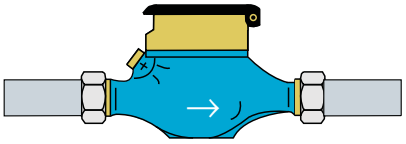
Multi-Jet Water Meter

MT-KD-P

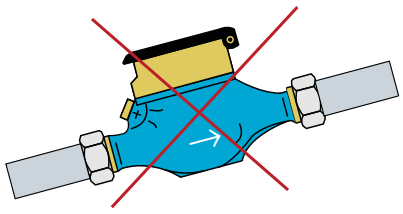
Installation Recommendations

- Follow arrow direction
- Keep MT-KD-P Multi-Jet water meter in a horizontal position
- Install a strainer upstream of the MT-KD-P to eliminate debris that could damage or stop the measuring element.
- Prior to installing a MT-KD-P in a new line, flush the line to remove debris.
- Ensure that the MT-KD-P is full of water during measuring.

Flow direction



Flow direction



Ordering Guide

Example: **MT-KD-P – 15-165 – 1 – S4 – (–)**

MT-KD-P	15-165	1	S4	(–)

TYPE
MT-KD-P

SIZES	Code
15 mm – 1/2" – 165	15-165
15 mm – 1/2" – 190	15-190
20 mm – 3/4" – 190	20-190
20 mm – 3/4" – 228	20-228
25 mm – 1" – 190	25-190
25 mm – 1" – 260	25-260
25 mm – 1" – 273	25-273
32 mm – 1 1/4"	32
40 mm – 1 1/2"	40
50 mm – 2"	50

CONNECTORS	Code
With connectors	1
Without connectors	2

OUTPUT PULSE OPTIONS	Code
1 Pulse for each – 1 liter	S5
1 Pulse for each – 10 liter	S4
1 Pulse for each – 100 liter	S3
1 Pulse for each – 1000 liter	S2
Output Pulse Preparation	
1 Pulse for each – 1 liter	Y/S5
1 Pulse for each – 10 liter	Y/S4
1 Pulse for each – 100 liter	Y/S3
1 Pulse for each – 1000 liter	Y/S2

CONECTIONS Flanged 50 mm only	Code
ISO-16	16
ANSI-125	A1
BST-D	BD
ASTE	AE
ABNT	B6

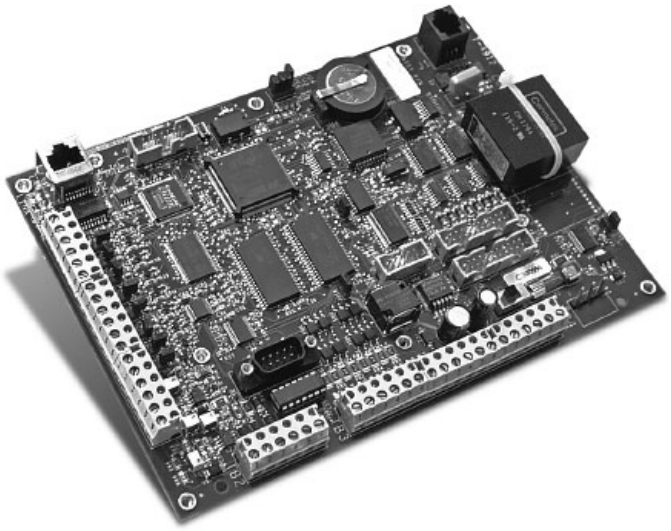
Orenco® *Technical Data Sheet*

Orenco® TCOM Remote Telemetry Board

Applications

Orenco's line of affordable TCOM remote telemetry units give facility managers, operators, and maintenance providers the ability to remotely monitor and control the performance of mechanical equipment in real time. Ideal for:

- Wastewater Collection and Treatment
- Water Systems
- Environmental Monitoring
- Industrial Processes



Orenco® TeleComm™ (TCOM) ATRTU-NET remote telemetry board

Features/Unique Specifications

To specify this panel for your installation, require the following:

- Automatic call-out to e-mail capable devices during alarm conditions or when panel detects trends that could lead to system failure
- Ability to maintain logs for system conditions and events, such as Motor Run Time, Motor Cycles, and Alarm Conditions
- Downloadable logs into a *.dif or ASCII format for simple conversion to common spreadsheet or word processor programs
- No proprietary computer software needed for remote monitoring and control. VT100 protocol allows remote access and control from any computer modem (Mac or PC) with a simple communications program (e.g. Windows® HyperTerminal).
- Bluetooth® adapter available.
- Multi-level password security to ensure that only qualified personnel can remotely access site
- Simple interface using status, reference, and control parameters (Points). Points are viewable/editable by the operator. The following "point" types are supported:
  - Digital: on or off condition
  - Analog: numeric range (± 20,000,000)
  - Date: mm/dd/yy format
  - Time: 24 hour clock
  - Label: Text (7 character max)
- Program logic (rules) consists of simple conditional "If…Then" declarations. Rules can be written based on several operands, including the following:
  - Input / Output status
  - Point status
  - Date: mm/dd/yy format
  - Time of day: 24 hour clock
  - Timers
  - Historical data (allows for control optimization or detection of trends)
- Schedule Functions to control digital "Points" based on date or day of week/time
- Automatic daylight savings time adjustment
- Optional graphical interface software to view system status and permit interactive system control
- Ability to upload new programming remotely
- Ability to upload firmware updates remotely

Model: ATRTU-NET
Hardware Specifications

Physical Size
- 5.75" x 8.0"

Terminations
- Removable terminal blocks with screw compression terminals
- Accepts 16 to 22 AWG solid or stranded wires

Digital Input Features
- Eight inputs
- Discrete or pulse (25 pulse/sec maximum)
- Self-powered: 24 VDC at 10 mA maximum
- Yellow LED input indicators
- Optically isolated
- Expandable to 16 inputs with expansion board

Analog Input Features
- Eight inputs
- Expandable to 16 inputs with expansion board
- 0-5 VDC input signal, or 4-20 mA input with jumper)
- Linear or 10k ohm thermistor scaling
- 12-bit analog-to-digital resolution

Digital Output Features
- Eight outputs
- Expandable to 16 outputs with expansion board

Analog Output Features
- Two outputs
- 4-20 mA output signal
- 10-bit digital-to-analog resolution

Communication Ports
- RS-232 port – 9 pin (Bluetooth adapter available)
- On-board modem: 33.6-k baud (RJ11 phone jack)
- Ethernet port (10 base T, RJ45 jack)
- Serial modbus port (RS422/485 terminals)

Sensor/External Relay Power Supply
- 5 VDC, 30 mA maximum
- 24 VDC, 350 mA maximum

Power Requirements
- 24 VDC, 1.2 A

Environment
- 32° F to 122° F (0° C to 50° C)
- 5% to 95% RH, non-condensing

Firmware Specifications

Safety Features
- Non-volatile memory backup of program
- Lithium battery backup of data and program settings (1-year storage without power)
- Hardware Watchdog Timer to restart system in the event of a program corruption
- Battery backup to allow continued monitoring and alarm functions during power outage (optional)

Logs
- Activity log (a minimum of 2048 defined digital events)
- Alarm log (up to 240 board-level events)
- Custom designed user logs for recording flow, level, alarms, etc. (up to 32 individual logs, with a total of 65,472 logged data points)
- Maintenance log (up to 64 entries of 60 characters)

Control Parameters (Points)
- 672 available control parameters

Program Logic (Rules)
- 800 available rules

Schedules
- 64 available events (time and day or date-based) events

Alarm Callout Capability (Mailboxes)
- 16 destinations (mailboxes) available for alarm event notifications
- E-mail capable (POP3/SMTP e-mail server required)

Networking Protocols
- Ethernet
  a. Modbus TCP-capable (permits peer-to-peer communications, up to 16 peers)
  b. HTTP Web server-capable
  c. TELNET text terminal compatible
- Serial modbus (permits our controller to act as master or slave)
  a. As “master,” modbus permits connection to off-the-shelf, non-proprietary devices that support modbus protocols. Can control and monitor up to 32 clients.
  b. As “slave,” modbus permits connection to and communication with modbus servers.

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