

ASHBOURNE RESIDENTIAL DEVELOPMENT

INFRASTRUCTURE REPORT

PROJECT INFORMATION

CLIENT	Matamata Developments Ltd
PROJECT	289001

DOCUMENT CONTROL

DATE OF ISSUE	26/06/2025
REVISION	C
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1. Introduction

1.1. Background

Maven Waikato Ltd have been engaged by Matamata Developments Ltd to undertake Infrastructure Design in support of Ashbourne Residential Development in the Matamata township.

1.2. Purpose of this Report

The purpose of this report is to provide an assessment of infrastructure associated with the proposed development. The information provided herein outlines the methodology associated with the proposed infrastructure onsite. This report is to be read in conjunction with the engineering drawings and calculations and is to accompany the Resource Consent application for subdivision consent.

1.3. Site Description

The Ashbourne Residential Development area is a circa 45.2ha block of land within the Matamata-Piako district. The current site access is through 127 Station Road in Matamata. This development will adjoin with the existing Highgrove Development to the north-west, and the Peakedale and Pippins developments to the east, and the remainder of the area surrounding the site will be agricultural land. The Waitoa River is approximately 1km to the west of the subject site.

The site has an existing farmhouse located at 127 Station Road. Most of the site is low-lying flat farmland, that is interspersed with artificial farm drains.

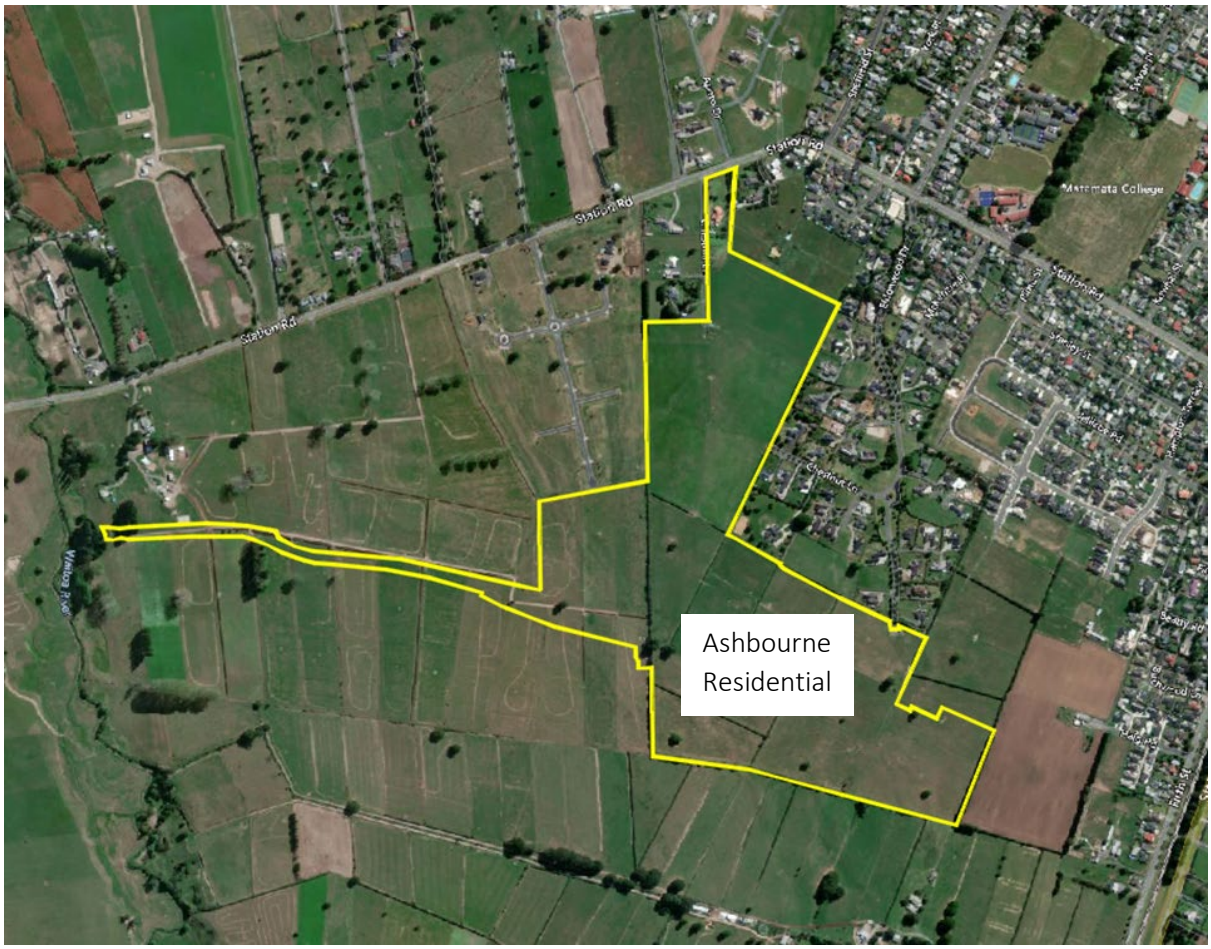


Figure 1: Site Locality

1.4. Legal Descriptions

This development site is currently split into five major parcels of land, which are summarized in Table 1 below:

Lot Description	Area (m^2)
Lot 1 DPS 65481	42,012
Lot 4 DP 384886	8,795
Lot 5 DP 384886	80,997
Lot 204 DP 535395	241,260
Lot 3 DPS 14362	137,069

Table 1: Legal Descriptions

2. Earthworks

Earthworks will include re-contouring, excavations for the construction of the drainage reticulation, formation of building platforms, roading and formation of any required retaining walls. The site will contain specific erosion and sediment control measures suitable to control the earthworks area.

2.1. Geotechnical Investigation

Various site-specific geotechnical investigations have been conducted and a geotechnical investigation report has been prepared by CMW on 22nd May 2025, to support the fast-track resources consent application.

The report identifies the approximate distribution of prevailing landforms and geologies for the local area. The published geological maps for the area generally align with the geology encountered onsite as comprised of interbedded sand, silt, and gravel from the Hinuera formation. Please refer to the Geotechnical Investigation Report for more information.

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
Firm to Stiff Silt/Sandy Silt	0.8	1.2	0.5	0.9
Stiff to Very Stiff Silt (Hinuera Formation)	1.0	1.2	0.5	1.0
Loose to Medium Dense Sand/Silty Sand (Hinuera Formation)	1.4	2.5	0.6	1.7
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 onsite, the geotechnical engineer will be required to prepare an Earthworks Completion Report. This report will certify the adequacy of the earthworks, and it will also provide recommendations for the foundation designs for the proposed lots within this development.

2.2. Bulk Earthworks

The total bulk earthworks for whole site is summarized in table below:

Bulk Subgrade Earthworks (topsoil stripping exclusive)	
Total area of ground disturbance	451,969 m^2 (45.20ha)
Total volume of CUT	238,619 m^3
Total volume of FILL	215,675m^3
Total Volume of FILL with Compaction Factor (1.1)	237,243 m^3
Maximum CUT and FILL depth	2.58m FILL / 3.52m CUT
Total Volume (surplus of CUT)	+ 1,376 m^3
Others	
Topsoil stripping (300 mm)	135,591 m^3

Table 3: Summary of Bulk Earthworks

Please refer to the Ashbourne - Earthwork Management Plan for sub-staged earthworks cut-fill balance.

2.3. Erosion and Sediment Control

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.

It is expected that all erosion and sediment control measures will comply with TR2009-09 - Guidelines for Soil Disturbing Activities for the Waikato region. 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.

3. Roading

3.1. Design Standards

The proposed roads have been designed in accordance with Austroads and Waikato's Regional Infrastructure Technical Specifications (RITS). Commute Kiwi are the lead transport engineers for this project and they have been providing the technical support with the roading design. The design provided is for resource consent purpose only. Finer design details will be confirmed at engineering approval stage.

3.1.1. Engineering Exception Decisions

- No engineering exceptions are proposed for this application.

3.2. Integrated Transportation Assessment

Integrated Transportation Assessment was carried out by Commute Kiwi considering the traffic and transportation effects of the proposed residential development.

For further details, please refer to Appendix C - Integrated Transportation Assessment.

3.3. Temporary Access

The Ashbourne Development will initially gain temporary access via Chestnut Lane from north and Peakedale Drive from east north. It might gain the temporary access through the eastern side of subject site connecting to Firth Street and SH27 depending on future developments.

3.4. Road Typology and Design

Road 1 and 7 are contained within a 20m corridor and include a carriageway width of 12.0m and design of:

- 40mm DG10 asphaltic concrete
- 650mm granular pavement of 175mm AP40 / 475mm GAP 65
- Subgrade improvement layer of 300mm brown rock If required
- To a design subgrade of CBR 3

Road 2 to 6 and 8 to 16 are contained within 18m corridor and include a carriageway width of 11.0m and design of:

- 40mm DG 10 asphaltic concrete
- 425mm granular pavement of 125mm AP40 / 300mm Gap 65
- Subgrade improvement layer of 300mm brown rock if required
- To a design subgrade of CBR 3

13 JOALs contained within 4m, 6m, and 8m wide titles including a 2.8m, 4.8m, and 5.8m concrete pavement respectively and design of:

For 8m wide JOALS:

- 150mm brushed concrete pavement
- 100mm granular pavement of GAP 20
- To a design subgrade of CBR 10

For 4m & 6m wide JOALS:

- 125mm brushed concrete pavement
- 75mm granular pavement of GAP 20

- To a design subgrade of CBR 10

3.5. Parking

One parking space is to be provided per dwelling unit. Dedicated on-street parallel parking lanes are to be provided within carriageway throughout to ensure that the requirements of the MPDC District Plan can be complied with.

3.6. Walking and Cycling

The 18m wide roads will provide 1.8m wide footpaths on both sides of the road for pedestrian foot traffic and cyclists will share the road with motorised vehicles. For the 20m wide roads a 1.8m wide footpath will provided on side and a 2.5m wide footpath for a pedestrian and cycle shared path.

4. Stormwater

4.1. Design Standards

The MPDC 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.

4.1.1. Engineering Exception Decisions

- No engineering exceptions are proposed for this application.

4.2. Stormwater Management Plan (SMP)

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

- Residential Development (related to this Infrastructure Report)
- Northern and Southern Solar Farms
- Retirement Village

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

The proposed stormwater management system has been designed to provide the following:

- Full soakage and treatment for up to the 10- year ARI storm event through a combination of on-lot soakage devices, raingardens, and road soakage systems.
- Conveyance of flows exceeding the 10YR ARI and up to the 100YR ARI storm events as overland flows within the road corridors that will directed to the designated dry detention basins, for each of the stormwater catchments. Limit post-development peak discharges to no more than 80% of pre- development flows, where applicable.
- Preserve existing flow paths and discharge locations to avoid introducing new hydrological impacts.
- Account for external inflows and upstream catchments to ensure downstream impacts are not worsened under post-development conditions.
- Support future maintenance, accessibility, and ecological enhancement through features such as maintenance tracks and riparian planting zones.

A flood model has been developed and calibrated using the region's observed rainfall and river data. The model has been used to test a sensitivity scenario in which all primary stormwater devices are blocked. Even under this worst-case condition the model demonstrates that the development maintains flood immunity with only minor exceedances and expected to be mitigated through detailed design refinements.

The SMP aligns with the requirements of both the Matamata-Piako District Council and Waikato Regional Council and has been developed in accordance with relevant planning instruments, including Part 4 Stormwater Drainage, MPDC Manual Infrastructure Standards and the Waikato Comprehensive Network Discharge Consent (#105063).

Several design aspects of the proposed stormwater will require further refinement during detailed design stage to ensure compliance and for further value engineering.

4.3. Stormwater System

Ashbourne Residential Development will be serviced by a soakage trench up to 10-year stormwater event. Flows exceeding the 10-year soakage capacity are redirected back into the road carriageway and get discharged at the designated downstream stormwater basin. Total four (4) stormwater basins are proposed which are basin A, B, C, and D. Raingardens are proposed for stormwater treatment for road area as per RITS requirements.

Please refer to the appended engineering plans (Appendix A) for further details.

4.3.1. Existing Reticulation

There is no existing reticulation at the proposed site.

4.3.2. Proposed Soakage System

The stormwater runoff for Ashbourne Development will be soaked into the ground via a soakage trench up to 10-year stormwater event. For storm events exceeding the 10-year ARI storm event, the excess flows will bubble up into the road, where it will form part of the overland flow paths where it will eventually discharge into the designated downstream stormwater basin.

4.3.3. Lot Connections

- All lots are serviced with lot connections as per RITS guidelines and specifications.

4.4. 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 100year - 10year detention devices.

The preliminary OLFP design is shown in Maven Waikato Ltd drawings C460 contained within Appendix A. Summary of results provided below 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 100year – 10year 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.

	SECTION	CATCHMENT AREA HA	FLOWRATE m3/s	MAX DEPTH m	VELOCITY m/s	DEPTH x VELOCITY
CATCHMENT A	1	3.1	0.6	0.137	0.77	0.105
	2	6.2	1.1	0.158	0.97	0.153
	3	2.9	0.6	0.131	0.82	0.107
CATCHMENT B	1	5.9	0.9	0.167	0.81	0.135
	2	2.3	0.3	0.116	0.59	0.068
	3	1.1	0.2	0.091	0.61	0.056
	4	12.5	1.5	0.216	0.79	0.171
	5	4.2	0.6	0.121	0.912	0.110
CATCHMENT C	1	2.3	0.5	0.125	0.81	0.101
CATCHMENT D	1	2.8	0.3	0.116	0.59	0.068
	2	2.7	0.3	0.109	0.59	0.064

Table 4: OLFP Results

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

Most OLFP sections comply with standard design thresholds. However, three sections recorded maximum water depths above the 150mm guideline.

- Catchment A – Section 2: max depth = 0.158
- Catchment B – Section 4: max depth = 0.216
- Catchment C – Section 1: max depth = 0.137m (just below threshold)

Despite minor exceedances in depth, 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 $0.171m^2/s$ 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 basins 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.

4.5. 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 a roadside soakage trench via soakage or on-site stormwater tank. Overflow is located in the catchpit system for flows surpassing the 10-year event within the lot areas. Excess flows will be diverted into the downstream basin via the road carriageway.

Stormwater Strategy for Road Carriageway

The initial runoff volume (WQV) is treated via proposed roadside raingardens. the proposed rain gardens are integrated with the roadside soakage trench combined to cater for up to the 10-year storm event. Flows exceeding the 10-year soakage capacity are redirected back into the road carriageway and get discharged at the downstream stormwater basin.

Stormwater Strategy for SW Basin A, C, and D

These basins forms critical part of the overall stormwater mitigation system. They have been sized to accommodate the 100-year event or excess flows from both the road carriageway and on lot flows exceeding the 10-year event. Additionally, the upstream inflows particularly in basins A and D has been accounted for as well in these basins. it is anticipated that through soakage and storage capacity of the proposed basins, no flows are expected to discharge into the downstream environment from these basins.

Stormwater Strategy for SW Basin B and Greenway

Stormwater Basin B is connected with the greenway, and both serve a dual purpose; attenuating flows from Catchment B flows (to at least 80% pre-development) and conveying flows from the southern solar farm and external inflow from the southern external catchment as depicted in plans.

4.6. Flooding

A 2D flood model has been developed for the site using HEC-RAS and it has been calibrated using the regions observed rainfall and river data. The model has been used to test a sensitivity scenario, which all stormwater soakage attenuation devices have already reached their capacity. Even under this worst-case condition, the model demonstrates that the development maintains flood immunity, with only minor exceedances expected to be mitigated through detailed design refinements.

4.7. Connection Points and Staging

- Stage 1 to 2 - These stages collectively form Catchment A, which is serviced by the proposed dry Basin A. The proposal allows for the construction of Basin A during Stage 1. This will ensure that required stormwater devices are/is in place before establishment of future stages within Catchment A. Stage 2 will follow, completing the remainder of stages within Catchment A.
- Stage 3 - The stormwater basin B and the integrated greenway to be constructed at stage 3. SW discharge over 10 years to be discharged to the stormwater basin B via temporary swale.
- Stage 4 - SW discharge over 10 years to be discharged to the stormwater basin B via temporary swale on Road 7.
- Stage 5 - SW discharge over 10 years to be discharged to the low point on Road 7 and then to the stormwater basin B through the proposed carriageway.
- Stage 6 - SW discharge over 10 years to be discharged to the low point on Road 7 and then to the stormwater basin B through the proposed carriageway.
- Stage 7 - This stage forms part of Catchment C and will be serviced by stormwater Basin C. SW discharge over 10 years to be discharged to the low point on Road 4 and then to the stormwater basin C through the proposed carriageway.
- Stage 8 - This stage forms part of Catchment D and will be serviced by stormwater Basin D. SW discharge over 10 years to be discharged to the low point on Road 1 and then to the stormwater basin D through the proposed carriageway.

5. Wastewater

5.1. Design Standards

Wastewater systems have been designed in accordance with RITS and other relevant standards including the MPDC Development Manual 2010.

5.1.1. Engineering Exception Decisions

- No engineering exceptions are proposed for this application.

5.2. Catchment Area

The proposed development consists of 518 units across approx. 27.78ha. It consists of 7.18ha (Catchment A), 12.63ha (Catchment B), and 7.97ha (Catchment C). The wastewater design has been based on 45 persons per hectare as per the requirements of RITS.

5.3. Design Flows

Calculations for wastewater demand indicate a calculated peak sewer discharge to the existing DN150 uPVC wastewater main of 4.40l/s (Catchment A), 7.08l/s (Catchment B), 4.80l/s (Catchment C). Please refer to the Appended Engineering Calculations (Appendix B) for further details.

5.4. Reticulation

5.4.1. Existing Reticulation

There is an existing wastewater manhole 20230419105331 located inside the northeastern corner of the staging boundary for Stage 1 wastewater discharge, and an existing wastewater gravity main 20230419113654 on Peakedale Drive which a connection will be made to service Stage 2.

5.4.2. Proposed Reticulation

The internal reticulation for Ashbourne Development will be achieved via new 150mm dia. uPVC SN16 wastewater lines. Gravity reticulation network will be provided for stage 1 and 2. From stage 3 to 6, central wastewater pump station to be constructed to pump the wastewater into existing wastewater manhole (MH 3000028) on Burwood Road. From stage 7, additional wastewater pump station to be constructed to convey wastewater for stage 7 and 8 to the gravity manhole within stage 5 on the spine road.

In the event that access through the proposed Pippins development area is not feasible, an alternative route is available via public land. This alternative would proceed north along Peakedale Drive and then east through the MPDC vested reserve to Beatty Road.

Please refer to the Appended Engineering Plans (Appendix A) for further details.

5.5. Lot Connections

All lots are serviced with lot connections as per RITS guidelines and specifications.

5.6. Connection Points and Staging

- Stage 1 – Gravity reticulation network will be provided, and the wastewater will connect into the existing wastewater manhole 20230419105331 located inside the northeastern corner of the staging boundary. The wastewater would then be conveyed to the existing Eldonwood wastewater pump station 20080213160306. The existing wastewater pumpstation would need to be upgraded to support a further 100 lots for Stages 1 and 2 by providing an additional 20m³ of underground wastewater storage.

- Stage 2 - Gravity reticulation network will be provided for this stage. The proposed network will be extended to a new manhole, that will be constructed over the existing 150mm uPVC line 20230419113654 located in Peakedale Drive. The wastewater would then be conveyed through the same wastewater network to the existing Eldonwood wastewater pump station 20080213160306.
- Stage 3 – A new central wastewater pump station would be constructed near the entrance to the Southern Solar Farm site. Wastewater from this stage would be conveyed by a gravity reticulation network to the new wastewater pump station.

  The wastewater would then be pumped via a rising main through the site to the east following the road network and it would then pass through the proposed Pippins development area out to Firth Street following Haig Road. The rising main would then cross under the railway out to SH27 and it would then head north and it would continue to Burwood where it would terminate at the new discharge manhole.

  The network would then switch over to a gravity network starting from the new discharge manhole. A new 225mm uPVC gravity reticulation line would then be constructed from the manhole following Burwood Road, heading northeast from the discharge manhole before connecting into the existing wastewater manhole MH 300028 on Burwood Road.
- Stage 4 – The gravity reticulation network would be extended through stage 5 to connect into the new central wastewater pumpstation.
- Stage 5 – Similar to Stage 4 new gravity reticulation network will be constructed to service this stage.
- Stage 6 – The new gravity reticulation network would connect into the Stage 5 network downstream.
- Stage 7 – A new northern wastewater pumpstation would be constructed within Stage 8, that would service Stages 7 and 8. A new wastewater gravity network would be constructed through Stage 7 and then extended through Stage 8 following the Road 1 heading north before terminating at the new northern wastewater pumpstation. The wastewater from the northern wastewater pumpstation would pump the wastewater to the Stage 5 upstream manhole in Road 1.
- Stage 8 – The new gravity reticulation network through Stage 8 would direct the wastewater to the northern wastewater pumpstation.

5.7. Wastewater Pump Station

5.7.1. RITS Wastewater Pump Station Requirements

This section of the report relates to the proposed Wastewater Pump Stations within the Catchment B and C. The specification and design of the new wastewater pump station has been developed in partnership with Aquate. The proposed pump station will comprise of a collection manhole, inlet pipes, a wet well, control cabinet, odour biofilter and emergency storage tanks. Detailed descriptions of the pump station and compliance check in accordance with RITS is presented in Table 5 below.

Requirements	Requirements check
a) Area around the pump station shall be graded to prevent surface water flowing onto or over the pump station cover slabs.	The pump station areas have been elevated above the nearby roads and they will grade back to the road areas.
b) Free of secondary flow paths for 1% AEP	As the pump station will be sitting at a higher

	flood level, and the pump station lid levels shall be provided with a minimum freeboard of 300mm above the estimated flood level.	elevation than the nearby stormwater greenway, this will ensure that the minimum freeboard will be achieved. The pump station lid level will be at least 300mm above the overland flow path on the road and 300mm above the 100yr flood level in the stormwater greenway.
c)	Pumping systems shall • Have a pumping capacity of N+1 with a minimum of two identical pedestal mounted submersible sewage pumps. • Each pump shall be capable of discharging the design peak wet weather flow rate from the catchment. • Include sufficient well volume to operate under normal conditions without surcharge to the incoming wastewater network.	The pumpstation is compliant with these conditions referring to the Aquate Pump Station for technical specifications for further details.
d)	The station shall be located to ensure that the entire design catchment can be serviced.	Northern wastewater pumpstation will manage all of Catchment C. The central wastewater pumpstation will manage pumped flows from Catchment C and Catchment B. The pump stations have been strategically placed in the catchment low points.
e)	All stations shall be contained within a separate local purpose reserve - drainage title set out to provide safe and easy operation and maintenance of the site without impacting on public activities surrounding the site and is designated in accordance with the relevant district plan or vested as part of a subdivision.	A designated local purpose reserve has been proposed to allow for the operation and maintenance of the pump station.
f)	The station shall be designed to service the entire catchment area of land beyond the reach of the existing gravity system. Refer to Clause 5.1.6.	The wastewater pump stations have been designed to account for the Catchment B Catchment C.
g)	In staged construction, guidance from the Council is required to ensure the correct sizing of the pump station and associated rising mains and storage facilities meet the short and long-term requirements of the catchment.	The pumpstations have been designed to cater for the short term and long-term requirements. There is allocated space to expand the underground wastewater storage if required to do so in the future. Matamata-Piako District Council to review and provide feedback.
h)	A minimum emergency storage capacity of nine hours average dry weather flow, measured between the high-level alarm and the point of overflow.	The pump station has been designed to account for a minimum emergency storage capacity of 9 hours.
i)	It is recommended that prior to submission of the detailed design, consultation is undertaken with Council to ensure that the design is fit for purpose.	Matamata-Piako District Council to review and provide any comments on Maven Waikato Limited's wastewater pump station proposal prior to EPA submission.

Table 5: WWPS RITS Requirements

Please refer to C530 and C540 Engineering Plans (Appendix A), and Wastewater Pump Station Technical Specifications (Appendix D) for further details.

5.7.2. Emergency Storage

The proposed pump station will be provided with emergency storage tanks to store wastewater in the event of pump failure. A minimum 9-hour emergency storage based on average daily flow will be provided prior to emergency overflow occurring in accordance with RITS. This equates to a total volume of 74m^3 which will be stored across the wet well, additional ancillary storage chambers, and pipelines including the upstream network. The ancillary storage chambers will be connected to the collection manhole via pipes which will be laid at a gradient of 1% towards the manhole to allow self-draining.

5.7.3. External Services

The successful operation of the wastewater pump station is reliant on the provision of adequate external services including:

- Wash Water
- Power
- Stormwater / Overland Flow
- Telemetry wireless pathways

Wash Water

The proposed pump station will be provided with a DN50 PE rider main from the proposed 63mm OD water main in the proposed adjacent road (Road 14). They will provide the water supply required for wash down purpose for the pump station.

Power

A reticulated power network will be designed and installed in the proposed adjacent road (Road 14) to provide a point of connection for power for the proposed pump station.

Stormwater / Overland Flow

The proposed pump station will be elevated from the ground and situated away from the overland flow paths and flood plain.

Electrical and Telemetry

The electrical and telemetry requirements for the proposed pump station will be confirmed with MPDC. The alarm and operational data control system will be installed by the developer, or by MPDC at the developer's cost.

6. Water

6.1. Design Standards

The Matamata-Piako District Council Development Manual 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).

6.1.1. Engineering Exception Decisions

- There are no engineering exception decisions.

6.2. Existing Fire Hydrant Testing

Pressure testing of the existing water supply network was done on the 4th of November 2024 at three test locations and the results are as follows:

- Fire hydrant outside 99 Smith Street property – Flow 2140 L/min and 3.86 bar pressure.
- Fire hydrant outside 11 Aporo Drive property – Flow 1540 L/min and 4.26 bar pressure.
- Fire hydrant outside 1 Bowman Road property – Flow 1180 L/min and 3.86 bar pressure.

6.3. Design Flows

Calculations for water demand indicate a calculated peak demand of 24.06l/s. Please refer to Engineering Calculations (Appendix B) for further details.

6.4. Water Supply Modelling

WSP were engaged to do a proposed water modelling assessment on behalf of MPDC for the proposed development scenarios for the Ashbourne residential development and the Ashbourne retirement village.

Scenario 1 was the full development of the residential and the retirement village connected to the existing network with the future projected demands for 2053. The results showed that the existing network could not provide sufficient flow into these developments, however the existing surrounding network had reduced pressure, but was still meeting the minimum pressure requirements without providing any downstream network upgrades.

Scenario 2 was for Stage 1 residential only with the future projected demands for 2053, by connecting into the existing water supply network at the end of Peakedale Drive. The results showed the existing network could support Stage 1 residential for the water supply requirements.

Scenario 3 was for Stage 1 and Stage 2 residential only by extending the water network within the residential development. It showed that there is sufficient flow and pressure to support stages 1 and 2, however the existing inlet pipes were now only providing the minimum required pressure.

We did identify that the water modelling was missing the 200mm uPVC watermain pipe section between the end of Eldonwood Drive, and the existing 200mm watermain in Peakedale Drive, which is shown on the MPDC GIS. We anticipate this will address the pipe pressure issues identified in the existing network along Peakedale Drive. We have advised WSP of the issue and they will update their water supply model, and they will provide us with the updated results. This report will be subsequently updated to reflect the revised results.

To address the pressure issues for the fully developed water network within the residential development, booster pump(s) are being considered. A new water supply pumpstation would be constructed, next to the proposed overland flowpath that connects to the proposed stormwater basin A. The pumpstation will connect into the proposed 250OD watermain, that will be located within the road. A single booster pump will be installed within the proposed water supply pumpstation, the proposed pumpstation is shown in Figure 2 below.

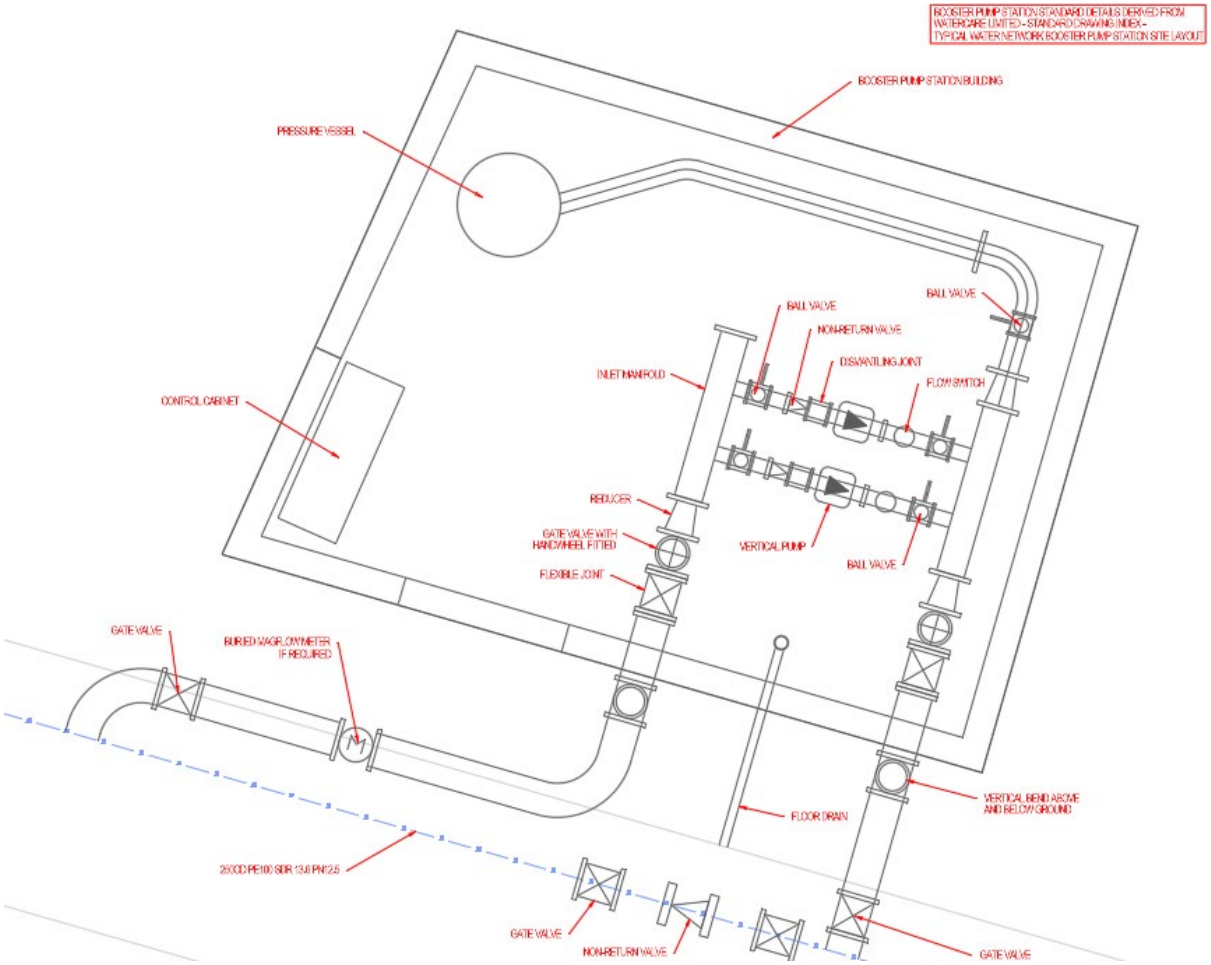


Figure 2: Proposed Water Supply Pumpstation

The water supply pumpstation design will be further investigated with WSP during the detailed design stage.

6.5. Reticulation

6.5.1. Existing Reticulation

There are existing DN63 PE100 rider main and DN200 PVC water mains on Peakedale Drive, and DN20 PVC rider main on Station Road.

6.5.2. Proposed Reticulation

The proposed reticulation network consists of DN250 PE and DN125 PE mains servicing the 20m wide main spine road (Road 1) with sluice valves and hydrants located at appropriate locations throughout. DN63 PE and DN125 PE mains are proposed for the rest of roads (Road 2 to 16).

Please refer to C600 Engineering Plans (Appendix A) for further details.

6.6. Lot Connections

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

6.7. Connection Points and Staging

- Stage 1 - The existing water supply network will be extended from the end of Peakedale Drive into Stage 1. A new connection to the 200mm PVC line, where the existing valve 20230417141330 is and it will provide the main pressure for the Stage 1 water supply network.
- Stage 2 - The water supply network would be extended from Stage 1 into Stage 2.
- Stage 3 - The water supply network would be extended from Stage 2 into Stage 3.
- Stage 4 - The water supply network would be extended from Stages 2 and 3 into Stage 4.
- Stage 5 - The water supply network would be extended from Stage 4 into Stage 5.
- Stage 6 - The water supply network would be extended from Stage 5 into Stage 6.
- Stage 7 - The water supply network would be extended from stage 5 into stage 7.
- Stage 8 - The water supply network would be extended from stage 7 through to the end of the spine road.

6.8. Firefighting Supply

A principal main and associated hydrant is provided internal to the development to comply with the Matamata-Piako District Council Development Manual and associated firefighting standards.

The minimum firefighting water supply classification for development in urban areas is FW2 and FW3 for the proposed commercial hub. The development meets the following water supply requirements:

- A primary water flow of 12.5 litres/sec within a radial distance of 135m.
- An additional secondary flow of 12.5 litres/sec within a radial distance of 270m.
- The required flow can be achieved from a maximum of one or two hydrants operating simultaneously.
- A minimum running pressure of 100kPa.

7. Services

7.1. Power

Power will be provided by a service provider (Powerco) and has been incorporated into the typical service cross section per agreement with the service provider. Service providers confirmed that power connections will be made available for the Ashbourne residential development.

7.2. Communications

Communications will be provided by a service provider (Tuatahi First Fibre) and has been incorporated into the typical service cross section per agreement with the service provider. Service providers confirmed that TFF telecommunications connections will be made available for the Ashbourne residential development.

Please refer to Service Provisions (Appendix E) for further details.

8. Conclusions

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

Stormwater drainage can be provided for the proposed development. Various options have been considered, and we are confident the best practicable option is proposed. The treatment and disposal methods both offer a high amenity value consistent with the urban design ideals.

Wastewater drainage can be provided for the proposed development.

There is public water supply infrastructure surrounding the site, which can provide potable water and firefighting supply for this proposed development.

Utility providers will be engaged to confirm that the network have sufficient capacity in the surrounding streets to provide service or are able to undertake upgrades in a suitable timeframe.

Therefore, information gathered to-date confirms the site is suitable for the proposed development.

Appendix A – Engineering Plans

Appendix B – Engineering Calculations

289001 – Ashbourne Soakage Calculation

1. The total effective area (per metre length of road)

= **Impervious Area + (0.3 * Pervious Area)**

Based on MPDC definition, we can calculate 2 effective areas for our design.

a. 20m wide road = 16.3 + (0.3*3.7) = **17.41m²**
b. 18m wide road = 14.6 + (0.3*3.4) = **15.62m²**

2. Design Soakage Rate

DSR of 4 Soakage holes from CMW Geotech report were calculated which are:
SO-01: 1.7 litres/min/m²
SO-02: 5.7 litres/min/m²
SO-03: 0.5 litres/min/m²
SO-04: 0.2 litres/min/m² -> But we go with 0.5 litres/min/m²

->Considering Test Pit Results, only 1.7 and 5.7 litres/min/m² will be used.

3. Maximum Impervious Area per Soakage Trench

There is no graph available for 10y 24h soakage trench with 1.2m width and 2.0m width, so we need a fair assumption for Maximum Impervious Area per soakage trench.

For 1.7 Design Soakage Rate (litres/min/m²)

0.4m wide	1m deep = 6m²
	2m deep = 12m²
0.8m wide	1m deep = 8m²
	2m deep = 16m²
1.2m wide	1m deep = 10.6m² (33.3% Increased per 0.4m)
	1.5m deep = 16m² (33.3% Increased per 0.4m)
	2m deep = 21.3m² (33.3% Increased per 0.4m)
2.0m wide	1m deep = 18.9m² (33.3% Increased per 0.4m)
	1.5m deep = 28.4m² (33.3% Increased per 0.4m)
	2m deep = 37.8m² (33.3% Increased per 0.4m)

For 5.7 Design Soakage Rate (litres/min/m²)

0.4m wide	1m deep = 9m²
	2m deep = 18m²
0.8m wide	1m deep = 13m²
	2m deep = 26m²
1.2m wide	1m deep = 18.7m² (44.4% Increased per 0.4m)
	1.5m deep = 28.2m² (44.4% Increased per 0.4m)
	2m deep = 37.5m² (44.4% Increased per 0.4m)
2.0m wide	1m deep = 39m² (44.4% Increased per 0.4m)
	1.5m deep = 58.7m² (44.4% Increased per 0.4m)
	2m deep = 78.2m² (44.4% Increased per 0.4m)

4. Comparison between Road and Soakage Trench

1.7 Design Soakage Rate (litres/min/m²) Zone:

2.0m wide and 1.5m deep soakage trench is recommended for 18m wide road, this will give us:

- 15.62 / 28.4 = 0.55 -> 1:0.55 ratio (18m wide road)

-> Every 1m long road construction, we need 0.55m long soakage trench to be constructed.

-> Every 1m long road construction, we need 0.28m long soakage trench in each side.

1.2m wide and 1.5m deep soakage trench is recommended for 20m wide road, this will give us:

- 17.41 / 16 = 1.1 -> 1:1.1 ratio (20m wide road)

-> Every 1m long road construction, we need 1.1m long soakage trench to be constructed.

-> Every 1m long road construction, we need 0.55m long soakage trench in each side.

5.7 Design Soakage Rate (litres/min/m²) Zone:

2.0m wide and 1.5m deep soakage trench is recommended for 18m wide road, this will give us:

- 15.62 / 58.7 = 0.27 -> 1:0.27 ratio (18m wide road)

-> Every 1m long road construction, we need 0.27m long soakage trench to be constructed.

-> Every 1m long road construction, we need 0.135m long soakage trench in each side.

1.2m wide and 1.5m deep soakage trench is recommended for 20m wide road, this will give us:

- 17.41 / 28.2 = 0.62 -> 1:0.62 ratio (20m wide road)

-> Every 1m long road construction, we need 0.62m long soakage trench to be constructed.

-> Every 1m long road construction, we need 0.31m long soakage trench in each side.

289001 – Ashbourne Soakage Calculation (E1/VM1)

1. Soakage Rate from the Percolation Test

- ➔ Soakage Rate 0.5l/min/m² -> 21mm/hr from CMW Geotech Report HAM2023-0124AB Rev1
- ➔ Soakage Rate 1.5l/min/m² -> 85mm/hr (half of 171mm/hr)
- ➔ Soakage Rate 3.0l/min/m² -> 171mm/hr from CMW Geotech Report HAM2023-0124AB Rev1

2. Stormwater Catchment Volume (Rc)

Formula: Rc = 10 * CIA

1. Assume: Impervious area: 150m²
2. Assume: Impervious area: 200m²
3. Assume: Impervious area: 250m

Run-off coefficient (C) = 0.9 from E1/VM1 Table 1 (Hard Surfaces)

Rain Intensity (I) = 48.8mm/hour (10-year, RCP 8.5)

1. Rc (10-year) = (10 * 0.9 * 48.8 * 0.015) = 6.588m³
2. Rc (10-year) = (10 * 0.9 * 48.8 * 0.02) = 8.784m³
3. Rc (10-year) = (10 * 0.9 * 48.8 * 0.025) = 10.98m³

3. Volume of Water Disposed by Soakage: V(soak)

Formula: V(soak) = Soakage Trench Area * Soakage Rate / 1000

Impervious area (150m²)

0.5 Soakage Rate (21mm/hr): Soakage Trench Size = 7m (L) * 2.44m (W) * 1m (H)

Soakage Trench Volume =

7 * 2.44 * 1.0 * 0.38 (void ratio) = 6.49m³

This gives V(soak): 7 * 2.44 * 21 /1000 = 0.36m³

1.5 Soakage Rate (85mm/hr): Soakage Trench Size = 6m (L) * 2.44m (W) * 1m (H)

Soakage Trench Volume =

6 * 2.44 * 1.0 * 0.38 (void ratio) = 5.56m³

This gives V(soak): 6 * 2.44 * 85 /1000 = 1.24m³

3.0 Soakage Rate (171mm/hr): Soakage Trench Size = 5m (L) * 2.44m (W) * 1m (H)

Soakage Trench Volume =

5 * 2.44 * 1.0 * 0.38 (void ratio) = 4.64m³

This gives V(soak): 5 * 2.44 * 171 /1000 = 2.086m³

Impervious area (200m²)

0.5 Soakage Rate (21mm/hr): Soakage Trench Size = 13.5m (L) * 1.65m (W) * 1m (H)

Soakage Trench Volume =

13.5 * 1.65 * 1.0 * 0.38 (void ratio) = 8.46m³

This gives V(soak): 13.5 * 1.65 * 21 /1000 = 0.47m³

1.5 Soakage Rate (85mm/hr): Soakage Trench Size = 11.5m (L) * 1.65m (W) * 1m (H)

Soakage Trench Volume =

11.5 * 1.65 * 1.0 * 0.38 (void ratio) = 7.21m³

This gives V(soak): 11.5 * 1.65 * 85 /1000 = 1.613m³

3.0 Soakage Rate (171mm/hr): Soakage Trench Size = 10m (L) * 1.65m (W) * 1m (H)

Soakage Trench Volume =

10 * 1.65 * 1.0 * 0.38 (void ratio) = 6.27m³

This gives V(soak): 10 * 1.65 * 171 /1000 = 2.82m³

Impervious area (250m²)

0.5 Soakage Rate (21mm/hr): Soakage Trench Size = 11.74m (L) * 1.6m (W) * 1.5m (H)

Soakage Trench Volume =

11.74 * 1.6 * 1.5 * 0.38 (void ratio) = 10.71m³

This gives V(soak): 11.74 * 1.6 * 21 /1000 = 0.39m³

1.5 Soakage Rate (85mm/hr): Soakage Trench Size = 11.74m (L) * 1.6m (W) * 1.4m (H)

Soakage Trench Volume =

11.74 * 1.6 * 1.4 * 0.38 (void ratio) = 9.99m³

This gives V(soak): 11.74 * 1.6 * 85 /1000 = 1.60m³

3.0 Soakage Rate (171mm/hr): Soakage Trench Size = 11.74m (L) * 1.6m (W) * 1.1m (H)

Soakage Trench Volume =

11.74 * 1.6 * 1.1 * 0.38 (void ratio) = 7.85m³

This gives V(soak): 11.74 * 1.6 * 171 /1000 = 3.21m³

4. Required Storage Volume: V(storage)

Formula: V(storage) = Rc – V(soak)

Impervious area (150m²)

1. 21mm/hr

➔ Required 10-year V(storage) = 6.588 – 0.36 = 6.23m³

➔ Proposed Soakage Trench Volume (6.49m³) is larger than Required Volume (6.23m³),

➔ Soakage trench sizing is OK

2. 85mm/hr

➔ Required 10-year V(storage) = 6.588 – 1.24 = 5.35m³

➔ Proposed Soakage Trench Volume (5.56m³) is larger than Required Volume (5.35m³)

➔ Soakage trench sizing is OK

3. 171mm/hr

➔ Required 10-year V(storage) = 6.588 – 2.086 = 4.5m³

➔ Proposed Soakage Trench Volume (4.64m³) is larger than Required Volume (4.5m³)

➔ Soakage trench sizing is OK

Impervious area (200m²)

4. 21mm/hr

➔ Required 10-year V(storage) = 8.78 – 0.47 = 8.31m³

➔ Proposed Soakage Trench Volume (8.46m³) is larger than Required Volume (8.31m³),

➔ Soakage trench sizing is OK

5. 85mm/hr

➔ Required 10-year V(storage) = 8.78 – 1.61 = 7.17m³

➔ Proposed Soakage Trench Volume (7.21m³) is larger than Required Volume (7.17m³)

➔ Soakage trench sizing is OK

6. 171mm/hr

➔ Required 10-year V(storage) = 8.78 – 2.82 = 5.96m³

➔ Proposed Soakage Trench Volume (6.27m³) is larger than Required Volume (5.96m³)

➔ Soakage trench sizing is OK

Impervious area (250m²)

7. 21mm/hr

➔ Required 10-year V(storage) = 10.98 – 0.39 = 10.59m³

➔ Proposed Soakage Trench Volume (10.71m³) is larger than Required Volume (10.59m³),

➔ Soakage trench sizing is OK

8. 85mm/hr

➔ Required 10-year V(storage) = 10.98 – 1.6 = 9.38m³

➔ Proposed Soakage Trench Volume (9.99m³) is larger than Required Volume (9.38m³)

➔ Soakage trench sizing is OK

9. 171mm/hr

➔ Required 10-year V(storage) = 10.98 – 3.21 = 7.77m³

➔ Proposed Soakage Trench Volume (7.85m³) is larger than Required Volume (7.77m³)

➔ Soakage trench sizing is OK

MAVEN WAIKATO LTD	Job Number 289001	Sheet 3	Rev A
Job Title: ASHBOURNE, MATAMATA Calc Title: BASIN A Outlet design	Author: MKS	Date: 19-Feb	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	**2689**	m3	
Actual ED	3227	m^3	1.2WQV

LEVELS

WQV EL.	64.7	m	
EDV el.	65.05	m	Set to 350mm above PWL per ICMP
2yr el.	65.35	m	Set 300mm above EDV
Q2 post	1.50	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 = 3227 per 24 hours

0.04 m3/s

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

Qmax = 0.075 m3/s

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

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

orifice dia	0.274	m	**Use goal seek, Qi to equal Qmax by changing d**
A =	0.0589646	m	
h =	0.213	m	
Qi =	0.075	m3/s	too large

Use 270 mm orifice

Calc 2: Spill way sizing for 2 years event

Pond vol. required for post-development case

WQV EL.	64.7	m
Top of weir level	65.05	m
2yr ponded water level is set at	65.4	m

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

orifice dia	0.274	m
A =	0.0589646	m
h =	0.51	m

Outflow from ED orifice Qi = 0.1159821 m3/s OK

Broad Crested Weir	(this is more conservative as assumes vertical sides)		
	Q=	$1.7Lh^{3/2}$	
Where	Q=	discharge through the spillway	m3/s
	h =	depth of design flow	m
	L =	horizontal bottom width of the spillway	m
emergency spillway sizing			1% AEP
	h=	0.3 m	
	Q=	1.38 m3/s	(Q2 post - Qi)
Weir Width	**L=**	**5.0 m**	

MAVEN	MAVEN WAIKATO LTD	Job Number 289001	Sheet 4	Rev A
Job Title	ASHBOURNE, MATAMATA	Author	Date	Checked
Calc Title	BASIN C Outlet design	MKS	21-Feb	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	**1149**	m3	
Actual ED	1379	m^3	1.2WQV

LEVELS

WQV EL.	64.9	m	
EDV el.	65.25	m	Set to 350mm above PWL per ICMP
2yr el.	65.55	m	Set 300mm above EDV
Q2 post	0.64	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 = 1379 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 flwos through the pond

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

orifice dia	0.169	m	**Use goal seek, Qi to equal Qmax by changing d**
A =	0.0224318	m	
h =	0.2655	m	
Qi =	0.032	m3/s	OK

Use 160 mm orifice

Calc 2: Spill way sizing for 2 years event

Pond vol. required for post-development case

WQV EL.	64.9	m
Top of weir level	65.25	m
2yr ponded water level is set at	65.6	m

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

orifice dia	0.169	m
A =	0.0224318	m
h =	0.57	m

Outflow from ED orifice — Qi = 0.0463256 m3/s — OK

Broad Crested Weir	(this is more conservative as assumes vertical sides)		
	Q=	$1.7Lh^{3/2}$	
Where	Q=	discharge through the spillway	m3/s
	h =	depth of design flow	m
	L =	horizontal bottom width of the spillway	m
emergency spillway sizing			1% AEP
	h=	0.3 m	
	Q=	0.59 m3/s	(Q2 post - Qi)
Weir Width	**L=**	**2.1 m**	

MAVEN	MAVEN WAIKATO LTD	Job Number 289001	Sheet 5	Rev A
Job Title	ASHBOURNE, MATAMATA	Author	Date	Checked
Calc Title	BASIN D Outlet design	MKS	21-Feb	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	**2135**	m3	
Actual ED	2562	m^3	1.2WQV

LEVELS

WQV EL.	64.8	m	
EDV el.	65.15	m	Set to 350mm above PWL per ICMP
2yr el.	65.45	m	Set 300mm above EDV
Q2 post	1.10	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 = 2562 per 24 hours
0.03 m3/s

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

Qmax = 0.059 m3/s

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

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

orifice dia	0.238	m	**Use goal seek, Qi to equal Qmax by changing d**
A =	0.0444881	m	
h =	0.231	m	
Qi =	0.059	m3/s	OK

Use 230 mm orifice

Calc 2: Spill way sizing for 2 years event

Pond vol. required for post-development case

WQV EL.	64.8	m
Top of weir level	65.15	m
2yr ponded water level is set at	65.5	m

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

orifice dia	0.238	m	
A =	0.0444881	m	
h =	0.53	m	
Outflow from ED orifice Qi =	0.0890292	m3/s	OK

Broad Crested Weir	(this is more conservative as assumes vertical sides)			
	Q=	$1.7Lh^{3/2}$		
Where	Q=	discharge through the spillway		m3/s
	h =	depth of design flow		m
	L =	horizontal bottom width of the spillway		m
emergency spillway sizing				1% AEP
	h=	0.3	m	
	Q=	1.01	m3/s	(Q2 post - Qi)
Weir Width	**L=**	**3.6**	**m**	

#UNKNOWN!	Maven Waikato Ltd	Job Number	Author	Date
		289001	MKS	15/04/2025
Job Title		Sheet Number	Revision	Checked
Calculation Title	Pavement Design	1	A	SB

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:

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

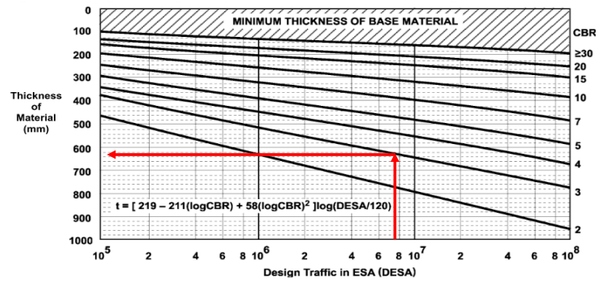
Thickness of Base Material:

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

Thickness of Basecourse:

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

Figure 8.4: Design chart for granular pavements with thin bituminous surfacing



AADT

Description	Movements	Contingency
Road Description	Total Vehicle Movements Per Day for all Lanes	10% Contingency
Main	5180	5698
Green road	600	660

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	30	1	5698	1	7	398.86	2	40.6	365	5.91E+06	YES	2.2	1.3E+07	0.6	7.80E+06	, see AGPT02-17 S
1	30	1	660	1	3	19.8	2	40.6	365	2.93E+05	YES	2.0	5.9E+05	0.2	1.17E+05	OK

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	**633**	163	470
3	**393**	101	292

Adopted Design

Base	Basecourse	Sub-base
Thickness of Granular material (mm)	AP40 Basecourse (mm)	GAP65 Sub-base (mm)
650	175	475
425	125	300

Maven Associates Ltd.	Job Number 289001	Sheet 1	Rev A
Job Title / Calc Title: Station Road, Matamata — Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
B	Open Space (Sandy Loam or Silty Loam)	61	10.10	616.10
* from Appendix B		Totals =	10.10	616.10

WQV

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{616.10}{10.10} = 61.0$

Ia (weighted) = $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{5 \times 10.10}{10.10}$ 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2) natural channels

Catchment length L = 0.39 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, $\frac{CN}{200 - CN} = \frac{61.0}{200-61.0} = 0.44$

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

$= 0 \quad 1 \quad 0.54 \quad 1.57 \quad 4.90 = 0.580$ hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c = 0.388$ hrs

OK
use
0.39 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [4]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd.		Job Number 289001	Sheet 2	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

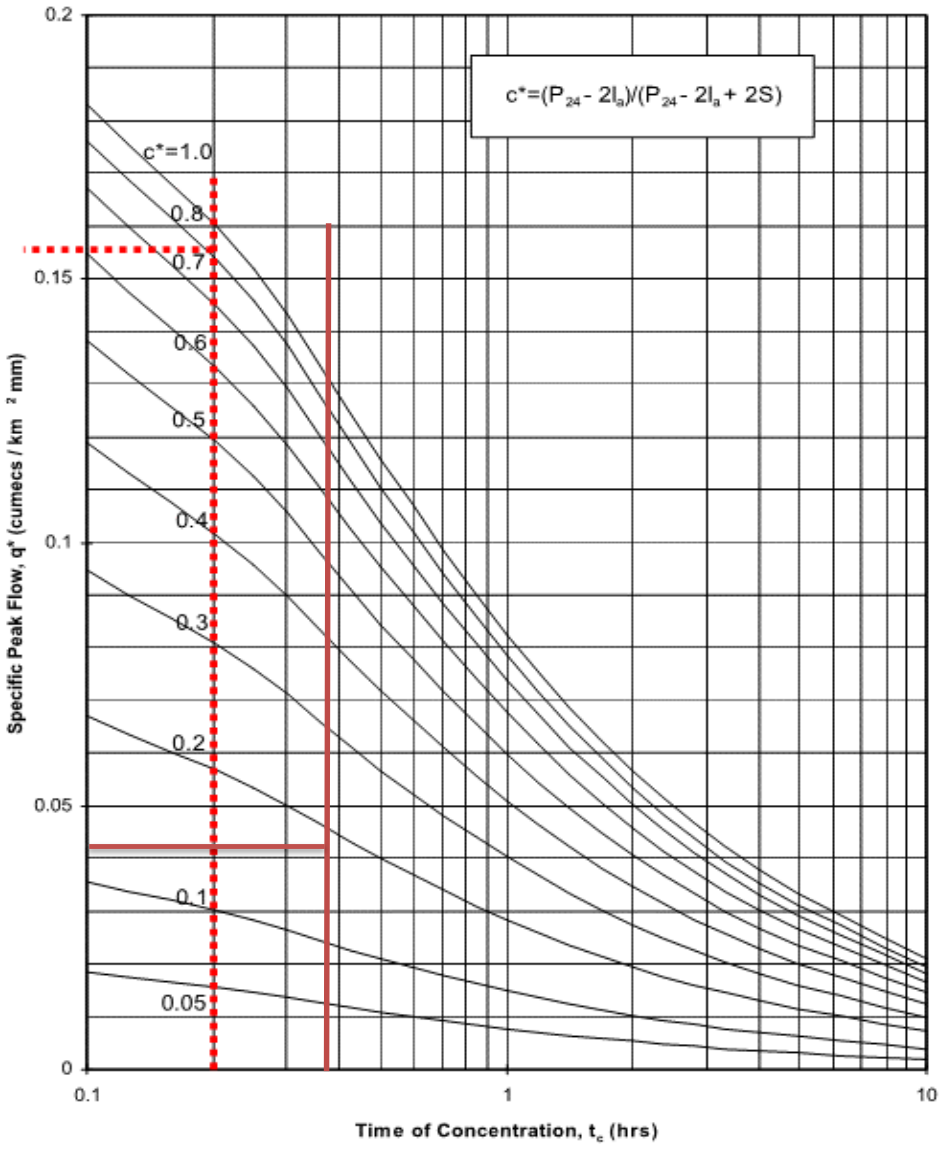
Catchment Area	A=	0.10100	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.39	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	2	(yr)
4. 24 hour rainfall depth, P24	83	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.184	
6. Specific peak flow rate q*	0.042	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.352**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	25.3	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2556.16	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 3	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

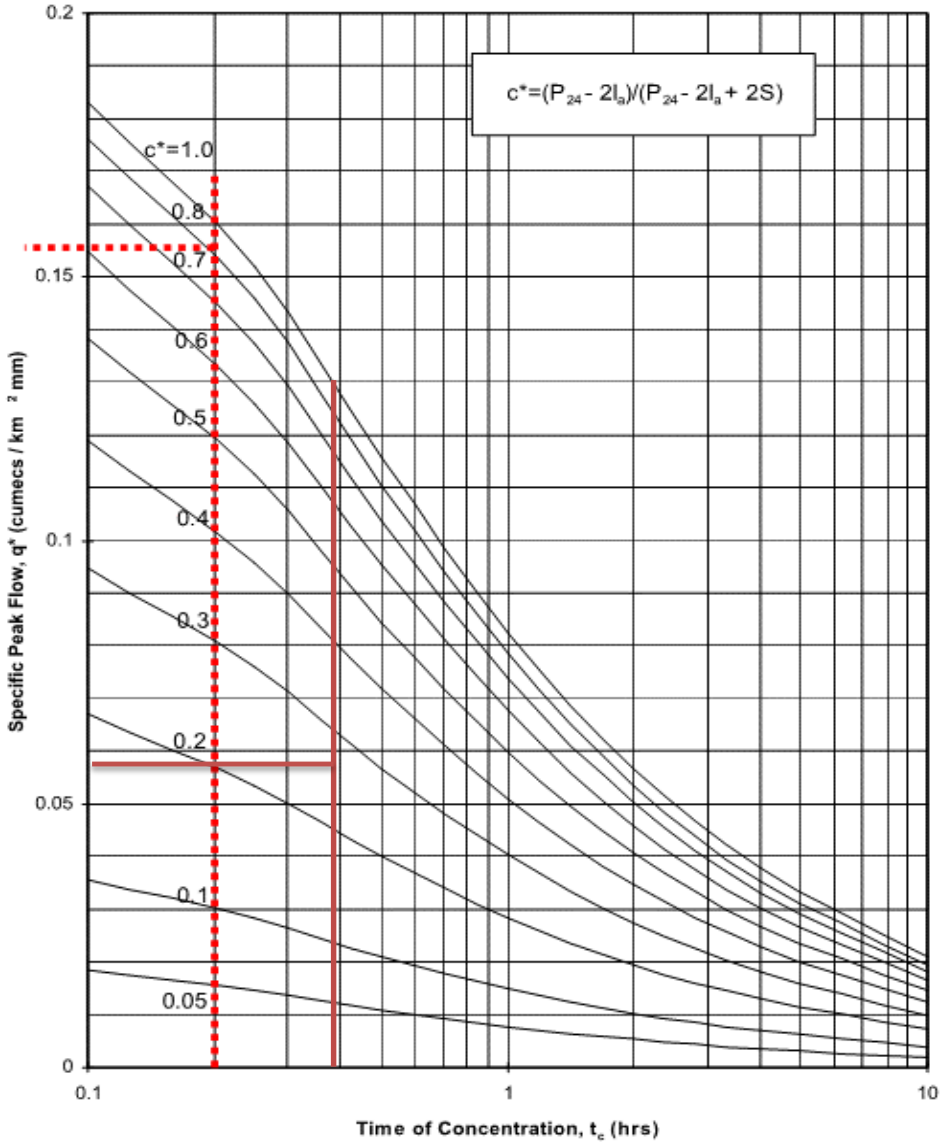
Catchment Area	A=	0.10100	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.39	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	10	(yr)
4. 24 hour rainfall depth, P24	128	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.266	
6. Specific peak flow rate q*	0.058	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.750**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	53.0	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	5354.11	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24- 2Ia)/(P24- 2Ia+ 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 4	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

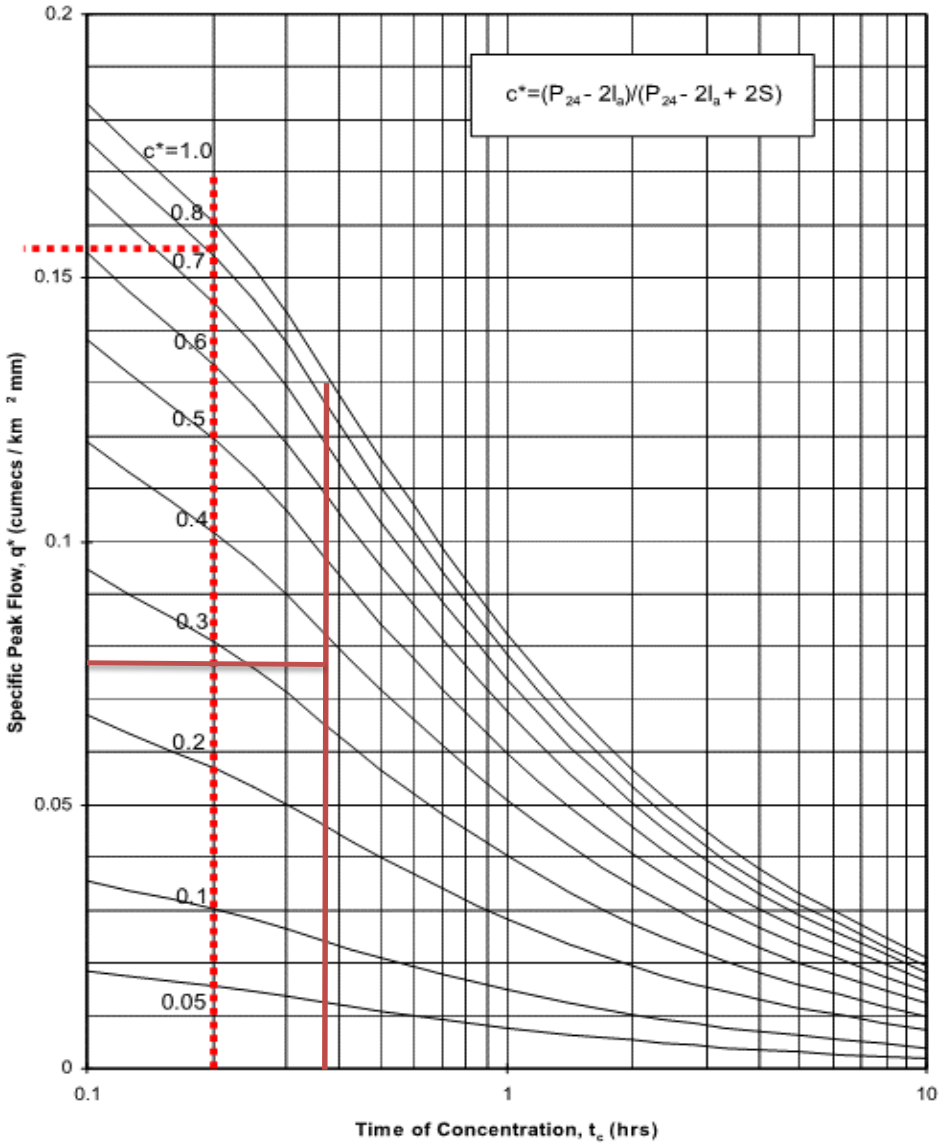
Catchment Area	A=	0.10100	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.39	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	100	(yr)
4. 24 hour rainfall depth, P24	200	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.369	
6. Specific peak flow rate q*	0.078	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.576**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	106.4	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	10745.93	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 5	Rev A
Job Title: Eldonwood, Matamata Calc Title: Post-development	Author: MKS	Date: 13/03/2025	Checked: DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Road	98	2.76	270.5
C	Residential District (30% PERVIOUS)	74	2.2	163.5
C	Residential District (70% IMPERVIOUS)	90	5.13	461.7
* from Appendix B		Totals =	10.10	895.7

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{895.72}{10.100} = 88.7$

Ia (weighted) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 2.21}{10.10} = 1.1$ mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2) piped

Catchment length L = 0.39 km (along drainage path)

Catchment Slope Sc= 0.01 m/m (by equal area method)

Runoff factor, $\frac{CN}{200 - CN} = \frac{88.7}{200-88.7} = 0.80$

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

= 0.1 0.6 0.54 1.13 3.98 = 0.204 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.136 hrs

NO GOOD
use
0.170 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd	Job Number 289001	Sheet 6	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.101	km2(100ha =1km2)	
Runoff curve number	CN=	88.7	(from worksheet 1)	
Initial abstraction	Ia=	1.1	mm (from worksheet 1)	
Time of concentration	tc=	0.170	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 32 mm

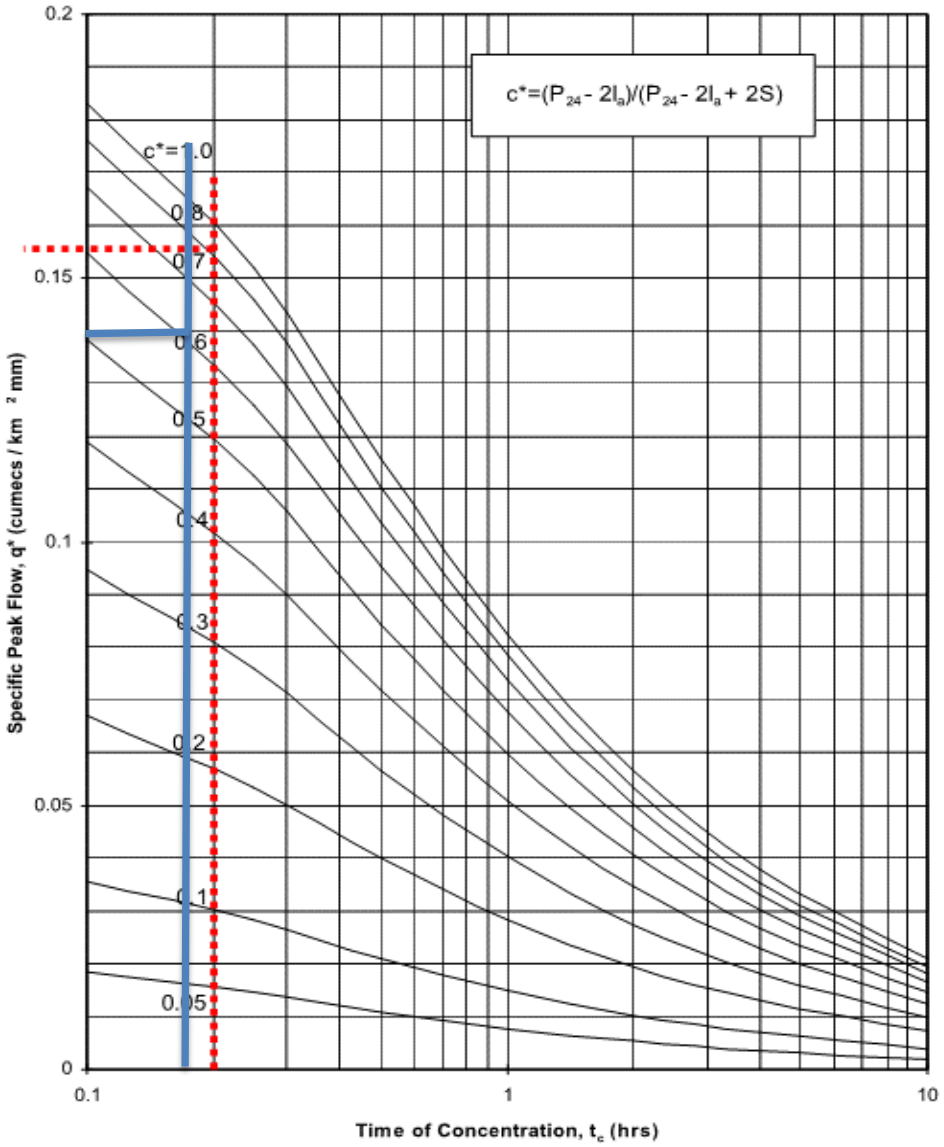
3.	Average recurrence interval, ARI	2	(yr)
4.	24 hour rainfall depth, P24	106	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.616	
6.	Specific peak flow rate q*	0.140	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**1.499**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	80.1	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	8094.91	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**2556.16**	(m3)
Post development run off volume	**8094.91**	(m3)
Pre development flow rate	**0.35**	(m3/s)
Post development flow rate	**1.50**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 7	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.101	km2(100ha =1km2)	
Runoff curve number	CN=	88.7	(from worksheet 1)	
Initial abstraction	Ia=	1.1	mm (from worksheet 1)	
Time of concentration	tc=	0.170	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 32 mm

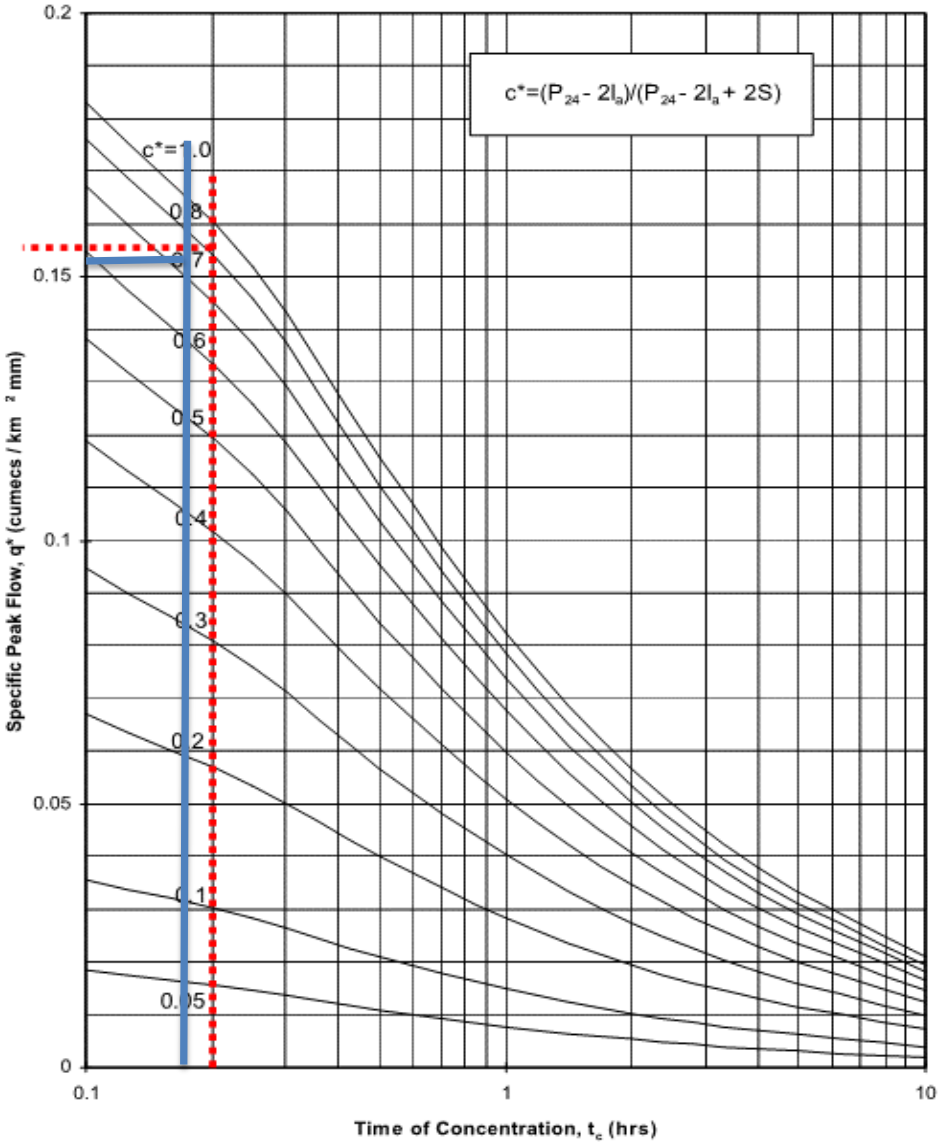
3.	Average recurrence interval, ARI	10	(yr)
4.	24 hour rainfall depth, P24	167	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.718	
6.	Specific peak flow rate q*	0.153	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**2.581**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	138.8	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	14018.30	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**5354.11**	(m3)
Post development run off volume	**14018.30**	(m3)
Pre development flow rate	**0.75**	(m3/s)
Post development flow rate	**2.58**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 8	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

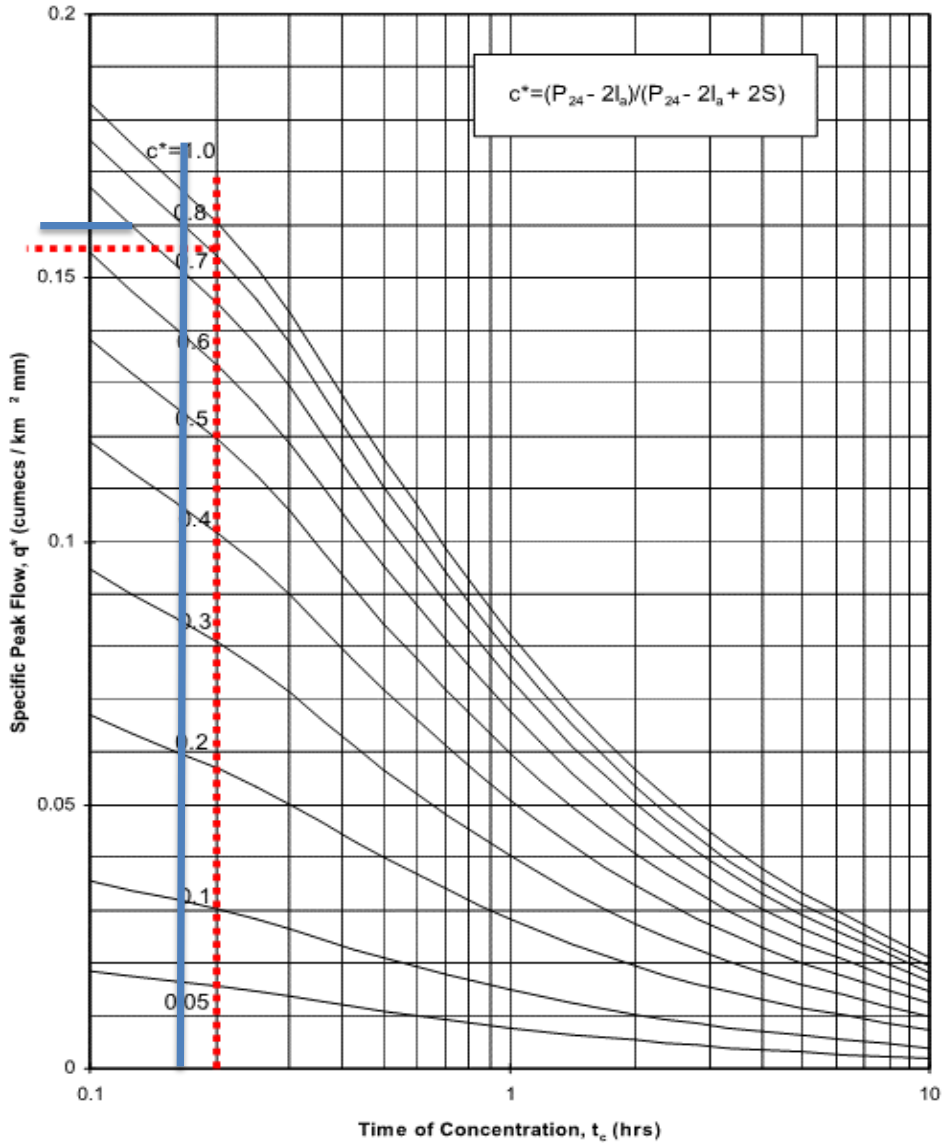
Catchment Area	A=	0.101	km2(100ha =1km2)	
Runoff curve number	CN=	88.7	(from worksheet 1)	
Initial abstraction	Ia=	1.1	mm (from worksheet 1)	
Time of concentration	tc=	0.170	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 32 mm

3.	Average recurrence interval, ARI	100	(yr)	
4.	24 hour rainfall depth, P24	265	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.802		
6.	Specific peak flow rate q*	0.160		*HEC-HMS Check*
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**4.282**		**1.260** 80% Pre
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	235.0		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	23739.41	(m3)	

Pre development run off volume	**10745.93**	(m3)
Post development run off volume	**23739.41**	(m3)
Pre development flow rate	**1.58**	(m3/s)
Post development flow rate	**4.28**	(m3/s)
100yr - 10yr post development	**9721.11**	(m3)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 1	Rev A
Job Title / Calc Title: Station Road, Matamata – Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
B	Open Space (Sandy Loam or Silty Loam)	61	19.50	1189.50
* from Appendix B		Totals =	19.50	1189.50

WQV

CN (weighted) = total product / total area = 1189.50 / 19.50 = 61.0

Ia (weighted) = 5 x pervious area / total area = 5 x 19.50 / 19.50 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2) natural channels

Catchment length L = 0.6 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 61.0 / (200- 61.0) = 0.44

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

= 0 1 0.71 1.57 4.90 = 0.770 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.516 hrs

OK use 0.52 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd.		Job Number 289001	Sheet 2	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

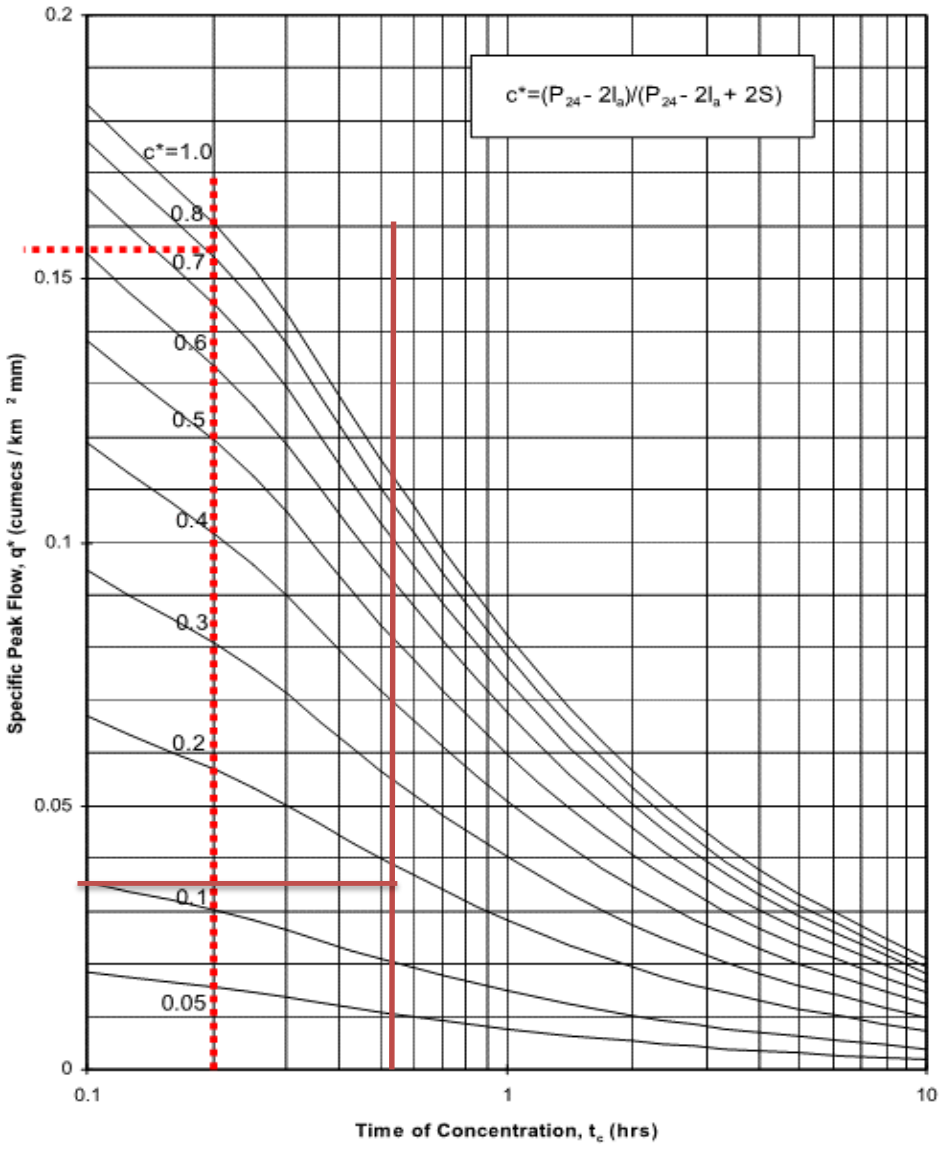
Catchment Area	A=	0.19500	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.52	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	2	(yr)
4. 24 hour rainfall depth, P24	83	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.184	
6. Specific peak flow rate q*	0.036	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.583**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	25.3	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	4935.16	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 3	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

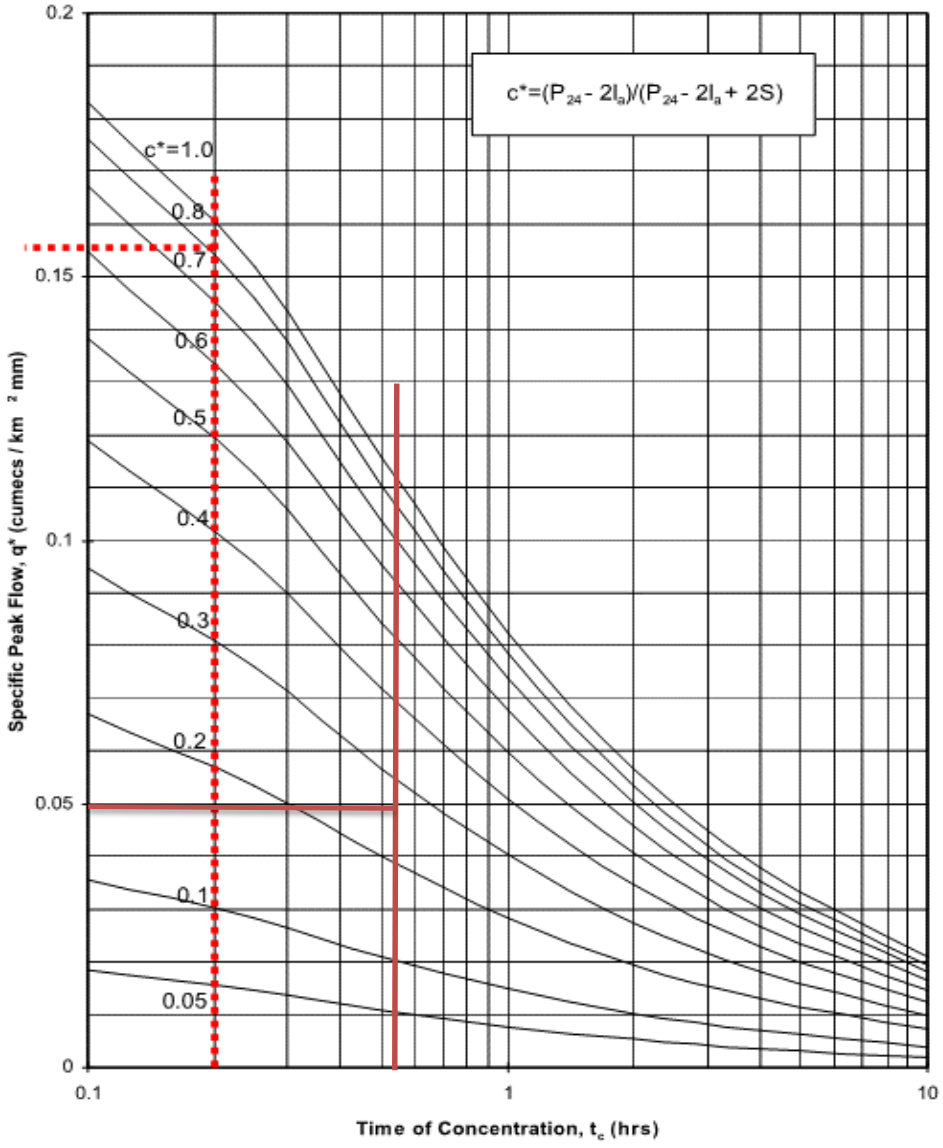
Catchment Area	A=	0.19500	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.52	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	10	(yr)
4. 24 hour rainfall depth, P24	128	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.266	
6. Specific peak flow rate q*	0.049	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.223**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	53.0	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	10337.15	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24- 2Ia)/(P24- 2Ia+ 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 4	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

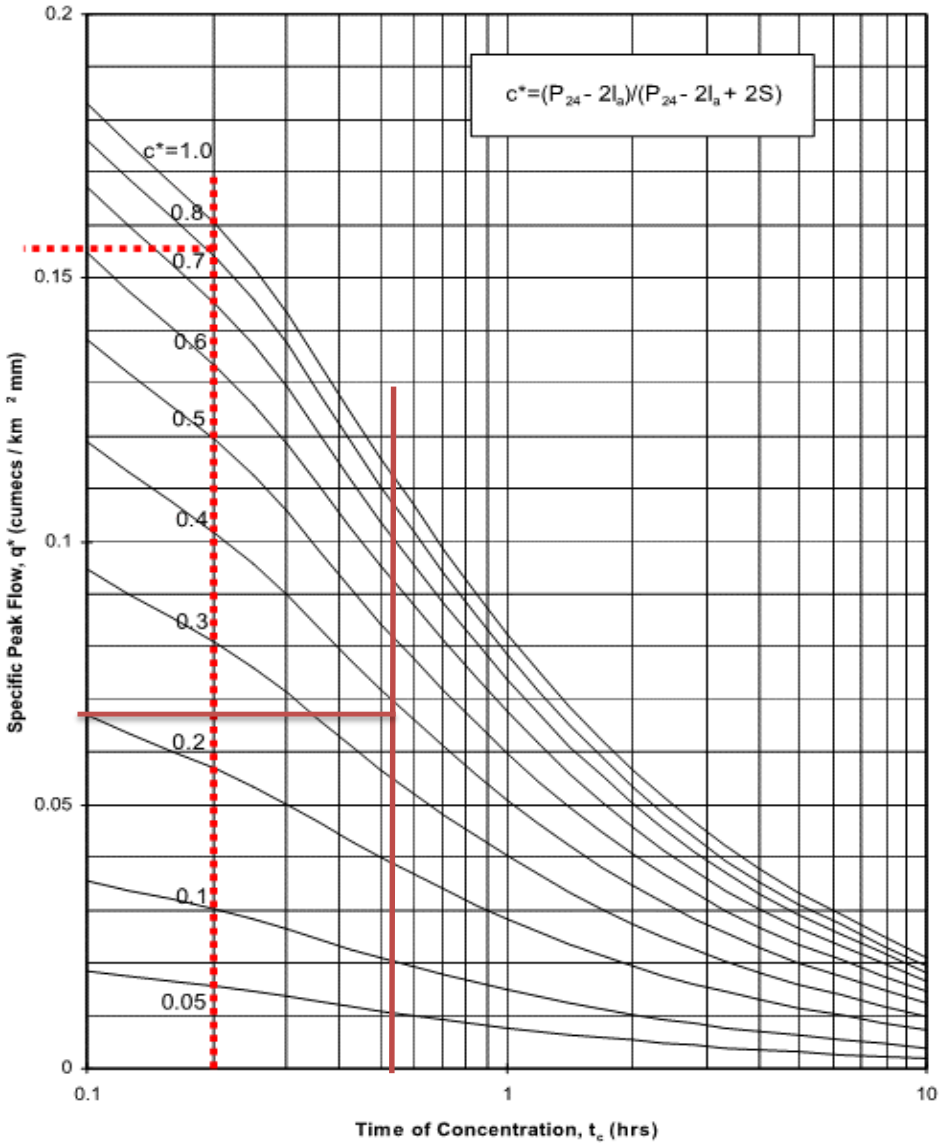
Catchment Area	A=	0.19500	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.52	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	100	(yr)
4. 24 hour rainfall depth, P24	200	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.369	
6. Specific peak flow rate q*	0.068	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**2.652**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	106.4	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	20747.09	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 5	Rev A
Job Title / Calc Title: Eldonwood, Matamata / Post-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Road	98	5.96	583.6
C	Residential District (30% PERVIOUS)	74	4.1	300.8
C	Residential District (70% IMPERVIOUS)	90	9.48	853.6
* from Appendix B		Totals =	19.50	1738.0

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1738.02}{19.505} = 89.1$

Ia (weighted) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 4.06}{19.50} = 1.0$ mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2) piped

Catchment length L = 0.6 km (along drainage path)

Catchment Slope Sc= 0.01 m/m (by equal area method)

Runoff factor, $\frac{CN}{200 - CN} = \frac{89.1}{200-89.1} = 0.80$

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

$= 0.1 \quad 0.6 \quad 0.71 \quad 1.13 \quad 3.98 = 0.269$ hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c = 0.180$ hrs

OK
use
0.180 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd	Job Number 289001	Sheet 6	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.195	km2(100ha =1km2)
Runoff curve number	CN=	89.1	(from worksheet 1)
Initial abstraction	Ia=	1.0	mm (from worksheet 1)
Time of concentration	tc=	0.180	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 31 mm

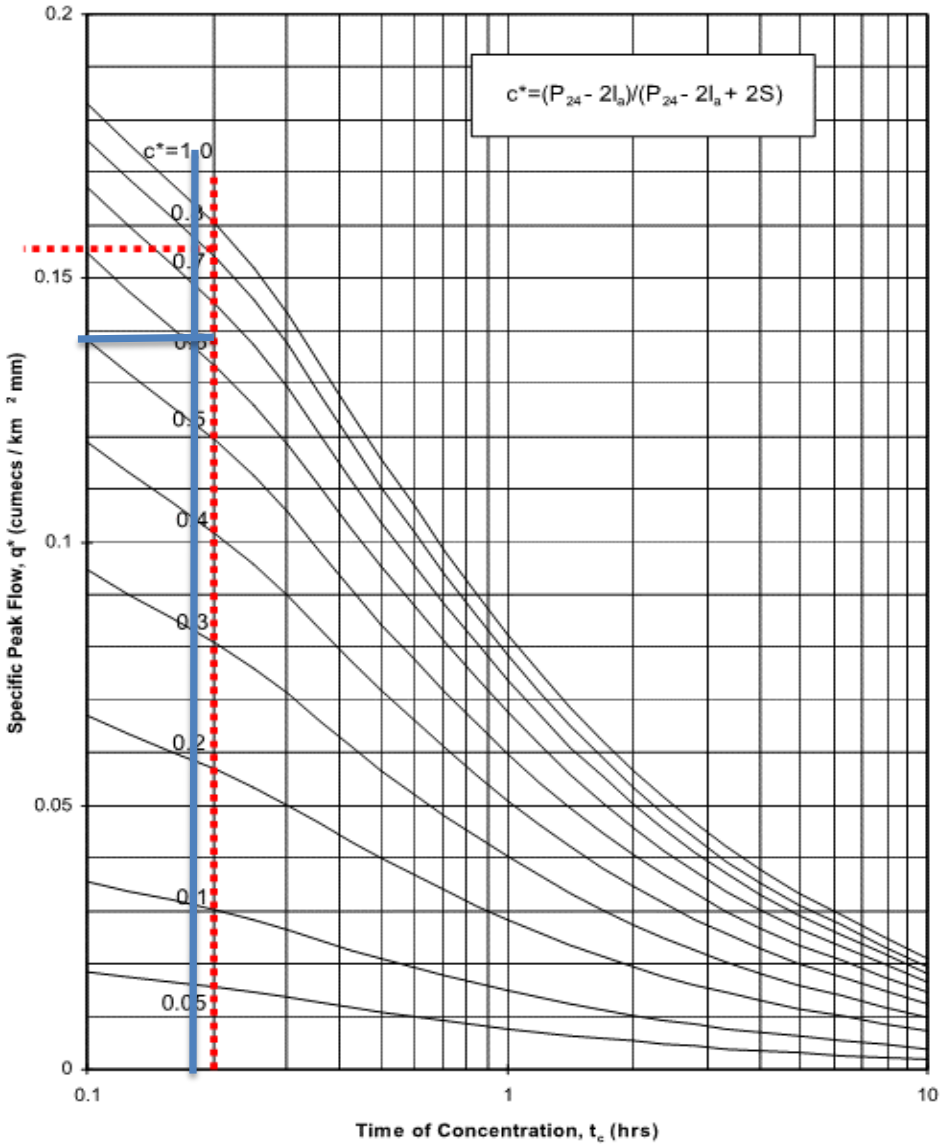
3.	Average recurrence interval, ARI	2	(yr)
4.	24 hour rainfall depth, P24	106	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.626	
6.	Specific peak flow rate q*	0.139	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**2.874**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	81.0	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	15798.35	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**4935.16**	(m3)
Post development run off volume	**15798.35**	(m3)
Pre development flow rate	**0.58**	(m3/s)
Post development flow rate	**2.87**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.9
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 7	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.195	km2(100ha =1km2)	
Runoff curve number	CN=	89.1	(from worksheet 1)	
Initial abstraction	Ia=	1.0	mm (from worksheet 1)	
Time of concentration	tc=	0.180	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 31 mm

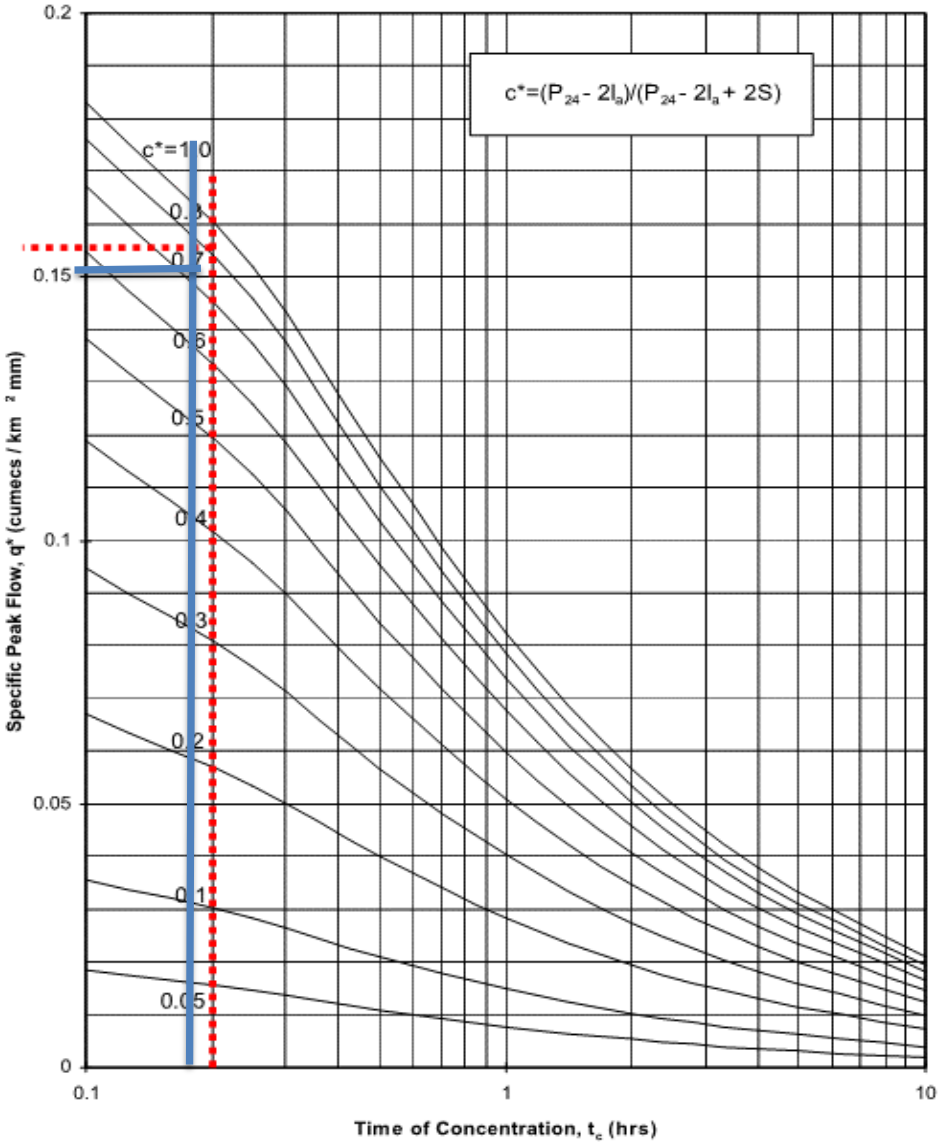
3.	Average recurrence interval, ARI	10	(yr)
4.	24 hour rainfall depth, P24	167	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.726	
6.	Specific peak flow rate q*	0.151	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**4.918**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	139.8	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	27268.12	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**10337.15**	(m3)
Post development run off volume	**27268.12**	(m3)
Pre development flow rate	**1.22**	(m3/s)
Post development flow rate	**4.92**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 8	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

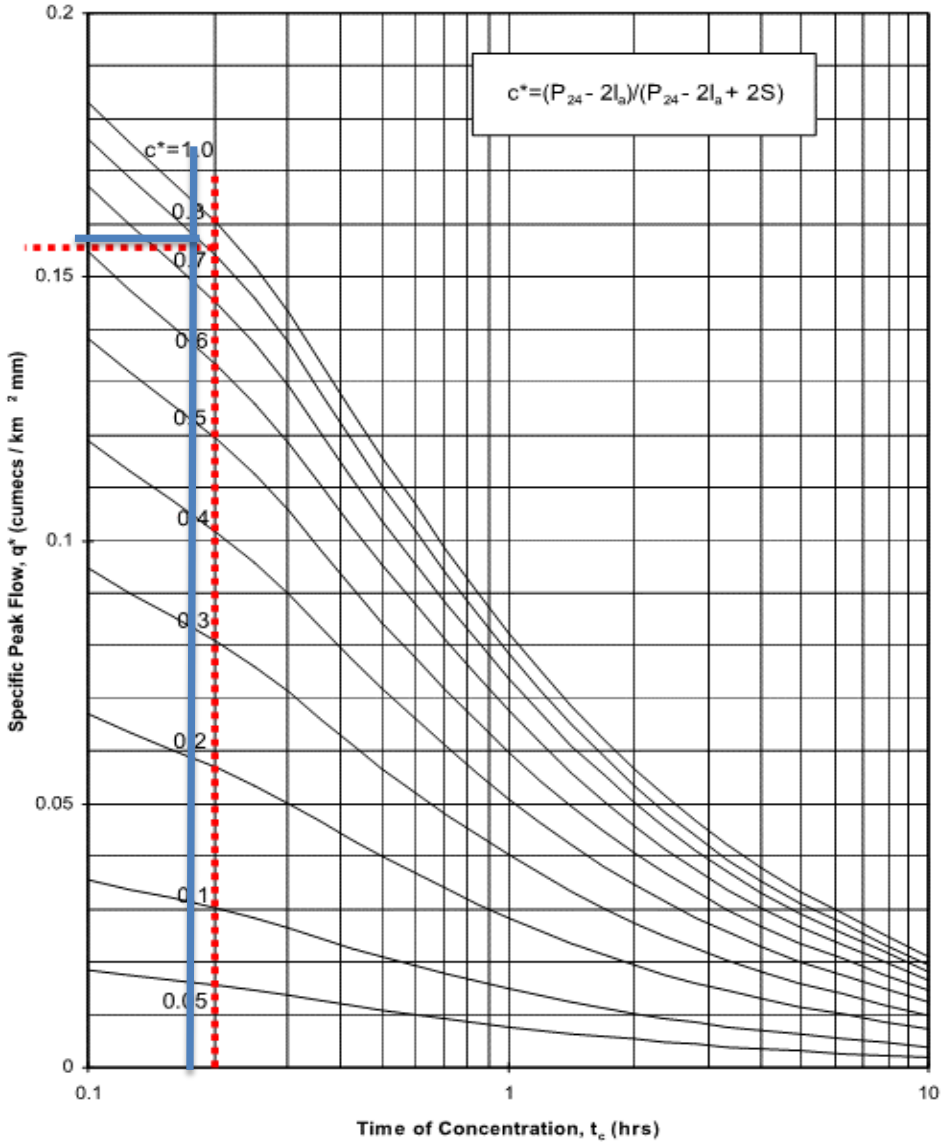
Catchment Area	A=	0.195	km2(100ha =1km2)	
Runoff curve number	CN=	89.1	(from worksheet 1)	
Initial abstraction	Ia=	1.0	mm (from worksheet 1)	
Time of concentration	tc=	0.180	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 31 mm

3.	Average recurrence interval, ARI	100	(yr)	
4.	24 hour rainfall depth, P24	265	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.809		
6.	Specific peak flow rate q*	0.158		*HEC-HMS Check*
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**8.167**		**2.122** 80% Pre
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	236.2		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	46065.59	(m3)	

Pre development run off volume	**20747.09**	(m3)
Post development run off volume	**46065.59**	(m3)
Pre development flow rate	**2.65**	(m3/s)
Post development flow rate	**8.17**	(m3/s)
100yr - 10yr post development	**18797.47**	(m3)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24- 2Ia)/(P24- 2Ia+ 2S)
c*=1.0
0.9
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 1	Rev A
Job Title / Calc Title: Station Road, Matamata – Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
B	Open Space (Sandy Loam or Silty Loam)	61	4.33	264.41
* from Appendix B		Totals =	4.33	264.41

WQV

CN (weighted) = total product / total area = 264.41 / 4.33 = 61.0

Ia (weighted) = 5 x pervious area / total area = 5 x 4.33 / 4.33 = 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2) natural channels

Catchment length L = 0.34 km (along drainage path)

Catchment Slope Sc= 0.001 m/m (by equal area method)

Runoff factor, CN / (200 - CN) = 61.0 / (200- 61.0) = 0.44

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

= 0 1 0.49 1.57 7.94 = 0.858 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.575 hrs

OK use 0.58 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd.		Job Number 289001	Sheet 2	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

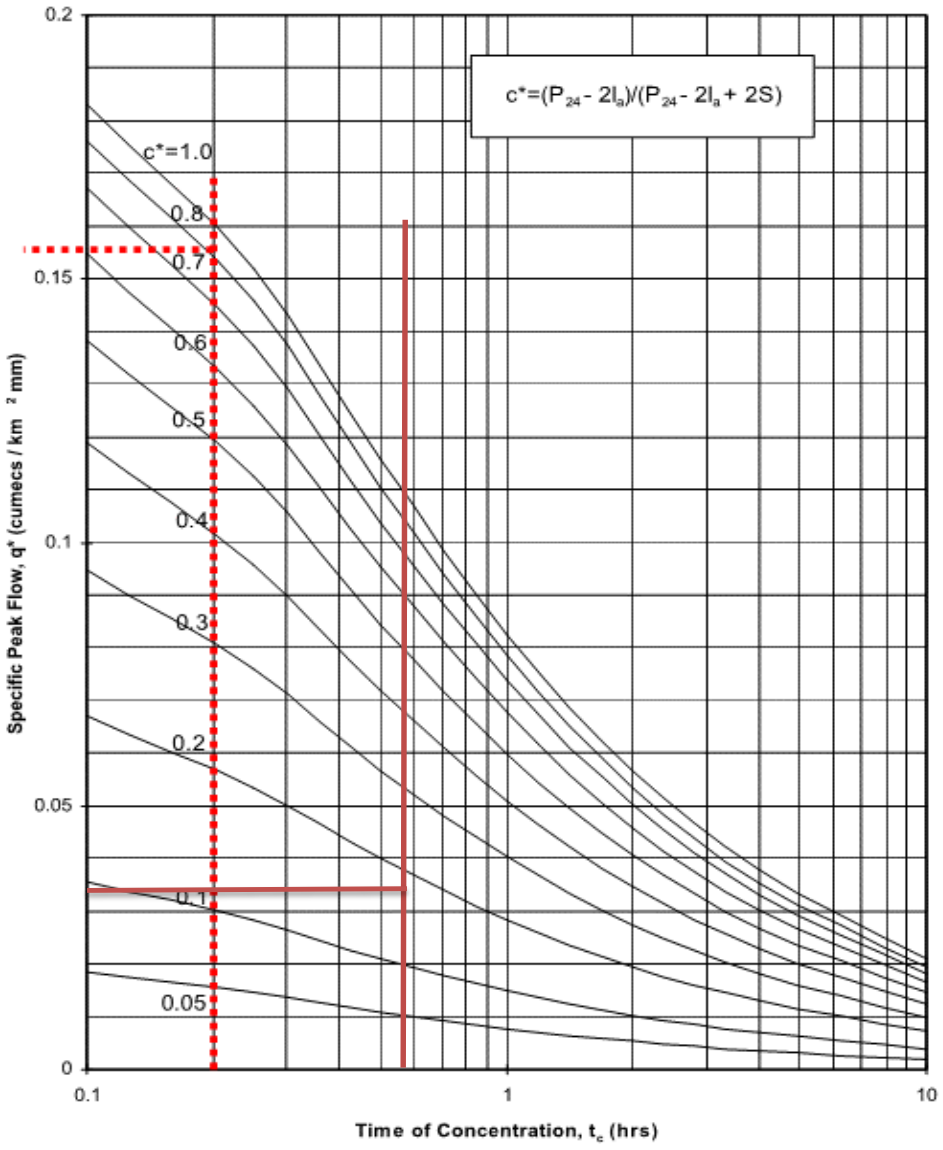
Catchment Area	A=	0.04335	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.58	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	2	(yr)
4. 24 hour rainfall depth, P24	83	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.184	
6. Specific peak flow rate q*	0.035	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.126**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	25.3	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1097.02	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 3	Rev A
Job Title / Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

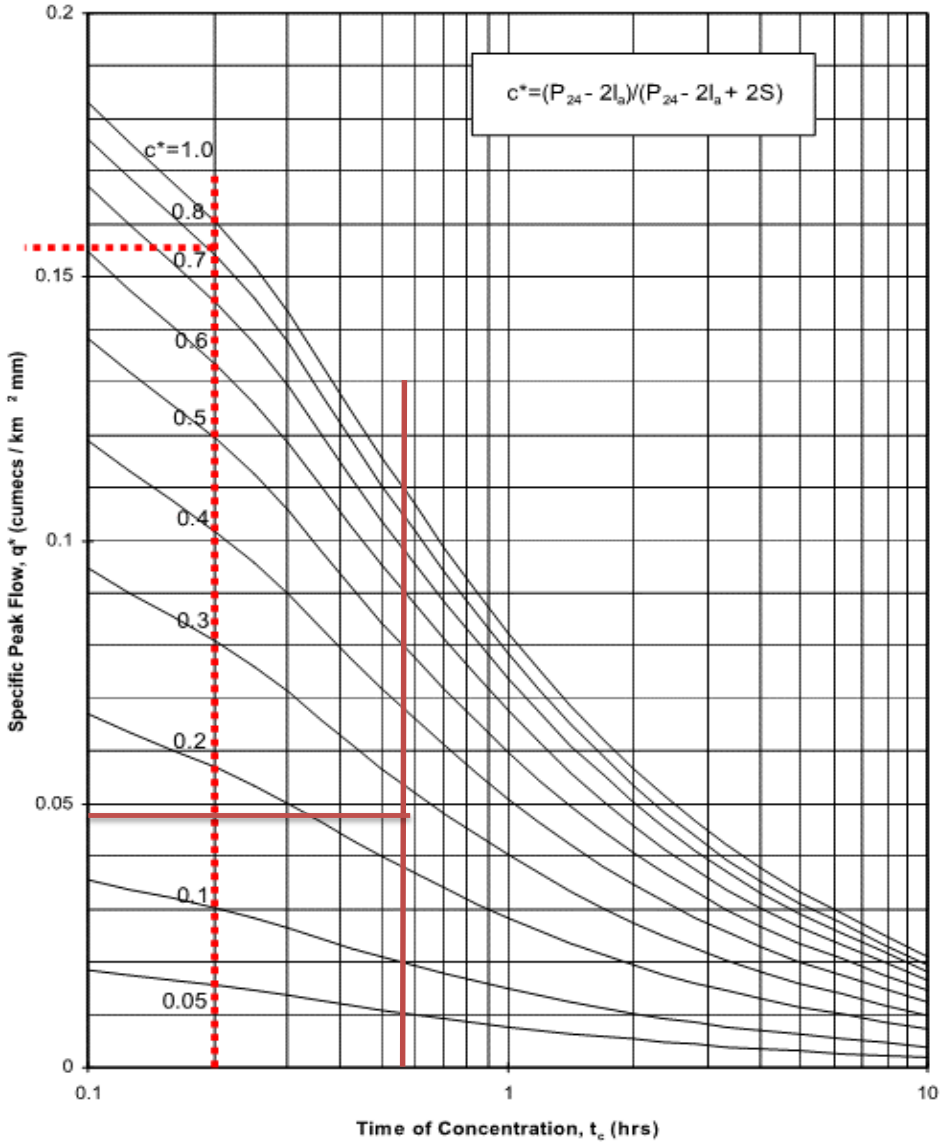
1. Data

Catchment Area	A=	0.04335	km2(100ha =1km2)	
Runoff curve number	CN=	61.0	(from worksheet 1)	
Initial abstraction	Ia=	5.0	mm (from worksheet 1)	
Time of concentration	tc=	0.58	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	10	(yr)	NO CLIMATE CHANGE
4. 24 hour rainfall depth, P24	128	(mm)	
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.266		
6. Specific peak flow rate q*	0.048		
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.266**	(m3/s)	
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	53.0		
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2297.82	(m3)	

Worksheet 2: Graphical Peak Flow Rate


c*=(P24- 2Ia)/(P24- 2Ia+ 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 4	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

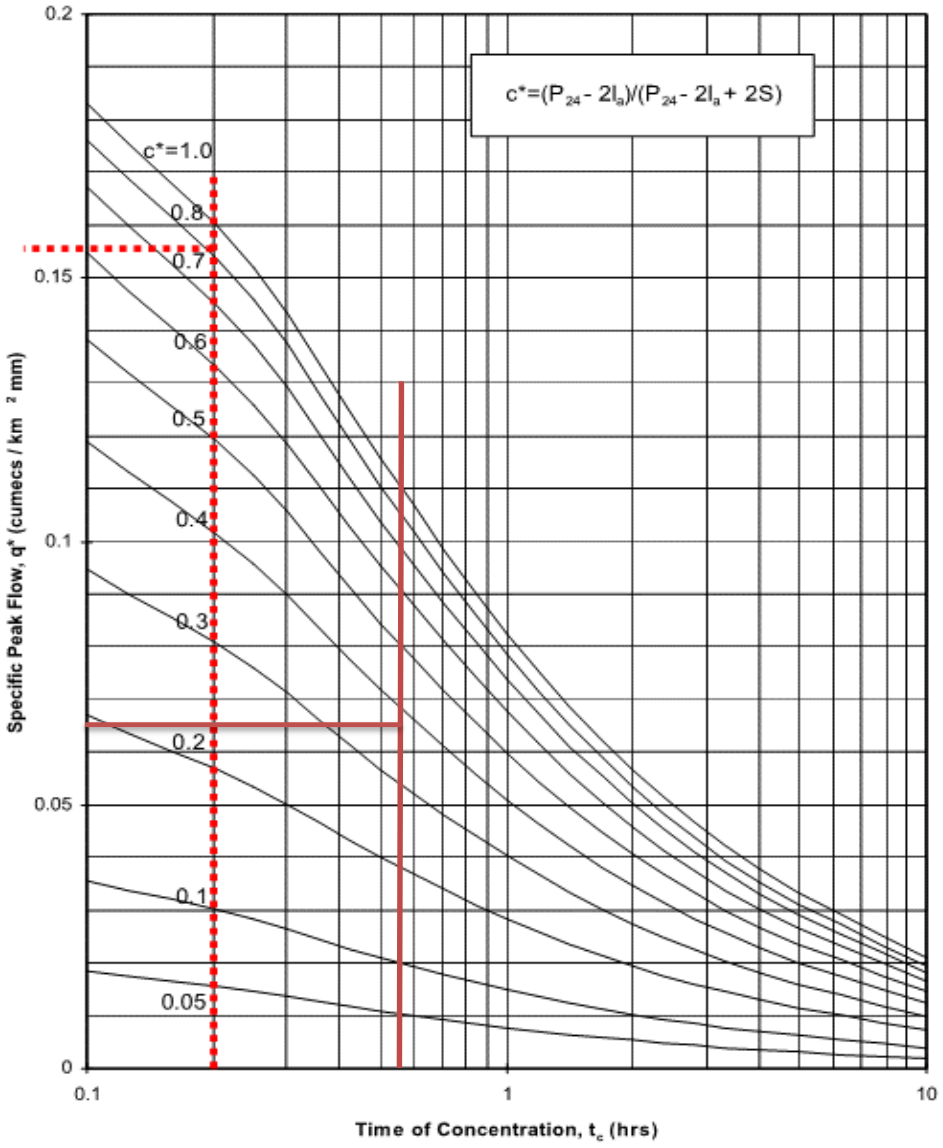
Catchment Area	A=	0.04335	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.58	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	100	(yr)
4. 24 hour rainfall depth, P24	200	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.369	
6. Specific peak flow rate q*	0.066	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.572**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	106.4	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	4611.81	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 5	Rev A
Job Title / Calc Title: Eldonwood, Matamata / Post-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Road	98	1.07	105.3
C	Residential District (30% PERVIOUS)	74	0.98	72.4
C	Residential District (70% IMPERVIOUS)	90	2.28	205.4
* from Appendix B		Totals =	4.33	383.0

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{383.05}{4.335} = 88.4$

Ia (weighted) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 0.98}{4.33} = 1.1$ mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2) piped

Catchment length L = 0.34 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, $\frac{CN}{200 - CN} = \frac{88.4}{200-88.4} = 0.79$

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

$= 0.1 \quad 0.6 \quad 0.49 \quad 1.14 \quad 4.90 =$ 0.230 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.154 hrs

NO GOOD
use
0.170 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description — Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group — A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [4]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd	Job Number 289001	Sheet 6	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

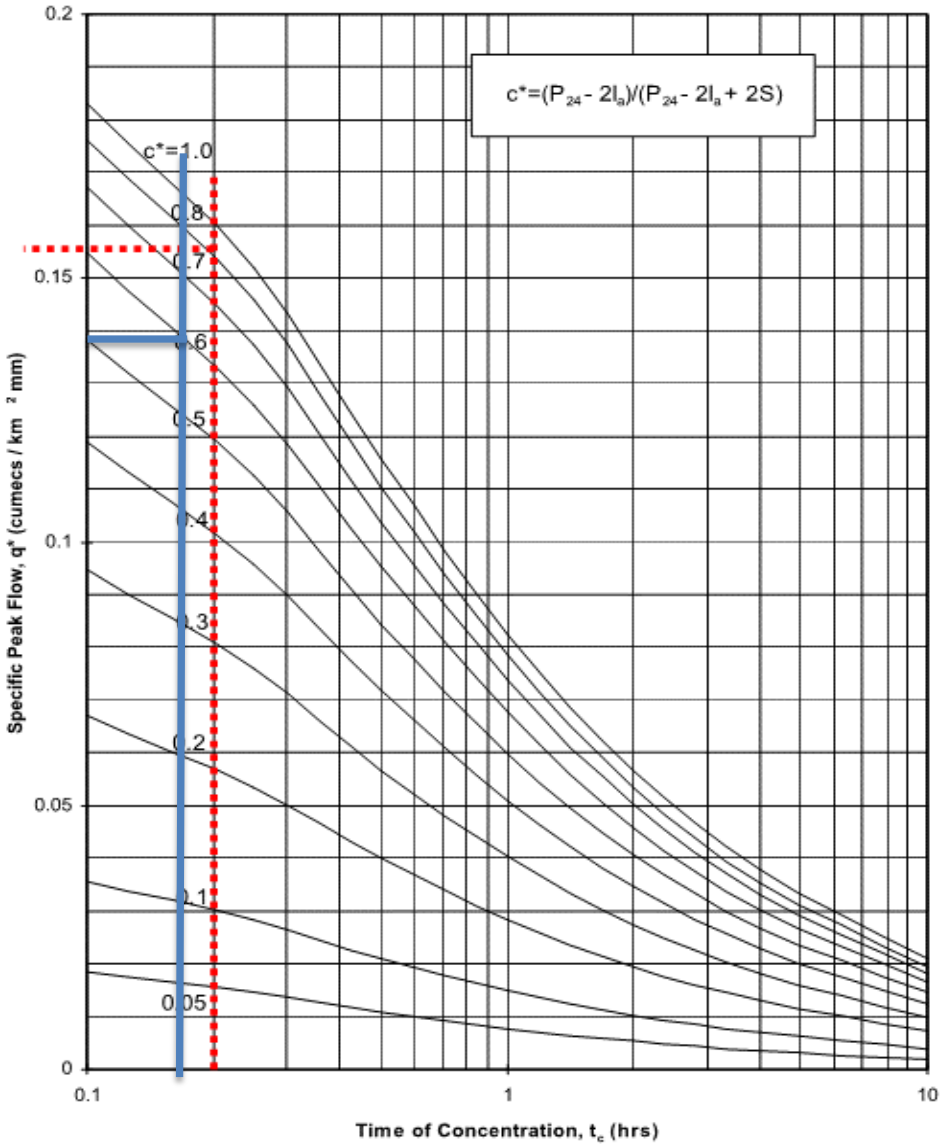
Catchment Area	A=	0.043	km2(100ha =1km2)	
Runoff curve number	CN=	88.4	(from worksheet 1)	
Initial abstraction	Ia=	1.1	mm (from worksheet 1)	
Time of concentration	tc=	0.170	hrs (from worksheet 1)	

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

3.	Average recurrence interval, ARI	2	(yr)	
4.	24 hour rainfall depth, P24	106	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.608		
6.	Specific peak flow rate q*	0.139		*HEC-HMS Check*
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**0.639**		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	79.5		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	3447.06	(m3)	

Pre development run off volume	**1097.02**	(m3)
Post development run off volume	**3447.06**	(m3)
Pre development flow rate	**0.13**	(m3/s)
Post development flow rate	**0.64**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 7	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

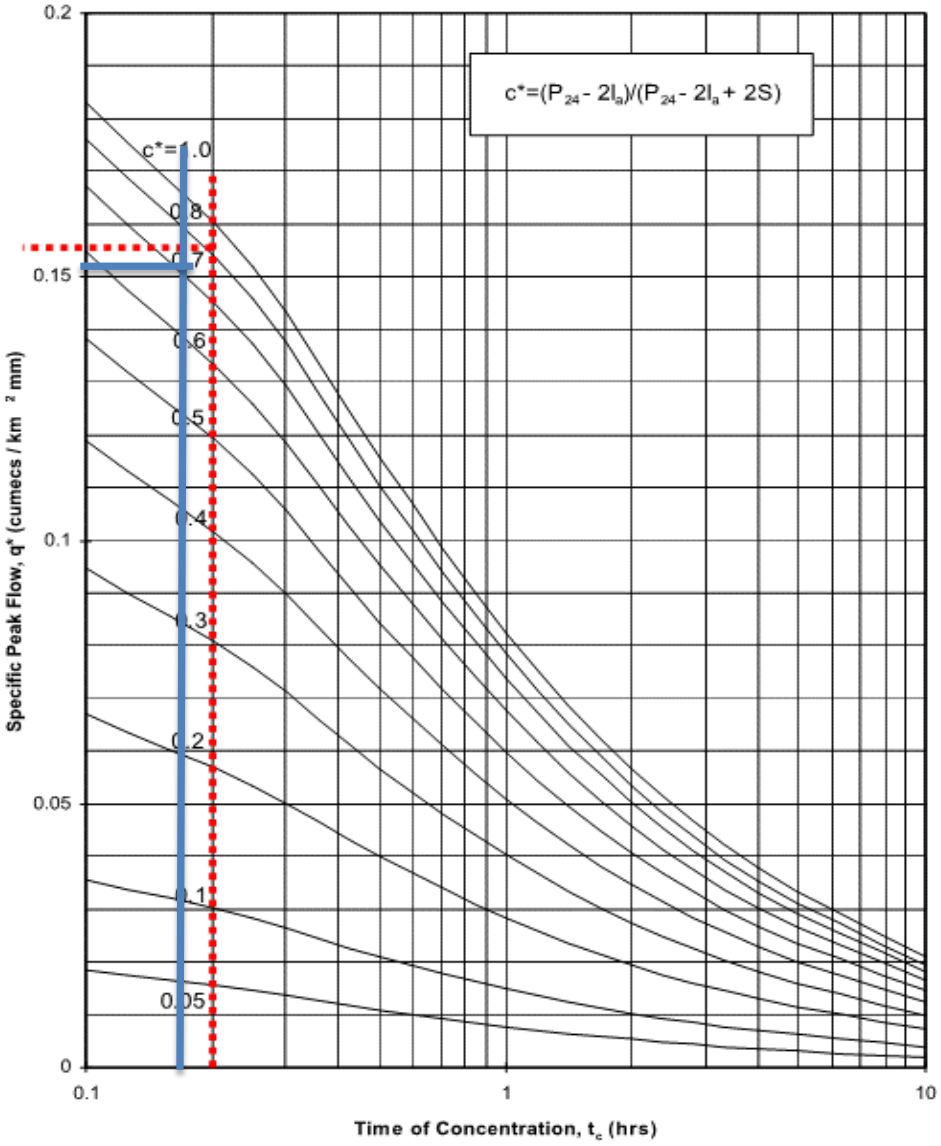
Catchment Area	A=	0.043	km2(100ha =1km2)
Runoff curve number	CN=	88.4	(from worksheet 1)
Initial abstraction	Ia=	1.1	mm (from worksheet 1)
Time of concentration	tc=	0.170	hrs (from worksheet 1)

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

3.	Average recurrence interval, ARI	10	(yr)	
4.	24 hour rainfall depth, P24	167	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.711		
6.	Specific peak flow rate q*	0.152		*HEC-HMS Check*
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**1.100**		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	138.1		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	5983.93	(m3)	

Pre development run off volume	**2297.82**	(m3)
Post development run off volume	**5983.93**	(m3)
Pre development flow rate	**0.27**	(m3/s)
Post development flow rate	**1.10**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 8	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

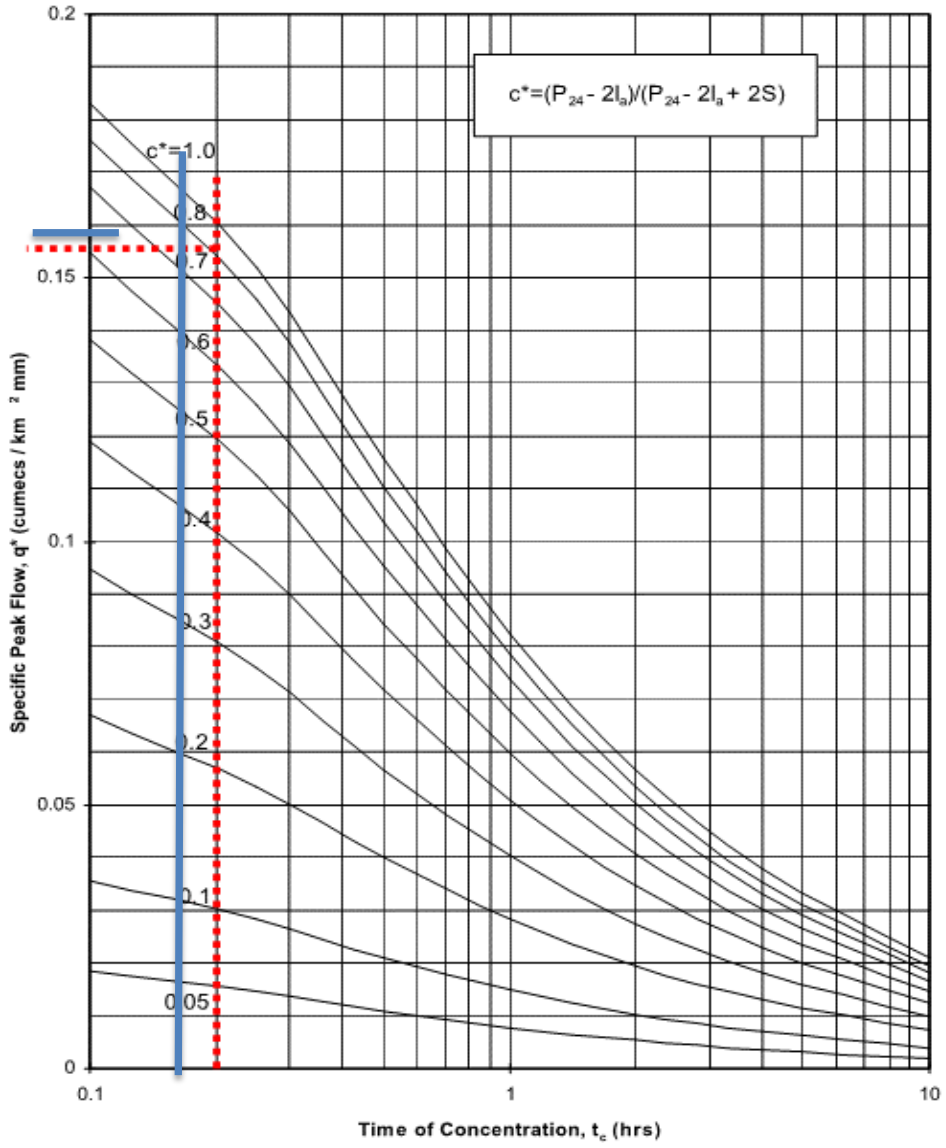
Catchment Area	A=	0.043	km2(100ha =1km2)	
Runoff curve number	CN=	88.4	(from worksheet 1)	
Initial abstraction	Ia=	1.1	mm (from worksheet 1)	
Time of concentration	tc=	0.170	hrs (from worksheet 1)	

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

3.	Average recurrence interval, ARI	100	(yr)	
4.	24 hour rainfall depth, P24	265	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.797		
6.	Specific peak flow rate q*	0.159		*HEC-HMS Check*
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**1.826**		**0.458** 80% Pre
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	234.2		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	10151.65	(m3)	

Pre development run off volume	**4611.81**	(m3)
Post development run off volume	**10151.65**	(m3)
Pre development flow rate	**0.57**	(m3/s)
Post development flow rate	**1.83**	(m3/s)
100yr - 10yr post development	**4167.72**	(m3)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 1	Rev A
Job Title / Calc Title: Station Road, Matamata — Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
B	Open Space (Sandy Loam or Silty Loam)	61	8.03	489.83
* from Appendix B		Totals =	8.03	489.83

WQV

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{489.83}{8.03} = 61.0$

Ia (weighted) = $\frac{\text{5 x pervious area}}{\text{total area}} = \frac{5 \times 8.03}{8.03}$ 5.0 mm

2. Time of Concentration

Channelisation factor C = 1 (From Table 4.2) natural channels

Catchment length L = 0.62 km (along drainage path)

Catchment Slope Sc= 0.001 m/m (by equal area method)

Runoff factor, $\frac{CN}{200 - CN} = \frac{61.0}{200-61.0} = 0.44$

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

= 0 1 0.73 1.57 7.94 = 1.276 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.855 hrs

OK use 0.85 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd.		Job Number 289001	Sheet 2	Rev A
Job Title / Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

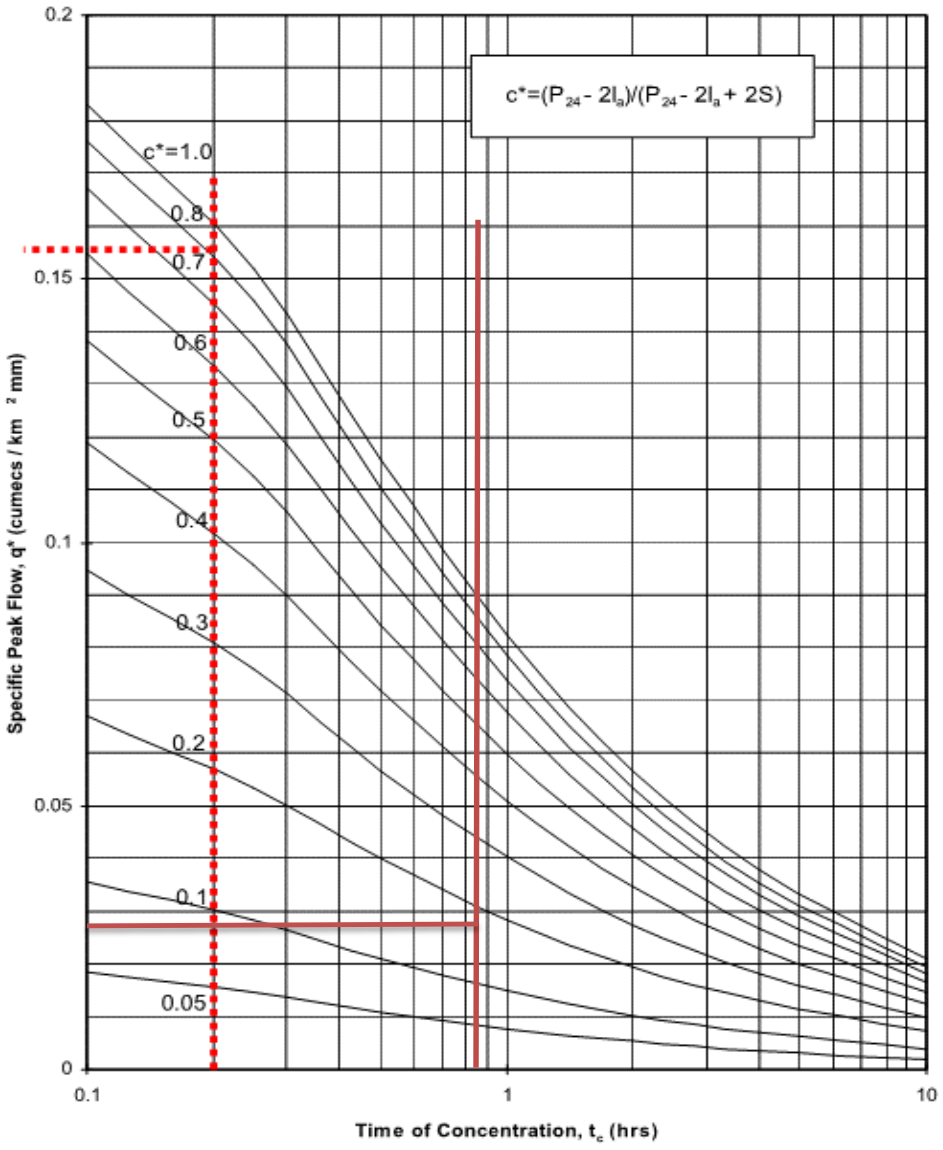
Catchment Area	A=	0.08030	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.85	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	2	(yr)
4. 24 hour rainfall depth, P24	83	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.184	
6. Specific peak flow rate q*	0.028	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.187**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	25.3	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	2032.27	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 3	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

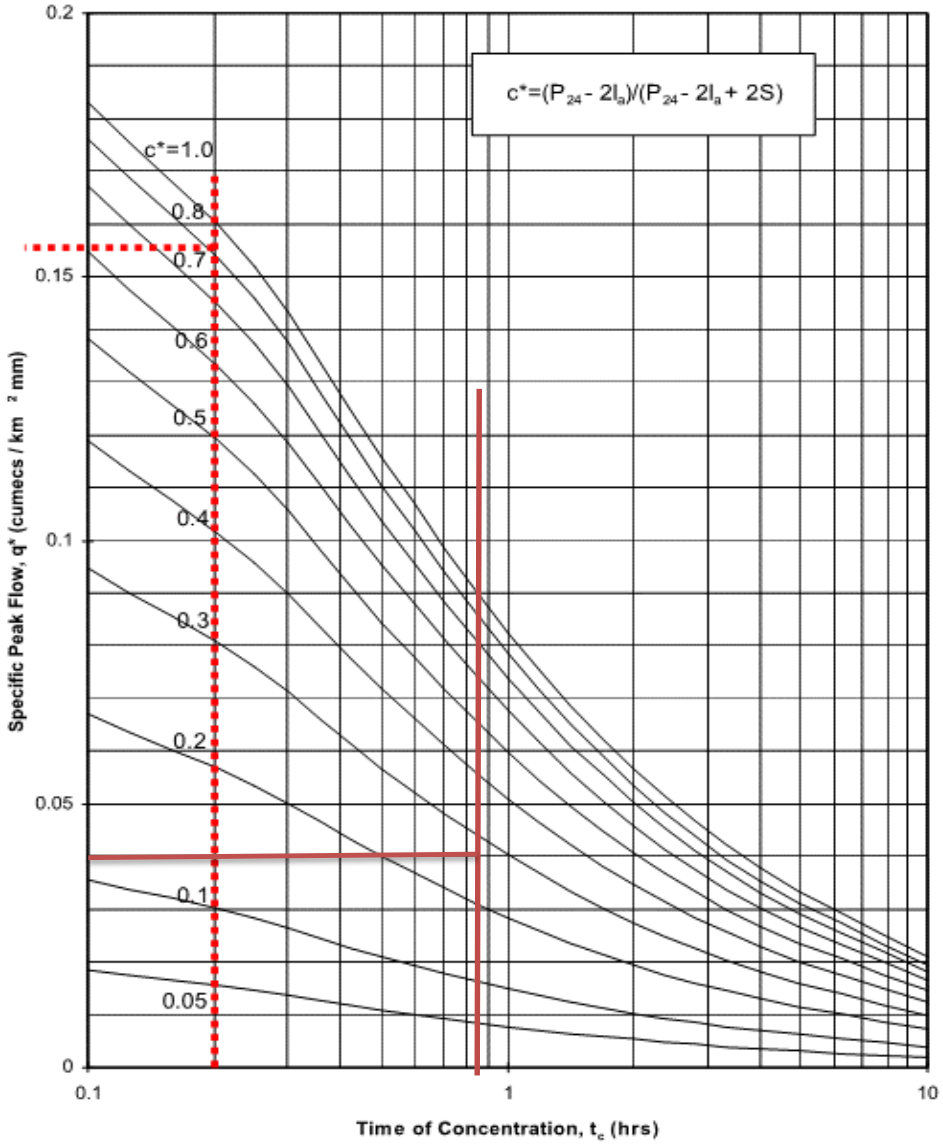
Catchment Area	A=	0.08030	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.85	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	10	(yr)
4. 24 hour rainfall depth, P24	128	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.266	
6. Specific peak flow rate q*	0.040	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.411**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	53.0	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	4256.79	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24- 2Ia)/(P24- 2Ia+ 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.		Job Number 289001	Sheet 4	Rev A
Job Title Calc Title	Station Road, Matamata Pre-development	Author MKS	Date 13/03/2025	Checked DJM

1. Data

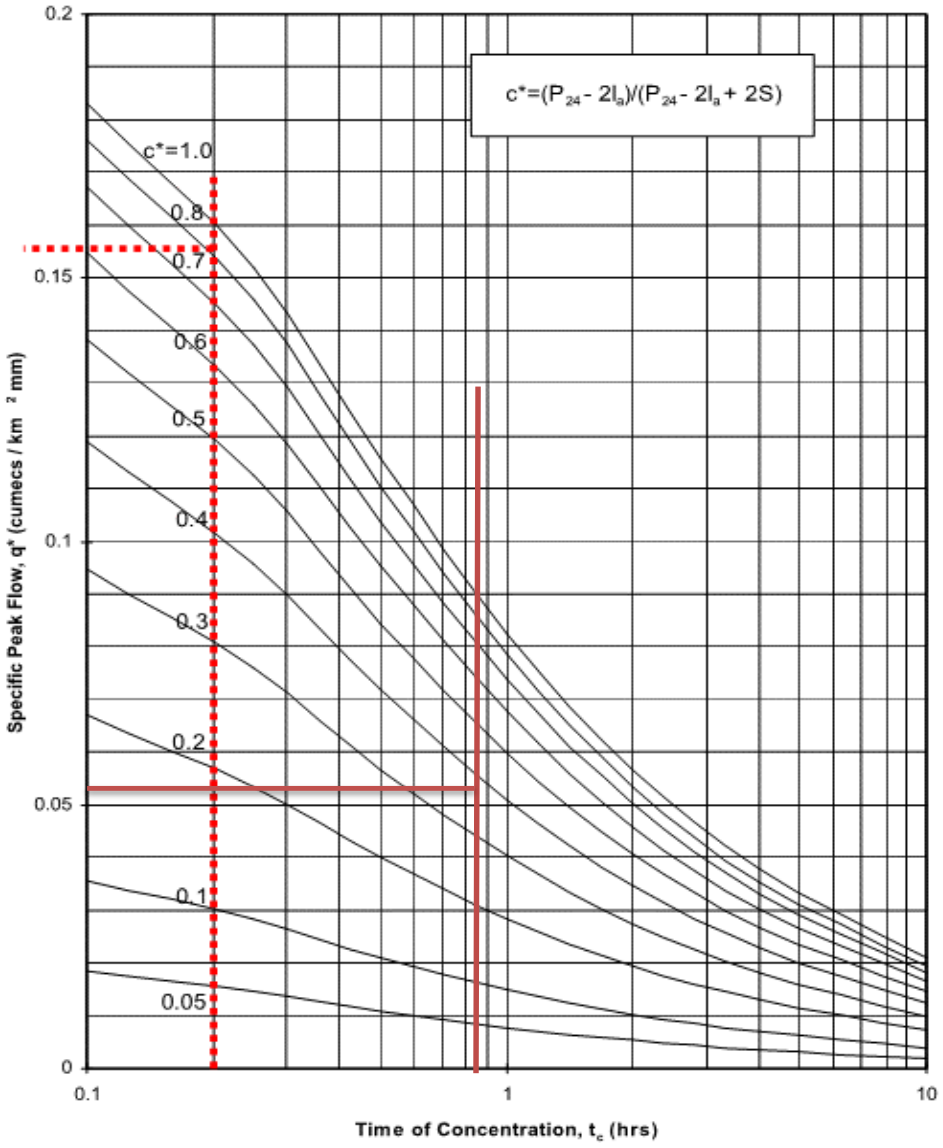
Catchment Area	A=	0.08030	km2(100ha =1km2)
Runoff curve number	CN=	61.0	(from worksheet 1)
Initial abstraction	Ia=	5.0	mm (from worksheet 1)
Time of concentration	tc=	0.85	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

3. Average recurrence interval, ARI	100	(yr)
4. 24 hour rainfall depth, P24	200	(mm)
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.369	
6. Specific peak flow rate q*	0.053	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.851**	(m3/s)
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	106.4	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	8543.55	(m3)

NO CLIMATE CHANGE

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd.	Job Number 289001	Sheet 5	Rev A
Job Title / Calc Title: Eldonwood, Matamata / Post-development	Author MKS	Date 13/03/2025	Checked DJM

1. Runoff Curve Number (CN) and initial Abstraction (Ia)

Soil name and classification	Cover description (cover type, treatment, and hydrologic condition)	Curve Number CN*	Area (ha) 10000m2=1ha	Product of CN x area
C	Road	98	2.17	212.7
C	Residential District (30% PERVIOUS)	74	1.76	130.2
C	Residential District (70% IMPERVIOUS)	90	4.10	369.0
* from Appendix B		Totals =	8.03	711.9

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{711.89}{8.030} = 88.7$

Ia (weighted) = $\frac{5 \times \text{pervious area}}{\text{total area}} = \frac{5 \times 1.76}{8.03} = 1.1$ mm

2. Time of Concentration

Channelisation factor C = 0.6 (From Table 4.2) piped

Catchment length L = 0.62 km (along drainage path)

Catchment Slope Sc= 0.005 m/m (by equal area method)

Runoff factor, $\frac{CN}{200 - CN} = \frac{88.7}{200-88.7} = 0.80$

$t_c = 0.14\ C\ L^{0.66}\ (CN/200\text{-}CN)^{-0.55}\ Sc^{-0.30}$

$= 0.1 \quad 0.6 \quad 0.73 \quad 1.13 \quad 4.90 =$ 0.340 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.228 hrs

OK
use
0.228 hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Cover description — Cover type and hydrologic condition	Average percent impervious area [2]	Curve numbers for hydrologic soil group — A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

Maven Associates Ltd	Job Number 289001	Sheet 6	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.080	km2(100ha =1km2)	
Runoff curve number	CN=	88.7	(from worksheet 1)	
Initial abstraction	Ia=	1.1	mm (from worksheet 1)	
Time of concentration	tc=	0.228	hrs (from worksheet 1)	

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

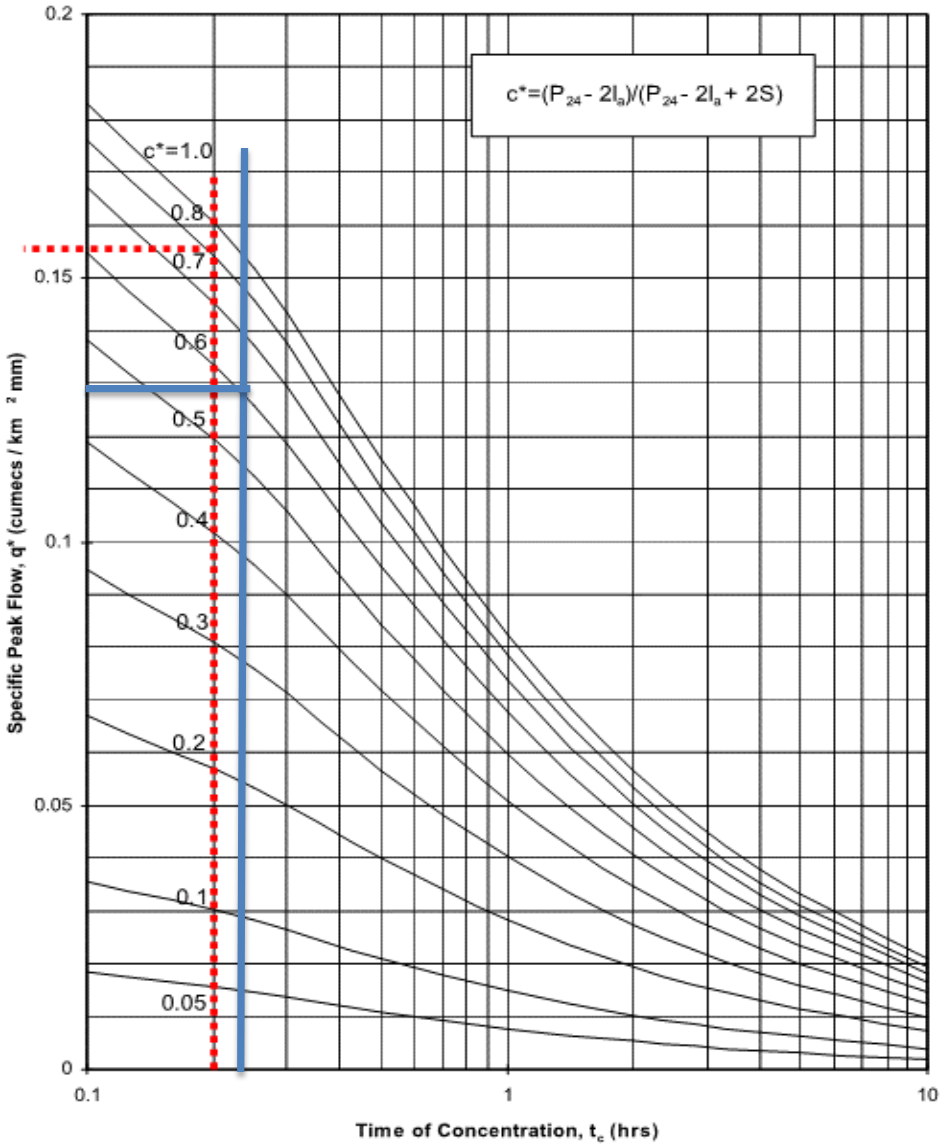
3.	Average recurrence interval, ARI	2	(yr)
4.	24 hour rainfall depth, P24	106	(mm)
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.615	
6.	Specific peak flow rate q*	0.129	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**1.098**	
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	80.1	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	6431.06	(m3)

HEC-HMS Check

	Pre-Dev

Pre development run off volume	**2032.27**	(m3)
Post development run off volume	**6431.06**	(m3)
Pre development flow rate	**0.19**	(m3/s)
Post development flow rate	**1.10**	(m3/s)

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 7	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1. Data

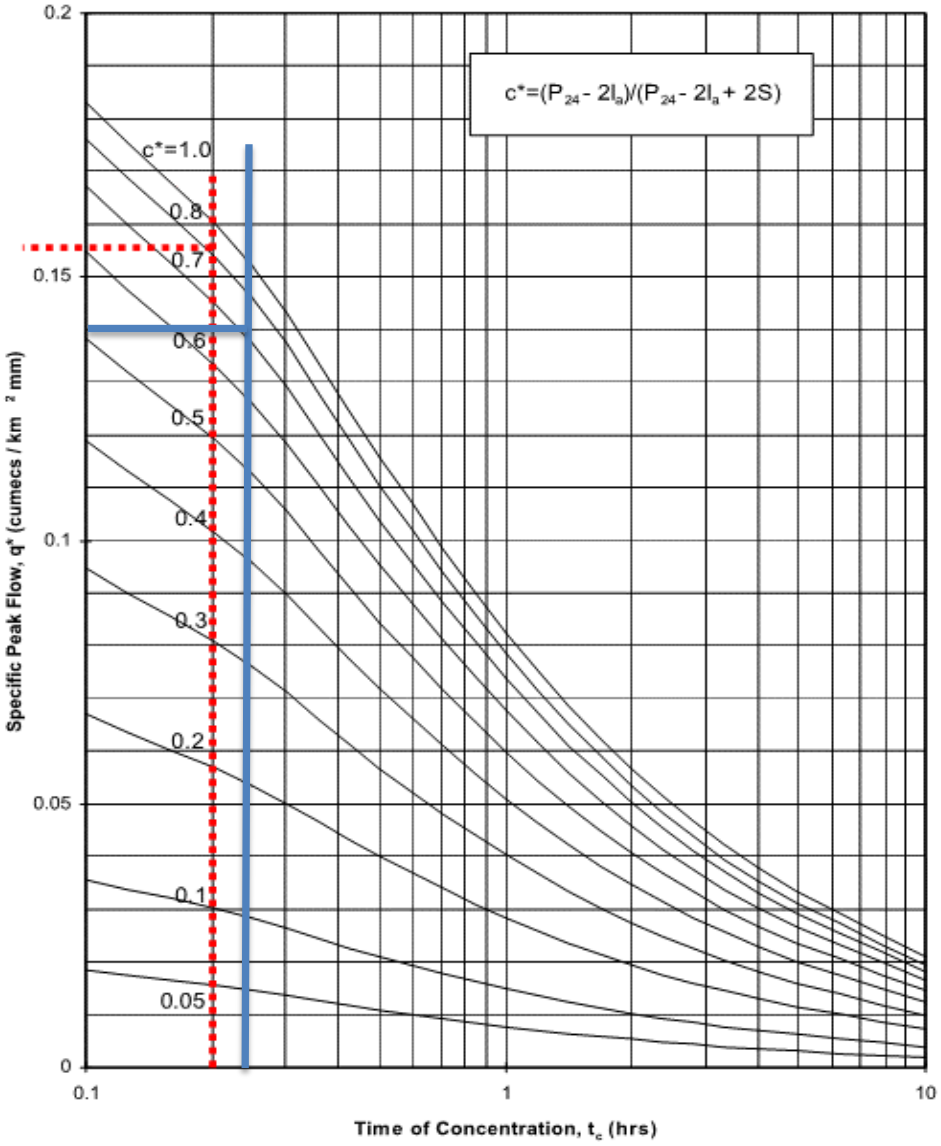
Catchment Area	A=	0.080	km2(100ha =1km2)
Runoff curve number	CN=	88.7	(from worksheet 1)
Initial abstraction	Ia=	1.1	mm (from worksheet 1)
Time of concentration	tc=	0.228	hrs (from worksheet 1)

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

3.	Average recurrence interval, ARI	10	(yr)	
4.	24 hour rainfall depth, P24	167	(mm)	
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.717		
6.	Specific peak flow rate q*	0.140		***HEC-HMS Check***
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**1.877**		Pre-Dev
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	138.7		
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	11139.43	(m3)	

Pre development run off volume	**4256.79**	(m3)
Post development run off volume	**11139.43**	(m3)
Pre development flow rate	**0.41**	(m3/s)
Post development flow rate	**1.88**	(m3/s)

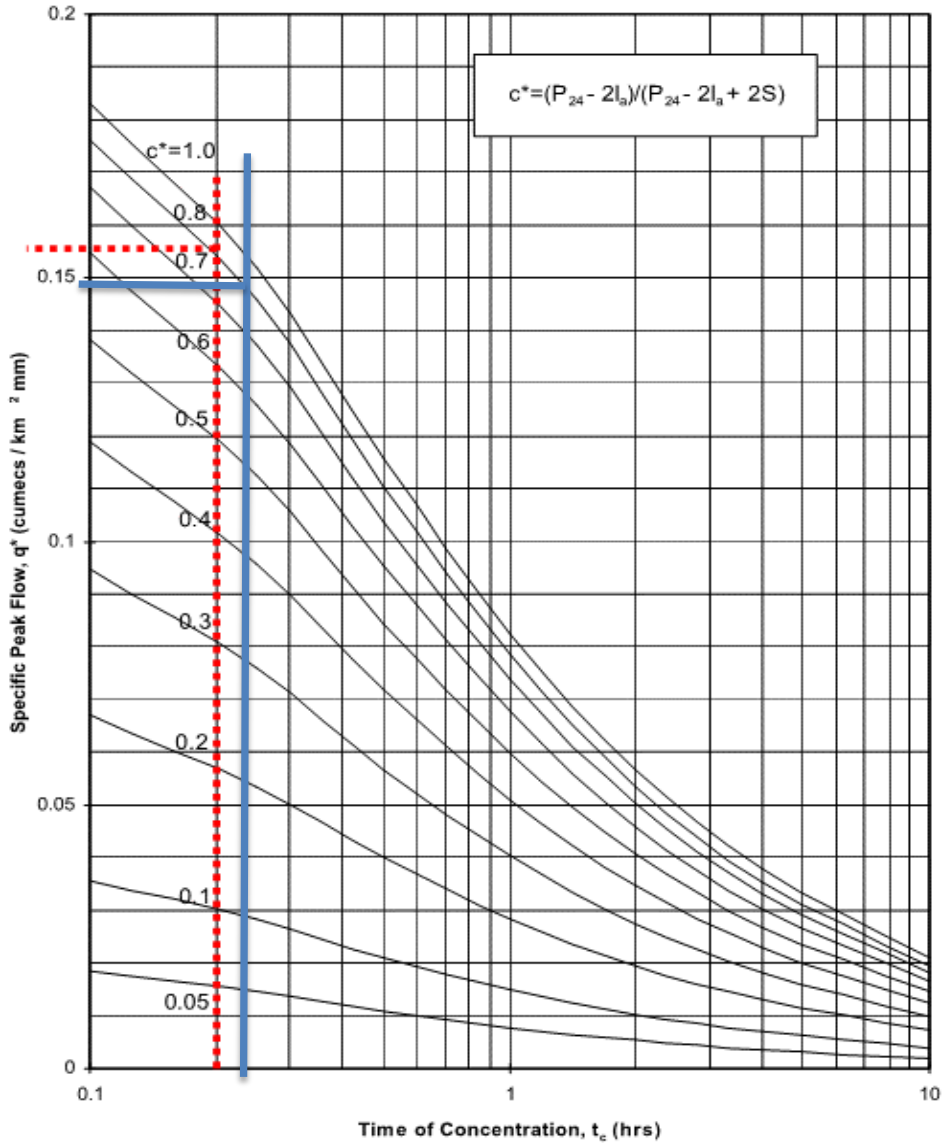
Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates Ltd	Job Number 289001	Sheet 8	Rev A
Job Title / Calc Title: Station Road, Matamata Post-development SW Demand	Author MKS	Date 13/03/2025	Checked DJM

1.	Data						
	Catchment Area	A=	0.080	km2(100ha =1km2)			
	Runoff curve number	CN=	88.7	(from worksheet 1)			
	Initial abstraction	Ia=	1.1	mm (from worksheet 1)			
	Time of concentration	tc=	0.228	hrs (from worksheet 1)			
2.	Calculate storage, S =(1000/CN - 10)25.4		=	33	mm		
3.	Average recurrence interval, ARI		100	(yr)			
4.	24 hour rainfall depth, P24		265	(mm)			
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S		0.802				
6.	Specific peak flow rate q*		0.149			*HEC-HMS Check*	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$		**3.171**			**0.681**	80% Pre
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$		235.0				
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$		18867.28	(m3)			
	Pre development run off volume		**8543.55**	(m3)			
	Post development run off volume		**18867.28**	(m3)			
	Pre development flow rate		**0.85**	(m3/s)			
	Post development flow rate		**3.17**	(m3/s)			
	100yr - 10yr post development		**7727.85**	(m3)			

Worksheet 2: Graphical Peak Flow Rate


c*=(P24 - 2Ia)/(P24 - 2Ia + 2S)
c*=1.0
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.05
0.2
0.15
0.1
0.05
0
0.1
1
10
Specific Peak Flow, q* (cumecs / km ² mm)
Time of Concentration, tc (hrs)

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title / Calc Title	Eldonwood, Matamata Pre-development		Author MHS	Date 25/06/2024	Checked

Catchment Total
Total Catchment 744082

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
B*		Pervious (100%)	61	74.41	4538.90
B		Impervious (0%)	98	0.00	0.00
					0.00
*Refer soakage tab for rationale			Totals =	74.41	4538.90

CN (weighted) = total product / total area = 4538.90 / 74.408 = **61.0**

S= (1000/CN - 10) * 25.4 = (1000/61.0 - 10) *25.4 = **162.4** mm

Ia= 0.05*S = 0.05x 162.4 = **8.1** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$
L= 629 m
S= 5.00 %
n= 0.015
T= 9.117 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33
w= 1 n= 0.04
d= 1 s= 2%
l= 500
(to be completed at detail design)
V= 1.6997074 m/s
T= 4.90 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 9.117 + 0.00 + 4.90 = 14.020 mins
0.2336634 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.157 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 180006.00	Sheet 2	Rev: B
Job Title / Calc Title	Eldonwood, Matamata Pre-development	Author MHS	Date 25/06/2024	Checked

1. Data

Catchment Area	A=	0.744082	km2(100ha =1km2)	
Runoff curve number	CN=	61.0	(from worksheet 1)	
Initial abstraction	Ia=	8.1	mm (from worksheet 1)	
Time of concentration	tc=	0.17	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

	WQV					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24	27.7	(mm)	83	128	200	(mm)
*As per RITS Amendments for Design Rainfall 2020						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.034		0.171	0.256	0.361	
6. Specific peak flow rate q*	0.011		0.052	0.074	0.098	
7. Peak flow rate, $q_p=q*A*P_{24}$	**0.227**	m^3/s	**3.189**	**7.042**	**14.599**	m^3/s
8. Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	2.1		23.6	50.9	103.9	
9. Runoff volume, $V_{24} = 1000xQ_{24}A$	1563	m^3	**17583.55**	**37883.15**	**77329.06**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 180006	Sheet 1	Rev: A
Job Title Calc Title	Eldonwood, Matamata Post development (Pervious)		Author MHS	Date 25/06/2024	Checked

Catchment **Total**
Total Catchmer **744082**

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 (29%)	74	21.58	1596.80
C		Impervious (71%)	98		0.00
					0.00
*Per TR20-06, 5.1, soil group classification reduced by one less post development			Totals =	21.58	1596.80

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1596.80}{21.578} =$ **74.0**

S= $\frac{(1000}{CN}$ -10) * 25.4 $\frac{(1000}{74.0}$ - 10) *25.4 = **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 180006.00	Sheet 2	Rev: B
Job Title Calc Title	Eldonwood, Matamata Post development (Pervious)	Author MHS	Date 25/06/2024	Checked

1. Data

Catchment Area	A=	0.2157838	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	
4. 24 hour rainfall depth, P24	35.2	(mm)	106	167	265	(mm)
*As per RITS Amendments for Design Rainfall 2020						
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	7.9		53.8	105.3	194.4	
9. Runoff volume, V_{24} = 1000xQ_{24}A	1703	m^3	**11612.03**	**22716.66**	**41948.52**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 180006	Sheet 1	Rev: A
Job Title Calc Title	Eldonwood, Matamata Post development (Impervious)		Author MHS	Date 25/06/2024	Checked

Catchment **Total**
Total Catchmer **744082**

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 (29%)	74		0.00
C		Impervious (71%)	98	52.83	5177.32
					0.00
			Totals =	52.83	5177.32

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{5177.32}{52.830}$ = **98.0**

S= $\frac{(1000}{CN}$ -10) * 25.4 $\frac{(1000}{98.0}$ - 10) *25.4 = **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 180006.00	Sheet 2	Rev: B
Job Title Calc Title	Eldonwood, Matamata Post development (Impervious)	Author MHS	Date 25/06/2024	Checked

1. Data

Catchment Area	A=	0.5282982	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					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24	35.2	(mm)	106	167	265	(mm)
*As per RITS Amendments for Design Rainfall 2020						
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	30.5		100.5	162.1	260.0	
9. Runoff volume, V_{24} = 1000xQ_{24}A	16093	m^3	**53098.63**	**85643.20**	**137366.28**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 180006	Sheet 1	Rev: A
Job Title / Calc Title: Eldonwood, Matamata / Post development (whole site)	Author MHS	Date 25/06/2024	Checked

Catchment Total
Total Catchmer 744082

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 (29%)	74	21.58	1596.80
C		Impervious (71%)	98	52.83	5177.32
					0.00
			Totals =	74.41	6774.12

CN (weighted) = total product / total area = 6774.12 / 74.408 = **91.0**

S= (1000/CN - 10) * 25.4 = (1000/91.0 - 10) *25.4 = **25.0** mm

Ia= 0.05*S = 0.05x 25.0 = **1.2** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design)
$T=100nL^{0.33}/S^{0.2}$
L= 629 m
S= 5.00 %
n= 0.015
T= 9.117 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$
R= A / Wp 0.33
w= 1 n= 0.04
d= 1 s= 2%
l= 500
(to be completed at detail design)
V= 1.6997074 m/s
T= 4.90 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 9.117 + 0.00 + 4.90 = 14.020 mins
0.2336634 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.157 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 180006.00	Sheet 2	Rev: B
Job Title / Calc Title	Eldonwood, Matamata Post development (whole site)	Author MHS	Date 25/06/2024	Checked

1. Data

Catchment Area	A=	0.744082	km2(100ha =1km2)	
Runoff curve number	CN=	91.0	(from worksheet 1)	
Initial abstraction	Ia=	1.2	mm (from worksheet 1)	
Time of concentration	tc=	0.17	hrs (from worksheet 1)	

2. Calculate storage, S =(1000/CN - 10)25.4 = 25 mm

	WQV					
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	yr
4. 24 hour rainfall depth, P24	26.4272	35.2	106	167	265	(mm)
*As per RITS Amendments for Design Rainfall 2020						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.324	0.396	0.674	0.767	0.840	
6. Specific peak flow rate q*	0.090	0.105	0.148	0.157	0.162	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**1.767**	**2.758**	**11.663**	**19.563**	**31.967**	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	17583.55	37883.15	77329.06	m^3
Post development run off volume - Pervious	11612.03	22716.66	41948.52	m^3
Post development run off volume - Impervious	53098.63	85643.20	137366.28	m^3
Post development run off volume - total	64710.66	108359.86	179314.81	m^3

Pre development flow rate	3.19	7.04	14.60	m^3/s
80% Pre development flow rate	2.55	5.63	**11.68**	**m^3/s**
Post development flow rate	11.66	19.56	31.97	m^3/s
100yr-10yr			12.4	m^3/s

Post Development minus predevelopment	70476.71	101985.75	
therefore volume Greenway must store =		31509.05	m^3
Detention volume required per WRC TR2020/06	108,360	179,315	m^3
Assume 10yr volume is managed at source via soakage/storage, therefore volume Greenway must store =		70,955	m^3
Soakage and storage beneath invert of Greenway =		0	m^3
Total remaining volume required within greenway =		**70,955**	**m^3**

Does not allow for release at 80% predevelopment into existing stream.
Therefore, undertake HEC-HMS Check

HEC-HMS Outputs

Volume required within Greenway allowing for soakage and discharge via weir to 80% predevelopment	41,000	**m^3**
Peak discharge rate	11.7	**m^3/s**

Refer to HEC-HMS Outputs for details

Maven Associates		Job Number 180006.00	Sheet 2	Rev: A
Job Title Calc Title	Eldonwood, Matamata WQV and ED	Author MHS	Date 25/06/2024	Checked

1. Data

Runoff volume (pervious)	V_p=	1703	m^3	
Runoff volume (impervious)	V_{ip}=	16093	m^3	
Combined volume	V=	17796.0	m^3	
Pre-development initial abstration	I_{a1}=	8.1	mm	
Post-development compacted pervious area CN		74		Class C
Post-development initial abstration of	I_{a2}=	4.5	mm	
Post development Impervious area	A_{ip}=	52.83	ha.	
Post development compacted perviou	A_{pp}=	21.58	ha.	

2. Retention reduction

Impervious surface retention	Vrip=	4289.6	m^3
Pervious surface retention	Vrp=	789.2	m^3

3. Water Quality Volume WQV= 12717.2 m^3

4. Extended Detention Volume ED= 15261 m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number	Sheet	Rev
	289001	1	A

Job Title	Station Road, Matamata	Author	Date	Checked
Calc Title	WW Demand Calc CATCHMENT A	MKS	14/02/2025	DJM

As per Waikato Local Authority RITS standards

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*

Refer to C450-1 for catchment details

No. of residential dwellings =	**100**	
Catchment area =	**7.18**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	323	
Wastewater Peaking factor as per Table 5-2=	3.8	

Using a population value person (max development scenario)

Average Daily Flow (ADF)=	80.78	m^3/day
Peak Daily Flow (PDF)=	3.03	*L/sec*
Peak Wet Weather Flow (PWWF)=	**4.40**	*L/sec*

Pipe Ks (uPVC) = 0.10

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
4.400	0.150	1.00	**22.56**	1.28	OK

Maven Associates	Job Number	Sheet	Rev
	289001	2	A

Job Title	Station Road, Matamata	Author	Date	Checked
Calc Title	WW Demand Calc CATCHMENT B	MKS	20/11/2024	DJM

As per Waikato Local Authority RITS standards

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*

Refer to C450-1 for catchment details

No. of residential dwellings =	**288**	
Catchment area =	**12.63**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	568	
Wastewater Peaking factor as per Table 5-2=	3.3	

Using a population value person (max development scenario)

Average Daily Flow (ADF)=	142.09	*m³/day*
Peak Daily Flow (PDF)=	4.67	*L/sec*
Peak Wet Weather Flow (PWWF)=	**7.08**	*L/sec*

Pipe Ks (uPVC) = 0.10

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
7.082	0.150	1.00	**22.56**	1.28	OK

Maven Associates	Job Number	Sheet	Rev
	289001	3	A

Job Title	Station Road, Matamata	Author	Date	Checked
Calc Title	WW Demand Calc CATCHMENT C	MKS	21/11/2024	DJM

As per Waikato Local Authority RITS standards

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*

Refer to C450-1 for catchment details

No. of residential dwellings =	**130**	
Catchment area =	**7.97**	*Ha*
Population Equivalent as per Table 5-3=	45	*person per Ha*
Total Population	359	
Wastewater Peaking factor as per Table 5-2=	3.7	

Using a population value person (max development scenario)

Average Daily Flow (ADF)=	89.66	m^3/day
Peak Daily Flow (PDF)=	3.28	*L/sec*
Peak Wet Weather Flow (PWWF)=	**4.80**	*L/sec*

Pipe Ks (uPVC) = 0.10

PWW Flow	Pipe dia	Gradient	Capacity	Velocity	Check
l/s	*m*	*%*	*l/s*	*m/s*	*OK*
4.801	0.150	1.00	**22.56**	1.28	OK

Maven Associates	Job Number	Sheet	Rev
	289001	1	B
Job Title Station Road, Matamata	**Author**	**Date**	**Checked**
Calc Title Ashbourne Overall - Water Demand	TCH	28/03/2025	DJM

Water Catchment

As per RITS Standard 6.2.3

3 people per dwelling

Demand 260 l/person/day

Demand Rates

Average Demand = 260 litres/person/day

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

Population	Dwellings	People	Occupancy
Proposed Dwellings	518	3	1554
Commercial Unit (0.95ha x 45 person per ha)		45	45
Total			1599

Demand	Persons	Rate l/p/day	Flow l/s
AD Water	1599	260	4.81
PD Water	1599	1300	24.06

Peak Demand	Persons	Rate l/p/day	Flow l/s
PD Water	1599	1300	**24.06**

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title / Calc Title	Ashbourne RG - A Pre-development		Author MKS	Date 13/03/2025	Checked DJM

Eastern Rain Gardens
Total Catchment 27600

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=1ha	Product of CN x area
B		Open Space (Sandy Loam or Silty Loam)	61	2.76	168.36
			Totals =	2.76	168.36

CN (weighted) = total product / total area = 168.36 / 2.760 = **61.0**

S= (1000/CN - 10) * 25.4 = (1000/61.0 - 10) *2 66 = **162.4** mm

Ia= 0.05*S = 0.05x 162.4 = **8.1** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$ L= m; S= %; n=; T= 0.000 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33 w= 1 d= 1 l= 50 n= 0.04 s= 1%

(to be completed at detail design) V= 1.201874642 m/s; T= 0.69 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 0 + 0.00 + 0.69 = 0.693 mins

0.011556021 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.008 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 2	Rev: A
Job Title Calc Title	Ashbourne RG - A Pre-development	Author MKS	Date 13/03/2025	Checked DJM

Ea Data

Catchment Area A= 0.0276 km2(100ha =1km2)

Runoff curve number CN= 61.0 (from worksheet 1)

Initial abstraction Ia= 8.1 mm (from worksheet 1)

Catchment R1 (Impervious Area) 98

Time of con Catchment R1 (pervious Area) 74

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

		WQV					
3.	Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4.	24 hour rainfall depth, P24	32.3	(mm)	97	152	240	(mm)
	*as per HIRDS RCP6.0 for the period 2081-2100						
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.047		0.199	0.295	0.408	
6.	Specific peak flow rate q*	0.015		0.059	0.083	0.108	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**0.014**	m^3/s				m^3/s
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	3.1		31.4	67.6	136.4	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	87	m^3	**867.71**	1865.53	3763.91	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 3	Rev: A
Job Title Calc Title	Ashbourne RG - A Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 27600

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 (10%)	74	0.276	20.42
					0.00
			Totals =	0.276	20.42

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{20.42}{0.276} =$ **74.0**

S= $\frac{(1000}{CN}$ -10) * 25.4 $\frac{(1000}{74.0}$ - 10) *25.4 = **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	Sheet 4	Rev: A
Job Title Calc Title	Ashbourne RG - A Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.00276	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	
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	6.6		47.1	91.9	170.8	
9. Runoff volume, V_{24} = 1000xQ_{24}A	18	m^3	**130.02**	**253.73**	**471.45**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 5	Rev: A
Job Title / Calc Title	Ashbourne RG - A Post development (Impervious)		Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 27600

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		Impervious	98	2.48	243.43
					0.00
			Totals =	2.48	243.43

CN (weighted) = total product / total area = 243.43 / 2.484 = **98.0**

S= (1000/CN -10) * 25.4 = (1000/98.0 - 10) *25.4 = **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 6	Rev: A
Job Title Calc Title	Ashbourne RG - A Post development (Impervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.0248	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					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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	27.6		91.8	146.7	234.7	
9. Runoff volume, V_{24} = 1000xQ_{24}A	686	m^3	**2280.83**	**3644.73**	**5829.12**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 289001	Sheet 7	Rev: A
Job Title / Calc Title: Ashbourne RG - A / Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 27600

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		Impervious (90%)	98	2.48	243.43
C		Pervious (10%)	74	0.28	20.42
			Totals =	2.76	263.86

CN (weighted) = total product / total area = 263.86 / 2.760 = **95.6**

S= (1000/CN - 10) * 25.4 = (1000/95.6 - 10) *25.4 = **11.7** mm

Ia= 0.05*S = 0.05x 11.7 = **0.6** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$
L= 629 m
S= 5.00 %
n= 0.015
T= 9.117 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33
w= 1 n= 0.04
d= 1 s= 2%
l= 500
(to be completed at detail design)
V= 1.6997074 m/s
T= 4.90 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 9.117 + 0.00 + 4.90 = 14.020 mins
0.2336634 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.157 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 8	Rev: A
Job Title Calc Title	Ashbourne RG - A Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.0276	km2(100ha =1km2)
Runoff curve number	CN=	95.6	(from worksheet 1)
Initial abstraction	Ia=	0.6	mm (from worksheet 1)
Time of concentration	tc=	0.17	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 12 mm

		WQV				
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	yr
4. 24 hour rainfall depth, P24	24.25	32.3	97	152	240	(mm)
as per HIRDS RCP 6.0 2081-2100 data						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.497	0.571	0.804	0.866	0.911	
6. Specific peak flow rate q*	0.124	0.135	0.160	0.163	0.165	
7. Peak flow rate, $q_p=q^*A^*P_{24}$	**0.083**	**0.121**	**0.428**	**0.685**	**1.092**	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	867.71	1865.53	3763.91	m^3
Post development run off volume - Pervious	130.02	253.73	471.45	m^3
Post development run off volume - Impervious	2280.83	3644.73	5829.12	m^3
Post development run off volume - total	2410.84	3898.46	6300.58	m^3

Pre development flow rate	0.16	0.35	0.71	m^3/s
Post development flow rate	0.43	0.68	1.09	m^3/s

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 9	Rev: A
Job Title Calc Title	Ashbourne RG - A WQV and ED	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Runoff volume (pervious)	V_p=	18	m^3	
Runoff volume (impervious)	V_{ip}=	686	m^3	
Combined volume	V=	704	m^3	
Pre-development initial abstration	I_{a1}=	8.1	mm	
Post-development compacted pervious area CN		74		Class C
Post-development initial abstration of	I_{a2}=	4.5	mm	
Post development Impervious area	A_{ip}=	2.48	ha.	
Post development compacted perviou	A_{pp}=	0.28	ha.	

2. Retention reduction

Impervious surface retention	Vrip=	201.7	m^3
Pervious surface retention	Vrp=	10.1	m^3

3. Water Quality Volume WQV= 492 m^3

4. Extended Detention Volume ED= 591 m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title Calc Title	Ashbourne RG - B Pre-development		Author MKS	Date 13/03/2025	Checked DJM

Eastern Rain Gardens
Total Catchment 59600

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=1ha	Product of CN x area
B		Open Space (Sandy Loam or Silty Loam)	61	5.96	363.56
			Totals =	5.96	363.56

CN (weighted) = total product / total area = 363.56 / 5.960 = **61.0**

S= (1000/CN - 10) * 25.4 = (1000/61.0 - 10) *25.4 = 66 = **162.4** mm

Ia= 0.05*S = 0.05x 162.4 = **8.1** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$
L= m
S= %
n=
T= 0.000 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$
R= A / Wp 0.33
w= 1 n= 0.04
d= 1 s= 1%
l= 50
(to be completed at detail design)
V= 1.201874642 m/s
T= 0.69 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 0 + 0.00 + 0.69 = 0.693 mins
0.011556021 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.008 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 2	Rev: A
Job Title Calc Title	Ashbourne RG - B Pre-development	Author MKS	Date 13/03/2025	Checked DJM

Ea Data

Catchment Area A= 0.0596 km2(100ha =1km2)

Runoff curve number CN= 61.0 (from worksheet 1)

Initial abstraction Ia= 8.1 mm (from worksheet 1)

Catchment R1 (Impervious Area) 98

Time of con Catchment R1 (pervious Area) 74

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

		WQV					
3.	Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4.	24 hour rainfall depth, P24	32.3	(mm)	97	152	240	(mm)
	*as per HIRDS RCP6.0 for the period 2081-2100						
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.047		0.199	0.295	0.408	
6.	Specific peak flow rate q*	0.015		0.059	0.083	0.108	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**0.029**	m^3/s				m^3/s
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	3.1		31.4	67.6	136.4	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	187	m^3	**1873.74**	4028.46	8127.86	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 3	Rev: A
Job Title Calc Title	Ashbourne RG - B Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 59600

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 (10%)	74	0.596	44.10
					0.00
			Totals =	0.596	44.10

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{44.10}{0.596}$ = **74.0**

S= $\frac{(1000}{CN}$ -10) * 25.4 $\frac{(1000}{74.0}$ - 10) *25.4 = **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	Sheet 4	Rev: A
Job Title Calc Title	Ashbourne RG - B Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.00596	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	
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	6.6		47.1	91.9	170.8	
9. Runoff volume, V_{24} = 1000xQ_{24}A	40	m^3	**280.76**	**547.91**	**1018.07**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 5	Rev: A
Job Title	Ashbourne RG - B	Author	Date	Checked
Calc Title	Post development (Impervious)	MKS	13/03/2025	DJM

Wetland 0
Total Catchmer 59600

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		Impervious	98	5.36	525.67
					0.00
			Totals =	5.36	525.67

CN (weighted) = total product / total area = 525.67 / 5.364 = **98.0**

S= (1000 / CN -10) * 25.4 = (1000 / 98.0 - 10) *25.4 = **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	Sheet 6	Rev: A
Job Title Calc Title	Ashbourne RG - B Post development (Impervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.05364	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					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	27.6		91.8	146.7	234.7	
9. Runoff volume, V_{24} = 1000xQ_{24}A	1481	m^3	**4925.27**	**7870.51**	**12587.53**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 289001	Sheet 7	Rev: A
Job Title / Calc Title: Ashbourne RG - B / Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 59600

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		Impervious (90%)	98	5.36	525.67
C		Pervious (10%)	74	0.60	44.10
			Totals =	5.96	569.78

CN (weighted) = total product / total area = 569.78 / 5.960 = **95.6**

S= (1000/CN - 10) * 25.4 = (1000/95.6 - 10) *25.4 = **11.7** mm

Ia= 0.05*S = 0.05x 11.7 = **0.6** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$
L= 629 m
S= 5.00 %
n= 0.015
T= 9.117 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33
w= 1 n= 0.04
d= 1 s= 2%
l= 500
(to be completed at detail design)
V= 1.6997074 m/s
T= 4.90 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 9.117 + 0.00 + 4.90 = 14.020 mins
0.2336634 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.157 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 8	Rev: A
Job Title Calc Title	Ashbourne RG - B Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.0596	km2(100ha =1km2)
Runoff curve number	CN=	95.6	(from worksheet 1)
Initial abstraction	Ia=	0.6	mm (from worksheet 1)
Time of concentration	tc=	0.17	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 12 mm

		WQV				
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	yr
4. 24 hour rainfall depth, P24	24.25	32.3	97	152	240	(mm)
as per HIRDS RCP 6.0 2081-2100 data						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.497	0.571	0.804	0.866	0.911	
6. Specific peak flow rate q*	0.124	0.135	0.160	0.163	0.165	
7. Peak flow rate, $q_p=q*A*P_{24}$	**0.179**	**0.261**	**0.923**	**1.478**	**2.359**	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	1873.74	4028.46	8127.86	m^3
Post development run off volume - Pervious	280.76	547.91	1018.07	m^3
Post development run off volume - Impervious	4925.27	7870.51	12587.53	m^3
Post development run off volume - total	5206.03	8418.42	13605.60	m^3

Pre development flow rate	0.34	0.75	1.54	m^3/s
Post development flow rate	0.92	1.48	2.36	m^3/s

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 9	Rev: A
Job Title Calc Title	Ashbourne RG - B WQV and ED	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Runoff volume (pervious)	V_p=	40	m^3	
Runoff volume (impervious)	V_{ip}=	1481	m^3	
Combined volume	V=	1521	m^3	
Pre-development initial abstration	I_{a1}=	8.1	mm	
Post-development compacted pervious area CN		74		Class C
Post-development initial abstration of	I_{a2}=	4.5	mm	
Post development Impervious area	A_{ip}=	5.36	ha.	
Post development compacted perviou	A_{pp}=	0.60	ha.	

2. Retention reduction

Impervious surface retention	Vrip=	435.5	m^3
Pervious surface retention	Vrp=	21.8	m^3

3. Water Quality Volume WQV= 1063 m^3

4. Extended Detention Volume ED= 1276 m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title / Calc Title	Ashbourne RG - C Pre-development		Author MKS	Date 13/03/2025	Checked DJM

Eastern Rain Gardens
Total Catchment 10700

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=1ha	Product of CN x area
B		Open Space (Sandy Loam or Silty Loam)	61	1.07	65.27
			Totals =	1.07	65.27

CN (weighted) = total product / total area = 65.27 / 1.070 = **61.0**

S= (1000/CN - 10) * 25.4 = (1000/61.0 - 10) * 25.4 = 66 = **162.4** mm

Ia= 0.05*S = 0.05 x 162.4 = **8.1** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$ L= m; S= %; n=; T= 0.000 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33 w= 1 d= 1 l= 50 n= 0.04 s= 1%

(to be completed at detail design) V= 1.201874642 m/s; T= 0.69 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 0 + 0.00 + 0.69 = 0.693 mins

0.011556021 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.008 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 2	Rev: A
Job Title Calc Title	Ashbourne RG - C Pre-development	Author MKS	Date 13/03/2025	Checked DJM

Ea Data

Catchment Area A= 0.0107 km2(100ha =1km2)

Runoff curve number CN= 61.0 (from worksheet 1)

Initial abstraction Ia= 8.1 mm (from worksheet 1)

Catchment R1 (Impervious Area) 98

Time of con Catchment R1 (pervious Area) 74

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

		WQV					
3.	Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4.	24 hour rainfall depth, P24	32.3	(mm)	97	152	240	(mm)
	*as per HIRDS RCP6.0 for the period 2081-2100						
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.047		0.199	0.295	0.408	
6.	Specific peak flow rate q*	0.015		0.059	0.083	0.108	
7.	Peak flow rate, $q_p=q^*A^*P_{24}$	**0.005**	m^3/s				m^3/s
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	3.1		31.4	67.6	136.4	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	34	m^3	**336.39**	723.23	1459.20	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 3	Rev: A
Job Title Calc Title	Ashbourne RG - C Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 10700

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 (10%)	74	0.11	7.92
					0.00
			Totals =	0.11	7.92

CN (weighted) = total product / total area = 7.92 / 0.107 = **74.0**

S= (1000 / CN -10) * 25.4 = (1000 / 74.0 - 10) *25.4 = **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	Sheet 4	Rev: A
Job Title Calc Title	Ashbourne RG - C Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.00107	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	
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	6.6		47.1	91.9	170.8	
9. Runoff volume, V_{24} = 1000xQ_{24}A	7	m^3	**50.41**	**98.37**	**182.77**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 5	Rev: A
Job Title Calc Title	Ashbourne RG - C Post development (Impervious)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 10700

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		Impervious	98	0.96	94.37
					0.00
			Totals =	0.96	94.37

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{94.37}{0.963}$ = **98.0**

S= $\frac{(1000}{CN}$ -10) * 25.4 $\frac{(1000}{98.0}$ - 10) *25.4 = **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	Sheet 6	Rev: A
Job Title Calc Title	Ashbourne RG - C Post development (Impervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.00963	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					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	27.6		91.8	146.7	234.7	
9. Runoff volume, V_{24} = 1000xQ_{24}A	266	m^3	**884.23**	**1412.99**	**2259.84**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 289001	Sheet 7	Rev: A
Job Title / Calc Title: Ashbourne RG - C / Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 10700

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		Impervious (90%)	98	0.96	94.37
C		Pervious (10%)	74	0.11	7.92
			Totals =	1.07	102.29

CN (weighted) = total product / total area = 102.29 / 1.070 = **95.6**

S= (1000/CN - 10) * 25.4 = (1000/95.6 - 10) *25.4 = **11.7** mm

Ia= 0.05*S = 0.05x 11.7 = **0.6** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$

L= 629 m
S= 5.00 %
n= 0.015
T= 9.117 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33

w= 1 n= 0.04
d= 1 s= 2%
l= 500

(to be completed at detail design)

V= 1.6997074 m/s
T= 4.90 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 9.117 + 0.00 + 4.90 = 14.020 mins
0.2336634 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.157 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 8	Rev: A
Job Title Calc Title	Ashbourne RG - C Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.0107	km2(100ha =1km2)
Runoff curve number	CN=	95.6	(from worksheet 1)
Initial abstraction	Ia=	0.6	mm (from worksheet 1)
Time of concentration	tc=	0.17	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 12 mm

		WQV				
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	yr
4. 24 hour rainfall depth, P24	24.25	32.3	97	152	240	(mm)
as per HIRDS RCP 6.0 2081-2100 data						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.497	0.571	0.804	0.866	0.911	
6. Specific peak flow rate q*	0.124	0.135	0.160	0.163	0.165	
7. Peak flow rate, $q_p=q*A*P_{24}$	**0.032**	**0.047**	**0.166**	**0.265**	**0.424**	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	336.39	723.23	1459.20	m^3
Post development run off volume - Pervious	50.41	98.37	182.77	m^3
Post development run off volume - Impervious	884.23	1412.99	2259.84	m^3
Post development run off volume - total	934.64	1511.36	2442.62	m^3

Pre development flow rate	0.06	0.14	0.28	m^3/s
Post development flow rate	0.17	0.27	0.42	m^3/s

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 9	Rev: A
Job Title Calc Title	Ashbourne RG - C WQV and ED	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Runoff volume (pervious)	V_p=	7	m^3	
Runoff volume (impervious)	V_{ip}=	266	m^3	
Combined volume	V=	273	m^3	
Pre-development initial abstration	I_{a1}=	8.1	mm	
Post-development compacted pervious area CN		74		Class C
Post-development initial abstration of	I_{a2}=	4.5	mm	
Post development Impervious area	A_{ip}=	0.96	ha.	
Post development compacted perviou	A_{pp}=	0.11	ha.	

2. Retention reduction

Impervious surface retention	Vrip=	78.2	m^3
Pervious surface retention	Vrp=	3.9	m^3

3. Water Quality Volume WQV= 191 m^3

4. Extended Detention Volume ED= 229 m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 1	Rev: A
Job Title Calc Title	Ashbourne RG - D Pre-development		Author MKS	Date 13/03/2025	Checked DJM

Eastern Rain Gardens
Total Catchment 21700

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=1ha	Product of CN x area
B		Open Space (Sandy Loam or Silty Loam)	61	2.17	132.37
			Totals =	2.17	132.37

CN (weighted) = total product / total area = 132.37 / 2.170 = **61.0**

S= (1000/CN - 10) * 25.4 = (1000/61.0 - 10) * 25.4 = 66 = **162.4** mm

Ia= 0.05*S = 0.05 x 162.4 = **8.1** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$
L= m
S= %
n=
T= 0.000 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$
R= A / Wp 0.33
w= 1 n= 0.04
d= 1 s= 1%
l= 50
(to be completed at detail design)
V= 1.201874642 m/s
T= 0.69 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 0 + 0.00 + 0.69 = 0.693 mins
0.011556021 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.008 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 2	Rev: A
Job Title Calc Title	Ashbourne RG - D Pre-development	Author MKS	Date 13/03/2025	Checked DJM

Ea Data

Catchment Area A= 0.0217 km2(100ha =1km2)

Runoff curve number CN= 61.0 (from worksheet 1)

Initial abstraction Ia= 8.1 mm (from worksheet 1)

Catchment R1 (Impervious Area) 98

Time of con Catchment R1 (pervious Area) 74

2. Calculate storage, S =(1000/CN - 10)25.4 = 162 mm

		WQV					
3.	Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4.	24 hour rainfall depth, P24	32.3	(mm)	97	152	240	(mm)
	*as per HIRDS RCP6.0 for the period 2081-2100						
5.	Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.047		0.199	0.295	0.408	
6.	Specific peak flow rate q*	0.015		0.059	0.083	0.108	
7.	Peak flow rate, $q_p=q*A*P_{24}$	**0.011**	m^3/s				m^3/s
8.	Runoff depth, $Q_{24} = (P_{24}-Ia)^2/(P_{24}-Ia)+S$	3.1		31.4	67.6	136.4	
9.	Runoff volume, $V_{24} = 1000xQ_{24}A$	68	m^3	**682.22**	1466.74	2959.30	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 3	Rev: A
Job Title Calc Title	Ashbourne RG - D Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 21700

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 (10%)	74	0.217	16.06
					0.00
			Totals =	0.217	16.06

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{16.06}{0.217}$ = **74.0**

S= $\frac{(1000}{CN}$ -10) * 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	Sheet 4	Rev: A
Job Title Calc Title	Ashbourne RG - D Post development (Pervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.00217	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	
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	6.6		47.1	91.9	170.8	
9. Runoff volume, V_{24} = 1000xQ_{24}A	14	m^3	**102.22**	**199.49**	**370.67**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 5	Rev: A
Job Title Calc Title	Ashbourne RG - D Post development (Impervious)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 21700

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		Impervious	98	1.95	191.39
					0.00
			Totals =	1.95	191.39

CN (weighted) = total product / total area = 191.39 / 1.953 = **98.0**

S= (1000/CN -10) * 25.4 = (1000/98.0 - 10) *25.4 = **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	Sheet 6	Rev: A
Job Title Calc Title	Ashbourne RG - D Post development (Impervious)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.01953	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					
3. Average recurrence interval, ARI	1/3 of 2yr	(yr)	2	10	100	yr
4. 24 hour rainfall depth, P24 as per HIRDS RCP 6.0 2081-2100 data	32.3	(mm)	97	152	240	(mm)
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} = $(P_{24}-Ia)^2/(P_{24}-Ia)+S$	27.6		91.8	146.7	234.7	
9. Runoff volume, V_{24} = 1000xQ_{24}A	539	m^3	**1793.26**	**2865.61**	**4583.04**	m^3

Worksheet 2: Graphical Peak Flow Rate

Maven Associates	Job Number 289001	Sheet 7	Rev: A
Job Title / Calc Title: Ashbourne RG - D / Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

Wetland 0
Total Catchmer 21700

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		Impervious (90%)	98	1.95	191.39
C		Pervious (10%)	74	0.22	16.06
			Totals =	2.17	207.45

CN (weighted) = total product / total area = 207.45 / 2.170 = **95.6**

S= (1000/CN - 10) * 25.4 = (1000/95.6 - 10) *25.4 = **11.7** mm

Ia= 0.05*S = 0.05x 11.7 = **0.6** mm

2. Time of Concentration

Sheet and Shallow Flow (to be completed at detail design) $T=100nL^{0.33}/S^{0.2}$

L= 629 m
S= 5.00 %
n= 0.015
T= 9.117 mins

Concentrated Network Flow (to be completed at detail design) 0

Open Channel Flow $V=R^{2/3}S^{1/2}/n$ R= A / Wp 0.33

w= 1 n= 0.04
d= 1 s= 2%
l= 500

(to be completed at detail design)

V= 1.6997074 m/s
T= 4.90 mins

$Tc = T_{sheet\ flow} + T_{concentrated\ flow} + T_{open\ channel\ flow}$

= 9.117 + 0.00 + 4.90 = 14.020 mins
0.2336634 hrs

SCS Lag for HEC-HMS…. $t_p = 2/3\ t_c$ = 0.157 hrs

NO GOOD use **0.17** hrs

Worksheet 1: Runoff Parameters and Time of Concentration

Maven Associates		Job Number 289001	Sheet 8	Rev: A
Job Title Calc Title	Ashbourne RG - D Post development (whole site)	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Catchment Area	A=	0.0217	km2(100ha =1km2)
Runoff curve number	CN=	95.6	(from worksheet 1)
Initial abstraction	Ia=	0.6	mm (from worksheet 1)
Time of concentration	tc=	0.17	hrs (from worksheet 1)

2. Calculate storage, S =(1000/CN - 10)25.4 = 12 mm

		WQV				
3. Average recurrence interval, ARI	1/4 of 2yr	1/3 of 2yr	2	10	100	yr
4. 24 hour rainfall depth, P24	24.25	32.3	97	152	240	(mm)
as per HIRDS RCP 6.0 2081-2100 data						
5. Compute c* = P24 - 2Ia/P24 - 2Ia+2S	0.497	0.571	0.804	0.866	0.911	
6. Specific peak flow rate q*	0.124	0.135	0.160	0.163	0.165	
7. Peak flow rate, $q_p=q*A*P_{24}$	**0.065**	**0.095**	**0.336**	**0.538**	**0.859**	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	682.22	1466.74	2959.30	m^3
Post development run off volume - Pervious	102.22	199.49	370.67	m^3
Post development run off volume - Impervious	1793.26	2865.61	4583.04	m^3
Post development run off volume - total	1895.48	3065.09	4953.72	m^3
Pre development flow rate	0.12	0.27	0.56	m^3/s
Post development flow rate	0.34	0.54	0.86	m^3/s

Worksheet 2: Graphical Peak Flow Rate

Maven Associates		Job Number 289001	Sheet 9	Rev: A
Job Title Calc Title	Ashbourne RG - D WQV and ED	Author MKS	Date 13/03/2025	Checked DJM

1. Data

Runoff volume (pervious)	V_p=	14	m^3	
Runoff volume (impervious)	V_{ip}=	539	m^3	
Combined volume	V=	554	m^3	
Pre-development initial abstration	I_{a1}=	8.1	mm	
Post-development compacted pervious area CN		74		Class C
Post-development initial abstration of	I_{a2}=	4.5	mm	
Post development Impervious area	A_{ip}=	1.95	ha.	
Post development compacted perviou	A_{pp}=	0.22	ha.	

2. Retention reduction

Impervious surface retention	Vrip=	158.6	m^3
Pervious surface retention	Vrp=	7.9	m^3

3. Water Quality Volume WQV= 387 m^3

4. Extended Detention Volume ED= 465 m^3

Worksheet 2: Graphical Peak Flow Rate

Appendix C –Integrated 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
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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

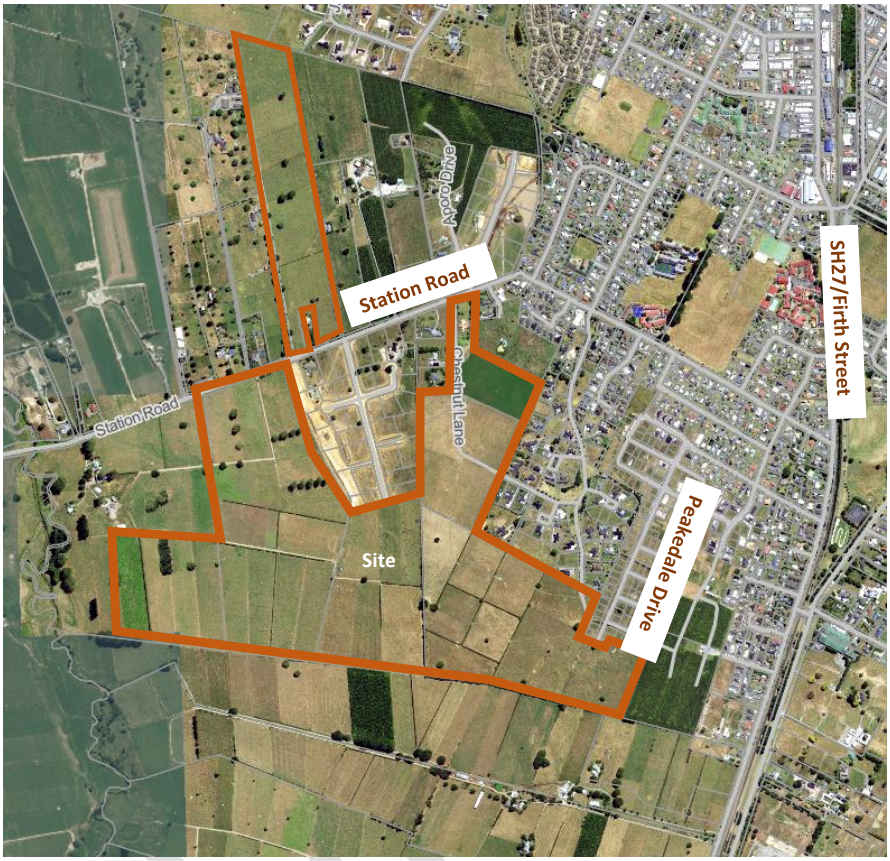
Matamata is located in central Waikato, within the Matamata - Piako District. It is approximately two hours from Auckland, 55 mins from Hamilton, 45 mins from Tauranga and 55 mins from Rotorua.

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.

DRAFT

Figure 2-1: Site Location and Context



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

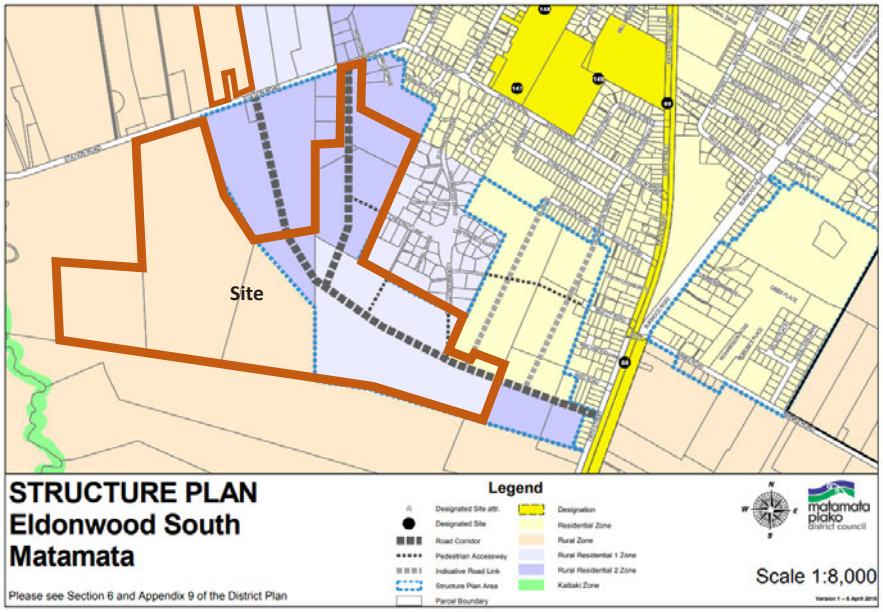
The site is proposed to have three connections to the existing road network, with two new intersections on Station Road and a connection to Peakedale Drive in the south.

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)

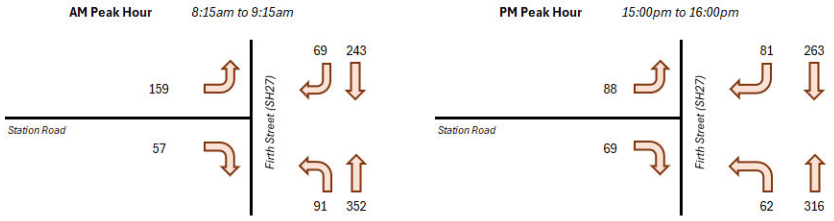
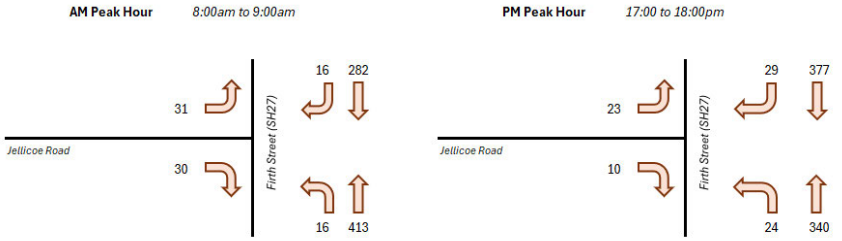


Figure 3-6: Turning Movement Vehicle Volumes at Jellicoe Road and Firth Street (SH27)



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

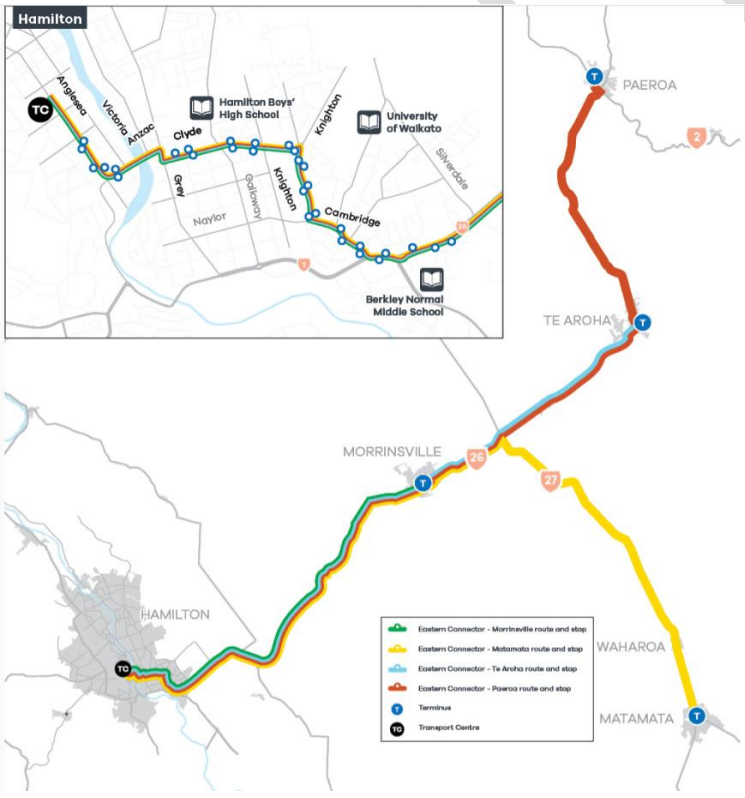
The proposed development area is well located in terms of connections to the roading network. Matamata is located at the intersection of State Highway 24 and State Highway 27, and the proposed plan change connects to Station Road, which in turn connects to SH27.

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



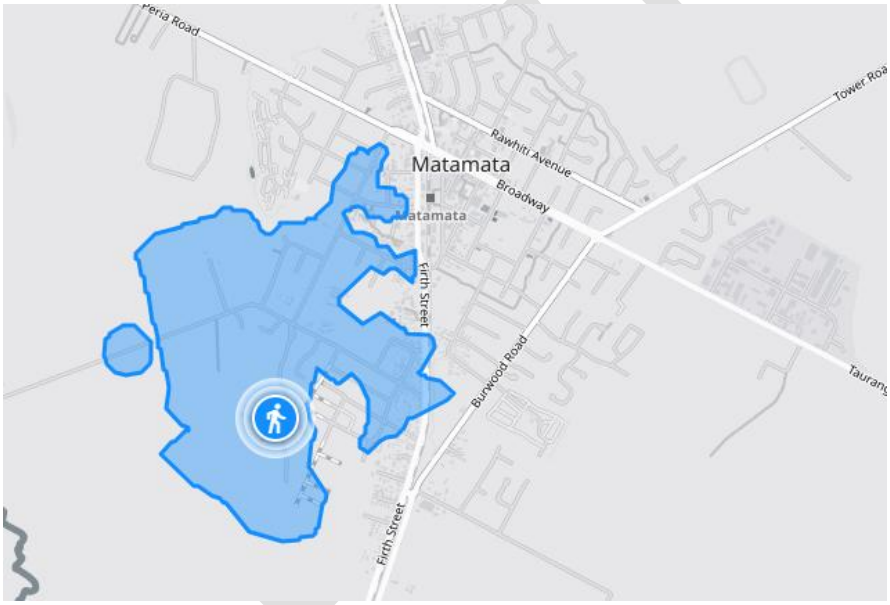
3.4.3 Walking

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.

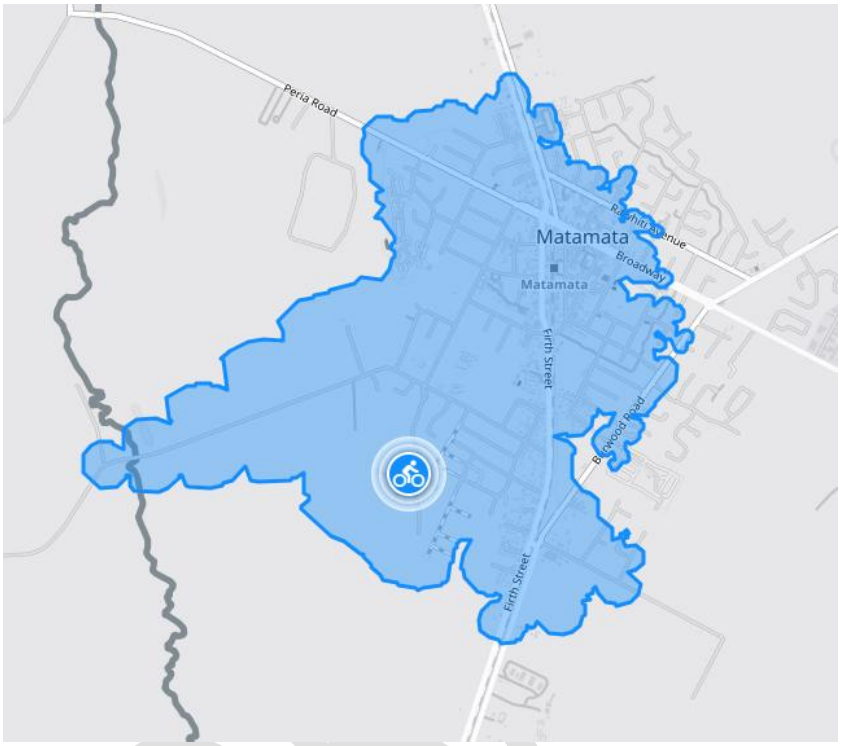
Figure 3-12: Walking Catchment



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)

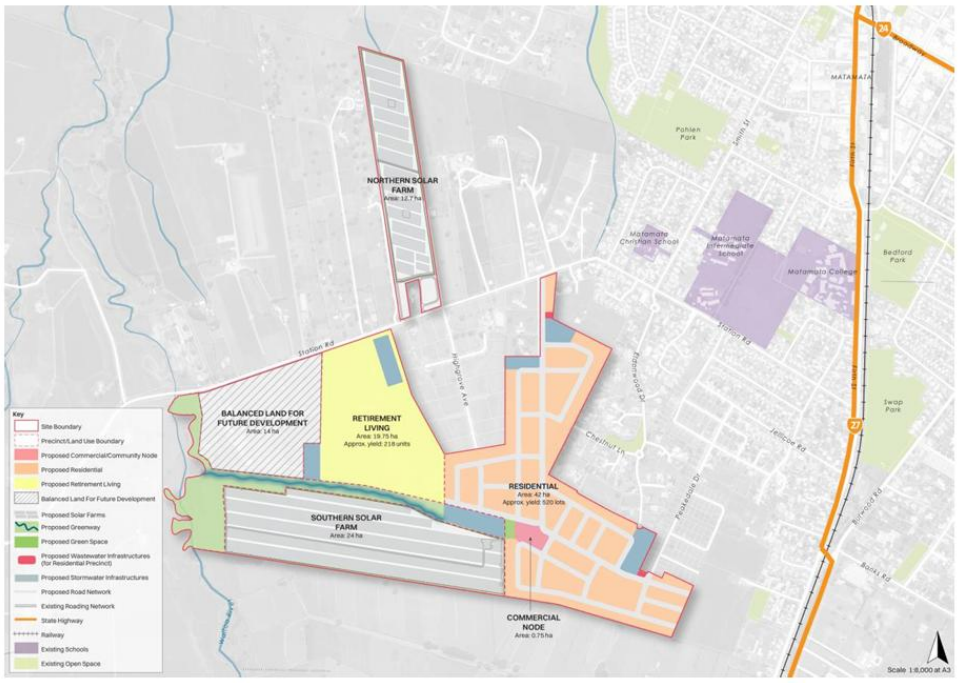
Based on the above, no definitive patterns or safety concerns are identifiable, and as such no road safety matters related to the proposed development have been identified.

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

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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.

DRAFT

[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.

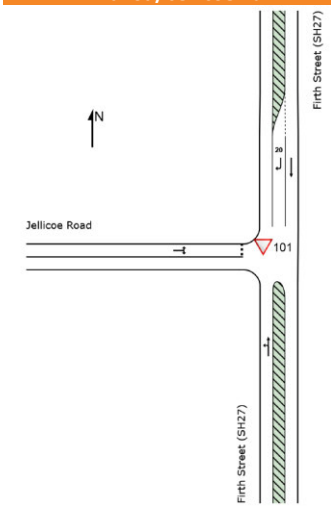
The intersection layouts modelled are shown in Figure 5-2, and the performance of these intersections are summarised in the SIDRA results in Figure 5-3 to Figure 5-5.

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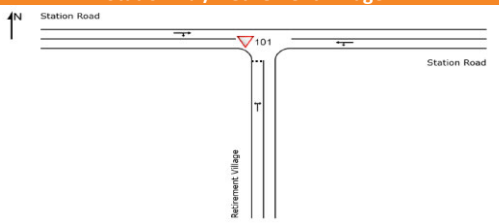
[7] Austroads Guide to Road Design Part 4A, Unsignalised and Signalised Intersections, Table 3.5: Critical acceptance gaps and follow-up headways

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.

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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	0.83	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

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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		

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6.1.1.1 Road 1 and 7 Cross-section

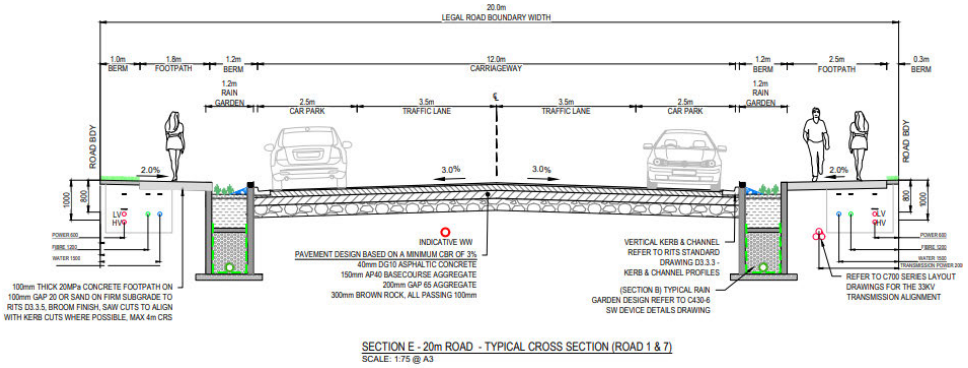
Road 1 provides the main access from Station Road into the site, with Road 7 providing the main southern entrance from Road 1 to the retirement village. Based on the definitions in Table 3.1 of the MPDCDM, Road 1 is anticipated to act as a sub collector road and Road 7 as a local road.

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



SECTION E - 20m ROAD - TYPICAL CROSS SECTION (ROAD 1 & 7)
SCALE: 1:75 @ A3

This meets the road reserve, carriageway and parking dimensional requirements of the MPDCDM and exceeds the pedestrian requirements, thus is considered acceptable.

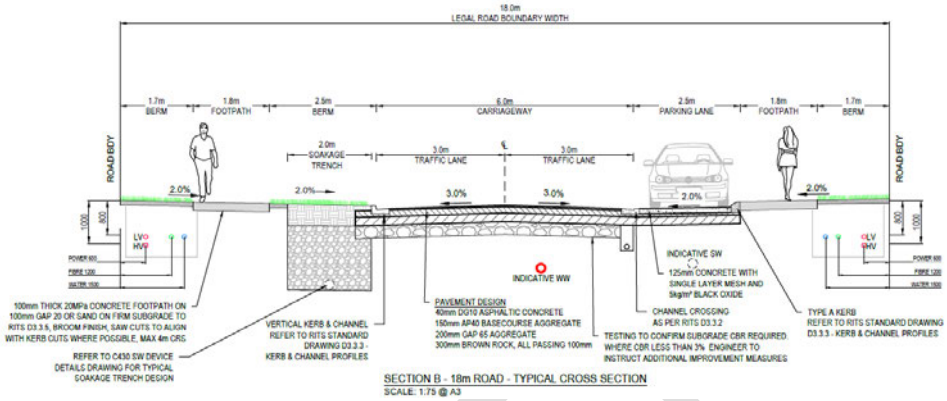
6.1.1.2 Other road cross-sections

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

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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

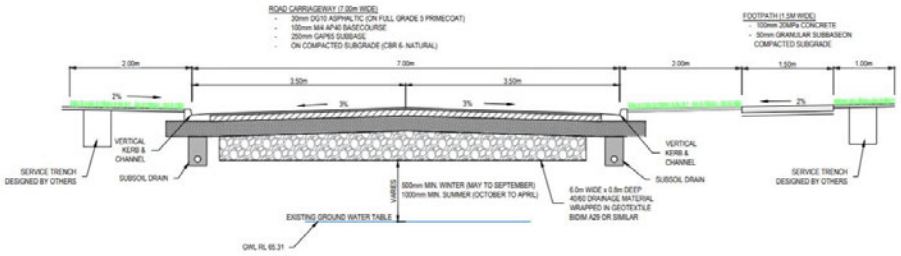


Figure 6-5: Cross Section for Roads 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13 and Road 15

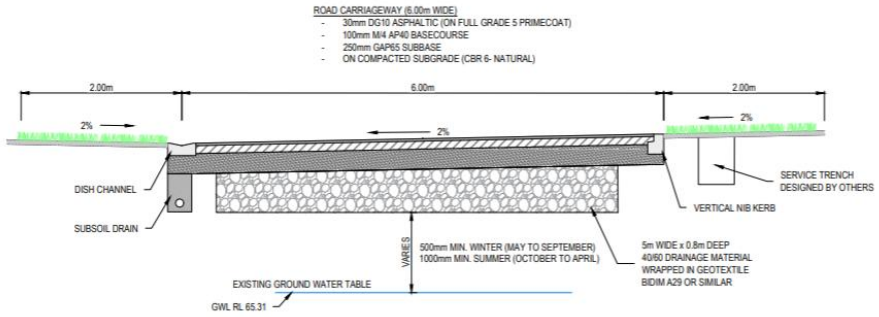
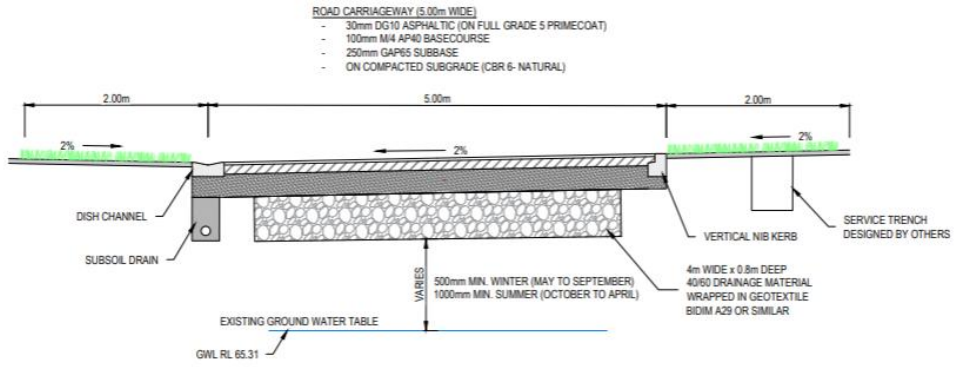


Figure 6-6: Cross Section for Road 14



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

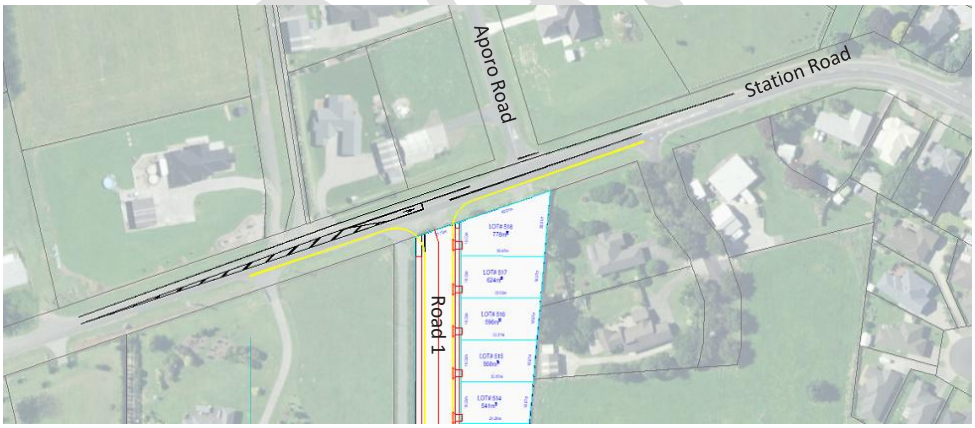
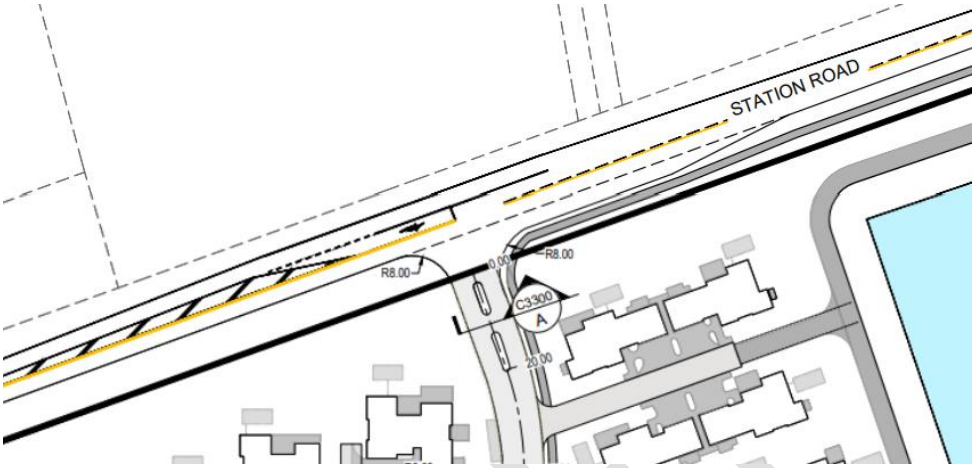


Figure 6-8: Proposed New Retirement Village intersection



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.

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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.

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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



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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**

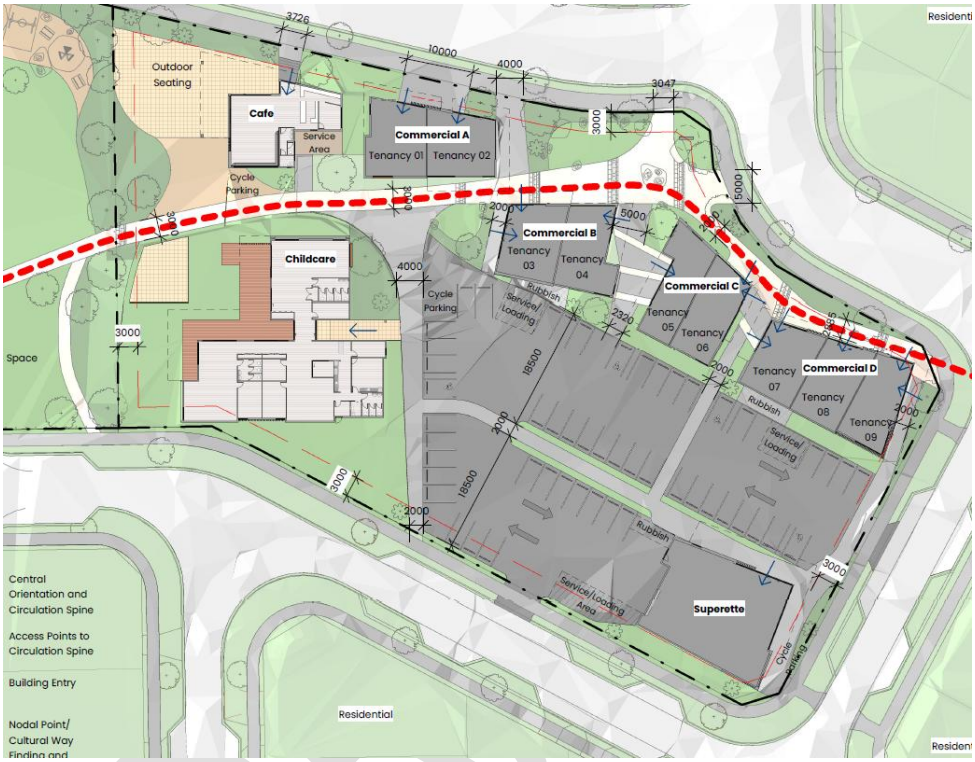
In addition, the NZ Building Code / NZS 4121:2001 document, requires that at least two mobility spaces are provided for the first 50 parking spaces, with an additional mobility space to be provided for each additional 50 spaces (or part of).

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.

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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).

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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

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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

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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.

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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.

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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

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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.

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Appendix A: Trip Distribution

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Appendix B: Vehicle Tracking

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Appendix D – Wastewater Pump Station Technical Specifications

Aquate Pump Station

Technical Specifications

Catchment B, Station Rd, Matamata

10 April 2025



Written by : Peter Carroll- Director

BE Civil, MBA, CPEng, FEngNZ

www.aquate.co.nz

Foreward

This installation manual is a guide only. All relevent Health and Safety laws and codes of construction must be adhered too and take precedence over any information in this manual. Installers must practice good professional practice and are required to understand all National and Local regulations in respect to the installation of drainage materials.

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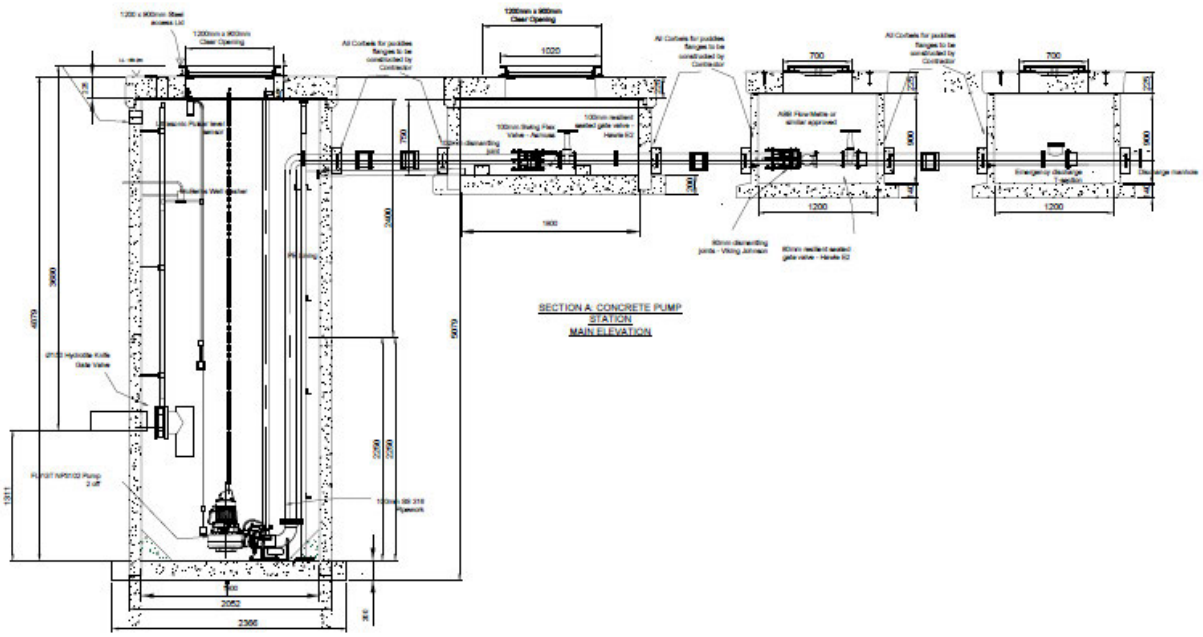
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APPENDICES ***12***

1 Technical Specifications

1.1 Storage Chamber

Tank Volume:	12.8 m^3
Effective volume:	10.24 m^3
Emergency storage:	63.75 m^3
Tank material:	Concrete
Manufacturing Std:	AS/NZS 4058:2007 and NZS 3101
Loading:	The standard lid is suitable for pedestrian loading only.
Inlet Connections:	the inlet pipe to be installed on site and sealed by the drainage contractor.
Outlet connection:	A flanged stainless steel is installed for connection to the outlet pressure pipe
Venting:	External venting required (see section 1.6 for venting details if required)
Dimensions:	see drawing below



1.2 Pumps/Pump Performance

See full specifications in the Appendices

Manufacturer: Xylem Pumps

Type: Flygt NP3102 SH3 256

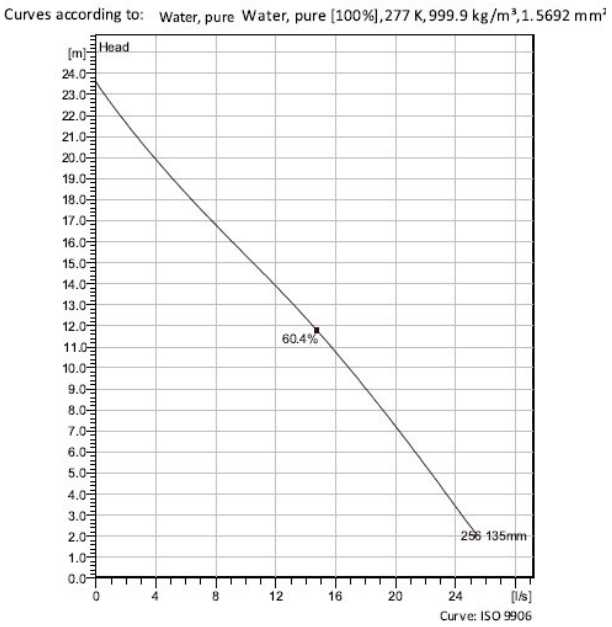
Connection: 415 V, 50 Hz

Power: 4.2 kW

Phases: Three

Technical specification





1.3 Design Information

1.3.1 Storage Calculations

The total Average Dry Weather flow has been calculated from the expected flow rate with the following assumption:

Average dry weather flow= 276.41 m^3/day

Total emergency storage required is 9 hours = 10.35 m^3

Less storage provided in Northern Pump Station which discharges in to this pump station – 34.75m^3

Total required for Central Pump Station : 68.9 m^3

Total emergency storage in wet-well and emergency storage tank is 74 m^3 so 9.65 hours storage has been provided.

1.3.2 Pump Design

The system above has been designed based on the information provided below.

Rising main length : 1587m

Static Lift : – 5.5m

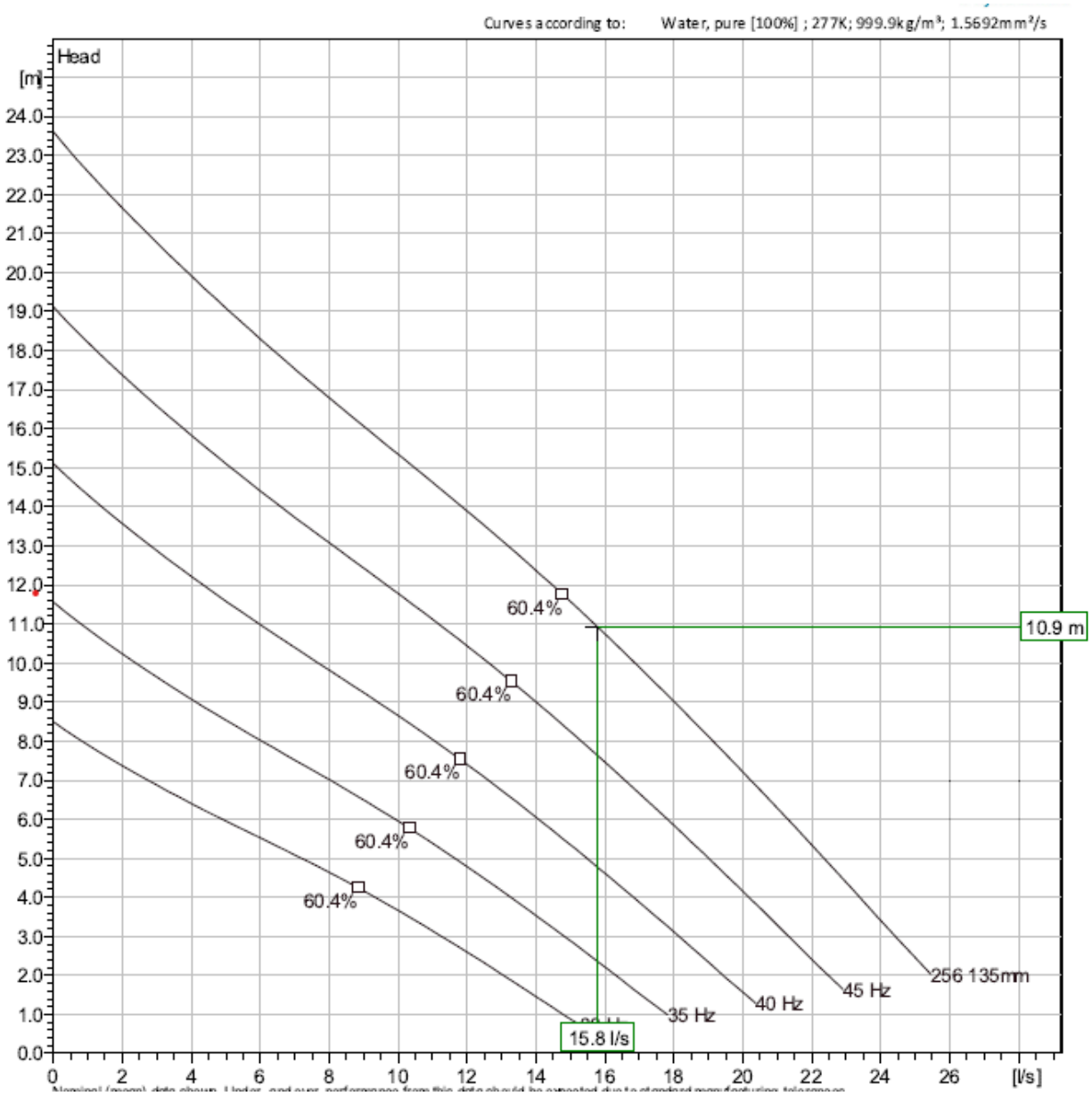
Rising main – 225mm (OD) DN200 PE100 SDR11

Option 1 K = 0.5

Flygt NP3085 - Flow rate = 15.8 l/s with a total head loss of 10.9 m (single pump).

Pumps to operate in a duty / assist / standby function

Velocity in PE pipe = 0.6 m/s

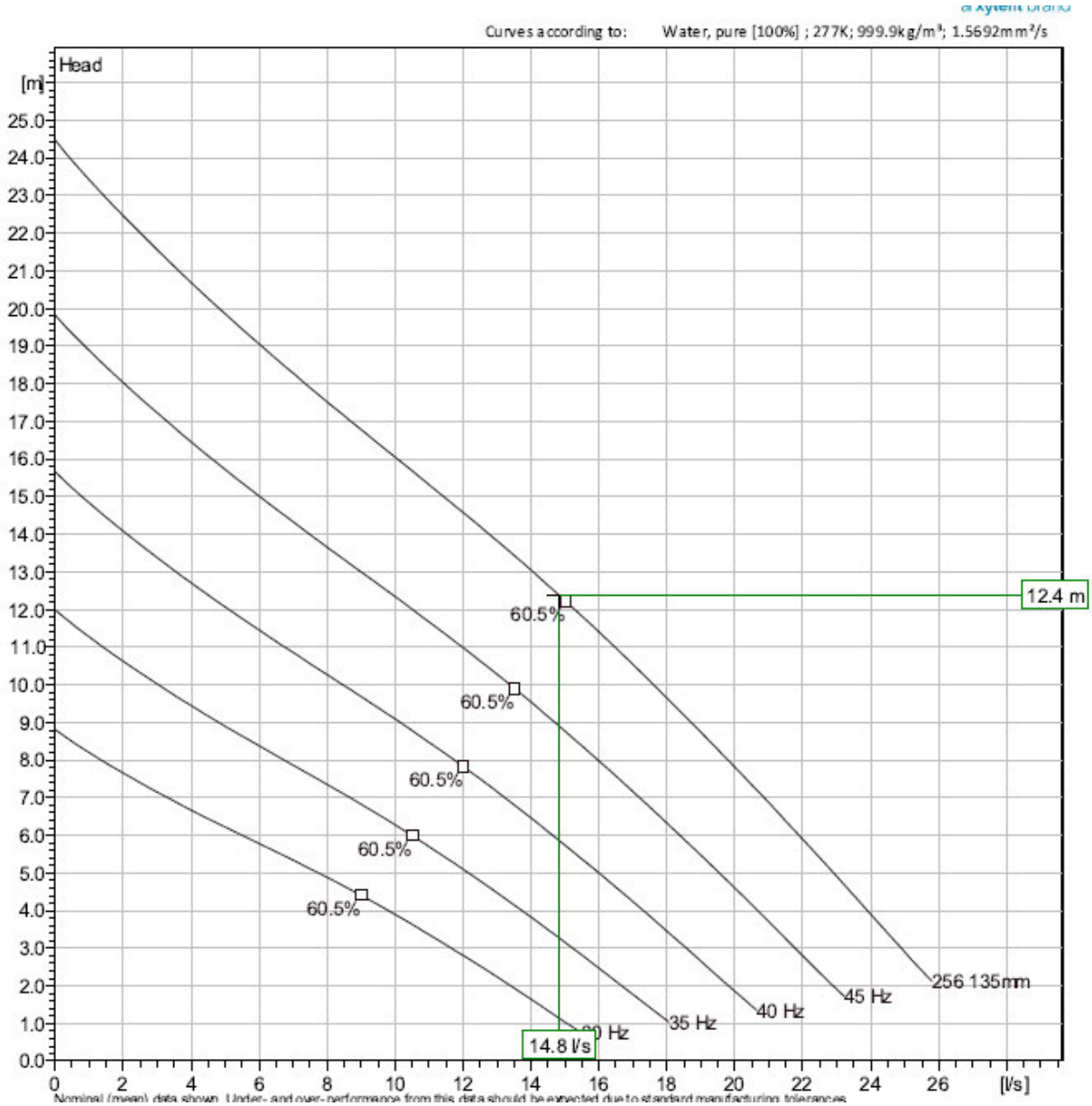


Option 2 K = 1.5

Flygt NP3085 - Flow rate = 14.8 l/s with a total head loss of 12.4 m (single pump).

Pumps to operate in a duty / assist / standby function

Velocity in PE pipe = 0.57m/s



1.3.3 Pump Operational Levels

The operational levels will be set as follows (dimensions taken from floor of wet-well) :

- High level alarm - 1150mm
- Assist Pump Start – 1050mm
- Duty Pump Start – 1000mm
- Both Pumps Stop – 350mm
- Low Level Alarm : 300mm

1.3.4 Pump Stop/Start Calculations

Expected daily flow:	276410	litres
Infiltration (l/day)	0	litres
SWI (l/day)	0	litres
Peaking factor :	3	
ADDWF	3.20	l/s
PDDWF	8.32	l/s
PWWF	13.01	l/s
Pump Station diameter	1.8	m
Pump station depth (total)	5.25	m
Pump station depth (effective)	4.25	m
Volume (effective)	10.81	m3
Pump Stop Level	0.4	m
Pump Start Level	1	m
Volume to pump:	1526	litres
Discharge rate:	15.1	l/s
Time to empty: (PDDWF)	3.8	minutes
Time to empty: (PWWF)	12.2	minutes
Time to fill (PDDWF)	3.1	minutes
Time to fill (PWWF)	2.0	minutes
No starts/ hour (PDDWF)	8.8	
No starts/ hour (PWWF)	4.2	
No starts per pump (PDDWF)	4.4	
No starts per pump (PWWF)	2.1	
Max Start/Hour permissible	30	Okay

1.4 Pipework, Valves and Fittings

Discharge connection: 100 mm diameter flange coupler

Inlet and outlets: the inlet pipe to be installed on site and sealed by the drainage contractor. The outlet pipe is pre-installed in the factory.

Discharge pipework: Includes a non-return valve, dismantling joint and an isolation valve.

Lifting chains: a stainless steel chain is connected from the pump to the underside of the chamber for ease of pump removal if required.

Materials: All pipework will be 100mm 316 Stainless steel Schedule 40 and will be manufactured to the relevant AUS/ NZ Standards

Guide rails: Stainless steel

1.5 Access lids

Steel access lids (1200 x 900mm) will be supplied as per the RITS design

1.6 Magflow metre

An ABB ProcessMaster DN100 is included installed in a 1200mm diameter manhole

1.7 Level Sensors

1 off – ABB Black Box Hydrostatic level sensor

2 off – Flygt ENM10 float switches for Low level and High-level alarms

1.8 Electrical & Controls

The controller will need to be designed to MPDC Standards by an approved supplier

Not included in this scope. The controller cabinet plus all SCADA connections to be designed and supplied to MPDC Standards.

1.9 Odour Control System

This has been excluded as per RITS standards. See section 5.3.7.16 RITS.

1.10 Protective lining

The wet-well including the underside of the lid will be lined with Blue-seal HDPE lining for sulphuric acid resistance (see Appendices)

1.11 Well-washer

A McBerns well washer has been specified by RITS – see appendices for details

A sprinkler system using BETE nozzles has been included in the storage tanks to RITS design

1.12 RPZ Cabinet

A steel cabinet to RITS design has been included along with an RPZ standpipe and two off solenoid valves for the well washer and sprinkler system

1.13 Inlet valve

A 150mm diameter knife-gate valve will be installed on the inlet pipe in to the wetwell. This includes a spindle to the underside of the lid

2 Construction

The pump station has been design using reinforced precast concrete components. The system will be fabricated off site and delivered to site ready for installation. The tank will have a 12800 litre capacity and a total depth of 5.25 m.

The pump stations will be delivered to site in a kit-set format and will need to be installed in the ground by the drainage contractor.

The construction and commissioning of the Aquate pump station will then be completed by a trained Hynds Environmental Construction Technician.

3 Safety in Design

This pump station has been designed to minimise any risk to operators and service personnel.

Access into the pump station should not be required for ongoing maintenance as almost all servicing work can be completed from ground level. The main components can be accessed as follows:

- Pumps – these can be removed from the pump station by lifting them up out of the wet-well and inspecting above ground. Note : the pumps weight 68 kg each.
- Floats – can be lifted from the connection points in the access hole in the lid.
- Non-return valves/Isolation valves –can be access from ground level without the need to enter the chamber
- Venting will be required and will need to be installed on site. The access lids are air-tight.

Risk register

The risk register is a live document which requires continuous monitoring updating. This will need to be completed by the maintenance company for the pump station. The items below are a guide only.

The safety and design and Hazops workshops have encompassed risks for normal operation of the vacuum wastewater pump station. Specific risks for the maintenance process are outlined below.

Risk matrix

			Consequence / potential severity				
			Minimal Non-injury or First Aid injury (FAI)	**Minor** Medical treatment injury	**Moderate** Medical treatment injury, with lost time (LTI)	**Major** Injury requiring hospital-/notifiable event	**Catastrophic** Fatality or multiple fatalities
Likelihood	Very high	**Almost certain:** Commonly occurs	3: Medium	4: High	4: High	5: Very high	5: Very high
	High	**Likely:** Could easily happen	2: Low	3: Medium	4: High	4: High	5: Very high
	Medium	**Possible:** Could happen or has been known to happen	2: Low	2: Low	3: Medium	4: High	4: High
	Low	**Unlikely:** Hasn't happened yet but could happen	1: Very Low	2: Low	3: Medium	3: Medium	4: High
	Very low	**Rare:** Very unlikely but could happen in exceptional circumstances	1: Very Low	2: Low	2: Low	3: Medium	4: High

	Hazards *(one per line)*		Hazard controls – what do we need to do to make it safe?	
What are we doing? *(step by step)*	**What could cause harm?**	**Existing risk level** (*use risk matrix)*	**Eliminate/ Controls**	Residual risk level
Wet-well inspection	The wet-well is classified as a confined space, an inspection is required prior to wet commissioning.	3	**Elimination:** The vessel will be isolated from the system at all exit points and inspected from the access hole in the lid . **Isolate/Engineering Controls/PPE:** Entry will only be required if debris is identified and cannot be removed by any other means. Entry to the vessel should follow confined space protocols, including ensuring all persons involved have the required training, admin and PPE controls.	1 1
Sewage Pump Testing	The wet well will be filled up for wet testing. This is a potential drowning hazard.	3	**Elimination** Barriers around the access hatch to be erected so no one can enter the wet-well. **Engineering Controls/PPE:** All essential persons to wear appropriate protection. Sewage pump shall only operate when required for wet testing..	1 1
Removing lids for access	Traffic moving through area Back strain	3 2	**Isolate/Engineering Controls/PPE:** Place cones around service area so vehicles cannot enter site **Engineering Controls/PPE –** use appropriate lifting equipment if lifting pumps / lids on site	
Removing pumps	This is a falling hazard	4	**Elimination** Barriers around the access hatch to be erected so no one can enter the wet-well.	
Electrical checks	Electrical shock	3	**Engineering Controls/PPE:** Only fully certified electricians to complete electrical work	

4 Warrantees

Aquate guarantees the performance and quality of its pump stations provided:

- The product is only used for the intended purposes as stated in the quote
- The control panel and pump station is correctly installed and commissioned by a suitable installer
- The fault is due to a defect in design, materials or workmanship
- The fault is reported to an Aquate agent or representative during the guarantee period
- No pump station components have been replaced by alternative products
- This guarantee does not cover faults resulting from misuse of the system, blockages or breakdowns caused by the introduction of inappropriate materials into the system, incorrect electrical installation of the control unit, deficient maintenance or normal wear and tear.

Aquate assumes no liability for bodily harm, property damage or economic losses as a result of its pump stations.

4.1 Pumps

The pumps come with a 12 month year warranty against faulty components and/or workmanship. If prohibited substances are introduced to the system causing the pump to block and burn out, the warranty is null and void.

Flygt undertakes to remedy faults in products sold by Flygt provided that:

- The fault is due to defects in design, materials or workmanship;
- The fault is reported to a Flygt representative during the guarantee period;
- The product is used only under conditions described in the care and maintenance instructions and in applications for which it is intended;
- The monitoring equipment incorporated in the product is correctly connected;
- All service and repair work is done by a workshop authorized by Flygt or the original manufacturer;
- Genuine manufacturer's parts are used
- Storage should be in accordance with the care and maintenance manual.
- The equipment is operated and maintained in accordance with the Operation and Care and Maintenance Manual.

Failure to comply with these requirements will render warranty void unless, due to the nature of the warranty claim, such voiding of warranty is prevented by law, regulation, act and/or ordinance.

Hence, the guarantee does not cover faults caused by deficient maintenance, abuse, incorrectly executed repair work or normal wear and tear.

5 Maintenance schedule

A certain amount of system maintenance is required on an ongoing basis to ensure that the system is working correctly. This is the responsibility of the owner

5.1 Six monthly

The following procedures should be completed every six months:

- The pumping station should be inspected to check the build-up of grease and fat particularly on the float switches and pumps. They may need to be withdrawn for cleaning.
- Visually inspect the pump station walls and hose down if necessary
- Ensure the pump station access lid is securely fastened and bolted down.
- Lift the pumps and inspect for any damage or blockages around the impellors
- Lift the floats and test the alarm system/pump operation
- Consult with the electrical control supplier for additional checks

5.2 Annually

The following procedures should be completed at least once every 12 months:

- The pumping station should be inspected to check the build-up of grease and fat particularly on the float switches and pumps. They may need to be withdrawn for cleaning.

- Visually inspect the pump station walls and hose down if necessary
- Lift the floats and test the alarm system/pump operation
- Press the mute button (audio alarms only) to check the audio alarm turns off.
- Visually check the pump station for any structural damage to the tank and pipework
- Ensure the pump station access lid is securely fastened and bolted down.
- Lift the pumps and inspect for any damage or blockages around the impellors
- Have the pump station sucked out to remove any debris/stones if necessary

5.3 Maintenance requirements

The pump maintenance and repair operations must be carried out by workers authorised by the manufacturer; Failure to comply with these instructions will result in forfeiture of the warranty and jeopardise the unit's safety.

Before any cleaning and/ or maintenance operations are carried out on the electric pump, the power supply must be switched off.

To disconnect the submersible electric pump from the electricity mains, first disconnect the phase conductors, then the yellow –green earth wires.

Use the special handle to remove the submersible electric pump from the tank.

ATTENTION: Before carrying out any operations, check the pump temperature. Only work on the pump when it is at room temperature.

Clean the electric pump thoroughly, using a jet of water or specific products to clean all its parts. When disposing of the waste material, follow the antipollution rules in force.

Replace any broken or worn parts with original spare parts only.

Given the likelihood that work on the electric pump will be carried out in confined spaces such as vats, wells, cesspools, tanks or cisterns, do not underestimate the risks caused by potentially poisonous exhalations.

APPENDICES

General Arrangement Drawing – Plan

General Arrangement Drawing – Section

General Arrangement Drawing – Plan with tank

General Arrangement Drawing – Section with tank

Flygt NP3102 SH3 256 Specifications k 0.5

Flygt NP3102 SH3 256 Specifications k 1.5

McBerns well washing brochure

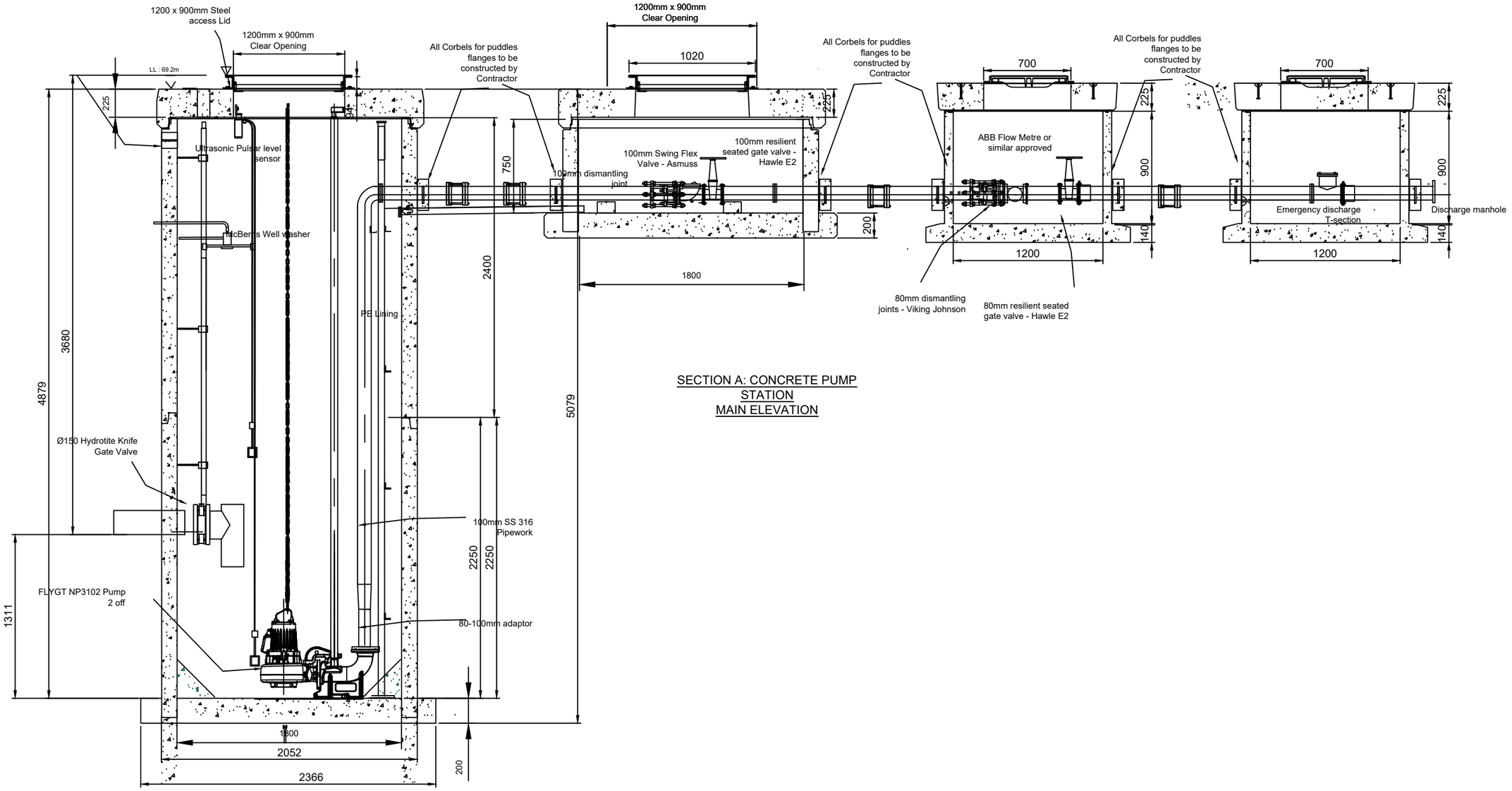
BlueSeal-AKS data sheet

Hyliner HDSPE liner – data sheet

ABB Magflow Meter Specifications

ABB Blackbox level sensor specifications

Flygt ENM10 float switch specifications



SECTION A: CONCRETE PUMP STATION
MAIN ELEVATION

NOTES:

1.

REVISIONS

REV #:	REVISION DESCRIPTION:	DATE:	DRAWN:
A	Preliminary design	10/4/25	PC

PO Box 58142, Botany, Auckland, 2316
Tel: 09-274 0316
Fax: 09-272 7485
email: hwwsupport@hynds.co.nz

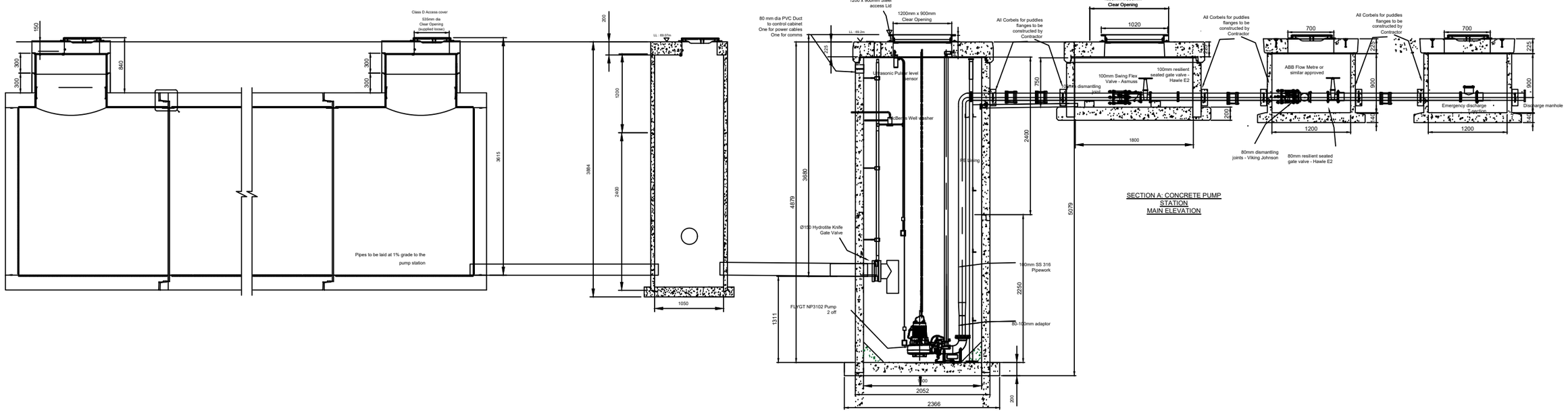
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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT:
Catchment B
Ashbourne Project
Matamata
Wastewater Pump Station

DRAWING TITLE:
Section View

REFERENCE/QUOTE NUMBER:	AQ2105A		
DRAWN: PC SIGNATURE:	DESIGN: PC SIGNATURE:	CHECKED: JB SIGNATURE:	
SCALE: As Shown PAPER SIZE: A3	Note: Do not scale drawing if in doubt **ASK!!!**	DATE: 10/4/25	
DRAWING NUMBER: AQ2105A 1	SHEET NUMBER: of 4	REVISION NUMBER: A	



SECTION A: CONCRETE PUMP STATION
MAIN ELEVATION

NOTES:

1.

REVISIONS

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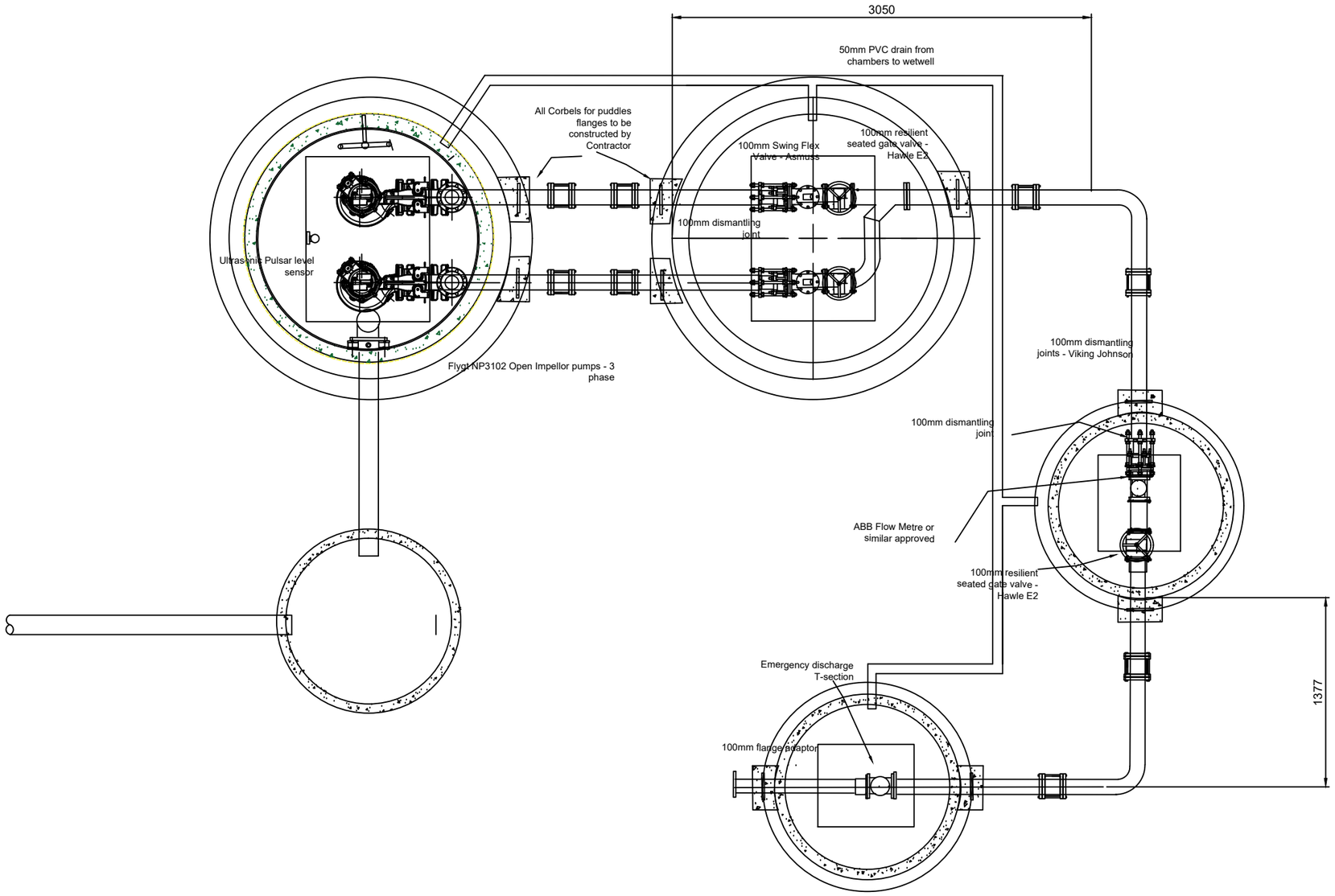
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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT:
Catchment B
Ashbourne Project
Matamata
Wastewater Pump Station

DRAWING TITLE:
Section View with tank

REFERENCE/QUOTE NUMBER:	AQ2105A		
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SCALE: As Shown PAPER SIZE: A3	Note: Do not scale drawing if in doubt **ASK!!!**	DATE: 10/4/25	
DRAWING NUMBER: AQ2105A 1	SHEET NUMBER: of 4	REVISION NUMBER: A	



NOTES:

1.

REVISIONS

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A	Preliminary design	10/4/25	PC

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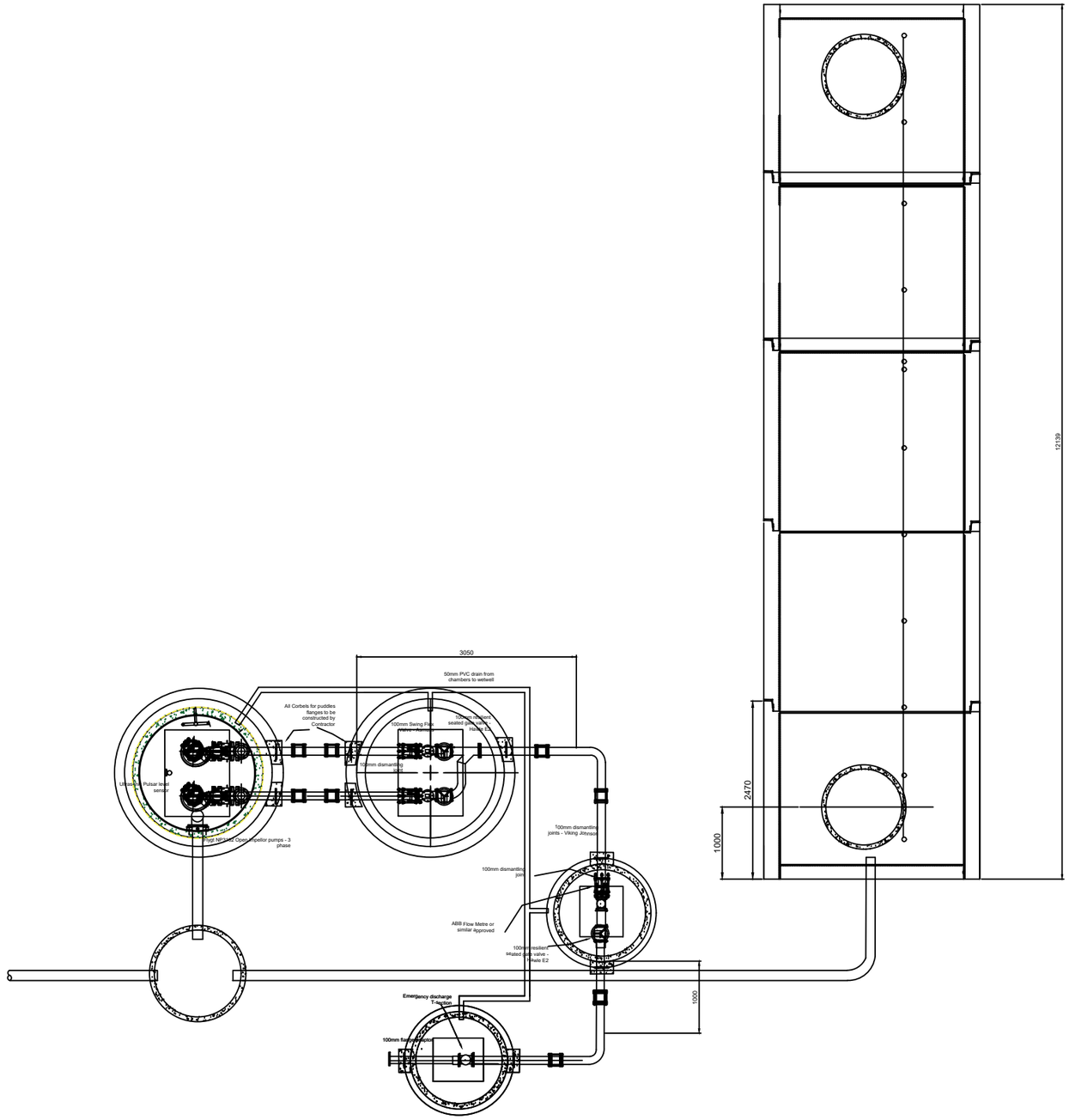
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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT:
Catchment B
Ashbourne Project
Matamata
Wastewater Pump Station

DRAWING TITLE:
Plan View

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DRAWING NUMBER: AQ2105A 3	SHEET NUMBER: of 4	REVISION NUMBER: A



NOTES:

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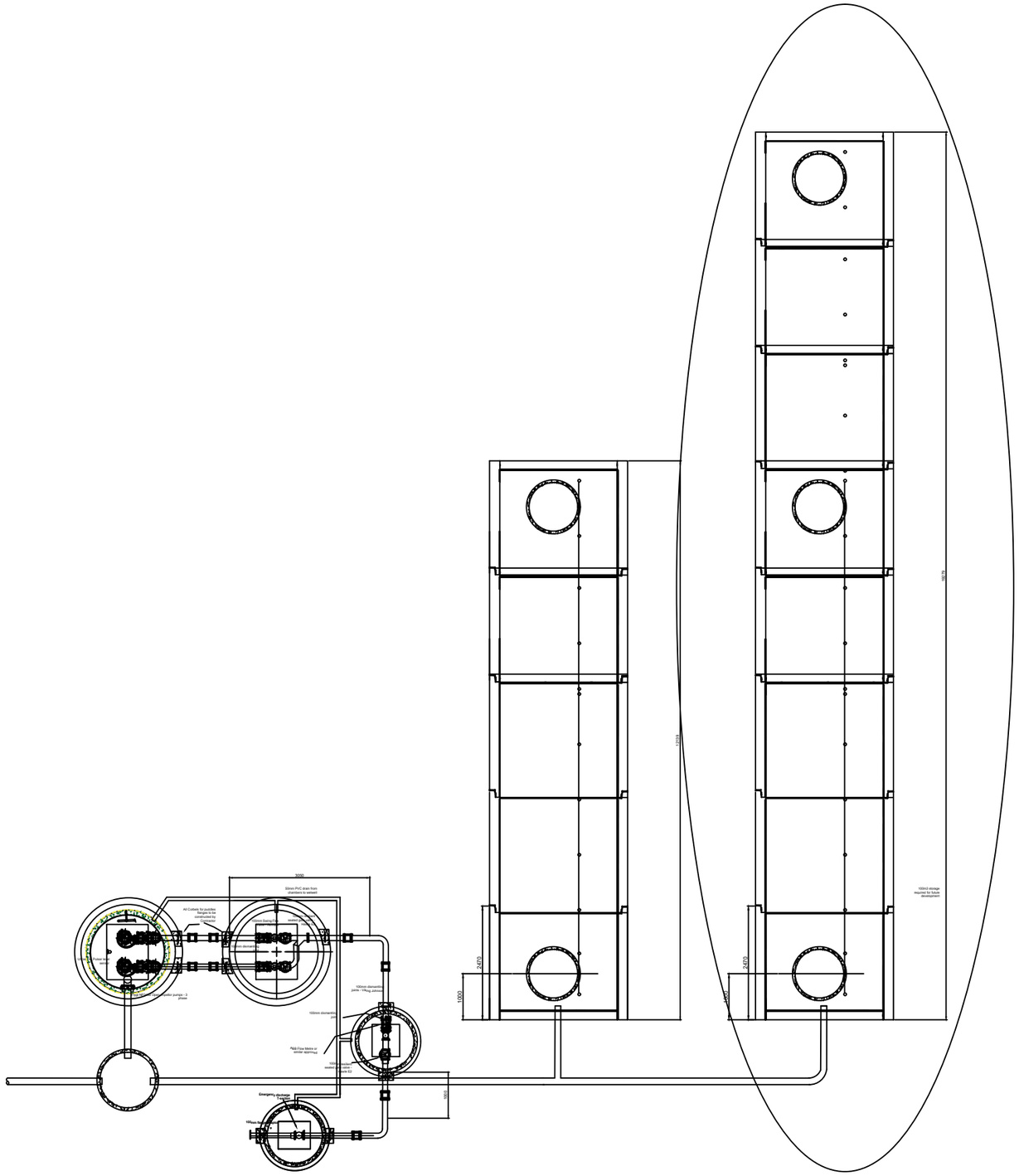
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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT:
Catchment B
Ashbourne Project
Matamata
Wastewater Pump Station

DRAWING TITLE:
Plan View with tank

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SCALE: As Shown	Note: Do not scale drawing if in doubt **ASK!!!**	DATE:
PAPER SIZE: A3		10/4/25
DRAWING NUMBER:	SHEET NUMBER:	REVISION NUMBER:
AQ2105A 3	of 4	A



NOTES:

1.

REVISIONS

REV #:	REVISION DESCRIPTION:	DATE:	DRAWN:
A	Preliminary design	10/4/25	PC

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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT:
Catchment B - future development
Ashbourne Project
Matamata
Wastewater Pump Station

DRAWING TITLE:
Plan View with tank

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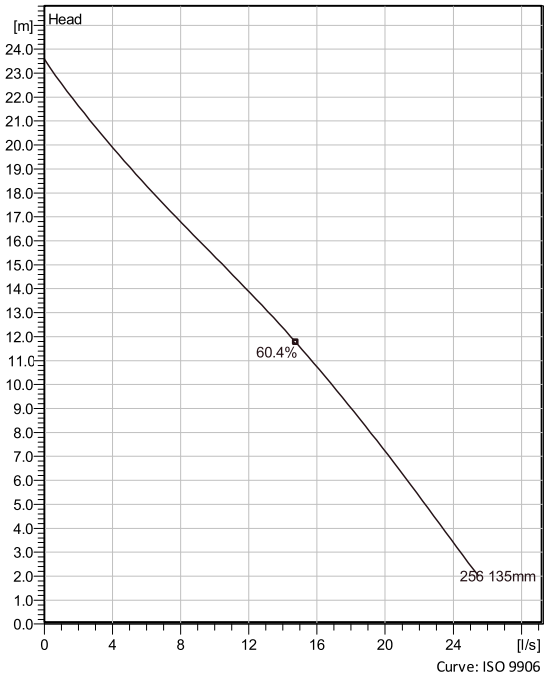
NP 3102 SH 3~ Adaptive 256

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
N3102.060 18-10-2AL-W 4.2KW

Installation type
P - Semi permanent, Wet

Impeller diameter
135 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
135 mm

Discharge diameter
80 mm

Inlet diameter
100 mm

Maximum operating speed
2890 1/min

Number of blades
2

Max. fluid temperature
40 °C

Material

Impeller
Hard-Iron

Stator housing material
Grey cast iron

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

Technical specification

Motor - General

Motor number N3102.060 18-10-2AL-W 4.2KW	**Phases** 3~	**Rated speed** 2890 1/min	**Rated power** 4.2 kW
Approval No	**Number of poles** 2	**Rated current** 7.4 A	**Stator variant** 67
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.92	**Motor efficiency - 1/1 Load** 85.1 %	**Total moment of inertia** 0.0147 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.90	**Motor efficiency - 3/4 Load** 86.5 %	**Starting current, direct starting** 56 A	
Power factor - 1/2 Load 0.84	**Motor efficiency - 1/2 Load** 86.4 %	**Starting current, star-delta** 18.7 A	

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

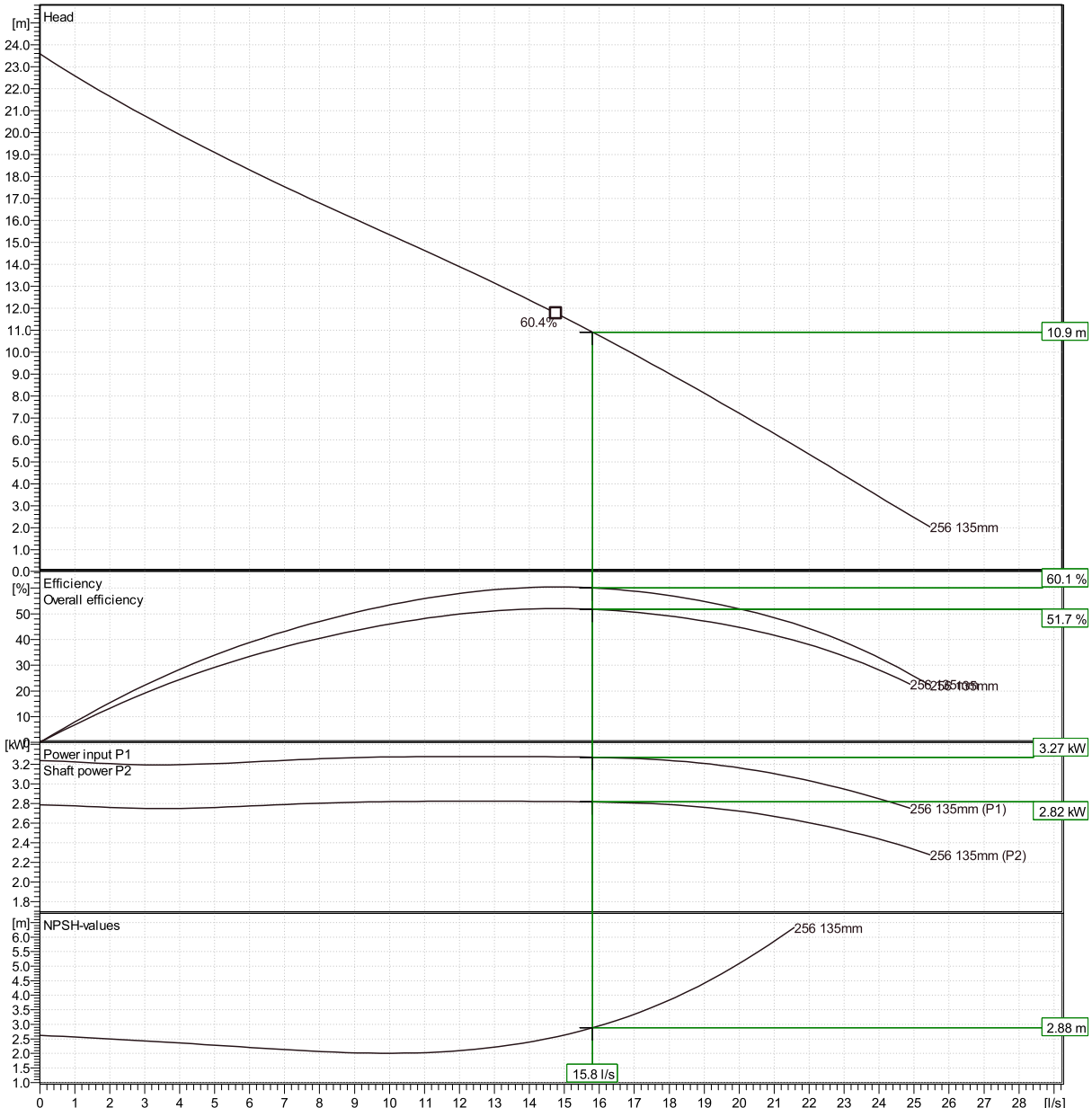
NP 3102 SH 3~ Adaptive 256

Performance curve

Duty point

Flow	Head
15.8 l/s	10.9 m

Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

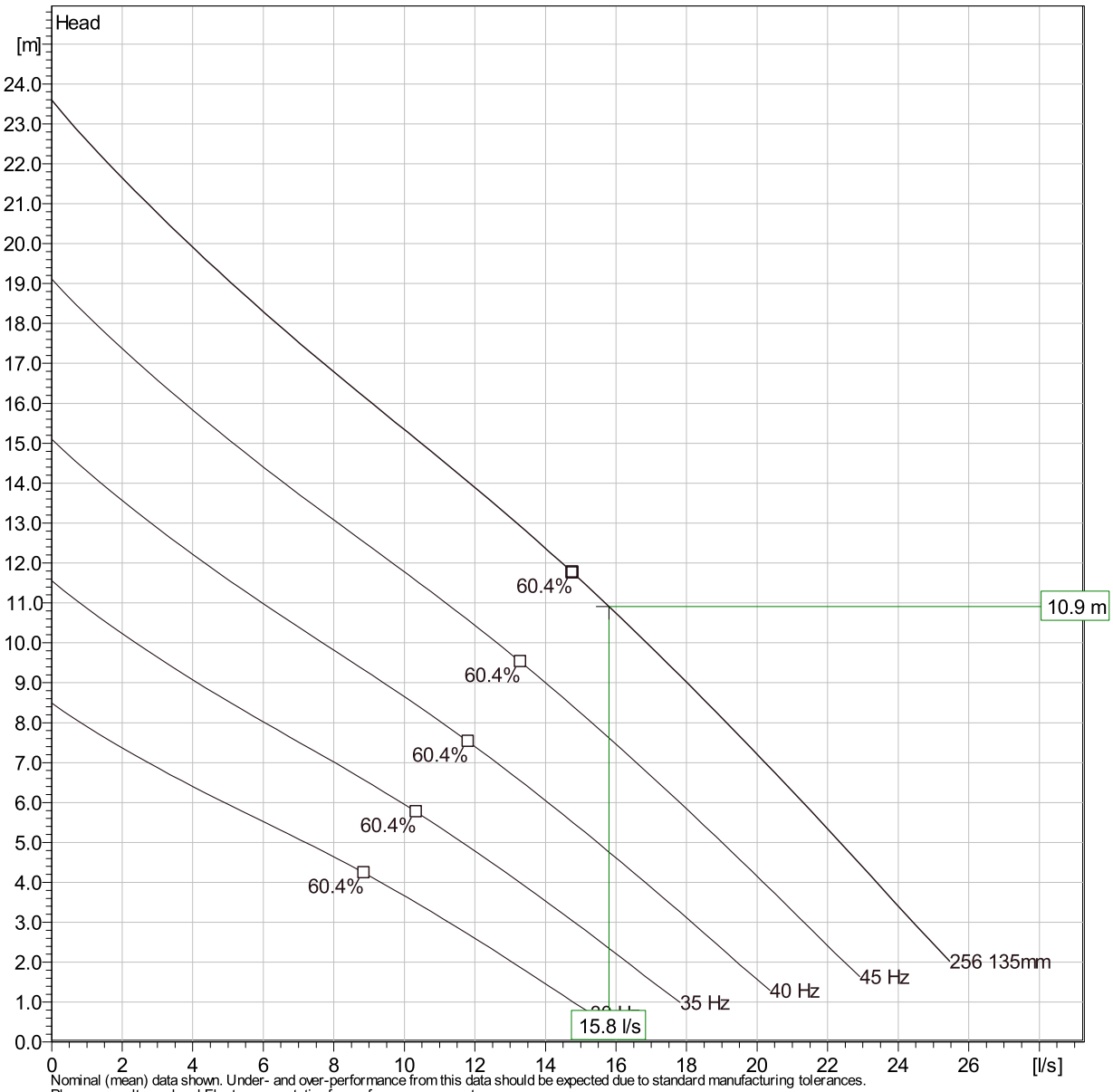
Curve: ISO 9906

Xylect-20124127		Peter Carroll			
	Created on	4/10/2025	**Last update**	4/10/2025	

NP 3102 SH 3~ Adaptive 256

Duty Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

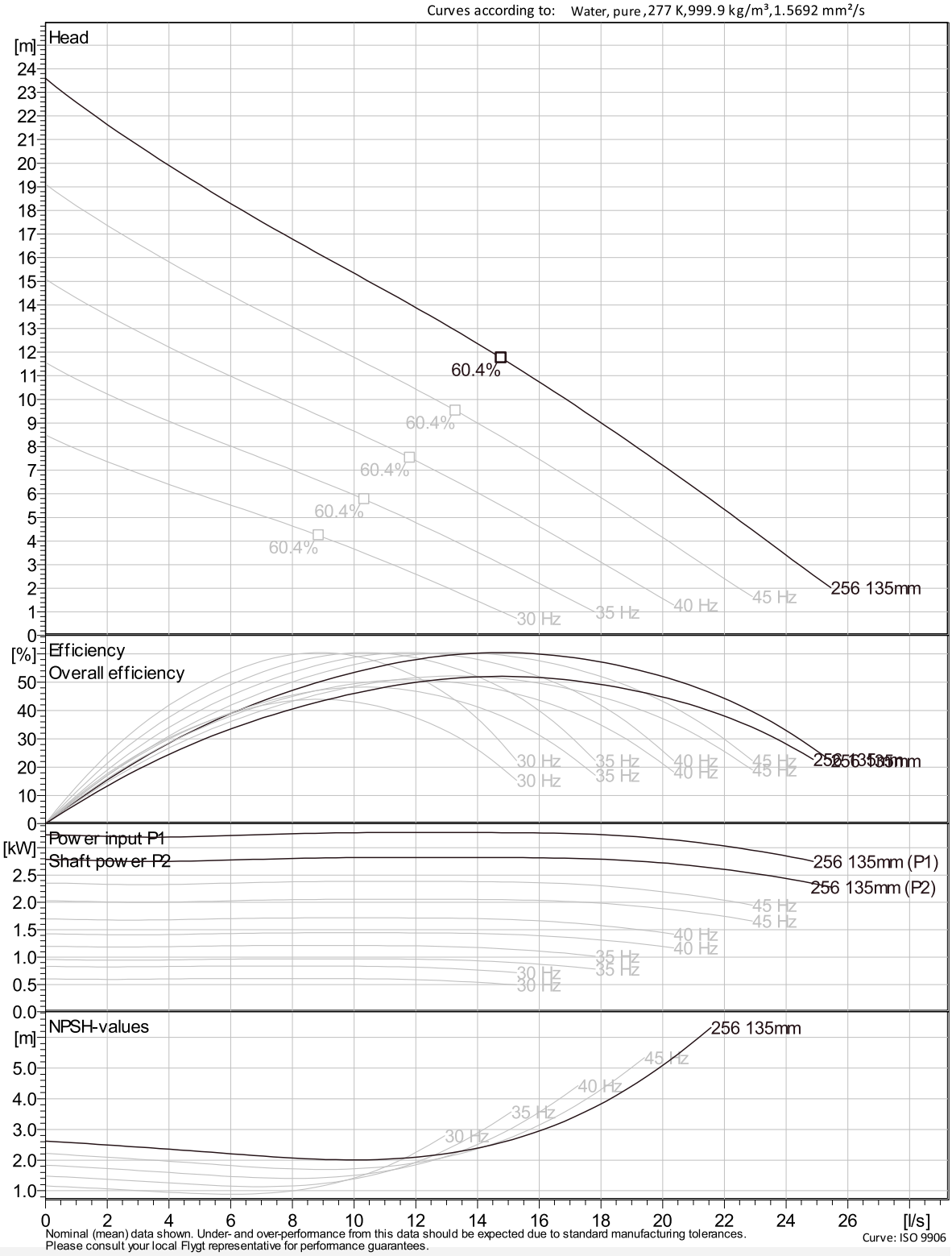
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/m³	m
1	15.8	10.9	2.82	15.8	10.9	2.82	60.1 %	0.0575	2.88

Project		**Created by**	Peter Carroll		
Block	Xylect-20124127	**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

VFD Curve

Curves according to: Water, pure ,277 K,999.9 kg/m³,1.5692 mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

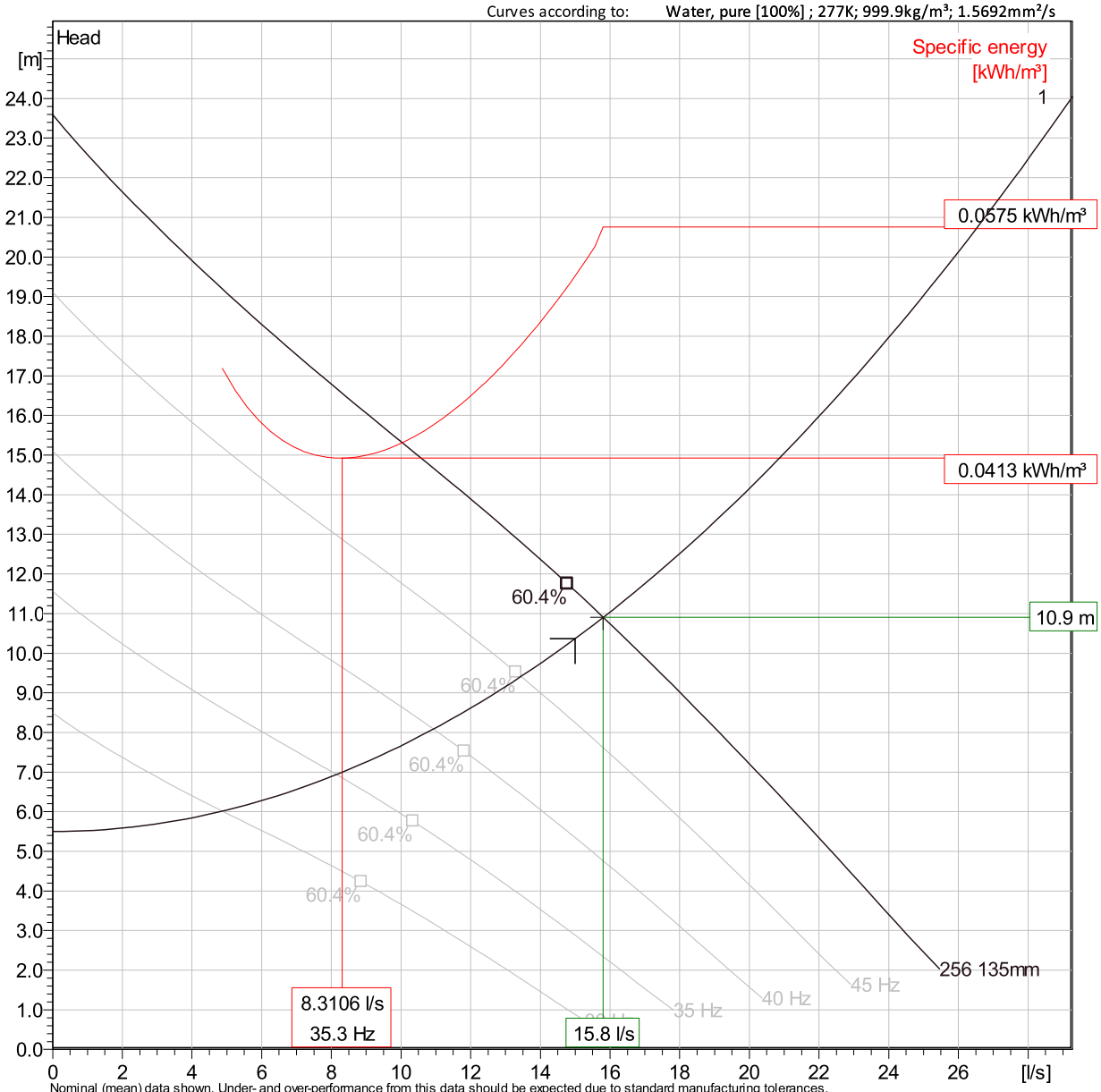
Curve: ISO 9906

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

VFD Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

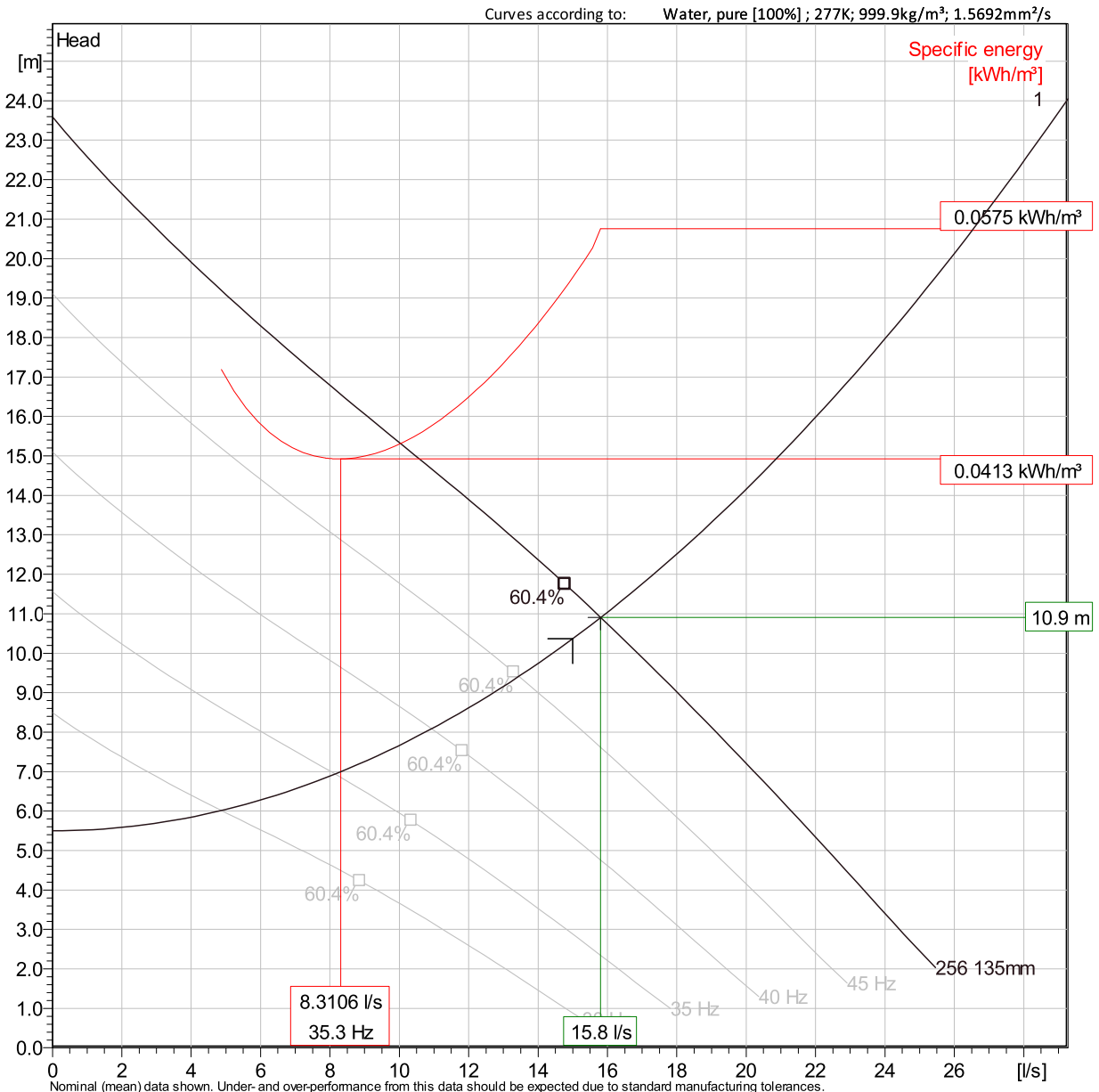
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	50 Hz	15.8	10.9	2.82	15.8	10.9	2.82	60.1 %	0.0575	2.88
1	45 Hz	13.4	9.41	2.05	13.4	9.41	2.05	60.4 %	0.0492	2.21
1	40 Hz	10.9	8.09	1.44	10.9	8.09	1.44	60 %	0.0436	1.63
1	35 Hz	8.15	6.94	0.968	8.15	6.94	0.968	57.3 %	0.0413	1.17

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

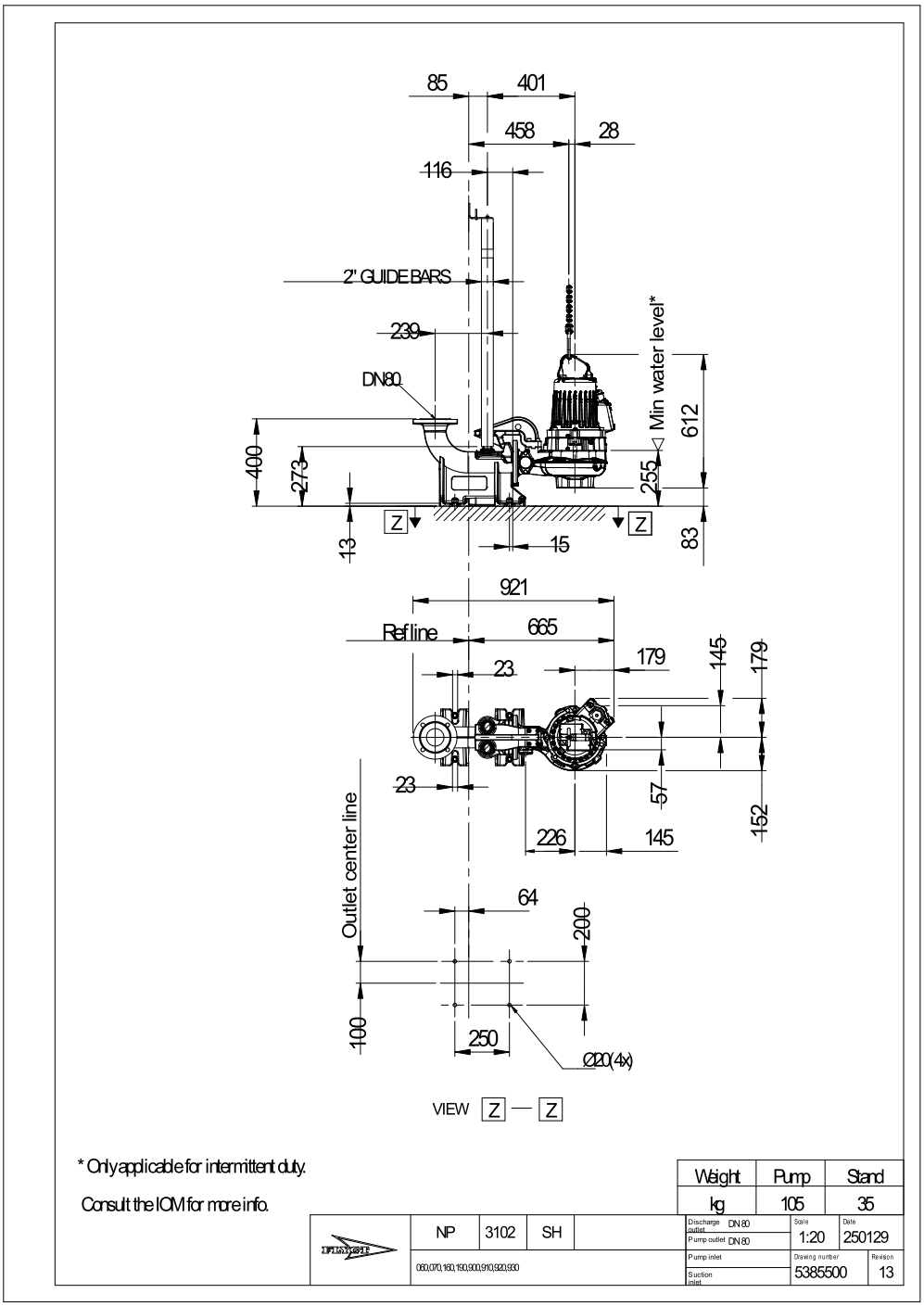
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	30 Hz	4.87	6.01	0.605	4.87	6.01	0.605	47.4 %	0.0476	0.91

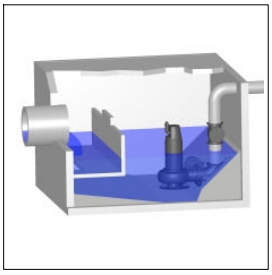
Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

Dimensional drawing



Project	Xylect-20124127	**Created by**	Peter Carroll
Block		**Created on**	4/10/2025 **Last update** 4/10/2025



Friction loss calculation

Pumped fluid Water, pure	**Static head** 5.5	**Layout** Wet well installation
Flow 15 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Stainless steel						
PN 10 / DN 100 (104x3,0 mm) / K factor for Wastewater acc. DWA-A110						
Pipe length	100	10 m	1	1.91	0.5	0.5786
Elbows	100	0.5	1	1.91		0.09296
Non-return valves	100	0.9	1	1.91		0.1673
T-piece	100	0.5	1	1.91		0.09296
Valve	100	0.5	1	1.91		0.09296
Total friction head						**1.025**
Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710						
SDR 11 (PN 16) / DN 200 (225x20,5 mm) / K factor for Wastewater acc. DWA-A110						
Pipe length	184	1587 m	1	0.5641	0.5	3.842
Total friction head						**3.842**
Friction loss head						4.867 m
Total static head						5.5 m
Total head						**10.37 m**

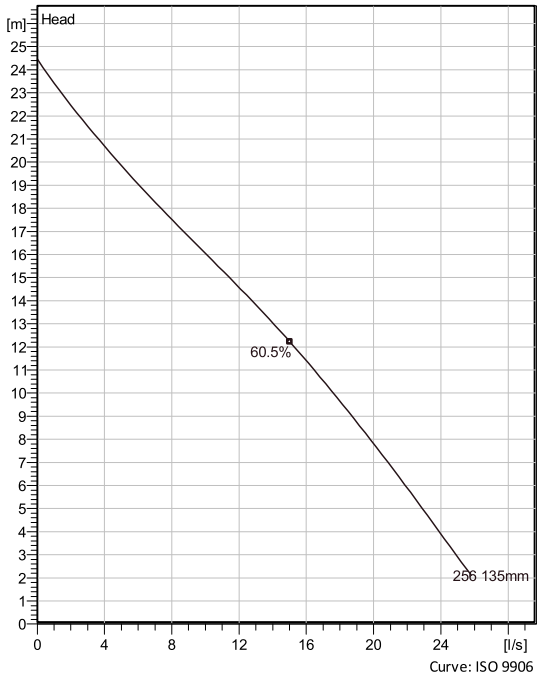
NP 3102 SH 3~ Adaptive 256

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
N3102.900 18-10-2AS-W IE3 4.5KW

Installation type
P - Semi permanent, Wet

Impeller diameter
135 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
135 mm

Discharge diameter
80 mm

Inlet diameter
100 mm

Maximum operating speed
3000 1/min

Number of blades
2

Max. fluid temperature
40 °C

Material

Impeller
Grey cast iron

Stator housing material
Grey cast iron

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

Technical specification

Motor - General

Motor number N3102.900 18-10-2AS-W IE3 4.5KW	**Phases** 3~	**Rated speed** 3000 1/min	**Rated power** 4.5 kW
Approval No	**Number of poles** 2	**Rated current** 7.8 A	**Stator variant** 67
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 900			

Motor - Technical

Power factor - 1/1 Load 0.90	**Motor efficiency - 1/1 Load** 89.5 %	**Total moment of inertia** 0.0107 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.88	**Motor efficiency - 3/4 Load** 89.9 %	**Starting current, direct starting** 54 A	
Power factor - 1/2 Load 0.81	**Motor efficiency - 1/2 Load** 89.3 %	**Starting current, star-delta** 18 A	

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

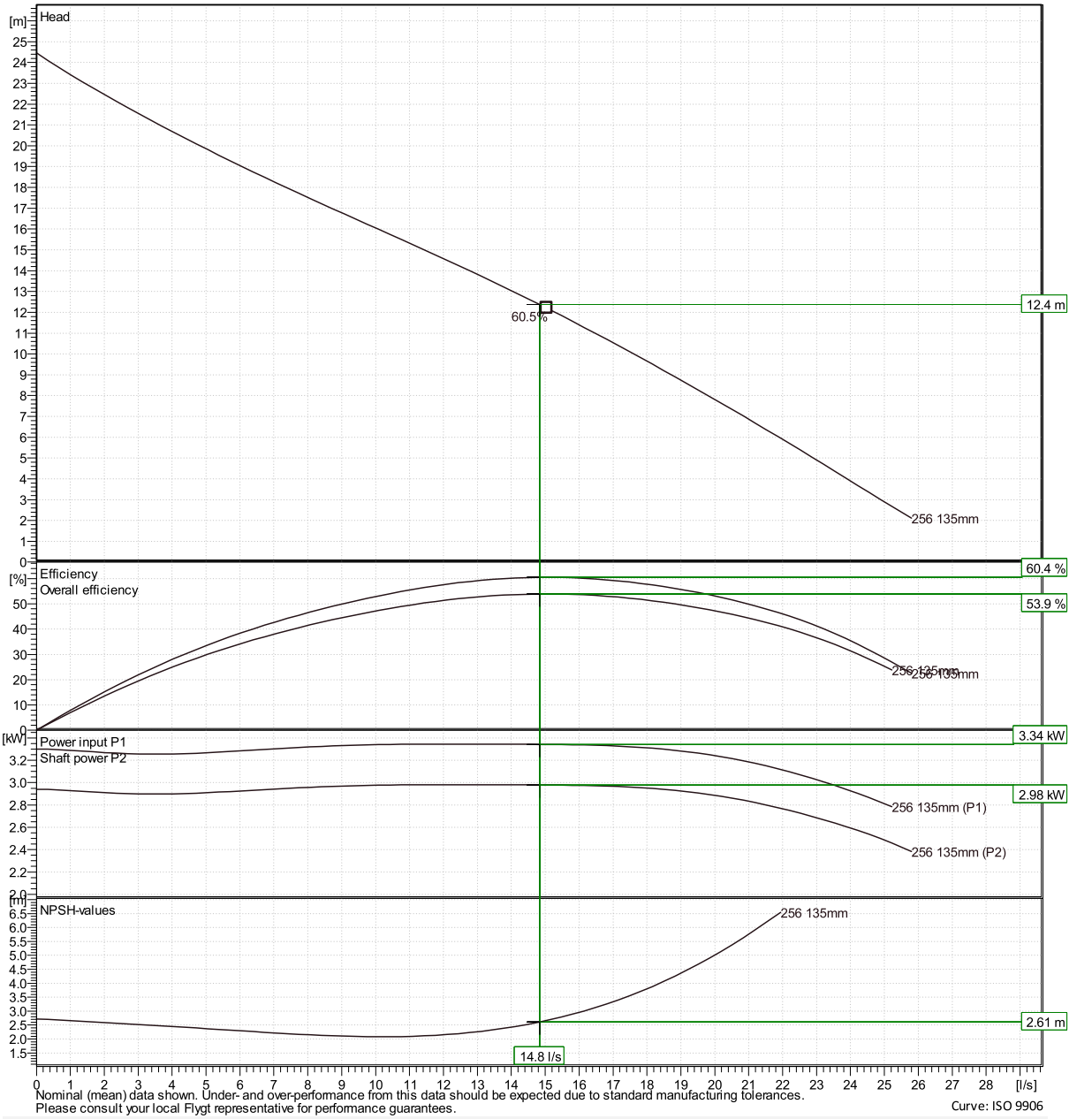
NP 3102 SH 3~ Adaptive 256

Performance curve

Duty point

Flow	Head
14.8 l/s	12.4 m

Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

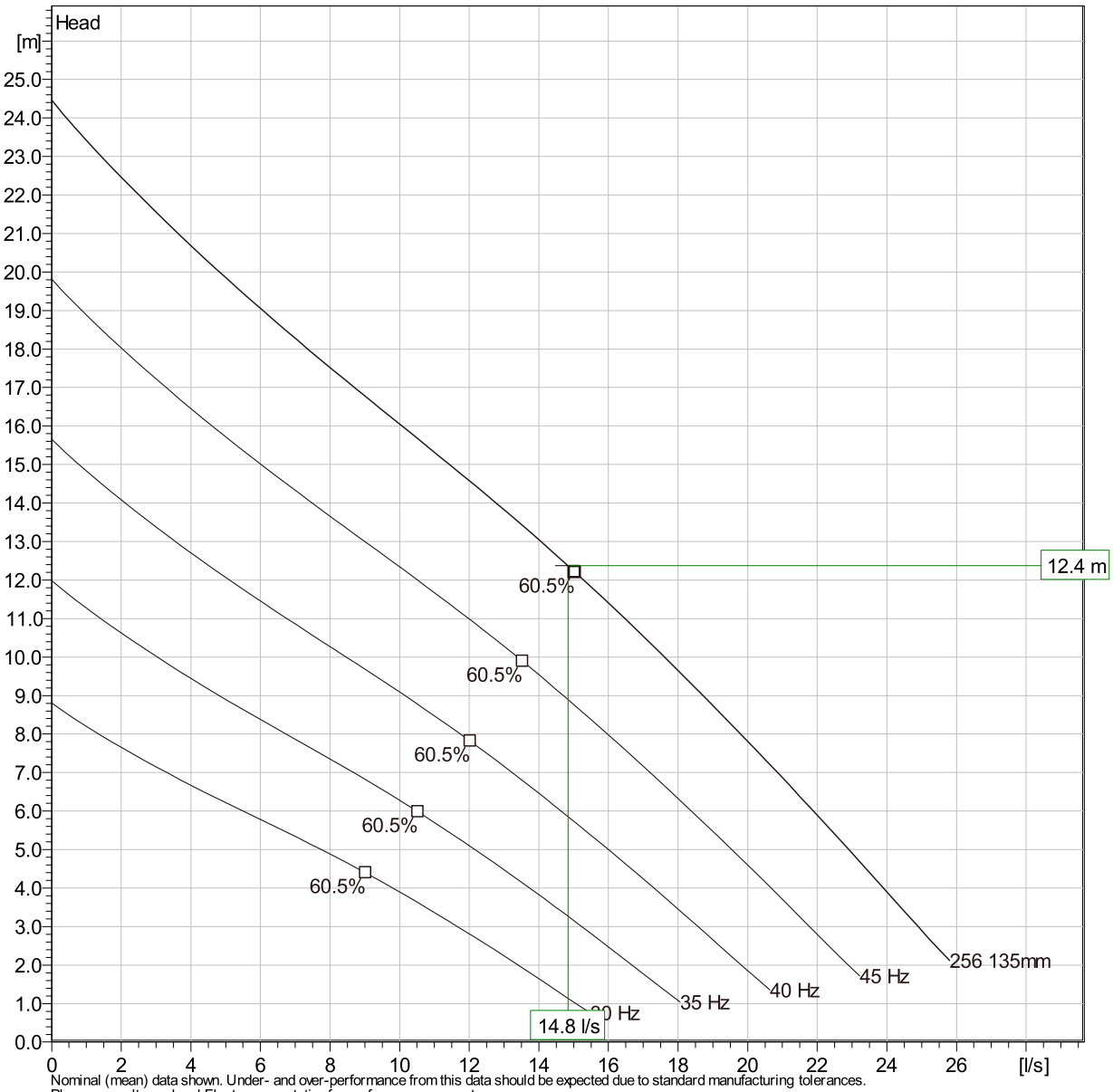
Curve: ISO 9906

Xylect-20124127		Peter Carroll	
	Created on	4/10/2025	**Last update** 4/10/2025

NP 3102 SH 3~ Adaptive 256

Duty Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

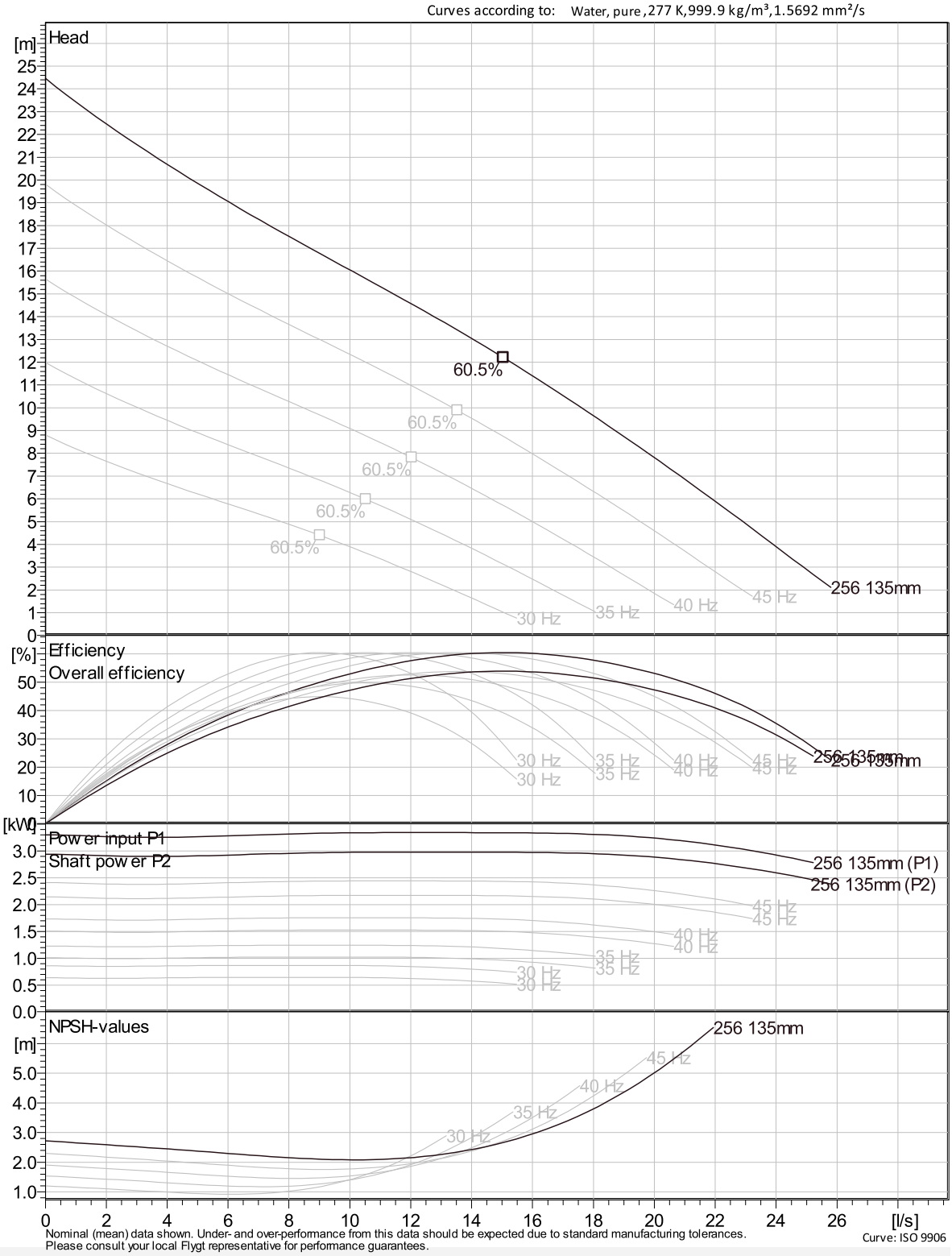
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/m³	m
1	14.8	12.4	2.98	14.8	12.4	2.98	60.4 %	0.0626	2.61

Project		**Created by**	Peter Carroll		
Block	Xylect-20124127	**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

VFD Curve

Curves according to: Water, pure ,277 K,999.9 kg/m³,1.5692 mm²/s



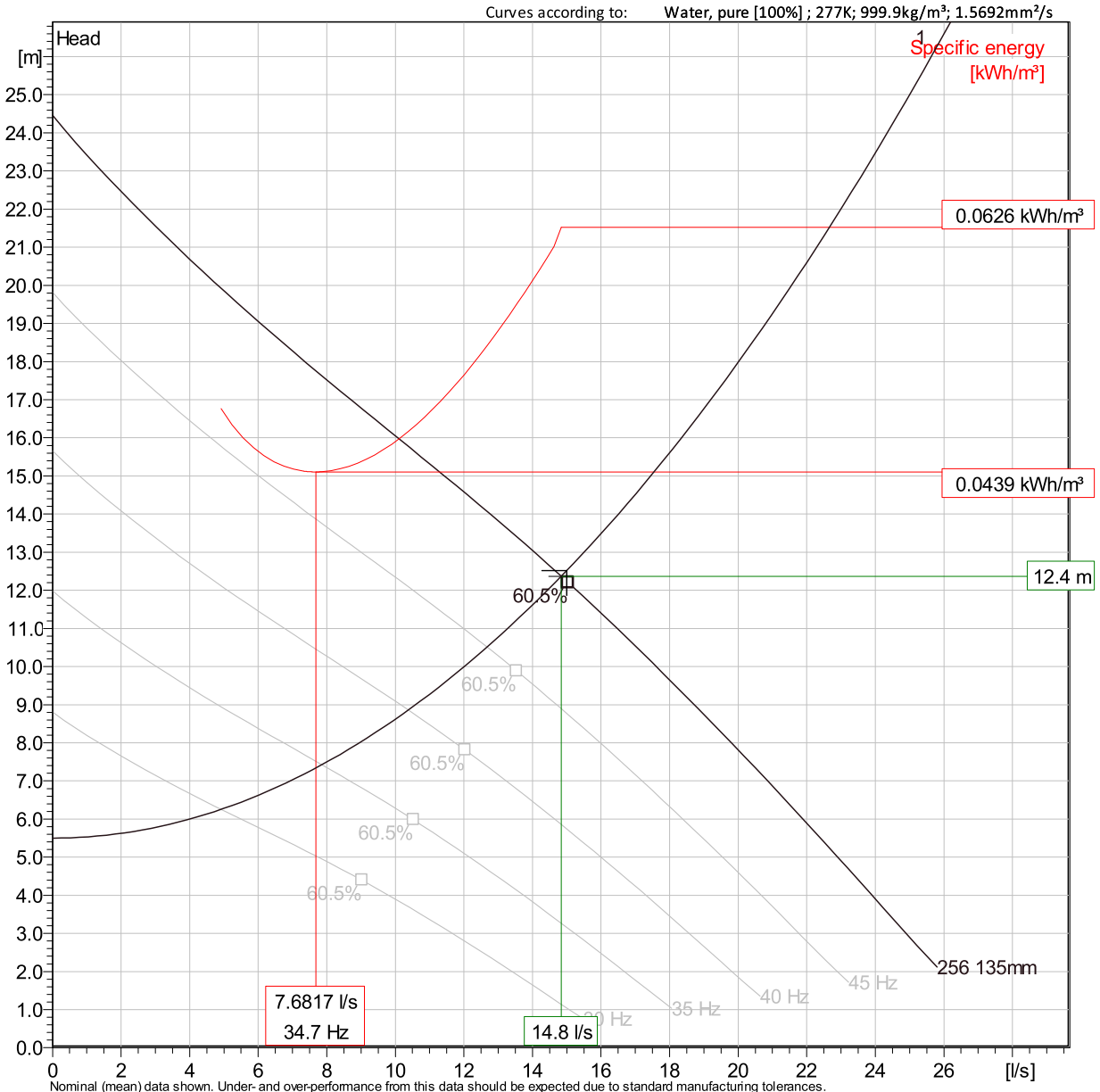
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
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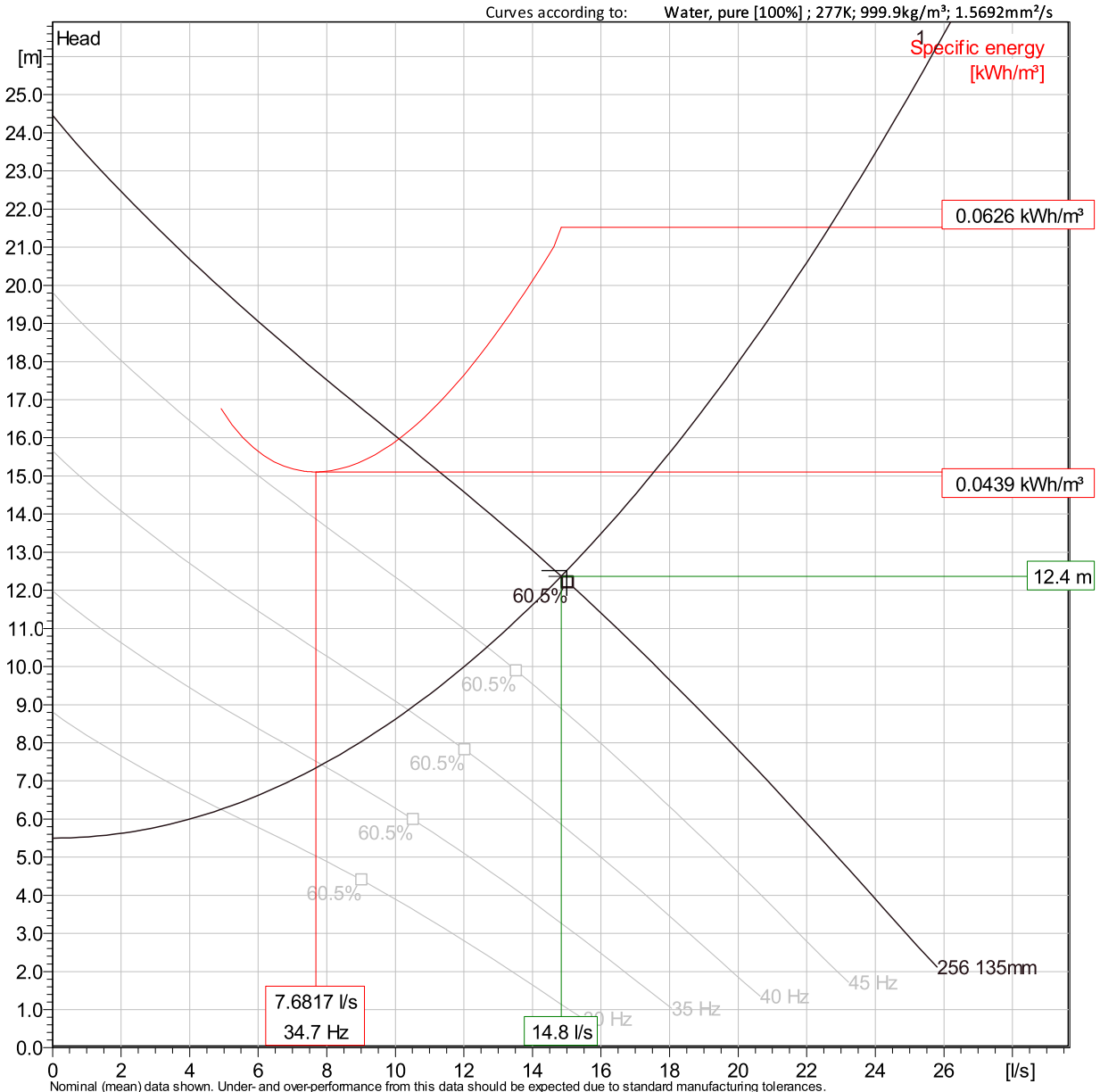
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	50 Hz	14.8	12.4	2.98	14.8	12.4	2.98	60.4 %	0.0626	2.61
1	45 Hz	12.7	10.5	2.17	12.7	10.5	2.17	60.2 %	0.0535	2.06
1	40 Hz	10.4	8.86	1.53	10.4	8.86	1.53	59.1 %	0.047	1.58
1	35 Hz	7.86	7.43	1.02	7.86	7.43	1.02	56 %	0.0439	1.19

Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
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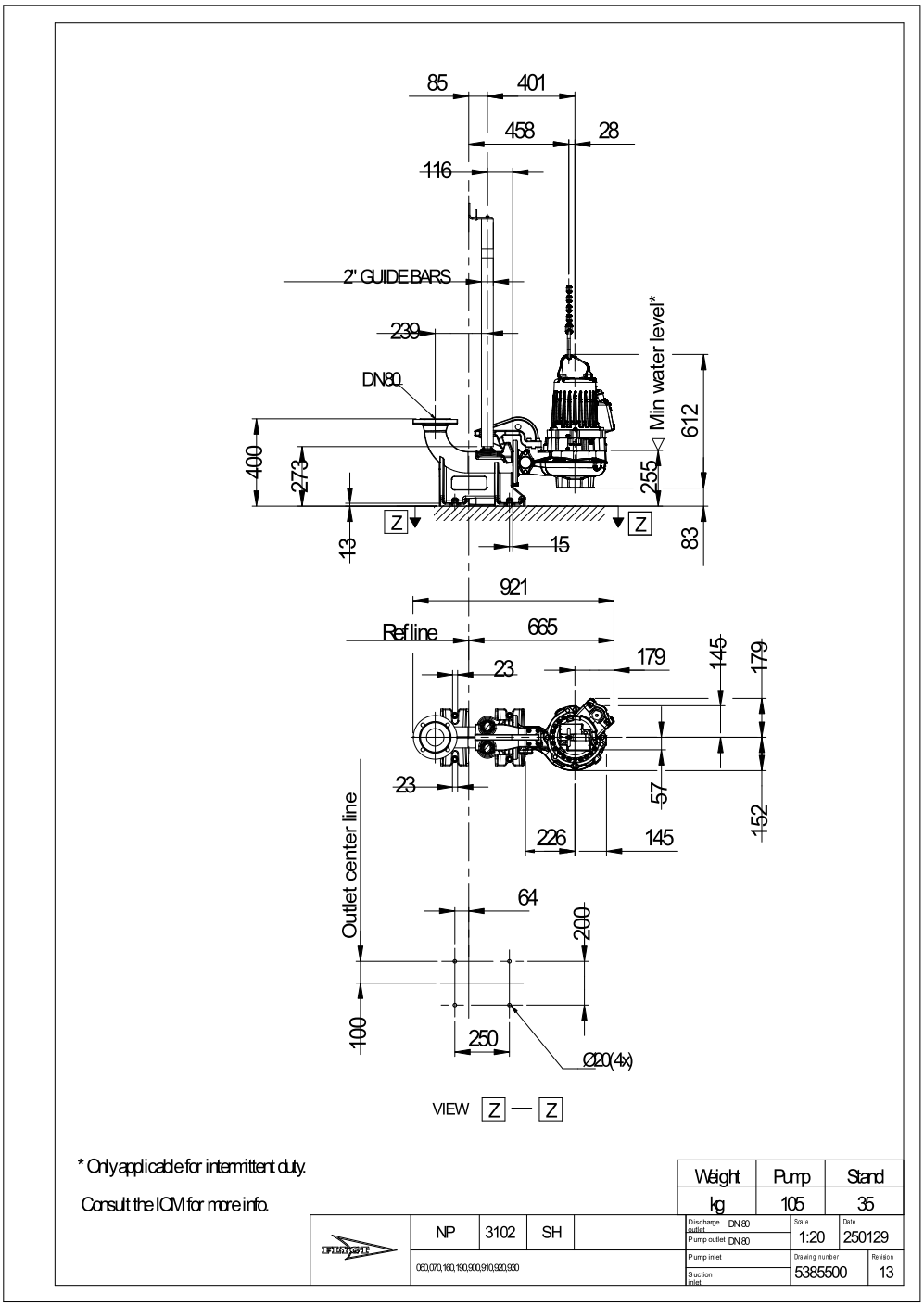
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	30 Hz	4.92	6.25	0.639	4.92	6.25	0.639	47.2 %	0.0487	0.946

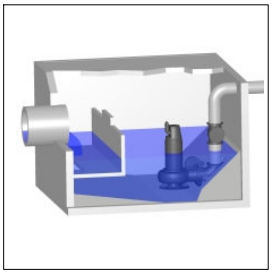
Project	Xylect-20124127	**Created by**	Peter Carroll		
Block		**Created on**	4/10/2025	**Last update**	4/10/2025

NP 3102 SH 3~ Adaptive 256

Dimensional drawing



Project	Xylect-20124127	**Created by**	Peter Carroll
Block		**Created on**	4/10/2025 **Last update** 4/10/2025



Friction loss calculation

Pumped fluid Water, pure	**Static head** 5.5	**Layout** Wet well installation
Flow 15 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Stainless steel						
PN 10 / DN 100 (104x3,0 mm) / K factor for Wastewater acc. DWA-A110						
Pipe length	100	10 m	1	1.91	1.5	0.811
Elbows	100	1.5	1	1.91		0.2789
Non-return valves	100	1.5	1	1.91		0.2789
T-piece	100	1.5	1	1.91		0.2789
Valve	100	1.5	1	1.91		0.2789
Total friction head						**1.926**
Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710						
SDR 11 (PN 16) / DN 200 (225x20,5 mm) / K factor for Wastewater acc. DWA-A110						
Pipe length	184	1587 m	1	0.5641	1.5	5.093
Total friction head						**5.093**
Friction loss head						7.019 m
Total static head						5.5 m
Total head						**12.52 m**

ABB MEASUREMENT & ANALYTICS | PRODUCT GUIDE

ProcessMaster electromagnetic flowmeter

The perfect fit for the oil and gas industry



ABB has responded to the oil and gas industry's need for a rugged, reliable electromagnetic flowmeter

Measurement made easy

ProcessMaster flowmeters – perfect for the oil and gas industry

Expertise in measurement technology

ABB's high pressure electromagnetic flowmeters are reliable, accurate and easily maintained. Customers worldwide have benefited from our application-oriented know-how and comprehensive service.

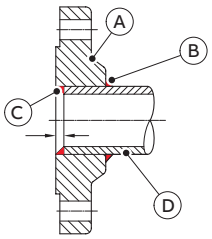
To learn more about our extensive portfolio, visit www.abb.com/measurement.

Designed specifically for oil and gas

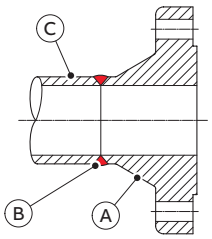
We have added a two-tier, high-pressure version to our comprehensive range of electro-magnetic ProcessMaster flowmeters. It is available with either weld neck or slip-on flanges with RTJ and raised face connections.
There are differences between X-Ray and dye penetrant test. For weld neck design we offer both dye penetrant and X-Ray tests; for slip-on design we offer only dye penetrant test.

Applications

- Slurries such as drilling mud
- Mixtures of fluids such as oil/water plus sand or produced water plus sand
- Injection fluids including sand and chemical additives for lubrication and corrision prevention
- Sludge or sludge-like wastewater from produced water treatment
- Operating conditions such as high pressure or entrained gas in the fluid
- Harsh environmental conditions such as heat, moisture or vibration and explosive or corrosive atmospheres



Ⓐ Slip-on flange Ⓑ Fillet weld (outside) Ⓒ Fillet weld (inside) Ⓓ Pipe



Ⓐ Weld neck flange Ⓑ Butt weld Ⓒ Pipe

Robust design for long life

The ProcessMaster flow sensor is designed for reliability in the demanding operating conditions found in oil and gas industry applications.

- Long lasting sensor lining materials withstand abrasion and corrosion, resulting in longer sensor service life and minimal maintenance requirements
- No additional pressure drop caused by protrusions into the pipe
- Optional self-cleaning measuring electrodes prevent issues caused by build-up of deposits
- Double sealed measuring electrodes minimize the risk of leakage and enhance reliability
- Optional all-316 stainless steel construction for corrosive offshore atmosphere
- Optional fully-welded sensor made from 316 material
- Protection of internal sensor components against moisture and vibration with potted Ex sensor

Range of certificates and test reports

- 3.1 material certificates and/or PMI certificates
- Certificates for non-destructive testing, X-Ray and/or dye penetration test
- Welder qualifications and procedures
- Hydrostic pressure testing

Specification

Accuracy	Standard: 0.4 % of rate Enhanced: 0.2 % of rate
Nominal size range	DN 25 to 400 (1 to 18 in)
Nominal pressure	ASME CL 600 to 2500
Lining	Hard rubber, ETFE
Electrodes	Stainless steel, Hastelloy C
Process connection	Steel, stainless steel
IP rating	IP67, IP68
Fluid temperature	–25 to 130 °C (–13 to 266 °F)
Power supply	100 to 230 V AC, 24 V AC/DC
I/Os	Current, pulse status output
Communication *	HART protocol, PROFIBUS PA, FOUNDATION Fieldbus
Sensor housing material	Stainless steel 316
Transmitter housing material	Stainless steel
Wetted parts material	Option for NACE
Ex approvals	ATEX/IEC Zone 1.2, FM/cFM Cl1 Div.1, Cl1 Div.2
Marine approval	DNV
Verification	ScanMaster

*** Acknowledgements**
HART is a registered trademark of FieldComm Group, Austin, Texas, USA.
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FEP630 high pressure magnetic flowmeter



FEP610 high pressure magnetic flowmeter

ABB Limited
Measurement & Analytics
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Gloucestershire, GL10 3TA, UK
Tel: +44 (0)1453 826 661
Email: instrumentation@gb.abb.com

abb.com/flow

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PG/FLOW/011-EN Rev. A 03.2020

BLACKBOX

Technical Specifications:



Blackbox 130 is a compact low-cost intelligent controller that allows users to locally program the unit and give a readout of level. Economical and simple to program and operate, users benefit from extremely accurate and reliable digital echo processing with access to the dB and dBR range of transducers, measuring from 125 mm (4.9 in) right through to 40 m (131.2 ft).

PHYSICAL: MOUNTING OPTION SPECIFIC

Mounting Option:	Standard Wall Mount:	Large Wall Mount:
Controller Body Dimensions:	130 mm x 150 mm x 63.5 mm (5.1 in x 5.9 in x 2.5 in)	130 mm x 180 mm x 85 mm (5.1 in x 7.09 in x 3.3 in)
Weight:	Nominal 0.7 kg (1.4 lb)	Nominal 0.8 kg (1.7 lb)
Enclosure Material/ Description:		ABS Base with polycarbonate lid, flammability rating UL 94 HB
Cable Entry Detail:	Underside fitted with 3 x M20, nylon cable glands suitable for 6 mm to 12 mm (0.2 in to 0.5 in) cable	Underside fitted with 3 x M20, nylon cable glands suitable for 6 mm to 12 mm (0.2 in to 0.5 in) cable
Transducer Cable Extensions:	2-core screened (2 conductor 20 AWG screened)	
Nominal Separation:	1,000 m (3,280 ft), for greater separation distances please contact us	

ENVIRONMENTAL

IP Rating:	IP66/67
Max. & Min. Temperature (Electronics):	-20 °C to +55 °C (-4 °F to +131 °F)
Flammable Atmosphere Approval:	All Blackbox units must be mounted in a safe area. Compatible with approved dB Transducers
CE Approval:	See EU Declaration of Conformity in the manual
UL Approval:	UL Listed. UL Listed to Canadian Safety Standards. Certificate Number E257330.

PERFORMANCE

Accuracy/Repeatability:	0.25% of the measured range or 6 mm (0.2 in), *whichever is greater*
Resolution:	dBMACH3 0.3 mm (0.01 in), dB3 0.5 mm (0.02 in), dB6 and dB10 1 mm (0.04 in), dB15 1.5 mm (0.06 in), dB25 2.5 mm (0.1 in), and dB40 5 mm (0.2 in).
Min. & Max. Range:	Dependent on Transducer. Nominally 125 mm to 40 m (4.9 in to 130 ft)
Echo Processing:	DATEM (Digital Adaptive Tracking of Echo Movement)
Rate Response:	Fully Adjustable

OUTPUTS

Analog Output:	Isolated output of 4-20mA or 0-20mA into 1 kΩ (user programmable and adjustable) 0.1% resolution
Digital Output:	RS232 for programming and data extraction
Volt Free Contacts, Number, & Rating:	2 form "C" (SPDT) rated at 2 A at 240 V AC
Display:	2 x 12 alpha numeric

PROGRAMMING

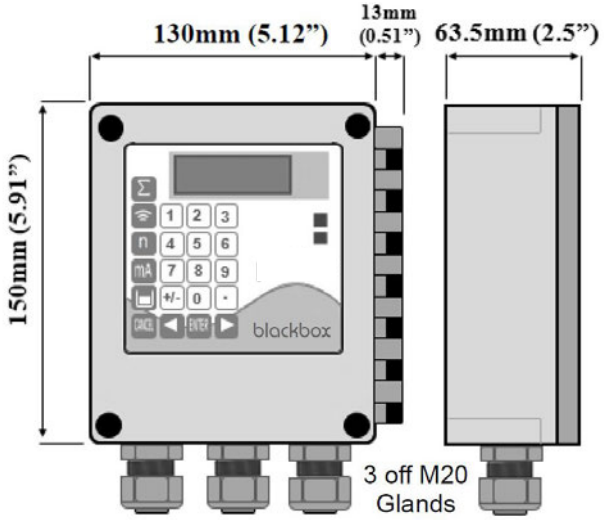
On-board Programming:	Via RS232 using supplied software
PC Programming:	Via RS232 using supplied software
Programming Security:	Via Passcode (user selectable and adjustable)
Programmed Data Integrity:	Via non-volatile RAM
Remote Programming:	Via RS232 using optional handheld calibrator

SUPPLY

Power Supply:	115 V AC +5% / -10% 50/60 Hz, 230 V AC +5% / -10% 50/60 Hz, 10-28 V DC, 10 W maximum power (typically 5 W)
Fuses:	50mA at 230 V AC, 100mA at 115 V AC

REMOTE COMMUNICATIONS

Power Supply:	Power supplied via Blackbox RS232 interface



Blackbox Drawing Front and Side

pulsar MEASUREMENT

INFO@PULSARMEASUREMENT.COM

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Registered Address: 1 Chamberlain Square CS, Birmingham B3 3AX
Registered No.: 3345604 England & Wales

Delivering the Measure of Possibility

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Long Sault, Ont. K0C 1P0
+1 855-300-9151

United Kingdom
Cardinal Building, Enigma Commercial Centre
Sandy's Road, Malvern WR14 1JJ
+44 (0) 1684 891371

Rev 4.0

dB ULTRASONIC TRANSDUCERS



Technical Specifications:

The dB Transducer Series is a range of non-contacting ultrasonic transducers for level, volume, and flow measurement. Available in a variety of models and compatible with all Pulsar controllers so that you have a specific solution to suit your application requirements.

PHYSICAL: TRANSDUCER SPECIFIC

Model:	Dimensions:	Dia Face:	Weight:	Measurement Range:	Frequency:	Beam Angle:
dB3	78 (D) mm x 115 (H) mm (3.1 in x 4.5 in)	19 mm (0.7 in)	1.1 kg (2.4 lb)	125 mm to 3 m (4.9 in to 9.8 ft)	125kHz	<10°
dB6	86 (D) mm x 106 (H) mm (3.4 in x 4.2 in)	30 mm (1.2 in)	1.1 kg (2.4 lb)	300 mm to 6 m (11.8 in to 19.7 ft)	75kHz	<10°
dBS6	86 (D) mm x 106 (H) mm (3.4 in x 4.2 in)	45 mm (1.8 in)	1.1 kg (2.4 lb)	200 mm to 6 m (7.9 in to 19.7 ft)	50kHz	<10°
dB10	86 (D) mm x 106 (H) mm (3.4 in x 4.2 in)	45 mm (1.8 in)	1.1 kg (2.4 lb)	300 mm to 10 m (11.8 in to 32.8 ft)	50kHz	<10°
dB15	86 (D) mm x 122 (H) mm (3.4 in x 4.8 in)	60 mm (2.4 in)	1.2 kg (2.6 lb)	500 mm to 15 m (19.7 in to 49.2 ft)	41kHz	<8°
dB25	105 (D) mm x 142 (H) mm (4.1 in x 5.6 in)	78 mm (3.1 in)	1.4 kg (3.1 lb)	600 mm to 25 m (23.6 in to 82 ft)	30kHz	<6°
dB40	205 (D) mm x 223 (H) mm (8.1 in x 8.8 in)	160 mm (6.3 in)	6 kg (13.2 lb)	1.2 m to 40 m (3.9 ft to 131.2 ft)	20kHz	<5°

PHYSICAL: ALL TRANSDUCERS

Sensor Body Material:	Valox 357 U and syntactic foam face
Cable Lengths:	Standard = 5 m, 10 m, 20 m, or 30 m (16.4 ft, 32.8 ft, 65.6 ft, or 98.4 ft). Optional: up to 150 m (492 ft) maximum (increments of 10 m (32.8 ft) only)
Maximum Separation:	500 m (1,640 ft)
Mounting Connection:	BSP or 1" NPT

ENVIRONMENTAL

Enclosure Protection:	IP68 / NEMA 6P
Max. And Min. Temperature (Electronics):	Standard: -40° C to +90° C (-40° F to +194° F) Hazardous area versions: -40° C to +75° C (-40° F to +167° F)

APPROVALS

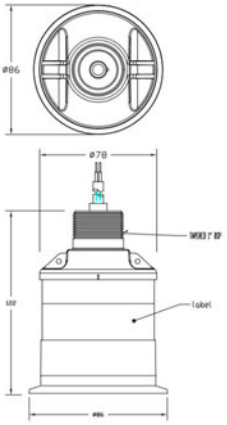
CE Approval:	2014/30/EU to EMC & 2014/34/EU ATEX Directives. Standards applied: EN 60079-0:2012+A11:2013/ EN 60079-11:2012 / EN 60079-18:2009 / EN 60079-26:2007 / EN 61326-1:2013
ATEX Approval:	Standard ATEX EEx m II T6 or optional EEx ia IIC T6. FM/FMC approval.

TRANSDUCER OPTIONS

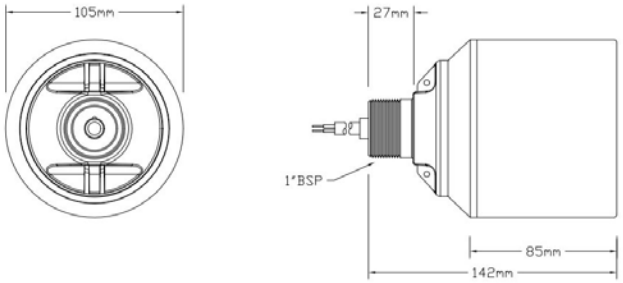
Model:	dB3	dBs6	dB6	dB10	dB15	dB25	dB40
PVDF		✓	✓	✓			
Front Threaded / PVDF	✓	✓	✓	✓			
Submergence Shield	✓	✓	✓	✓	✓	✓	
Flanged DIN/ANSI		✓	✓	✓	✓		
Foam Face		✓		✓	✓	✓	✓
Sanitary Flange		✓	✓	✓			
Intrinsically Safe of All the Above	✓	✓	✓	✓	✓	✓	✓

PERFORMANCE

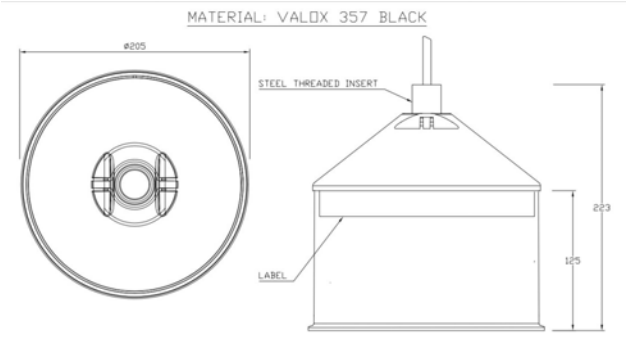
Accuracy:	0.25% or 6 mm (0.2 in) whichever is greater
Resolution:	0.01% or 2 mm (0.08 in) whichever is greater
Temp. Compensation:	Automatic, internal temperature sensor, ± 0.5 °C/°F



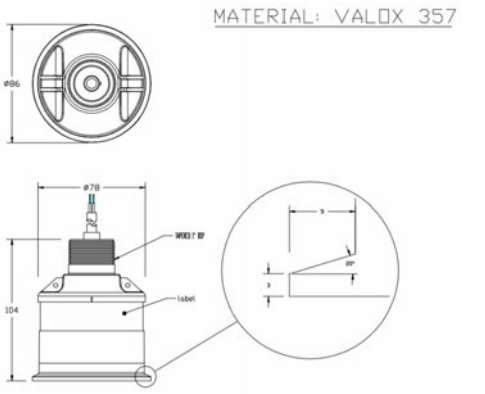
dB15 Transducer Drawing



dB25 Transducer Drawing



dB40 Transducer Drawing



dB6 & dB10 Transducer Drawing

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Rev 7.0

xylem
Let's Solve Water

Technical Specification

891480_17.0



ENM 10

Level switch

FLYGT
a xylem brand

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1 Product Description

1.1 Product design

Usage

ENM-10 is a level regulator for level control applications. The level regulator starts and stops a pump or activates an alarm device when the liquid level reaches the regulator.

Materials

Denomination	Standard version	Ex version
Regulator casing	Polypropylene	Polypropylene with black conductive casing
Bend relief	EPDM rubber	NBR-PVC rubber
Cable sheath	PVC	NBR-PVC rubber

The plastic components are welded and screwed together.

1.2 Technical data

Application limits

Feature	Value
Liquid temperature	Minimum 0°C (32°F) Maximum 60°C (140°F)
Liquid density	Minimum 0.65 g/cm^3 Maximum 1.5 g/cm^3

Electrical specifications

Feature	Value
Degree of protection	IP68, 20 m (65 ft), 2 bars
Interrupting capacity of micro switch	AC, resistive load, 250 V 10 A AC, inductive load, 250 V 3 A cos ϕ = 0.5 DC, 30 V 5 A
Interrupting capacity of gold-plated micro switch	AC, resistive load, 250 V 10 A AC, inductive load, 250 V 3 A cos ϕ = 0.5 DC, 24 V 10 mA

Voltage limits are subject to local regulations.

Density ranges

Density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
0.65 – 0.80	194 (7 10/16)	100 (4)
0.80 – 0.95	177 (7)	100 (4)
0.95 – 1.10	162 (6 3/8)	100 (4)
1.05 – 1.20	142 (5 9/16)	100 (4)
1.20 – 1.30	133 (5 1/4)	100 (4)
1.30 – 1.40	130 (5 2/16)	100 (4)

Density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
1.40 – 1.50	126 (5)	100 (4)

Weight

A regulator with standard density and 20 m cable weighs approximately 2 kg (4.5 lb).

1.3 Cables

Lengths

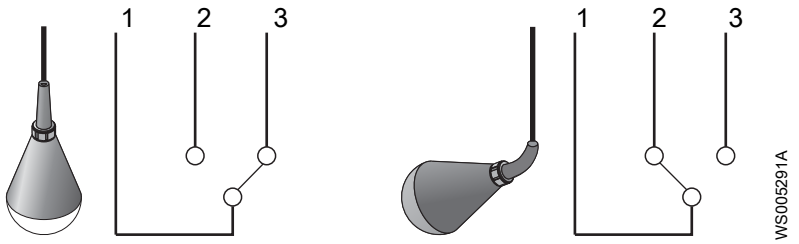
For liquids with specific density between 0.95 and 1.10 g/cm^3, the following cables are available:

Version	Lengths m (ft)
Standard	• 6 m (20 ft) • 13 m (42 ft) • 20 m (65 ft) • 30 m (100 ft) • 50 m (167 ft)
Ex	• 6 m (20 ft) • 13 m (42 ft) • 20 m (65 ft) • 30 m (98 ft) • 50 m (164 ft)

Diameter

The cable diameter for all product variants is 6.7 mm (0.26 in), +/- 0.2 mm (0.00787 in).

Color codes



Cable	1	2	3
Color	Grey	Black	Brown

1.4 Approvals and standards

Standard approvals

LVD approval according to EN61058
CSA approval: Certificate Number 1330172
Cl. I Zone 0, Gr. IIC
CL.I Div.1 Gr A, B, C and D
Cl.II Gr. E, F, and G

Ex approvals

IECEx ia IIC T4 Ga: -20°C≤Ta≤60°C
IECEx NEMKO 09.0008
ATEX II 1G Ex ia IIC T4 Ga

NEMKO 10 ATEX 1082

Applied standards for ATEX and IEC

- EN 60079-0:2012 / IEC 60079-0:2011
- EN 60079-11:2012 / IEC 60079-11:2011

Intrinsically safe circuits are required for the automatic control system. Use a Zener barrier, for example, part number 84 01 07.

The electrical connections must comply with the Ex regulations of the national submitter.



2 References

2.1 Chemical resistance tables

The tables show the degree of resistance the level regulator has to different chemicals at two different temperatures. The density of the liquid determines the buoyancy of the regulator.

Acids

Acid	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetic acid 50%	1	2	0	0
Acetic acid 75%	2	2	0	0
Benzoic acid	2	2	0	0
Boric acid 5%	0	–	0	0
Butyric acid	2	2	2	2
Chromic acid 10%	0	2	2	2
Citric acid	0	1	0	0
Hydrobromic acid 5%	1	2	0	0
Hydrochloric acid 10%	0	1	0	1
Hydrochloric acid 37%	1	2	0	2
Hydrocyanic acid 10%	0	0	1	2
Hydrofluoric acid 5%	0	2	0	1
Hypochloric acid	1	2	2	2
Maleic acid	2	2	2	2
Nitric acid 5%	1	1	1	1
Nitric acid 65%	2	2	2	2
Oleic acid	1	2	2	2
Oxalic acid 50%	1	1	1	2
Phosphoric acid 25%	0	0	1	2
Phosphoric acid 85%	0	0	1	2
Sulphuric acid 10%	1	2	1	2
Sulphuric acid 78%	2	2	2	2
Tannic acid	0	0	0	0
Tartaric acid	1	1	1	1

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Alkalis

Alkali	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Ammonium hydroxide	0	–	0	0
Calcium hydroxide	0	0	0	0

Alkali	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Potassium hydroxide	1	2	0	0
Sodium hydroxide	1	2	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Salts

Salt	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Aluminum chloride	0	0	0	0
Calcium sulphate	0	0	0	0
Calcium chloride	0	0	0	0
Calcium nitrate	0	0	0	0
Copper chloride	0	0	0	0
Copper sulphate	0	0	0	0
Ferric chloride	0	0	0	0
Ferrous sulphate	0	0	0	0
Magnesium chloride	0	0	0	0
Potassium sulphate	0	0	0	0
Potassium nitrate	0	0	0	0
Potassium carbonate	1	1	1	1
Potassium bicarbonate	0	0	0	0
Sodium sulphate	0	0	0	0
Sodium chloride	0	0	0	0
Sodium nitrate	0	0	0	0
Sodium bicarbonate	0	0	0	0
Sodium carbonate	0	0	0	0
Tin chloride	1	1	1	1
Zinc sulphate	0	0	0	0
Zinc chloride	0	0	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Oils

Oil	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Castor oil	1	1	1	1
Coconut oil	0	–	0	2
Corn oil	2	2	2	2
Diesel oil	2	2	2	2
Linseed oil	2	2	2	2
Mineral oils	2	2	2	2
Olive oil	1	1	1	1
Silicone oils	0	0	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Solvents and miscellaneous

Chemical	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetone	2	2	2	2
Aniline	2	2	1	2
Benzene	2	2	2	2
Butyl alcohol	2	2	0	1
Carbon tetrachloride	2	2	2	2
Chlorobenzene	2	2	2	2
Chloroform	2	2	2	2
Ethyl alcohol	2	2	0	1
Ethyl ether	2	2	2	2
Ethyl acetate	2	2	2	2
Ethylene dichloride	2	2	2	2
Ethylene chloride	2	2	2	2
Formaldehyde 37%	1	2	0	0
Gasoline	2	2	2	2
Kerosene	2	2	2	2
Methyl alcohol	2	2	0	0
Methyl ethyl ketone	2	2	2	2
Methylene chloride	2	2	2	2
Nitrobenzene	2	2	2	2
Phenol	2	2	2	2
Toluene	2	2	2	2
Trichlorethylene	2	2	2	2
Turpentine	2	2	2	2
Xylene	2	2	2	2

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Gases

Gas	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Carbon dioxide	0	0	0	0
Carbon monoxide	0	0	0	0
Chlorine – wet	2	2	2	2
Hydrogen sulfide	0	0	1	1
Sulphur dioxide – wet	1	1	2	2

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

2.2 Product range

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable[1]	Approvals	For market
582 88 00	0.65–0.80	Blue	20	1	CE	International
582 88 01	0.80–0.95	Blue	20	1	CE	International
582 88 02	0.95–1.10	Blue	6	1	CE	International
582 88 03	0.95–1.10	Blue	13	1	CE	International
582 88 04	0.95–1.10	Blue	20	1	CE	International
582 88 05	1.05–1.20	Blue	20	1	CE	International
582 88 06	1.20–1.30	Blue	20	1	CE	International
582 88 07	1.30–1.40	Blue	20	1	CE	International
582 88 08	1.40–1.50	Blue	20	1	CE	International
582 88 09	0.65–0.80	Gray	20	3	CSA/CE	Canada
582 88 10	0.80–0.95	Gray	20	3	CSA/CE	Canada
582 88 11	0.95–1.10	Gray	6	3	CSA/CE	Canada
582 88 12	0.95–1.10	Gray	13	3	CSA/CE	Canada
582 88 13	0.95–1.10	Gray	20	3	CSA/CE	Canada
582 88 14	1.05–1.20	Gray	20	3	CSA/CE	Canada
582 88 15	1.20–1.30	Gray	20	3	CSA/CE	Canada
582 88 16	1.30–1.40	Gray	20	3	CSA/CE	Canada
582 88 17	1.40–1.50	Gray	20	3	CSA/CE	Canada
582 88 18	0.65–0.80	Gray	20	1	CSA/CE	Canada
582 88 19	0.80–0.95	Gray	20	1	CSA/CE	Canada
582 88 20	0.95–1.10	Gray	6	1	CSA/CE	Canada
582 88 21	0.95–1.10	Gray	13	1	CSA/CE	Canada
582 88 22	0.95–1.10	Gray	20	1	CSA/CE	Canada
582 88 23	1.05–1.20	Gray	20	1	CSA/CE	Canada
582 88 24	1.20–1.30	Gray	20	1	CSA/CE	Canada
582 88 25	1.30–1.40	Gray	20	1	CSA/CE	Canada
582 88 26	1.40–1.50	Gray	20	1	CSA/CE	Canada
582 88 36	0.95–1.10	Gray	30	3	CSA/CE	Canada
582 88 37	0.95–1.10	Gray	50	3	CSA/CE	Canada
582 88 38	0.95–1.10	Gray	100	3	CSA/CE	Canada
582 88 39	0.95–1.10	Gray	150	3	CSA/CE	Canada
582 88 51	0.95–1.10	Red	65	2	CE	International
582 88 52	0.95–1.10	Red	6	2	CE	International
582 88 53	0.95–1.10	Red	13	2	CE	International
582 88 54	0.95–1.10	Red	20	2	CE	International
582 88 57	0.95–1.10	Red	20	2	CE	Canada
582 88 70	0.65–0.80	Blue	20	3	CE	International
582 88 71	0.80–0.95	Blue	20	3	CE	International
582 88 72	0.95–1.10	Blue	6	3	CE	International
582 88 73	0.95–1.10	Blue	13	3	CE	International

[1] See *Type of cables* on page 9.

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable[1]	Approvals	For market
582 88 74	0.95–1.10	Blue	20	3	CE	International
582 88 75	1.05–1.20	Blue	20	3	CE	International
582 88 76	1.20–1.30	Blue	20	3	CE	International
582 88 77	1.30–1.40	Blue	20	3	CE	International
582 88 78	1.40–1.50	Blue	20	3	CE	International
582 88 79	0.95–1.10	Blue	65	1	CE	International
582 88 80	0.95–1.10	Blue	30	1	CE	International
582 88 81	0.95–1.10	Blue	50	1	CE	International
582 88 82	0.95–1.10	Gray	30	1	CSA/CE	Canada
582 88 83	0.95–1.10	Gray	50	1	CSA/CE	Canada
582 88 86	0.95–1.10	Red	30	2	CE	International
582 88 87	0.95–1.10	Red	50	2	CE	International
582 88 90	0.95–1.10	Blue	30	3	CE	International
582 88 91	0.95–1.10	Blue	50	3	CE	International
582 88 92	0.95–1.10	Red	6	2	CE	Japan
582 88 93	0.95–1.10	Red	13	2	CE	Japan
582 88 94	0.95–1.10	Red	20	2	CE	Japan
582 88 95	0.95–1.10	Blue	6	1	CE	Japan
582 88 96	0.95–1.10	Blue	13	1	CE	Japan
582 88 98	0.95–1.10	Blue	50	1	CE	Japan
594 79 10	0.95–1.10	Blue	70	3	CE	International
594 79 13	0.95–1.10	Blue	100	3	CE	International
594 79 18	0.95–1.10	Blue	150	3	CE	International
594 79 19[2]	0.95–1.10	Blue	20	3	CE	International
594 79 20[2]	0.95–1.10	Gray	20	3	CSA/CE	International
594 79 21 [2]	0.95–1.10	Transparent	6	3	CE	For demonstration only.
594 79 40[2]	0.95–1.10	Black	6	3	ATEX/IECEx[3]	International
594 79 41[2]	0.95–1.10	Black	13	3	ATEX/IECEx[3]	International
594 79 42[2]	0.95–1.10	Black	20	3	ATEX/IECEx[3]	International
594 79 49[2]	0.95–1.10	Black	30	3	ATEX/IECEx[3]	International
594 79 50[2]	0.95–1.10	Black	50	3	ATEX/IECEx[3]	International

Type of cables

Type of cable	Jacket	Color coding of wires
1	Blue polyvinyl chloride (PVC)	Grey/Brown/Black
2	Red PVC	Grey/Brown/Black
3	Black nitrile rubber (NBR)/PVC	Grey/Brown/Black

1 See *Type of cables* on page 9.
2 Designed for low current, slow movements and oil. Includes micro switch with gold plated contacts.
3 Zener barrier 84 01 07 required.

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1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

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Scan for more information

Hynds Retention Tank with Mul-T-Level™ Outlet

Technical Guide D5.15

Hynds strong and reliable retention tanks are available in Ring Joint Pipe Internal Base or Flange Base manhole types.



Applications

- Stormwater retention & detention
- Sewer storage

Product Attributes

- Versatile Mul-T-Level™ outlet
- Highly durable
- Simple installation
- Various design layouts and large capacity options available
- Water tight
- Proven history

Approvals/Standards

- AS/NZS 4058:2007 Precast concrete pipes (pressure and non-pressure)

Quality

- ISO 9001:2008 Quality Management

Hynds strong and reliable retention tanks are available in Ring Joint Pipe, Internal Base or Flange Base Manhole types.

Design Specifications and Applications

RJ Retention Tank

- Generally used when the location permits the installation of a long narrow tank.
- Comprised of Hyspec reinforced concrete rubber ring joint pipes.
- Usually includes a spigot-plugged pipe, standard intermediate pipes and a collar-plugged pipe.
- The spigot and collar plugs are factory cast to ensure water tightness and integrity.
- A manhole offtake is factory fitted to one or more pipes to provide easy access for maintenance.

IB or FB Retention Tank

- Generally used in compact site conditions where relatively small volumes is required.
- Comprised of Hynds internal base or flange base manhole risers and a precast concrete lid.

Mul-T-Level™ outlet

- Enables the tank to be used for both detention and retention.
- Both the RJ and IB/FB retention tanks have a standard 100 or 150mm diameter PVC slip coupler and Mul-T-Level™ outlet cast-in or fitted during manufacturing.
- The required retention/detention volume is set by an orifice hole (of specified diameter) being drilled on the Mul-T-Level™ outlet at a pre-determined height.

General Specifications

- Manufactured from Hyspec spun concrete pipes, using the centrifugal spinning process.
- When the tank is installed in an aggressive environment, such as tidal areas, sewerage or mild acid solutions, the use of a special grade concrete is recommended. Contact Hynds Technical Team for more information.
- Retention tanks are available in various class types to suit specific site conditions, loading and applications.
- The diameter and length of the retention tank is dependent on:
  - Storage volume required
  - Site configuration and access equipment available
- Inspection and maintenance access is provided by a fitted inspection chamber or manhole riser starter.
- PVC slip couplers are fitted to end plugs to provide inlet and outlet connections to the retention tank.
- Non-standard couplers or starter types can be cast-in on request.
- Orifice holes are drilled at levels to suit the design requirements.
- Standard lids are available for access risers in the RJ type tanks.
- A light or heavy duty cast iron cover and frame will fit direcly onto the 600mm diameter access riser.
- The 1050 mm diameter access riser requires a 1050 mm diameter manhole lid, which can be fitted with the cast iron manhole frame and cover.
- The IB or FB tanks require a lid, which can be fitted with a cast iron frame and cover to suit the riser diameter.
  - Note: Lid thickness is dependent on loads and application
  - Refer to Table 1 for RJ tank capacities and Tables 2 and 3 for IB/FB tank capacities.

TABLE 1 **RJ type retention tank**

Nom Pipe Diameter and Joint Type	Pipe Effective Length (m)	Nom Vol per Pipe Length (m^3)	Nom Vol per Pipe Length (Litres)	Suggested Offtake Dia (mm)	Lifting plugged pipe anchor req.	Handling intermediate pipe anchor req.
675RJ	2.440	0.72	720	600	A1	A2
750RJ	2.440	0.92	920	600	A1	A2
825RJ	2.436	1.14	1140	600	A1	A2
900RJ	2.448	1.38	1380	600	A1	A2
975RJ	2.440	1.67	1670	600	B1	B2
1050RJ	2.440	1.94	1940	600	B1	B2
1200RJ	2.440	2.58	2580	600	B1	B2
1350RJ	2.454	3.31	3310	600/1050	B1	B2
*1600RJ	2.440	4.51	4510	1050	C1*	B2*
1800RJ	2.438	6.13	6130	1050	C1	C2
1950SRJ	2.440	7.05	7050	1050	C1	C2
2100SRJ	2.397	8.02	8020	1050	C1	C2
2300SRJ	2.735	11.01	11010	1050	C1	C2
2550SRJ	2.470	12.18	12180	1050	C1	C2

Key

- **A1** *1 Tonne*
  2 no. in plug
  1 no. in pipe
- **A2** *1 Tonne*
  2 no. in pipe
- **B1** *2.5 Tonne*
  2 no. in plug
  1 no. in pipe
- **B2** *2.5 Tonne*
  2 no. in pipe
- **C1** *5 Tonne*
  2 no. in plug
  1 no. in pipe
- **C2** *5 Tonne*
  1 no. in pipe

Notes:

- *All dimensions refer to Class 2 (X) pipes*
- *Outlet 75 mm minimum above bottom invert of pipe*
- *Overflow 125mm below top*
- **1600 Ø retention tanks require both B2 & C1 type lifting clutches for offloading and installation*
- *See Fig 6 for 3 point lift on typical plugged end pipe*

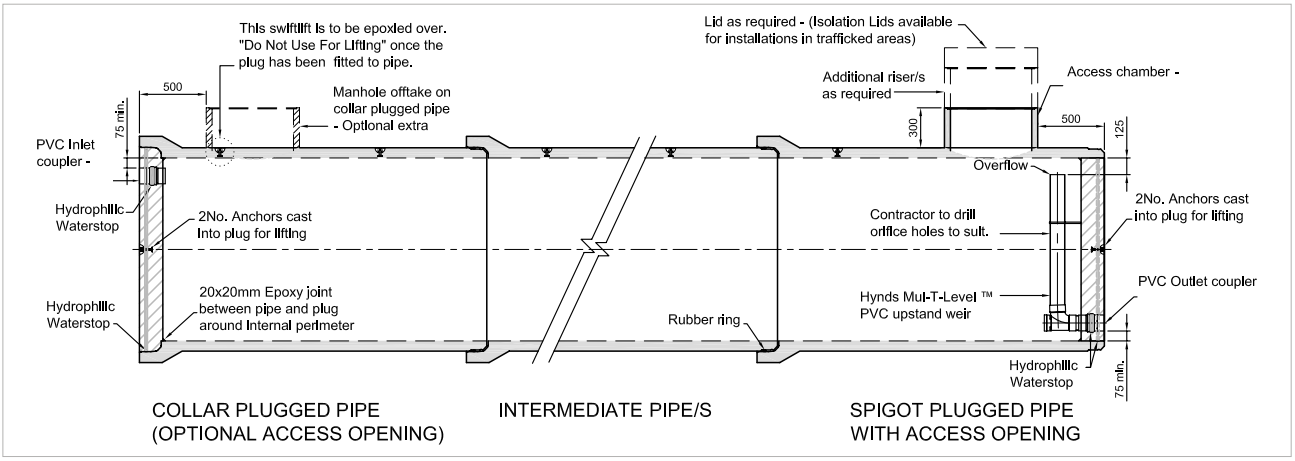


FIG. 1 General layout of typical RJ type retention tank with Mul-T-Level™ outlet

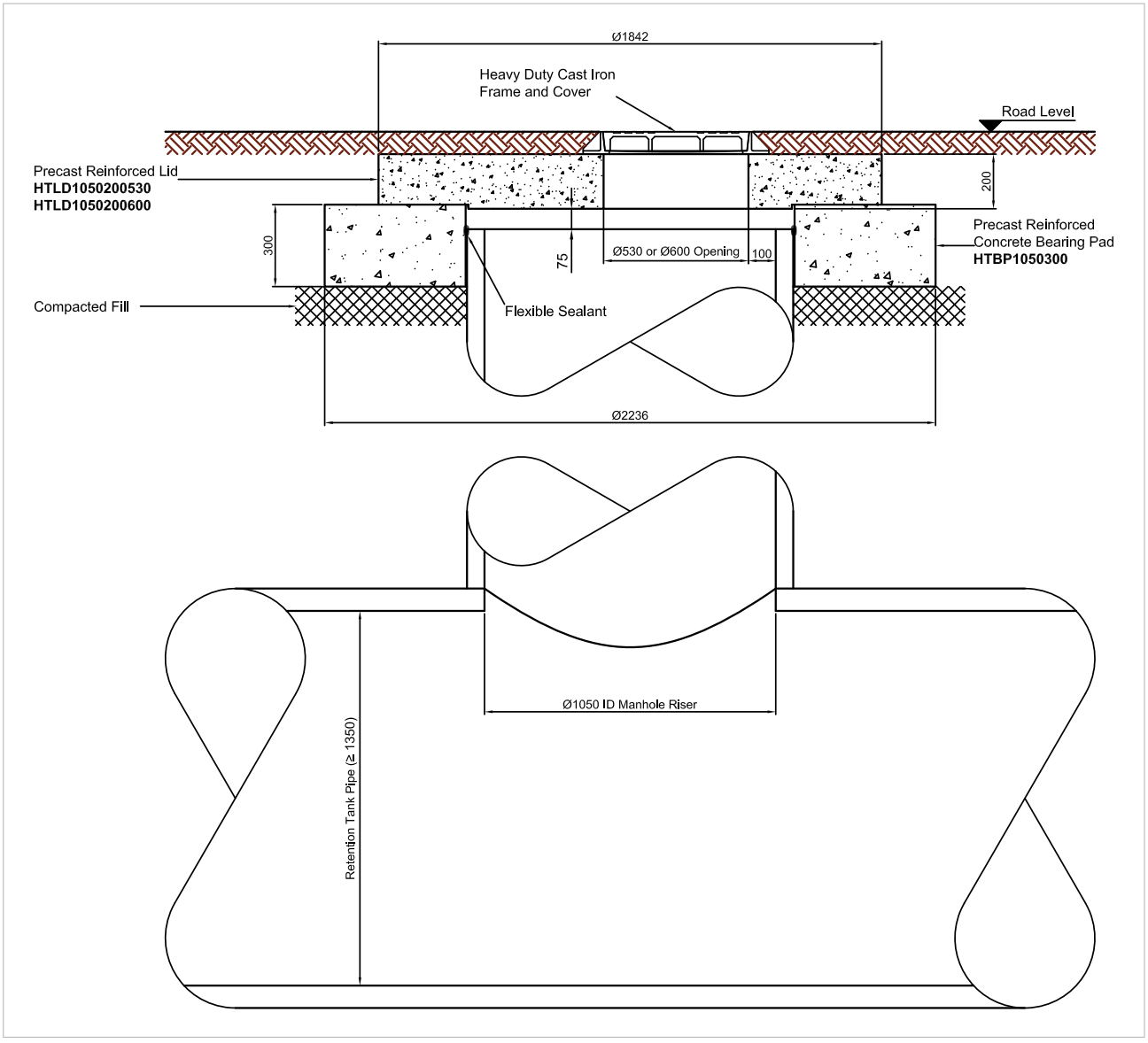
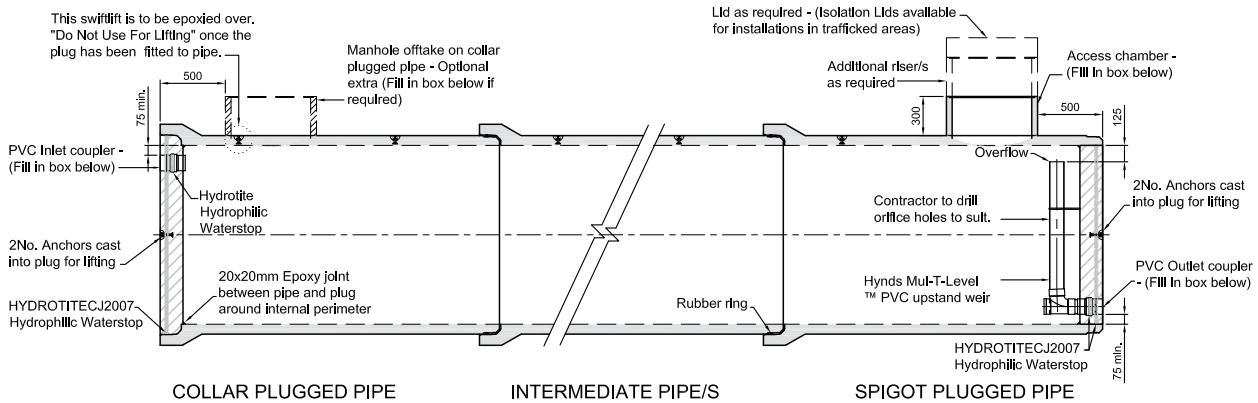


FIG. 2 Recommended detail for roadway installation



PIPE Ø

Min Recommended Ø 675mm

PIPE CLASS

TOTAL No. OF PIPES (Incl. ends)

COVER TO INVERT

Inlet	Outlet

PVC INLET FITTING Ø

Pipe Ø	Standard Fitting Ø	Ø Required
Ø675 to 1200mm	Ø100mm	
Ø1350 to 3000mm	Ø150mm	

PVC OUTLET FITTING Ø

Ø Pipe	Standard Fitting Ø	Ø Required
Ø675 to 1200mm	Ø100mm	
Ø1350 to 3000mm	Ø150mm	

ACCESS CHAMBER - OUTLET SIDE Ø

Ø Pipe	Standard Offtake Ø	Ø Required
Ø675 to 1200mm	Ø600mm	
Ø1350 to 3000mm	Ø1050mm	
Ø1350 to 3000mm	Specify	

ACCESS CHAMBER - OPTIONAL INLET SIDE Ø

Ø Pipe	Standard Offtake Ø	Ø Required
Ø675 to 1200mm	Ø600mm	
Ø1350 to 3000mm	Ø1050mm	
Ø1350 to 3000mm	Specify	

JOB DETAILS

QUOTE No.

CO No.

I AUTHORISE **HYNDS PIPE SYSTEMS LTD** TO PROCEED WITH THE MANUFACTURING OF THIS PIPE SPECIAL AS DETAILED ABOVE. I ACKNOWLEDGE THAT ANY SPECIALS, ONCE MANUFACTURED, ARE DEEMED TO BE MY (CONTRACTOR'S) PROPERTY & ARE NON REFUNDABLE. STORAGE & HANDLING FEES WILL BE INCURRED FOR PRODUCTS THAT ARE NOT DELIVERED/COLLECTED WITHIN 1 MONTH OF THE DATE AGREED AT THE TIME OF ORDER. PRODUCT NOT DELIVERED/COLLECTED WITHIN 3 MONTHS OF THE DATE AGREED WILL BE DESTROYED AT MY EXPENSE.

NAME :- ..... SIGNATURE :- .....

DATE :- .....

FIG. 3 RJ Retention Tank Order Form

Internal base type

TABLE 2 Internal base retention tank

Riser Height (mm)			**450**	**600**	**900**	**1200**	**1500**	**1800**	**2100**	**2400**
O/A Height Incl 150mm Thick Lid			580	730	1030	1330	1630	1930	2230	2530
O/A Height Incl 200mm Thick Lid			630	780	1080	1380	1680	1980	2280	2580
Effective Depth (mm)			225	375	675	975	1275	1575	1875	2175
Nominal Diameter	**A = Riser OD** (m)	**B = Riser ID** (m)	**IB Capacity** (m3)							
1050	1.194	1.066	0.20	0.33	0.60	0.87	1.14	1.41	1.67	1.94
1200	1.347	1.207	0.26	0.43	0.77	1.12	1.46	1.80	2.15	2.49
1400	1.524	1.372	0.33	0.55	1.00	1.44	1.88	2.33	2.77	3.22
1500	1.677	1.523	0.41	0.68	1.23	1.78	2.32	2.87	3.42	3.96
1650	1.842	1.676	0.50	0.83	1.49	2.15	2.81	3.47	4.14	4.80
1800	2.007	1.829	0.59	0.99	1.77	2.56	3.35	4.14	4.93	5.71
2050	2.236	2.036	0.73	1.22	2.20	3.17	4.15	5.13	6.10	7.08

Effective Depth (mm)			**–**	**–**	**625**	**925**	**1225**	**–**	**–**	**2125**
Nominal Diameter	**A = Riser OD** (m)	**B = Riser ID** (m)	**IB Capacity** (m^3)							
2300	2.58	2.30	–	–	–	3.84	–	–	–	8.83
2550	2.85	2.55	–	–	3.19	–	6.26	–	–	10.85

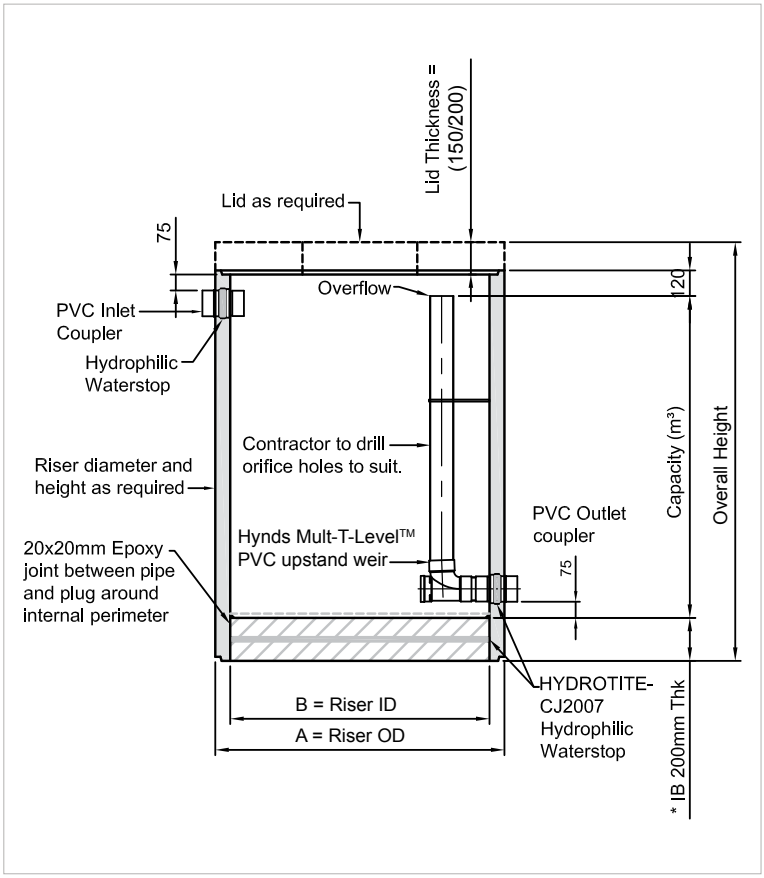


FIG. 4 Internal base

Flange base type

TABLE 3 **Flange base retention tank**

Riser Height (mm)			**450**	**600**	**900**	**1200**	**1500**	**1800**	**2100**	**2400**
O/A Height Incl 150mm Thick Lid			530	680	980	1280	1580	1880	2180	2480
O/A Height Incl 200mm Thick Lid			580	730	1030	1330	1630	1930	2230	2530
Effective Depth (mm)			225	375	675	975	1275	1575	1875	2175
Nominal Diameter	**A = Riser OD** (m)	**B = Riser ID** (m)	**FB Capacity** (m^3)							
1050	1.194	1.066	0.20	0.33	0.60	0.87	1.14	1.41	1.67	1.94
1200	1.347	1.207	0.26	0.43	0.77	1.12	1.46	1.80	2.15	2.49
1400	1.524	1.372	0.33	0.55	1.00	1.44	1.88	2.33	2.77	3.22
1500	1.677	1.523	0.41	0.68	1.23	1.78	2.32	2.87	3.42	3.96
1650	1.842	1.676	0.50	0.83	1.49	2.15	2.81	3.47	4.14	4.80
1800	2.007	1.829	0.59	0.99	1.77	2.56	3.35	4.14	4.93	5.71
2050	2.236	2.036	0.73	1.22	2.20	3.17	4.15	5.13	6.10	7.08

Effective Depth (mm)			–	–	**625**	**925**	**1225**	–	–	**2125**
Nominal Diameter	A = Riser OD (m)	B = Riser ID (m)	FB Capacity (m^3)							
2300	2.58	2.30	–	–	–	3.84	–	–	–	8.83
2550	2.85	2.55	–	–	3.19	–	6.26	–	–	10.85

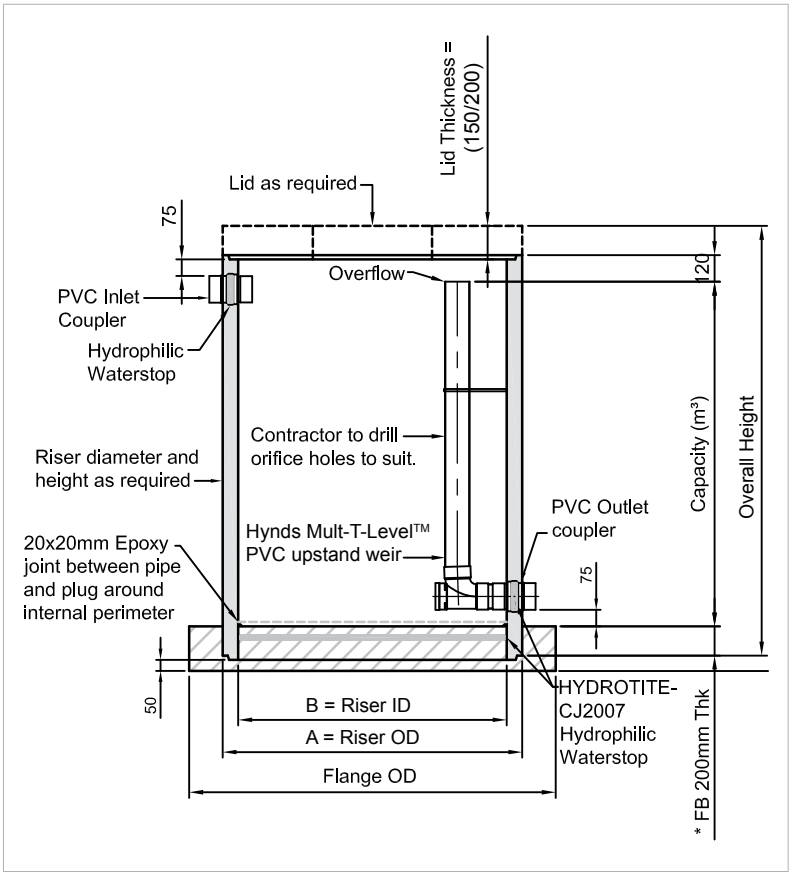


FIG. 5 Flange base

Installation

Mul-T-Level™ outlet

- Installation is simple and normally carried out by a drain layer using the same equipment and procedures as for the installation of concrete pipelines, or manholes.

RJ Retention Tank

- Similar installation to reinforced concrete rubber ring jointed pipes (including bedding requirements) and are dependent on site conditions and loading.
- Once the pipe sections have been installed and backfilled, the additional access risers are epoxied to the starter risers and brought up to the finished levels.
- The installation is then completed by fitting the required lids.
- The contractor must then drill the orifice holes at the required design levels.

Note: *Refer to Figure 1 for a general layout of a typical RJ type tank.*

RJ Retention Tank – Roadway Installation

- To minimise the effects of traffic, isolation of the manhole lid from the access riser is recommended.
- The depth of the modified flange base and riser must be kept to a minimum to enable maximum distribution of load above the tank.
- Refer to Figure 6 for 3 point lift of typical plugged end pipe.

IB or FB Retention Tank

- Similar installation to concrete manholes.
- Foundations should be prepared with compacted hardfill to prevent excessive settlement.
- Once the IB or FB tank is backfilled, the installation is completed by fitting the relevant concrete lid with the appropriate cast iron frame.



FIG. 6 Point lift of typical plugged and pipe

Disclaimer: While every effort has been made to ensure that the information in this document is correct and accurate, users of Hynds product or information within this document must make their own assessment of suitability for their particular application. Product dimensions are nominal only, and should be verified if critical to a particular installation. No warranty is either expressed, implied, or statutory made by Hynds unless expressly stated in any sale and purchase agreement entered into between Hynds and the user.

Hyliner AKS HDPE Lining

Technical Guide D1.12

HyLiner AKS HDPE is used as corrosion protection lining in precast and cast in-situ concrete elements or structures to increase durability and reduce the risk of abrasion.



Applications

- Corrosion protection lining for precast concrete pipes in sewer pipelines
- Corrosion protection lining for in-situ concrete structures in wastewater treatment plants
- Abrasion protection lining in high abrasion environments
- Broad range of application in both precast and cast in-situ concrete

Product Attributes

- Available in white (sewer applications) and black (where high UV resistance is required)
- 12 mm long anchors are integrally formed with the sheet
- Factory QA tested and welding of joints is 100% quality tested onsite

Quality

- ISO 9001:2008 Quality Management Standard

We are the supply partner of choice for New Zealand's civil construction industry, specialising in water and infrastructure based solutions.

HYNDS PIPE SYSTEMS

HyLiner AKS HDPE is used as corrosion protection lining in precast and cast in-situ concrete elements or structures to increase durability and reduce the risk of abrasion.

Lining systems are able to bridge discontinuities in pipe or structure walls unlike other coating systems that rely on the integrity of the surface and quality of the surface preparation and the installer's expertise for functionality.

HyLiner AKS HDPE is a thermoplastic lining used to reduce the risk of sulphide attack or corrosion in sewage applications.

The high density polyethylene *(HDPE)* lining suits both precast and in-situ applications. Firmly anchored to the concrete surface of the pipe or structure, the lining requires only welding of joints to form a durable, chemically resistant concrete protection membrane with high abrasion resistance.

Installation

Installation procedures vary depending on the product:

Spun concrete pipe

The liner is inserted into the pipe prior to the completion of manufacture, with the pipe spinning process completed with the liner installed. This ensures that all the anchor knobs are well embedded in the spun concrete prior to the concrete curing and hardening.

Wet cast concrete pipe

The liner is securely attached to the inner mould before placement of reinforcement and casting of the pipe. The pipe once cast is cured in the normal manner using heat to accelerate the hardening process.

Precast concrete

This follows a similar process to the wet cast concrete pipe whereby the liner is attached to the mould prior to casting of the element.

In-situ concrete

This follows the same process as for precast concrete whereby the liner is attached to the formwork prior to casting of the concrete.

Installation Detail

In the case of concrete pipes, the liner need only be applied to the pipe's internal surface above low flow level during normal operating conditions as shown in fig 3.

Where 360° cover is required, the liner is fitted with an overlap at the invert (50 mm min) as shown in fig 4 & 5. This joint is not usually welded as it allows any accumulation of moisture from external hydrostatic pressure to dissipate from behind the liner.

Where the fluid contents are themselves aggresive, such as trade waste discharges, a longitudinal weld can be provided to seal the pipe invert.



FIG. 1 Where 360° cover is required, the liner is fitted with an overlap at the invert (50 mm min)

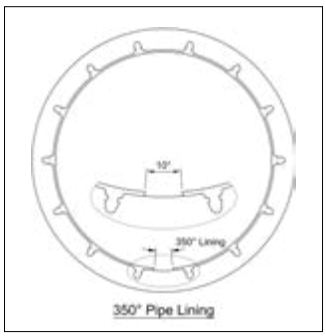


FIG. 3 Most concrete pipes only require the liner applied to the pipe's internal surface above low flow level during normal operating conditions.

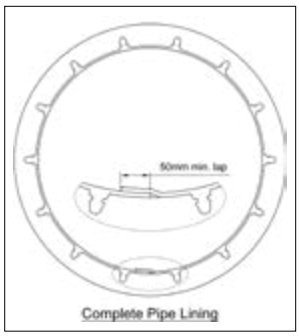


FIG. 2 Invert overlap in a 1050Ø pipe.

Jointing

A continuous lining system is created through the use of extrusion welding carried out by trained, qualified operators. Generally overlapped welds are recommended.

Various details for welded joints for precast concrete pipes and components are shown in Figures 4 to 6. Other details for site installation and fixing of brackets are shown in Figures 7 to 12.

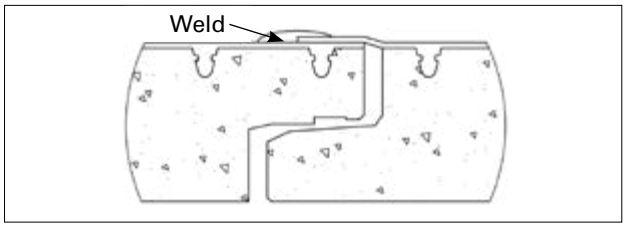


FIG. 4 HyLiner lined SRJ pipe (Lapped Joint)

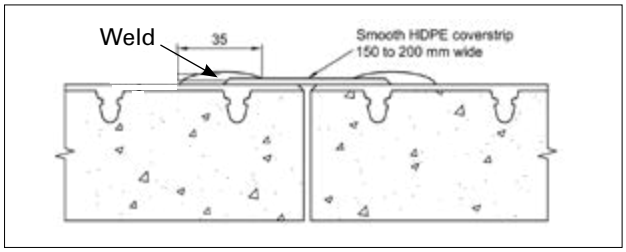


FIG. 5 Cover strip with 2 overlap welds

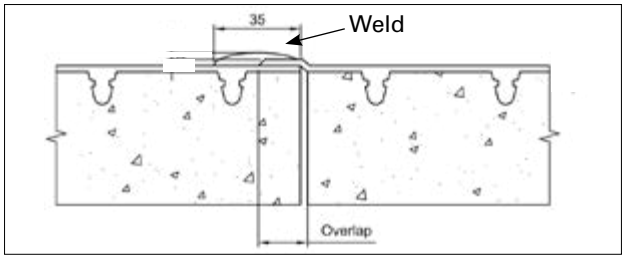


FIG. 6 Single overlap weld

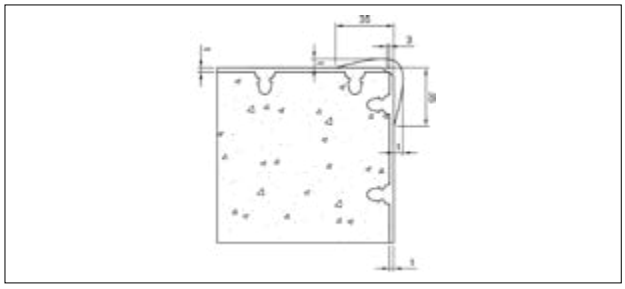


FIG. 7 Outside Corner Weld

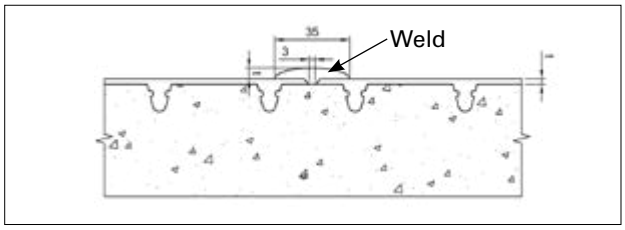


FIG. 8 Flat Extrusion Butt Weld

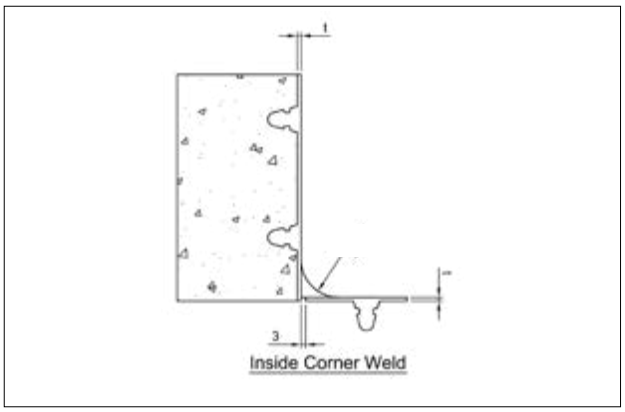


FIG. 9 Inside Corner Weld

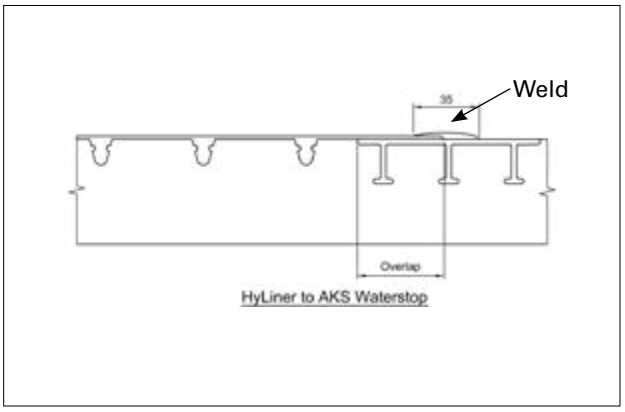


FIG. 10 HyLiner to AKS Waterstop

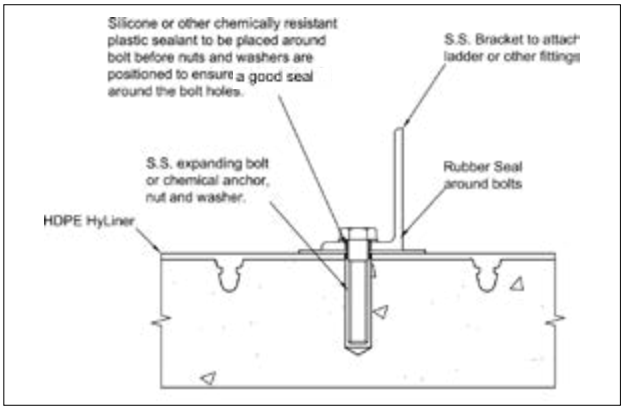


FIG. 11 Sealing of Brackets and Fittings to HyLiner Lined Structures

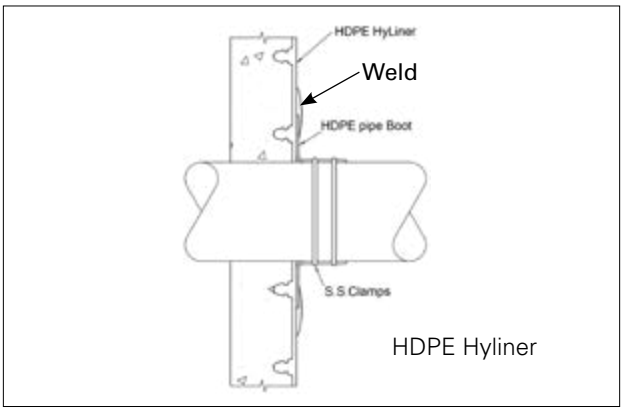


FIG. 12 Pipe Penetration Detail

Quality Control

In-plant quality control for the manufacture of the liner includes waviness, surface finish, knob shape and alignment, crimp height and depth of knobs, sheet thickness, density and tensile values.

Quality checks after casting into precast concrete pipes and components include effective anchor embedment, liner positioning on the product and spark testing for pin holes or damage.

All joints and the liner are spark tested after jointing is completed on site. This ensures the quality of the joints and identifies any damage in the liner as a result of handling and installation.

Abrasion resistance

HyLiner AKS HDPE has a good abrasion resistance when compared to other materials. A typical abrasion test value for HDPE liners is 0.3mm after 400 000 cycles *(Kirschmer, O., "Problems of Abrasion in Pipes", Steinzeugin Formationen, 1966, No 1, pp3-13)*.

Wear rates are very slow even under continuous flow of abrasive slurry. Most drainage applications would have intermittent exposure to abrasion.

Suitable Structures for Lining

HyLiner AKS HDPE is suitable for installation in spun and wet cast concrete pipes from 1050–3000 mm diameter.

HyLiner AKS HDPE is also suitable for lining a range of other concrete structures:

- Manhole risers and lids
- Rectangular or square precast concrete chambers and lids
- Precast concrete channels and lids
- Precast concrete pumpstations
- Insitu concrete structures such as tanks and chambers



FIG. 13 2300 Diameter Manhole Riser

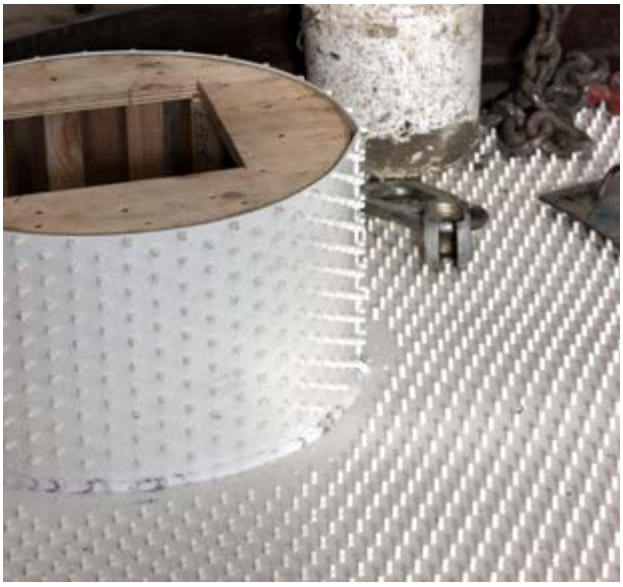


FIG. 14 Liner being installed for a manhole lid

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Technical Data Sheet

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

BluSeal Anchor Knob Sheet (AKS) is supplied and installed as a fully sealed and welded robust chemically resistant concrete protection lining.

BluSeal AKS is a synthetic membrane of HDPE sheet with integral anchors which are cast into concrete to form a flexible and durable corrosion protection lining. BluSeal AKS is used to protect concrete surfaces in chemically aggressive environments in sewerage tunnels, treatment works, pump stations, manholes and chemical retention bunds. It comes in a range of colours and thicknesses and can be applied to new and existing structures for protection or enhancement.

Application Advantages

- Fully welded homogenous lining
- Complete before 28-day concrete cure
- Factory assured thickness and absence of pinholes
- Retro-fitted lining is moisture compatible with assured bond

Lifecycle Advantages

- 100 year design life
- Membrane drainage eliminates negative pressure
- Chemical and impact resistant
- High anchor pull-out resistance
- Potable Water use to AS/NZS 4020:200
- Low coefficient of friction in lined conduits

About the Product

BluSeal AKS is supplied and installed as a fully sealed and welded, chemically resistant concrete protection system. The system includes propriety details for sealing around penetrations and against non-HDPE surfaces. Skilled applicators can fabricate the product into various shapes to suit irregular concrete formwork. All seams and joins are extrusion welded and then tested by spark or vacuum box testing. BluSeal AKS is designed and installed by approved applicators to international standards which are outlined in a manufacturer's installation manual. The elasticity of the membrane allows free drainage and relief of any hydrostatic pressure build-up in underground structures. The membrane can be cast into new structures or retrofitted by cement grouting onto the prepared surface of existing structures. AKS lined structures have an outstanding track record in aggressive environments, demonstrating a design life in excess of 100 years for the most demanding applications.

Application solutions

- Segmental sewer tunnels
- Inlet works and bioreactor tanks in WWTP
- Pump stations and manholes
- Tunnel waterproofing
- Chemical retention bunds
- Piles and foundation lining in aggressive ground conditions
- Sewer pipelines
- Slide pads on pipe plinths
- Concrete protection for industrial applications

Project Specification Clause

HDPE CORROSION PROTECTION LINING - The HDPE CPL membrane used for this project shall be supplied and installed as a fully sealed and welded robust continuous membrane system. It shall be a factory produced product that has independent testing to validate the performance outlined in the technical data table on the following pages. BluSeal AKS supplied by Bluey Technologies or equivalent shall be acceptable.

Project Examples

Sewerage treatment plants, sewer pump stations, sewer manholes, trunk sewer mains, chemical processing plant bunds and trenches, gas pipelines (pipe plinths).

A brand of MBCC GROUP

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

Application Specification

PREPARATION

1.1 BluSeal AKS must be installed onto formwork under the direction of an approved, specialised applicator who will plan layout configurations of sheets and weld seam locations. The applicator may also prefabricate some corner or seam sections and pipe penetration pieces offsite.

1.2 At joins in sheets the edge knobs are removed from one edge and the sheet is overlapped by 50mm to prevent egress of concrete fines and to provide a sound foundation for welding the seams.

1.3 Formwork shall be cleaned and free of defects. Form release oils are not necessary where BluSeal AKS is applied. Formwork should be designed to avoid leaking.

1.4 The sheets must be tensioned over the form within the yield elongation limit, prior to securing to the forms.

1.5 BluSeal Formtak can be used to assist in holding the sheet against timber formwork. Securing against the formwork is by nailing or stapling through the sheets at edges where extrusion welds will cover later or into edges that will be redundant and trimmed after the pour.

1.6 On circular forms, the sheets are wrapped and tensioned around and secured at the overlap by wires around the knobs and/or temporary speed welding along the seam.

1.7 In precast concrete applications the moulds may be designed to secure the membrane at the edges.

1.8 When BluSeal AKS is applied to an existing structure all corroded concrete and contaminants must be removed, leaving a surface profile greater or equal to CSP4 in accordance with ACI guidelines.

1.9 Treat or replace exposed reinforcement in accordance with ACI guidelines.

1.10 Refer to Bluey Technical Notes for recommendations regarding proving grout bond strength and design criteria.

APPLICATION

2.1 Always pour concrete or grout at a cooler ambient temperature than the temperature when the sheets were applied to the formwork. This will ensure the membrane is taut on the forms.

2.2 Anticipated maximum concrete temperature or accelerated curing temperature should not exceed 60 degrees Centigrade. Contact Bluey to discuss exceptions.

2.3 When grouting the sheets onto an existing structure, only grouts approved by Bluey such as BluCem HS200 shall be used, and mixing and placement shall be strictly in accordance with Bluey instructions. Fast set grouts, such as BluCem HE80, are recommended to be used for retrofitting the membrane in short time frames where assets must be returned to service quickly.

2.4 When grouting the membrane to floors, plan pours at times of the day where temperature changes before initial set of the grout are minimal. Avoid these pours in direct sunlight.

2.5 Concrete mix design, mixing, placement and compaction of concrete should follow standard civil construction practice to minimise voids and ensure full encapsulation of the anchors on the membrane.

2.6 Extrusion welding and weld testing at seams will be undertaken by approved applicators and in accordance with installation guidelines provided by the manufacturer and generally in accordance with DVS 2227. This includes proper preparation of the sheet surfaces to be welded and daily destructive seam peel tests sampled from trial welds. Welding technicians shall have formal industry training in extrusion welding techniques.

2.7 Non-destructive testing of completed welds will be either by vacuum box or spark testing.

2.8 Repairs and patching will be completed by extrusion welding over small defects or applying a minimum 200mm diameter patch over larger defects, with a minimum 80mm edge distance to the defect.

2.9 Destructive pull testing of anchors should be avoided.

2.10 Encapsulation of anchors can be easily checked by tapping across the surface of the membrane to detect any hollow sounds that indicate voids under the membrane. If voids are detected, they can be filled by injection of BluCem HS200 high flow grout through the lining. Repair by extrusion welding over the injection hole.

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

Product Data

Please refer to Important Notice on following page

Length of Knobs (nominal)	12mm
Knobs per m²	1230
Pull-off Resistance	>700N per knob or 850kPa (short term loading)
Membrane Thickness	2.0mm to 10mm*
Roll Widths	Up to 3.2m
Colours	Black for UV exposed applications and light colours (such as white) for underground or covered structures.

TESTED CHARACTERISTIC	STANDARD	RESULT			
Density	ASTM D 505/D 792	≥940kg/m³			
Carbon Black Content**	ASTM D 1603	2.0 - 3.0%			
Carbon Black Dispersion**	ASTM D 5596	Category 1 or Category 2			
ESCR (NCTL)	ASTM D 5397	>300 hours			
OIT	D 3895	>100 minutes			
Coefficient of Linear Expansion	ASTM E 831	1.1 - 1.4E-4cm/cm/deg C			
Tensile Properties (Sheet Material)	ASTM D 6693-04	Yield Stress 15MPa	Break Stress 27MPa	Yield Elongation 12%	Break Elongation 700%
Shore Hardness	DIN 53505	>50 Shore D			
Tear Resistance	ASTM D 1004	120N/mm			
Puncture Resistance	ASTM D 4833	300N/mm			
Dimensional Stability	ASTM D 1204	<2.0% change			
Water Absorption	ASTM D 570	<0.09%			
Flammability	UL94***	V0			

** Average minimum thickness to ASTM D 5199. Minimum thickness membrane made to order*

*** Black AKS only*

**** Plastics flammability standard released by Underwriters Laboratories of the USA*

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

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IMPORTANT NOTICE

This Technical Data Sheet is provided for general information and instruction only. The properties and characteristics set out herein represent typical testing results under laboratory conditions. Results of actual product characteristics may vary slightly. Site-specific and project-specific conditions may affect product performance, including without limitation: surfaces, environmental conditions, contact conditions, storage conditions, storage timeframes, weather, and climatic or seasonal conditions. Not all product parameters are batch tested as part of the manufacturing quality control process, and performance may vary between batches.

If Bluey gives any express written product warranty in relation to the product, that warranty is subject to the foregoing qualifications, despite anything to the contrary in any other document. All other representations, advice, suggestions or promises regarding the product's performance or its implementation, whether verbal or in writing, and whenever given, including in the course of any field services, are expressly disclaimed. Without limiting the foregoing, Bluey will have no liability for loss or damage of any kind if any application specifications are not followed.

The foregoing is not intended to exclude any warranties or guarantees which by law cannot be excluded. Subject only to the foregoing provisions of this Notice, and to the extent permitted by law, Bluey disclaims all liability for loss or damage of any kind suffered as a result of or in connection with the product or its implementation. If such liability cannot be wholly excluded, Bluey's liability will, to the extent permitted by law, be limited to the replacement of the product itself or the direct cost of replacement of the product itself (not including any collateral or consequential loss or damage of any kind).

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Aquate Pump Station

Technical Specifications

Catchment C, Station Rd, Matamata

7 April 2025



Written by : Peter Carroll- Director

BE Civil, MBA, CPEng, FEngNZ

www.aquate.co.nz

Foreward

This installation manual is a guide only. All relevent Health and Safety laws and codes of construction must be adhered too and take precedence over any information in this manual. Installers must practice good professional practice and are required to understand all National and Local regulations in respect to the installation of drainage materials.

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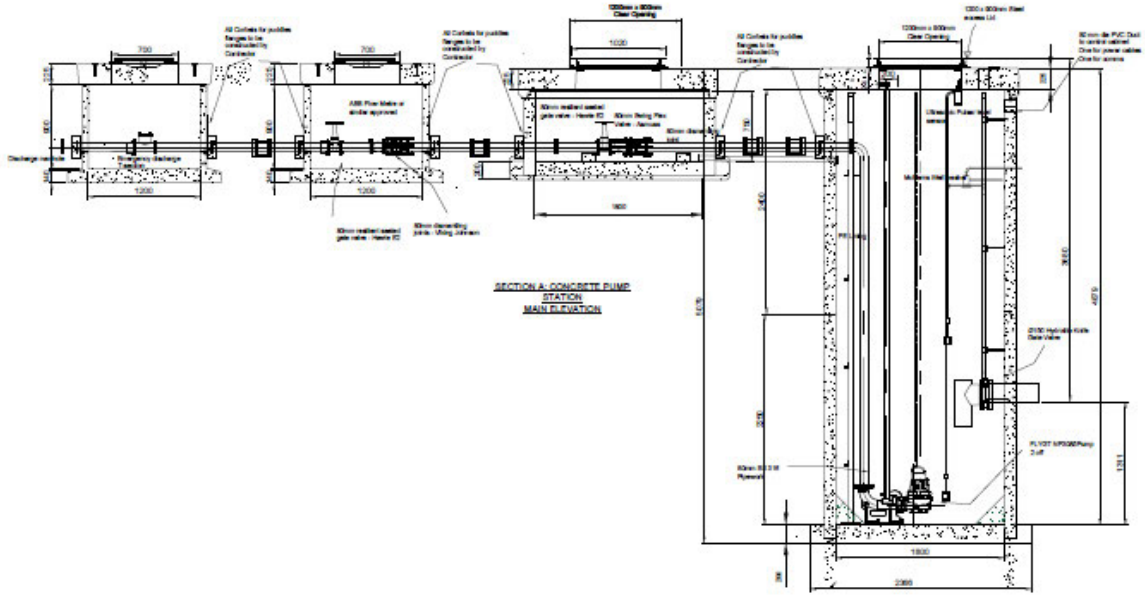
5.3 Maintenance requirements 12

APPENDICES ***12***

1 Technical Specifications

1.1 Storage Chamber

Tank Volume:	12.8 m^3
Effective volume:	10.24 m^3
Emergency storage:	24.5 m^3
Tank material:	Concrete
Manufacturing Std:	AS/NZS 4058:2007 and NZS 3101
Loading:	The standard lid is suitable for pedestrian loading only.
Inlet Connections:	the inlet pipe to be installed on site and sealed by the drainage contractor.
Outlet connection:	A flanged stainless steel is installed for connection to the outlet pressure pipe
Venting:	External venting required (see section 1.6 for venting details if required)
Dimensions:	see drawing below



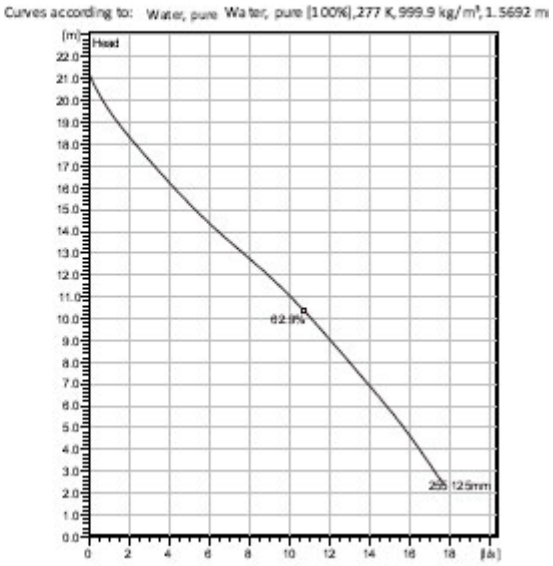
1.2 Pumps/Pump Performance

See full specifications in the Appendices

Manufacturer:	Xylem Pumps
Type:	Flygt NP3085 SH3 255
Connection:	415 V, 50 Hz
Power:	2.4 kW
Phases:	Three

Technical specification





1.3 Design Information

1.3.1 Storage Calculations

The total Average Dry Weather flow has been calculated from the expected flow rate with the following assumption:

Average dry weather flow= 88.66 m^3/day

Total emergency storage required is 9 hours = 33,600 litres

Total emergency storage in wet-well and emergency storage tank is 34,750 litres so 9.3 hours storage has been provided.

1.3.2 Pump Design

The system above has been designed based on the information provided below.

Rising main length : 503m

Static Lift : – 6.5m

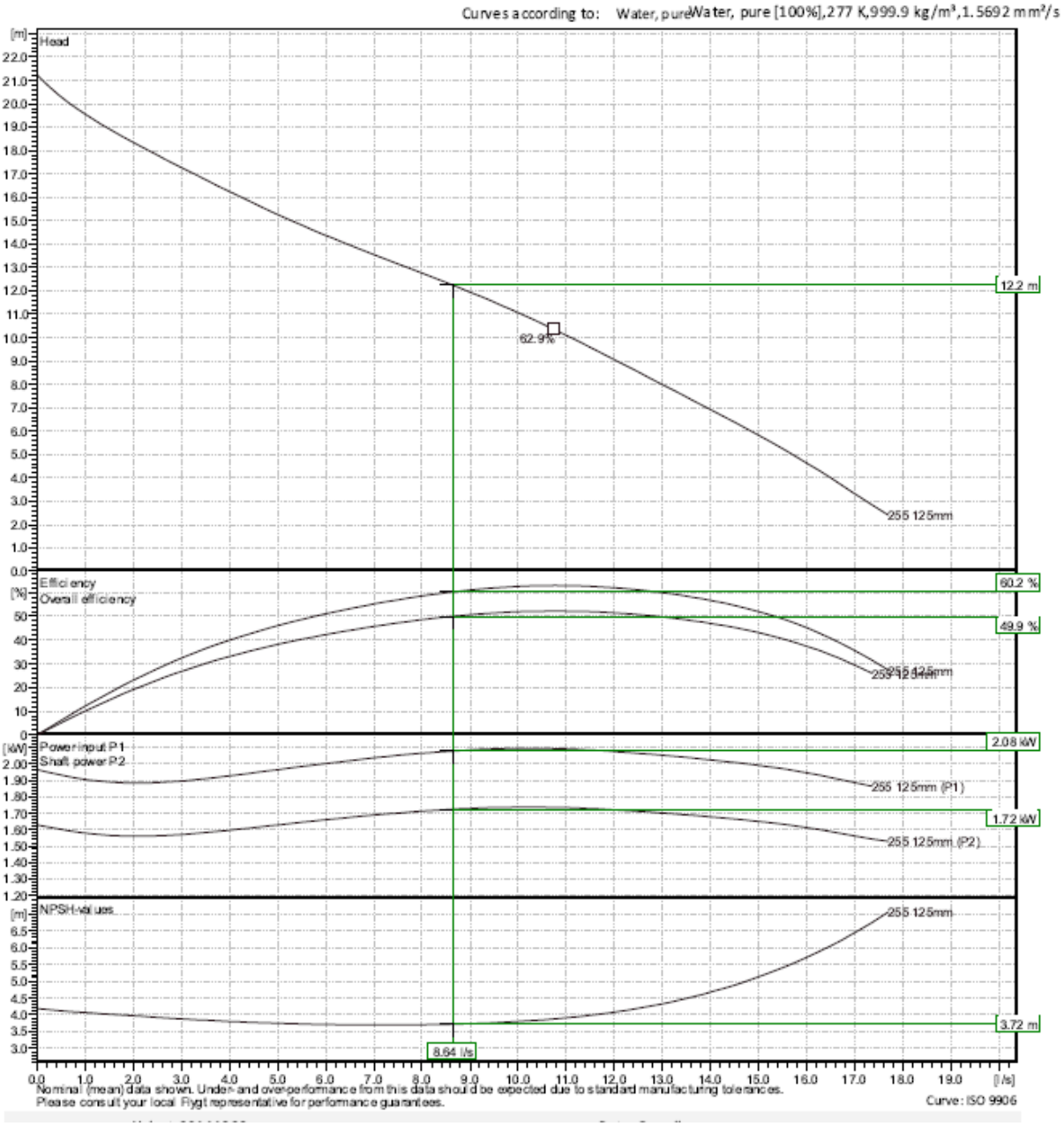
Rising main – 140mm (OD) DN125 PE100 SDR11

Option 1 K = 0.5

Flygt NP3085 - Flow rate = 8.6 l/s with a total head loss of 12.2 m (single pump).

Pumps to operate in a duty / assist / standby function

Velocity in PE pipe = 0.83 m/s

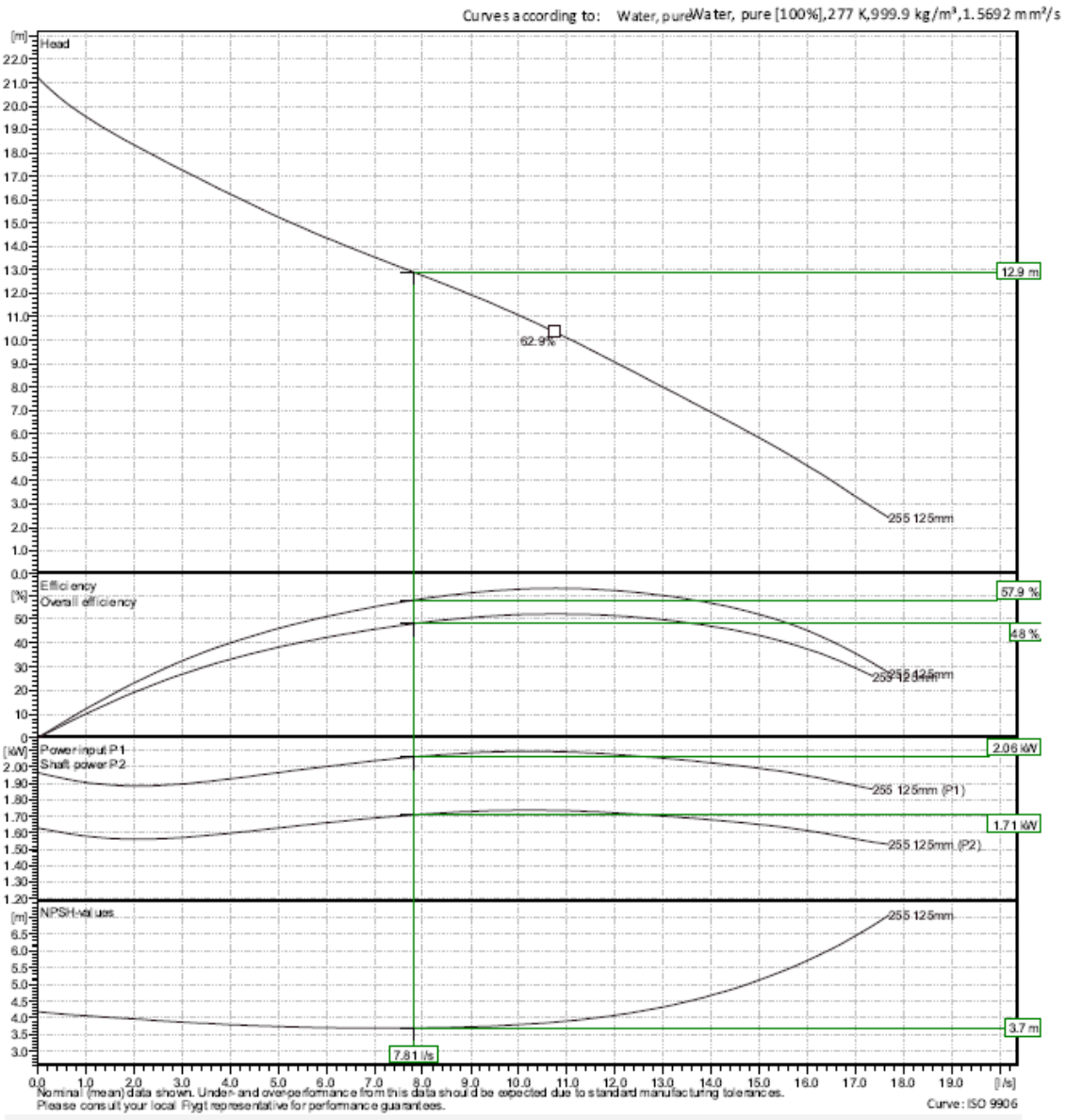


Option 2 K = 1.5

Flygt NP3085 - Flow rate = 7.8 l/s with a total head loss of 12.9 m (single pump).

Pumps to operate in a duty / assist / standby function

Velocity in PE pipe = 0.76 m/s



1.3.3 Pump Operational Levels

The operational levels will be set as follows (dimensions taken from floor of wet-well) :

- High level alarm - 1150mm
- Assist Pump Start – 1050mm
- Duty Pump Start – 1000mm
- Both Pumps Stop – 350mm
- Low Level Alarm : 300mm

1.3.4 Pump Stop/Start Calculations

Expected daily flow:	89660	litres
Infiltration (l/day)	0	litres
SWI (l/day)	0	litres
Peaking factor :	3.7	
ADDWF	1.04	l/s
PDDWF	3.28	l/s
PWWF	4.80	l/s
Pump Station diameter	1.8	m
Pump station depth (total)	5.25	m
Pump station depth (effective)	4.25	m
Volume (effective)	10.81	m3
Pump Stop Level	0.4	m
Pump Start Level	1	m
Volume to pump:	1526	litres
Discharge rate:	8.5	l/s
Time to empty: (PDDWF)	4.9	minutes
Time to empty: (PWWF)	6.9	minutes
Time to fill (PDDWF)	7.8	minutes
Time to fill (PWWF)	5.3	minutes
No starts/ hour (PDDWF)	4.8	
No starts/ hour (PWWF)	4.9	
No starts per pump (PDDWF)	2	
No starts per pump (PWWF)	3.2	
Max Start/Hour permissible	30	Okay

1.4 Pipework, Valves and Fittings

Discharge connection: 80 mm diameter flange coupler

Inlet and outlets: the inlet pipe to be installed on site and sealed by the drainage contractor. The outlet pipe is pre-installed in the factory.

Discharge pipework: Includes a non-return valve, dismantling joint and an isolation valve.

Lifting chains: a stainless steel chain is connected from the pump to the underside of the chamber for ease of pump removal if required.

Materials: All pipework will be 80mm 316 Stainless steel Schedule 40 and will be manufactured to the relevant AUS/ NZ Standards

Guide rails: Stainless steel

1.5 Access lids

Steel access lids (1200 x 900mm) will be supplied as per the RITS design

1.6 Magflow metre

An ABB ProcessMaster DN80 is included installed in a 1200mm diameter manhole

1.7 Level Sensors

1 off – ABB Black Box Hydrostatic level sensor

2 off – Flygt ENM10 float switches for Low level and High-level alarms

1.8 Electrical & Controls

The controller will need to be designed to MPDC Standards by an approved supplier

Not included in this scope. The controller cabinet plus all SCADA connections to be designed and supplied to MPDC Standards.

1.9 Odour Control System

This has been excluded as per RITS standards. See section 5.3.7.16 RITS.

1.10 Protective lining

The wet-well including the underside of the lid will be lined with Blue-seal HDPE lining for sulphuric acid resistance (see Appendices)

1.11 Well-washer

A McBerns well washer has been specified by RITS – see appendices for details

A sprinkler system using BETE nozzles has been included in the storage tanks to RITS design

1.12 RPZ Cabinet

A steel cabinet to RITS design has been included along with an RPZ standpipe and two off solenoid valves for the well washer and sprinkler system

1.13 Inlet valve

A 150mm diameter knife-gate valve will be installed on the inlet pipe in to the wetwell. This includes a spindle to the underside of the lid

2 Construction

The pump station has been design using reinforced precast concrete components. The system will be fabricated off site and delivered to site ready for installation. The tank will have a 12800 litre capacity and a total depth of 6.85 m.

The pump stations will be delivered to site in a kit-set format and will need to be installed in the ground by the drainage contractor.

The construction and commissioning of the Aquate pump station will then be completed by a trained Hynds Environmental Construction Technician.

3 Safety in Design

This pump station has been designed to minimise any risk to operators and service personnel.

Access into the pump station should not be required for ongoing maintenance as almost all servicing work can be completed from ground level. The main components can be accessed as follows:

- Pumps – these can be removed from the pump station by lifting them up out of the wet-well and inspecting above ground. Note : the pumps weight 68 kg each.
- Floats – can be lifted from the connection points in the access hole in the lid.
- Non-return valves/Isolation valves –can be access from ground level without the need to enter the chamber
- Venting will be required and will need to be installed on site. The access lids are air-tight.

Risk register

The risk register is a live document which requires continuous monitoring updating. This will need to be completed by the maintenance company for the pump station. The items below are a guide only.

The safety and design and Hazops workshops have encompassed risks for normal operation of the vacuum wastewater pump station. Specific risks for the maintenance process are outlined below.

Risk matrix

Likelihood			Consequence / potential severity				
			Minimal Non-injury or First Aid injury (FAI)	**Minor** Medical treatment injury	**Moderate** Medical treatment injury, with lost time (LTI)	**Major** Injury requiring hospital-/notifiable event	**Catastrophic** Fatality or multiple fatalities
	Very high	**Almost certain:** Commonly occurs	3: Medium	4: High	4: High	5: Very high	5: Very high
	High	**Likely:** Could easily happen	2: Low	3: Medium	4: High	4: High	5: Very high
	Medium	**Possible:** Could happen or has been known to happen	2: Low	2: Low	3: Medium	4: High	4: High
	Low	**Unlikely:** Hasn't happened yet but could happen	1: Very Low	2: Low	3: Medium	3: Medium	4: High
	Very low	**Rare:** Very unlikely but could happen in exceptional circumstances	1: Very Low	2: Low	2: Low	3: Medium	4: High

	Hazards *(one per line)*		Hazard controls – what do we need to do to make it safe?	
What are we doing? *(step by step)*	**What could cause harm?**	**Existing risk level** (*use risk matrix)*	**Eliminate/ Controls**	Residual risk level
Wet-well inspection	The wet-well is classified as a confined space, an inspection is required prior to wet commissioning.	3	**Elimination:** The vessel will be isolated from the system at all exit points and inspected from the access hole in the lid . **Isolate/Engineering Controls/PPE:** Entry will only be required if debris is identified and cannot be removed by any other means. Entry to the vessel should follow confined space protocols, including ensuring all persons involved have the required training, admin and PPE controls.	1 1
Sewage Pump Testing	The wet well will be filled up for wet testing. This is a potential drowning hazard.	3	**Elimination** Barriers around the access hatch to be erected so no one can enter the wet-well. **Engineering Controls/PPE:** All essential persons to wear appropriate protection. Sewage pump shall only operate when required for wet testing..	1 1
Removing lids for access	Traffic moving through area Back strain	3 2	**Isolate/Engineering Controls/PPE:** Place cones around service area so vehicles cannot enter site **Engineering Controls/PPE –** use appropriate lifting equipment if lifting pumps / lids on site	
Removing pumps	This is a falling hazard	4	**Elimination** Barriers around the access hatch to be erected so no one can enter the wet-well.	
Electrical checks	Electrical shock	3	**Engineering Controls/PPE:** Only fully certified electricians to complete electrical work	

4 Warrantees

Aquate guarantees the performance and quality of its pump stations provided:

- The product is only used for the intended purposes as stated in the quote
- The control panel and pump station is correctly installed and commissioned by a suitable installer
- The fault is due to a defect in design, materials or workmanship
- The fault is reported to an Aquate agent or representative during the guarantee period
- No pump station components have been replaced by alternative products
- This guarantee does not cover faults resulting from misuse of the system, blockages or breakdowns caused by the introduction of inappropriate materials into the system, incorrect electrical installation of the control unit, deficient maintenance or normal wear and tear.

Aquate assumes no liability for bodily harm, property damage or economic losses as a result of its pump stations.

4.1 Pumps

The pumps come with a 12 month year warranty against faulty components and/or workmanship. If prohibited substances are introduced to the system causing the pump to block and burn out, the warranty is null and void.

Flygt undertakes to remedy faults in products sold by Flygt provided that:

- The fault is due to defects in design, materials or workmanship;
- The fault is reported to a Flygt representative during the guarantee period;
- The product is used only under conditions described in the care and maintenance instructions and in applications for which it is intended;
- The monitoring equipment incorporated in the product is correctly connected;
- All service and repair work is done by a workshop authorized by Flygt or the original manufacturer;
- Genuine manufacturer's parts are used
- Storage should be in accordance with the care and maintenance manual.
- The equipment is operated and maintained in accordance with the Operation and Care and Maintenance Manual.

Failure to comply with these requirements will render warranty void unless, due to the nature of the warranty claim, such voiding of warranty is prevented by law, regulation, act and/or ordinance.

Hence, the guarantee does not cover faults caused by deficient maintenance, abuse, incorrectly executed repair work or normal wear and tear.

5 Maintenance schedule

A certain amount of system maintenance is required on an ongoing basis to ensure that the system is working correctly. This is the responsibility of the owner

5.1 Six monthly

The following procedures should be completed every six months:

- The pumping station should be inspected to check the build-up of grease and fat particularly on the float switches and pumps. They may need to be withdrawn for cleaning.
- Visually inspect the pump station walls and hose down if necessary
- Ensure the pump station access lid is securely fastened and bolted down.
- Lift the pumps and inspect for any damage or blockages around the impellors
- Lift the floats and test the alarm system/pump operation
- Consult with the electrical control supplier for additional checks

5.2 Annually

The following procedures should be completed at least once every 12 months:

- The pumping station should be inspected to check the build-up of grease and fat particularly on the float switches and pumps. They may need to be withdrawn for cleaning.

- Visually inspect the pump station walls and hose down if necessary
- Lift the floats and test the alarm system/pump operation
- Press the mute button (audio alarms only) to check the audio alarm turns off.
- Visually check the pump station for any structural damage to the tank and pipework
- Ensure the pump station access lid is securely fastened and bolted down.
- Lift the pumps and inspect for any damage or blockages around the impellors
- Have the pump station sucked out to remove any debris/stones if necessary

5.3 Maintenance requirements

The pump maintenance and repair operations must be carried out by workers authorised by the manufacturer; Failure to comply with these instructions will result in forfeiture of the warranty and jeopardise the unit's safety.

Before any cleaning and/ or maintenance operations are carried out on the electric pump, the power supply must be switched off.

To disconnect the submersible electric pump from the electricity mains, first disconnect the phase conductors, then the yellow –green earth wires.

Use the special handle to remove the submersible electric pump from the tank.

ATTENTION: Before carrying out any operations, check the pump temperature. Only work on the pump when it is at room temperature.

Clean the electric pump thoroughly, using a jet of water or specific products to clean all its parts. When disposing of the waste material, follow the antipollution rules in force.

Replace any broken or worn parts with original spare parts only.

Given the likelihood that work on the electric pump will be carried out in confined spaces such as vats, wells, cesspools, tanks or cisterns, do not underestimate the risks caused by potentially poisonous exhalations.

APPENDICES

General Arrangement Drawing – Plan

General Arrangement Drawing – Section

General Arrangement Drawing – Plan with tank

General Arrangement Drawing – Section with tank

Flygt NP3085 SH3 255 Specifications

McBerns well washing brochure

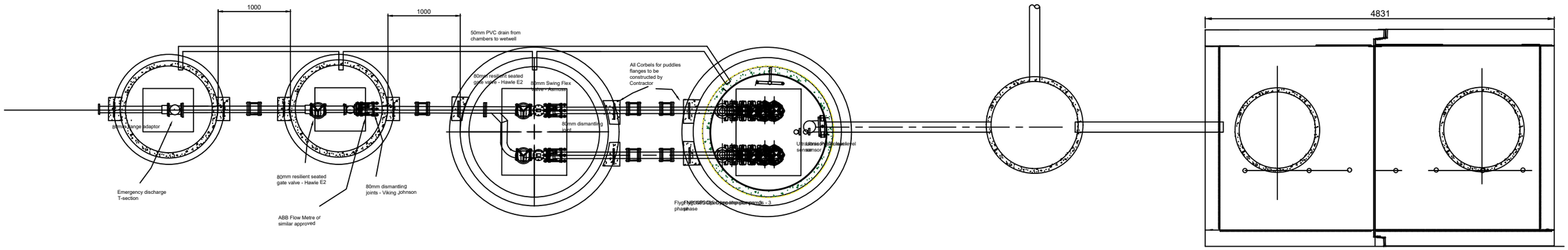
BlueSeal-AKS data sheet

Hyliner HDSPE liner – data sheet

ABB Magflow Meter Specifications

ABB Blackbox level sensor specifications

Flygt ENM10 float switch specifications



NOTES:

1.

REVISIONS

REV #:	REVISION DESCRIPTION:	DATE:	DRAWN:
A	Preliminary design	7/4/25	PC

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Tel: 09-274 0316
Fax: 09-272 7485
email: hwwsupport@hynds.co.nz

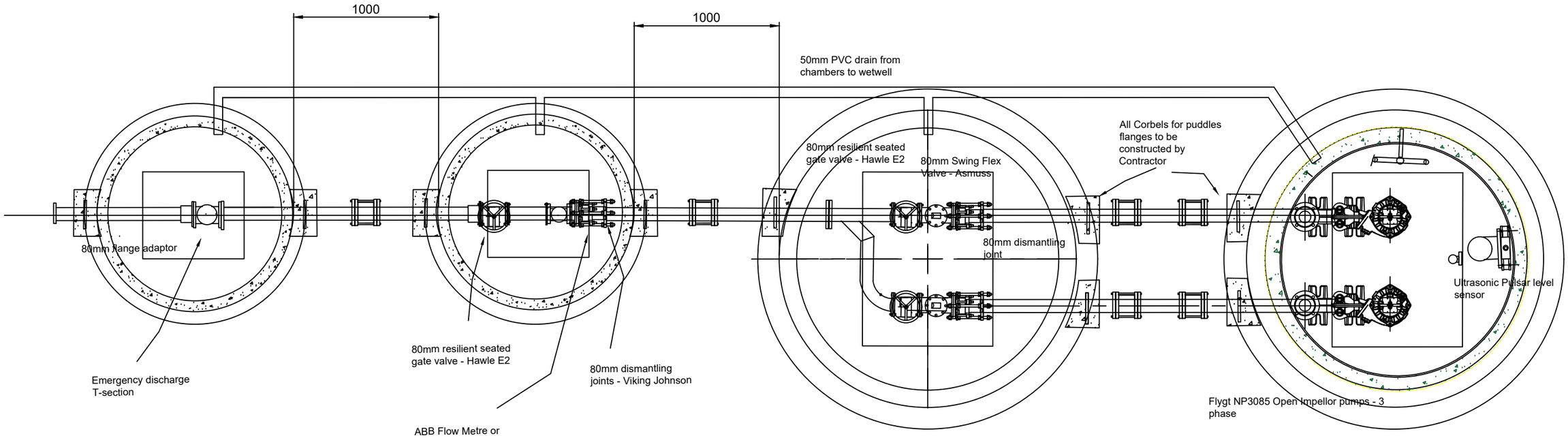
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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT:
Catchment C
Ashbourne Project - Catchment B
Matamata
Wastewater Pump Station

DRAWING TITLE:
Plan View with tank

REFERENCE/QUOTE NUMBER:	AQ2105A		
DRAWN: PC SIGNATURE:	DESIGN: PC SIGNATURE:	CHECKED: JB SIGNATURE:	
SCALE: As Shown PAPER SIZE: A3	Note: Do not scale drawing if in doubt **ASK!!!**	DATE: 7/4/25	
DRAWING NUMBER: AQ2105A 3	SHEET NUMBER: of 4	REVISION NUMBER: A	



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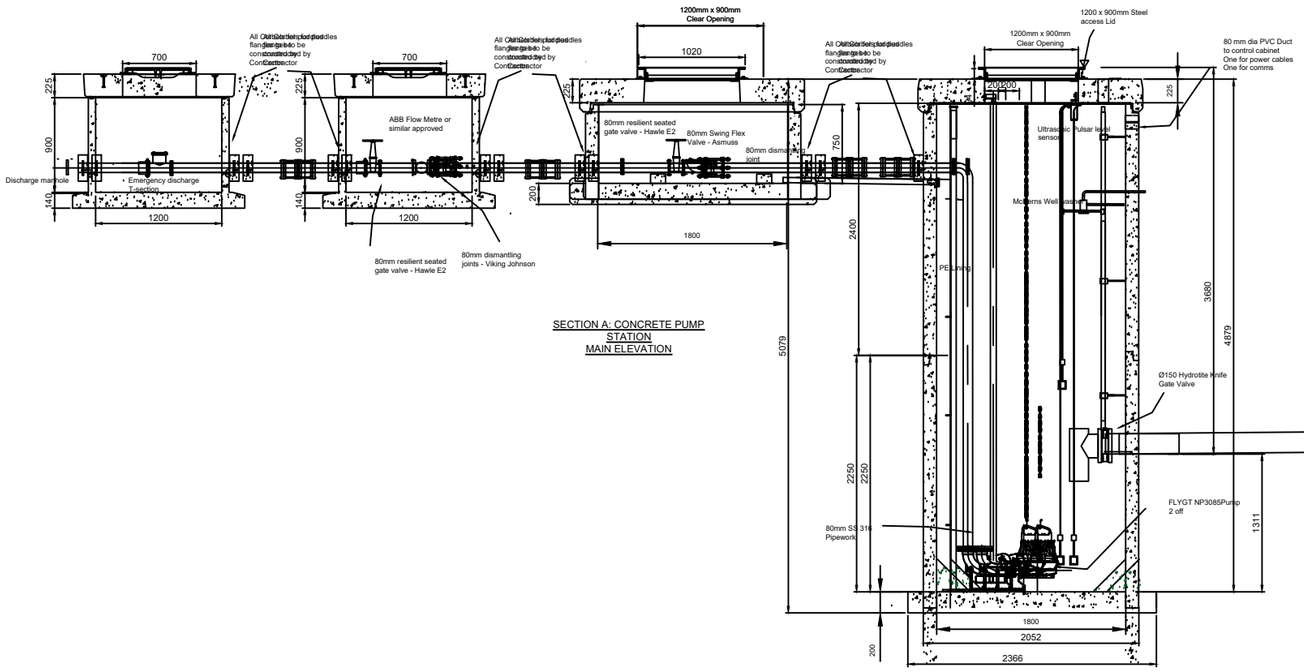
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SCALE: As Shown PAPER SIZE: A3	Note: Do not scale drawing if in doubt **ASK!!!**	DATE: 7/4/25	
DRAWING NUMBER: AQ2105A 3	SHEET NUMBER: of 4	REVISION NUMBER: A	



SECTION A: CONCRETE PUMP STATION
MAIN ELEVATION

NOTES:

1.

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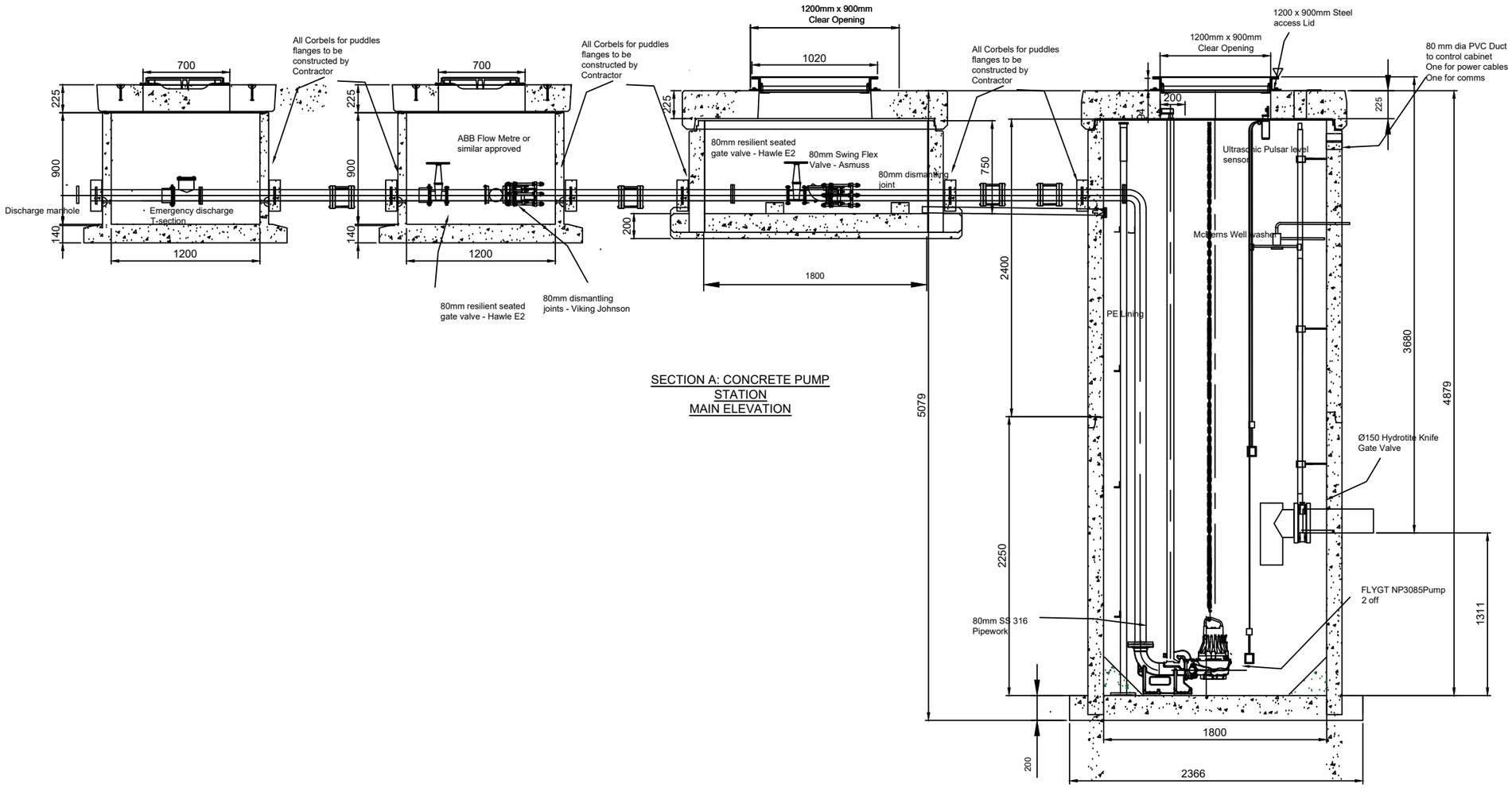
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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

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Ashbourne Project - Catchment B
Matamata
Wastewater Pump Station

DRAWING TITLE:
Section View with tank

REFERENCE/QUOTE NUMBER:	AQ2105A		
DRAWN: PC	DESIGN: PC	CHECKED: JB	
SIGNATURE:	SIGNATURE:	SIGNATURE:	
SCALE: As Shown	Note: Do not scale drawing if in doubt **ASK!!!**	DATE:	
PAPER SIZE: A3		7/4/25	
DRAWING NUMBER:	SHEET NUMBER:	REVISION NUMBER:	
AQ2105A 1	of 4	A	



SECTION A: CONCRETE PUMP STATION
MAIN ELEVATION

NOTES:

1.

REVISIONS

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A	Preliminary design	7/4/25	PC

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ISO 9001 CERTIFIED MANAGEMENT SYSTEM

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Ashbourne Project - Catchment B
Matamata
Wastewater Pump Station

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Section View

REFERENCE/QUOTE NUMBER:	AQ2105A		
DRAWN: PC	DESIGN: PC	CHECKED: JB	
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DRAWING NUMBER:	SHEET NUMBER:	REVISION NUMBER:	
AQ2105A 1	of 4	A	

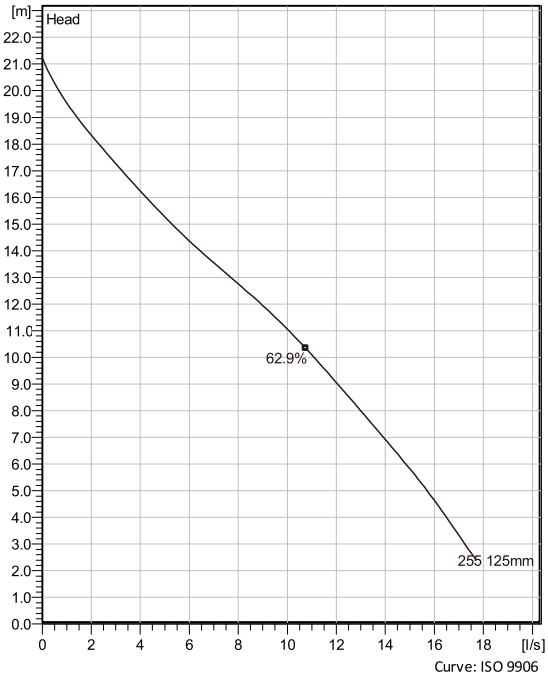
NP 3085 SH 3~ Adaptive 255

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
N3085.060 15-09-2AL-W 2.4KW

Installation type
P - Semi permanent, Wet

Impeller diameter
125 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
125 mm

Discharge diameter
80 mm

Inlet diameter
80 mm

Maximum operating speed
2880 1/min

Number of blades
2

Max. fluid temperature
40 °C

Material

Impeller
Hard-Iron

Stator housing material
Grey cast iron

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

Technical specification

Motor - General

Motor number N3085.060 15-09-2AL-W 2.4KW	**Phases** 3~	**Rated speed** 2880 1/min	**Rated power** 2.4 kW
Approval No	**Number of poles** 2	**Rated current** 4.8 A	**Stator variant** 38
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 81.9 %	**Total moment of inertia** 0.0066 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.80	**Motor efficiency - 3/4 Load** 82.6 %	**Starting current, direct starting** 32 A	
Power factor - 1/2 Load 0.69	**Motor efficiency - 1/2 Load** 81.1 %	**Starting current, star-delta** 10.7 A	

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

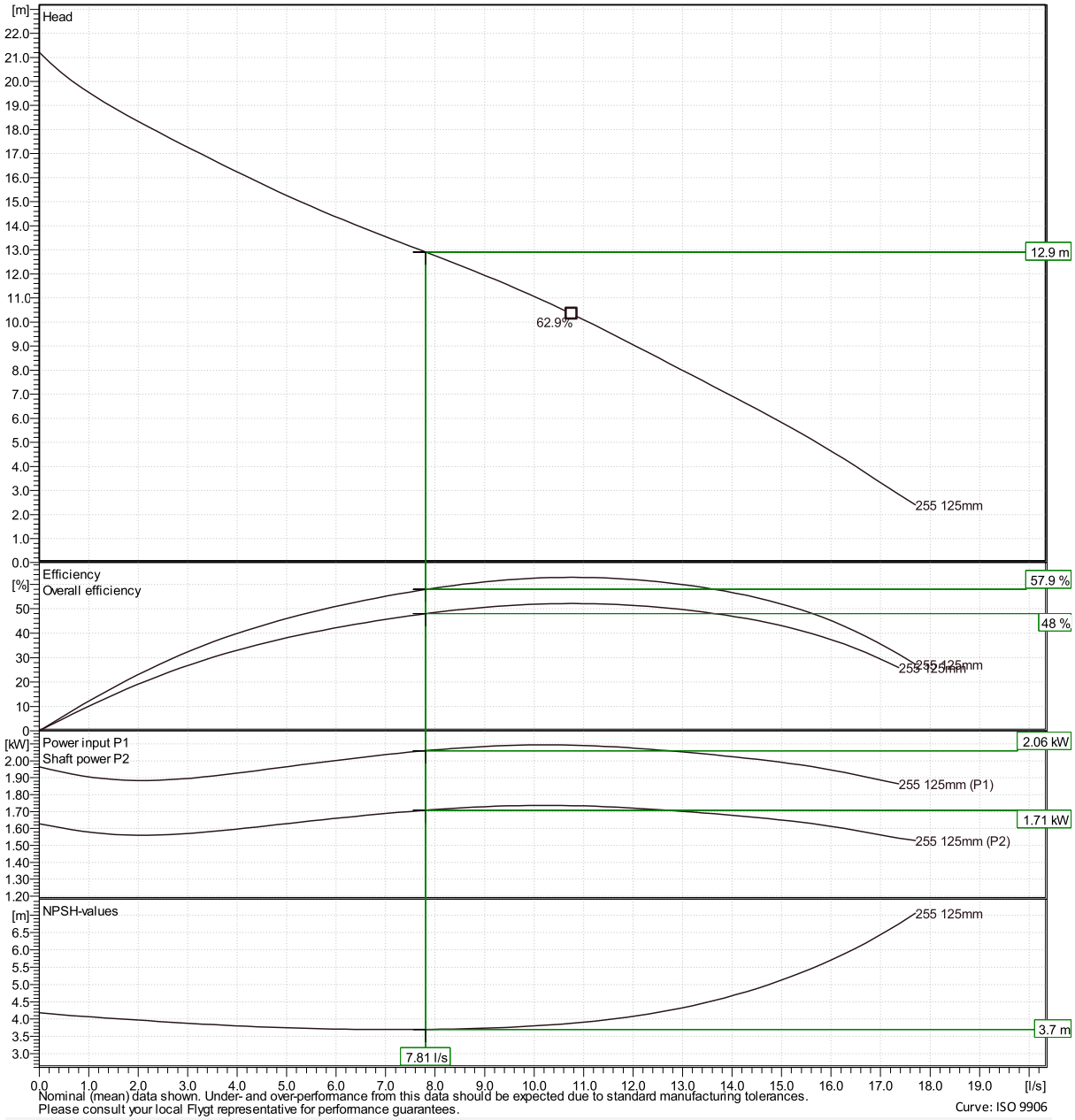
NP 3085 SH 3~ Adaptive 255

Performance curve

Duty point

Flow	Head
7.81 l/s	12.9 m

Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

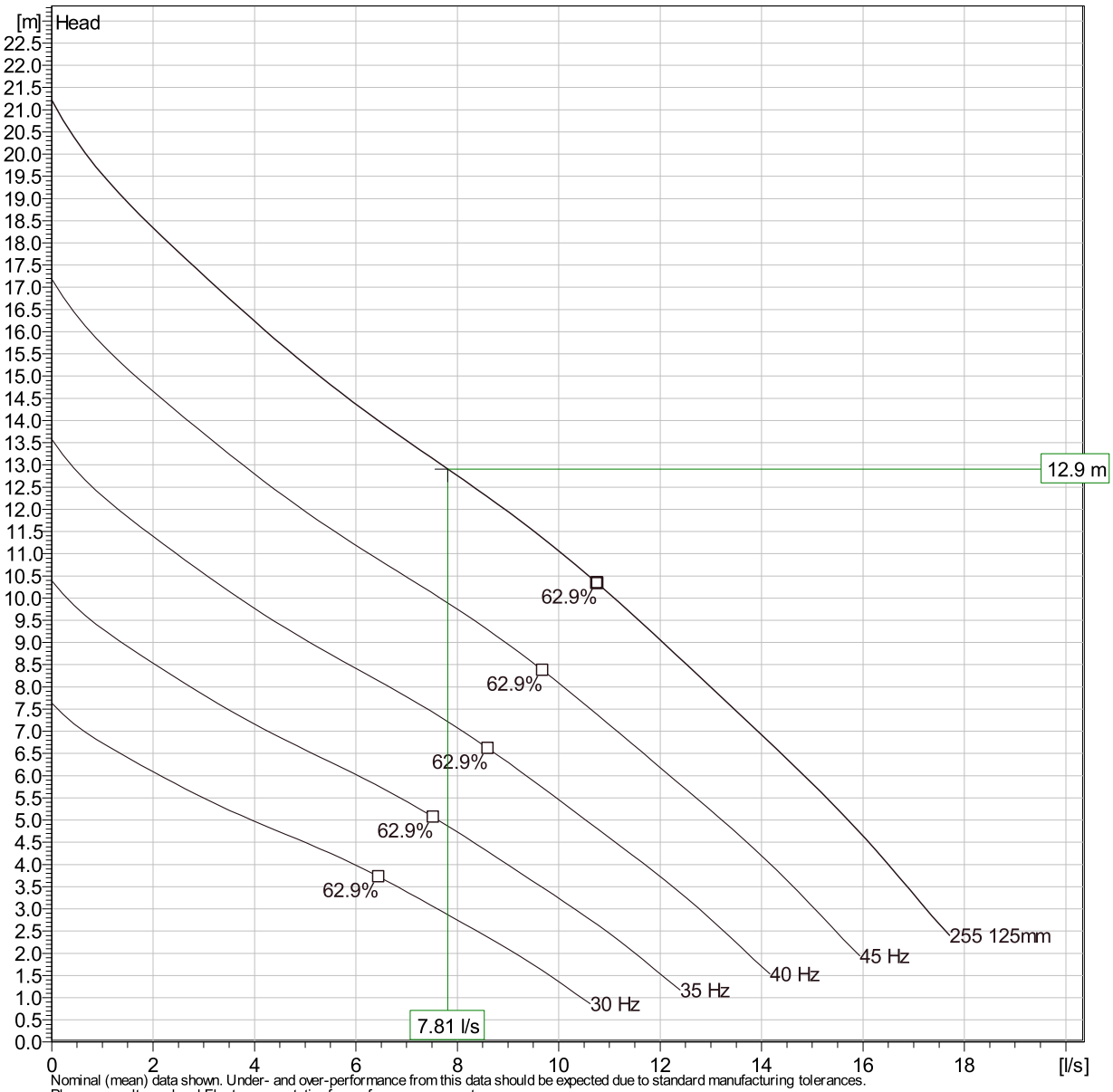
Curve: ISO 9906

Xylect-20111898	Peter Carroll		
	Created on 4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

Duty Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

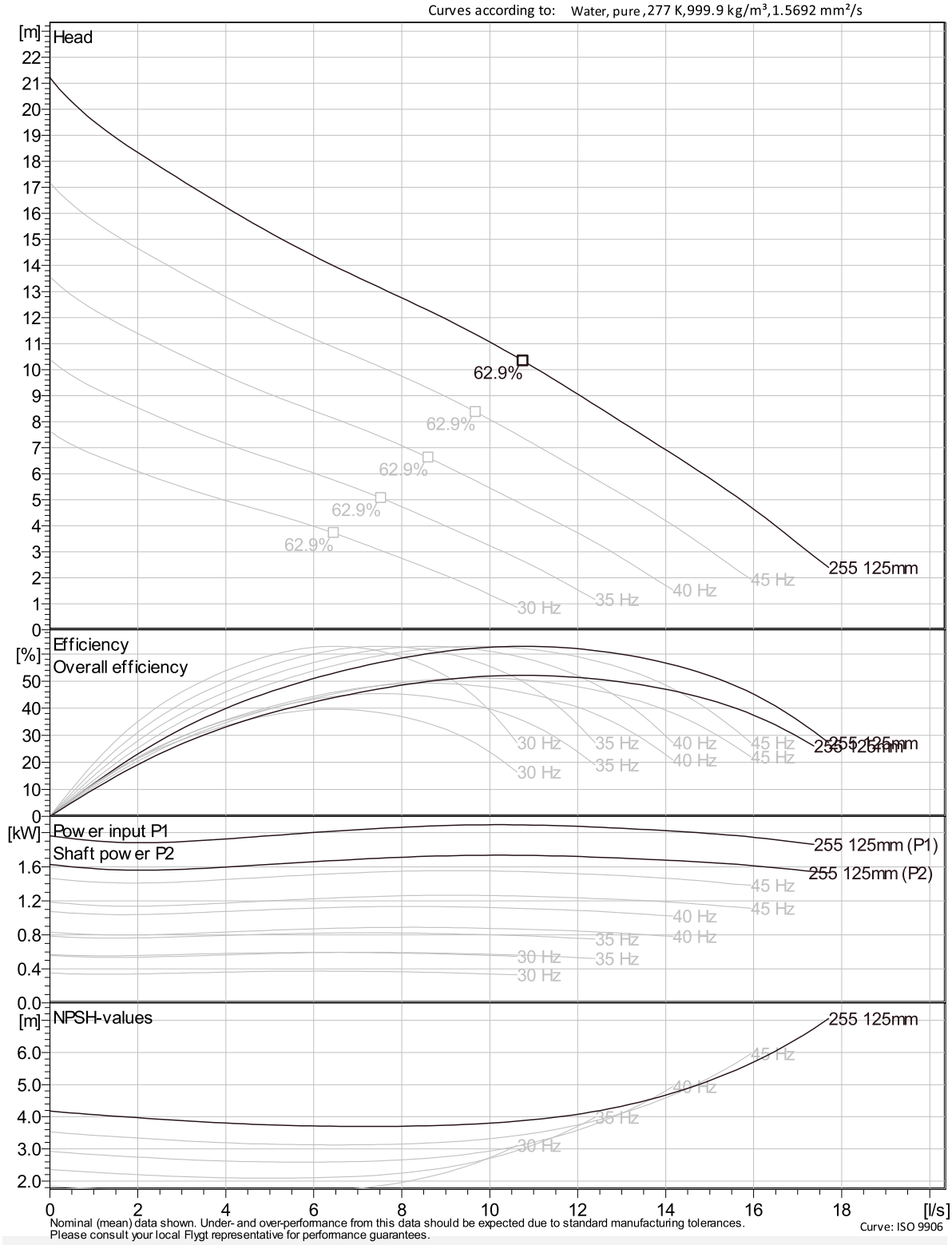
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/m³	m
1	7.81	12.9	1.71	7.81	12.9	1.71	57.9 %	0.0732	3.7

Project		**Created by**	Peter Carroll		
Block	Xylect-20111898	**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

VFD Curve

Curves according to: Water, pure ,277 K,999.9 kg/m³,1.5692 mm²/s



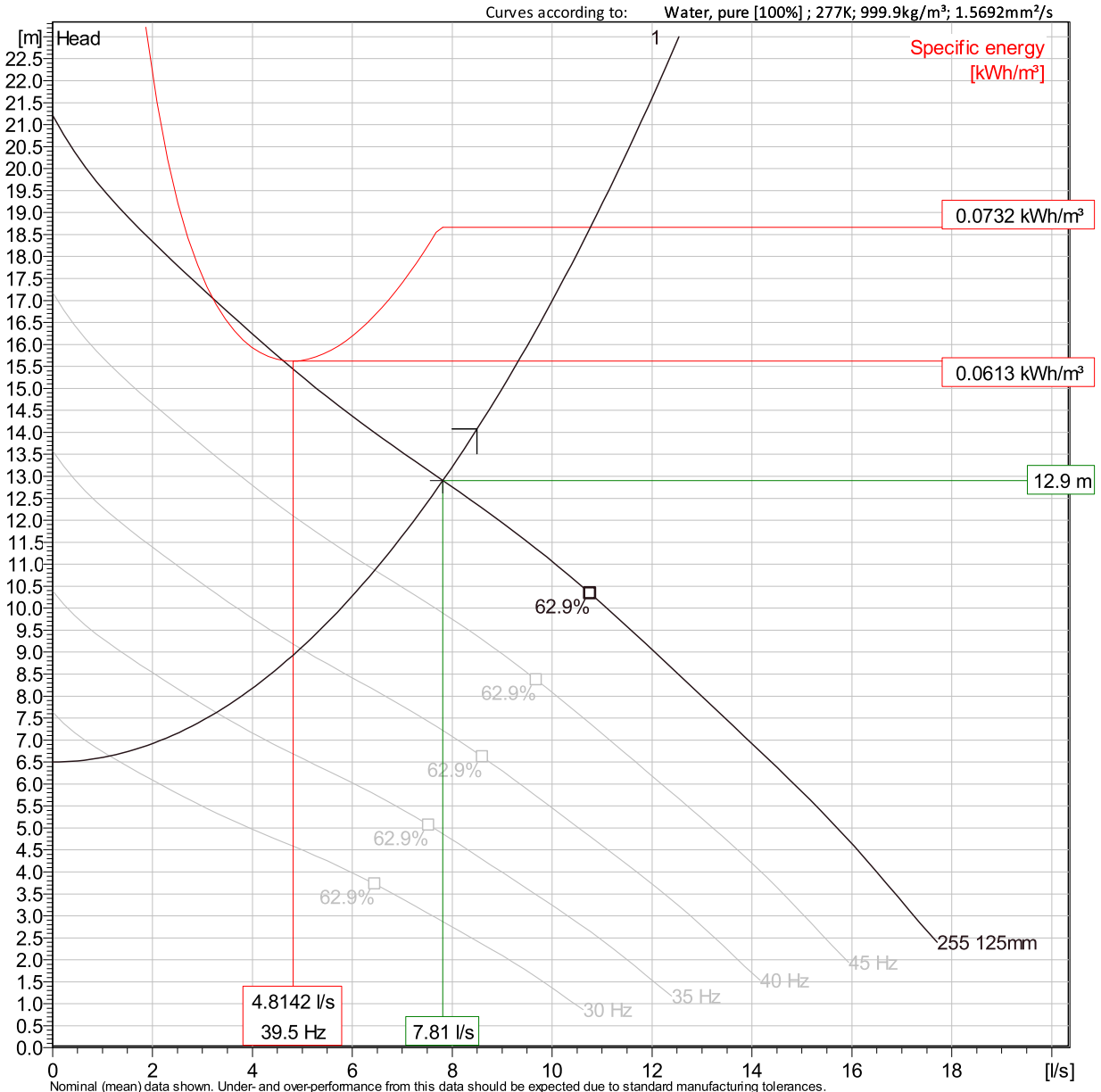
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

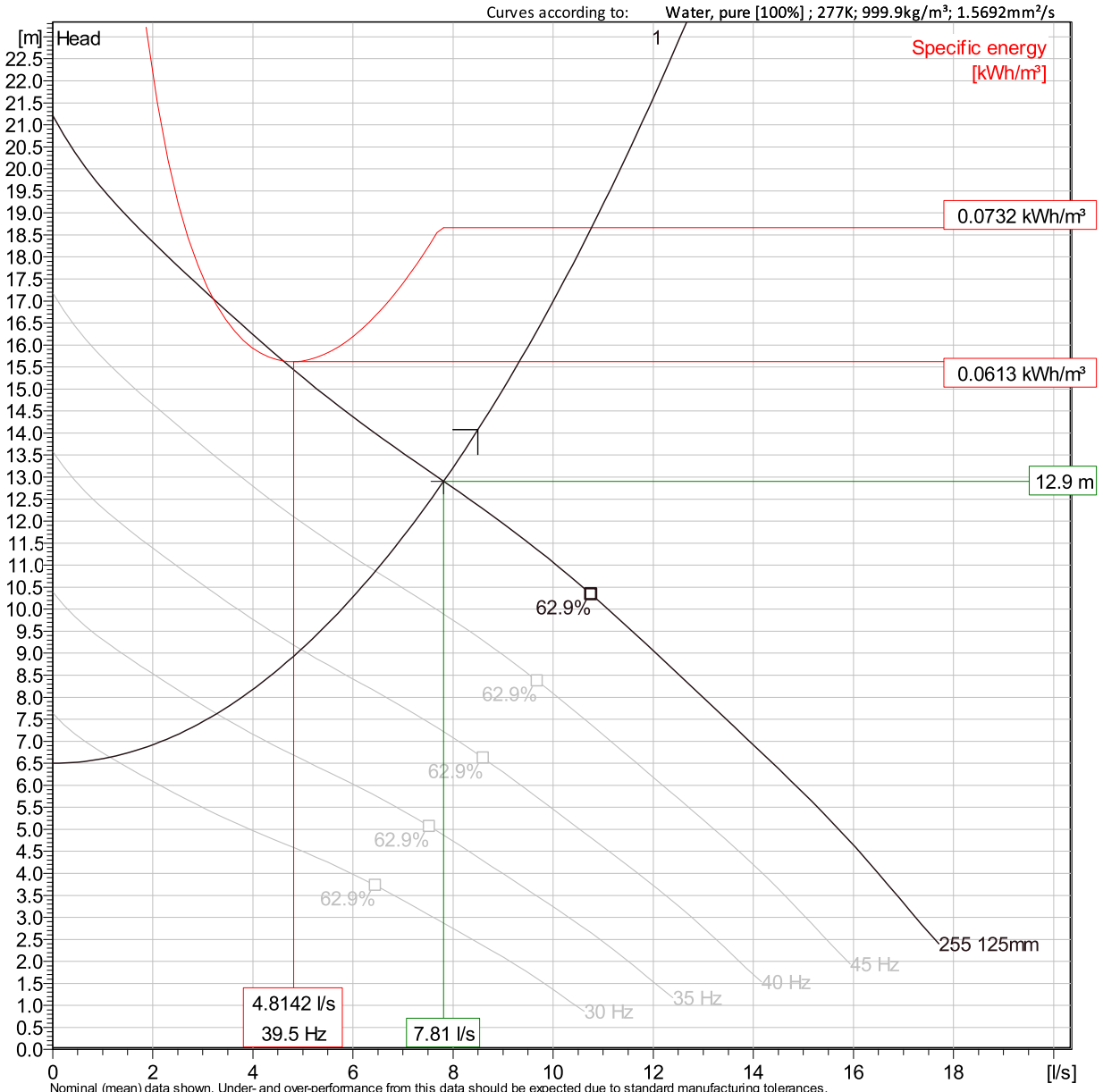
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	50 Hz	7.81	12.9	1.71	7.81	12.9	1.71	57.9 %	0.0732	3.7
1	45 Hz	6.45	10.9	1.23	6.45	10.9	1.23	55.7 %	0.0654	3.13
1	40 Hz	4.96	9.09	0.853	4.96	9.09	0.853	51.9 %	0.0613	2.6
1	35 Hz	3.28	7.63	0.555	3.28	7.63	0.555	44.2 %	0.0663	2.13

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

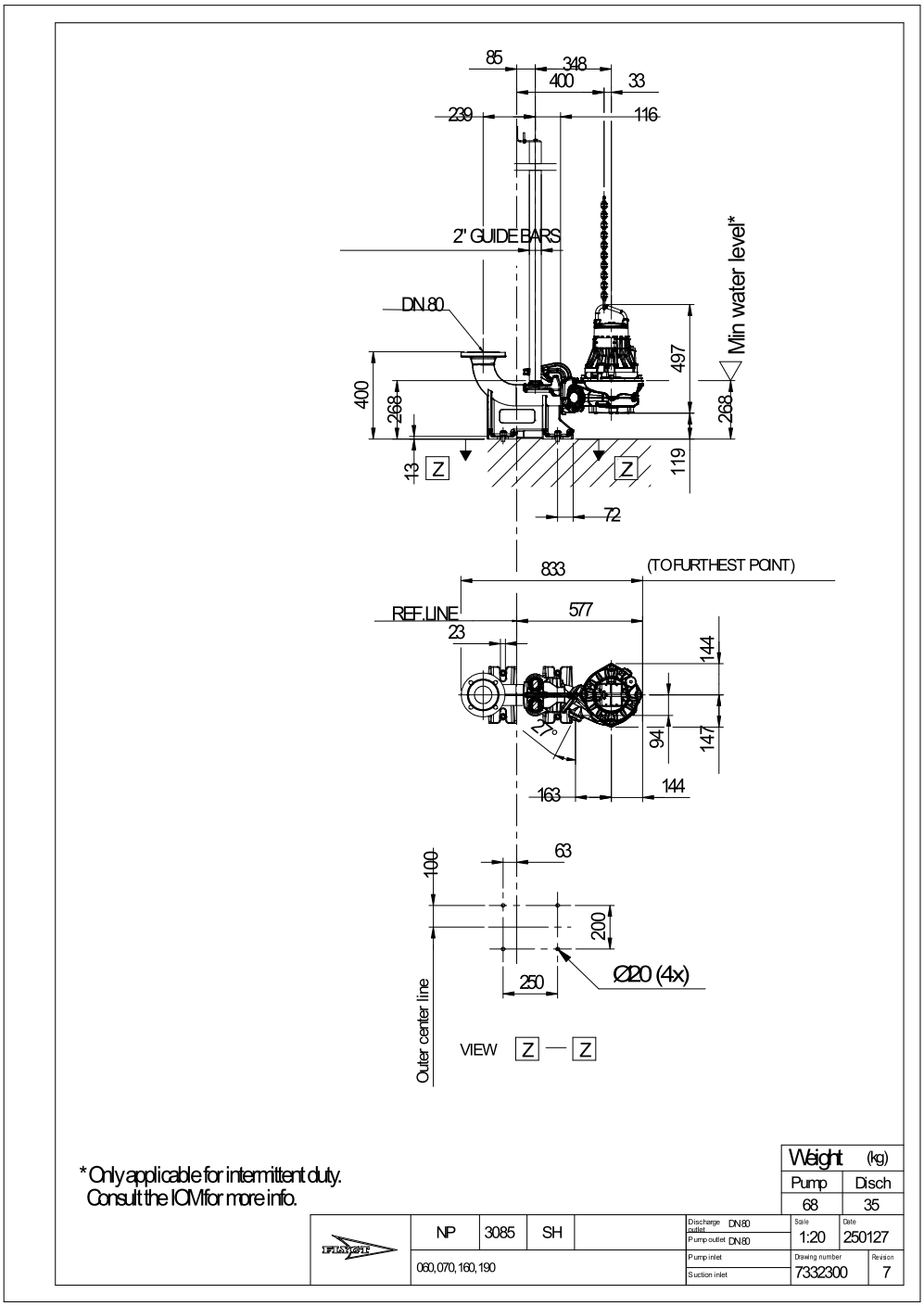
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	30 Hz	1.15	6.64	0.337	1.15	6.64	0.337	22.2 %	0.134	1.76

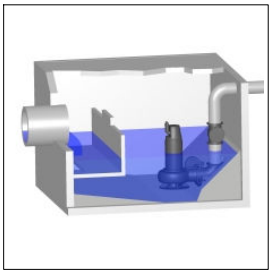
Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

Dimensional drawing



Project	Xylect-20111898	**Created by**	Peter Carroll
Block		**Created on**	4/7/2025 **Last update** 4/7/2025



Friction loss calculation

Pumped fluid Water, pure	**Static head** 6.5	**Layout** Wet well installation
Flow 8.5 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Stainless steel **PN 10 / DN 80 (84x2,0 mm) / K factor for Wastewater acc. DWA-A110**						
Pipe length	80	10 m	1	1.691	1.5	0.8632
Elbows	80	0.3	1	1.691		0.04372
Non-return valves	80	0.9	1	1.691		0.1312
T-piece	80	0.4	1	1.691		0.0583
Valve	80	0.3	1	1.691		0.04372
Total friction head						**1.14**
Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710 **SDR 11 (PN 16) / DN 125 (140x12,7 mm) / K factor for Wastewater acc. DWA-A110**						
Pipe length	114.6	503 m	1	0.8241	1.5	6.441
Total friction head						**6.441**
Friction loss head						7.581 m
Total static head						6.5 m
Total head						**14.08 m**

Project		**Created by**	Peter Carroll	**Last update**	4/7/2025
Block	NP 3085 SH 3~ Adaptive 254	**Created on**	4/7/2025		

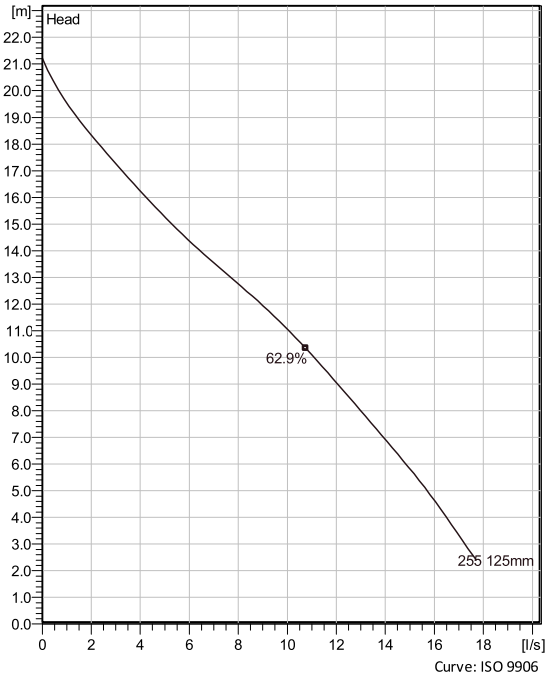
NP 3085 SH 3~ Adaptive 255

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Modular based design with high adaptation grade.

Technical specification



Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Curve: ISO 9906

Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Configuration

Motor number
N3085.060 15-09-2AL-W 2.4KW

Installation type
P - Semi permanent, Wet

Impeller diameter
125 mm

Discharge diameter
80 mm

Pump information

Impeller diameter
125 mm

Discharge diameter
80 mm

Inlet diameter
80 mm

Maximum operating speed
2880 1/min

Number of blades
2

Max. fluid temperature
40 °C

Material

Impeller
Hard-Iron

Stator housing material
Grey cast iron

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

Technical specification

Motor - General

Motor number N3085.060 15-09-2AL-W 2.4KW	**Phases** 3~	**Rated speed** 2880 1/min	**Rated power** 2.4 kW
Approval No	**Number of poles** 2	**Rated current** 4.8 A	**Stator variant** 38
Frequency 50 Hz	**Rated voltage** 415 V	**Insulation class** H	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 81.9 %	**Total moment of inertia** 0.0066 kg m²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.80	**Motor efficiency - 3/4 Load** 82.6 %	**Starting current, direct starting** 32 A	
Power factor - 1/2 Load 0.69	**Motor efficiency - 1/2 Load** 81.1 %	**Starting current, star-delta** 10.7 A	

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

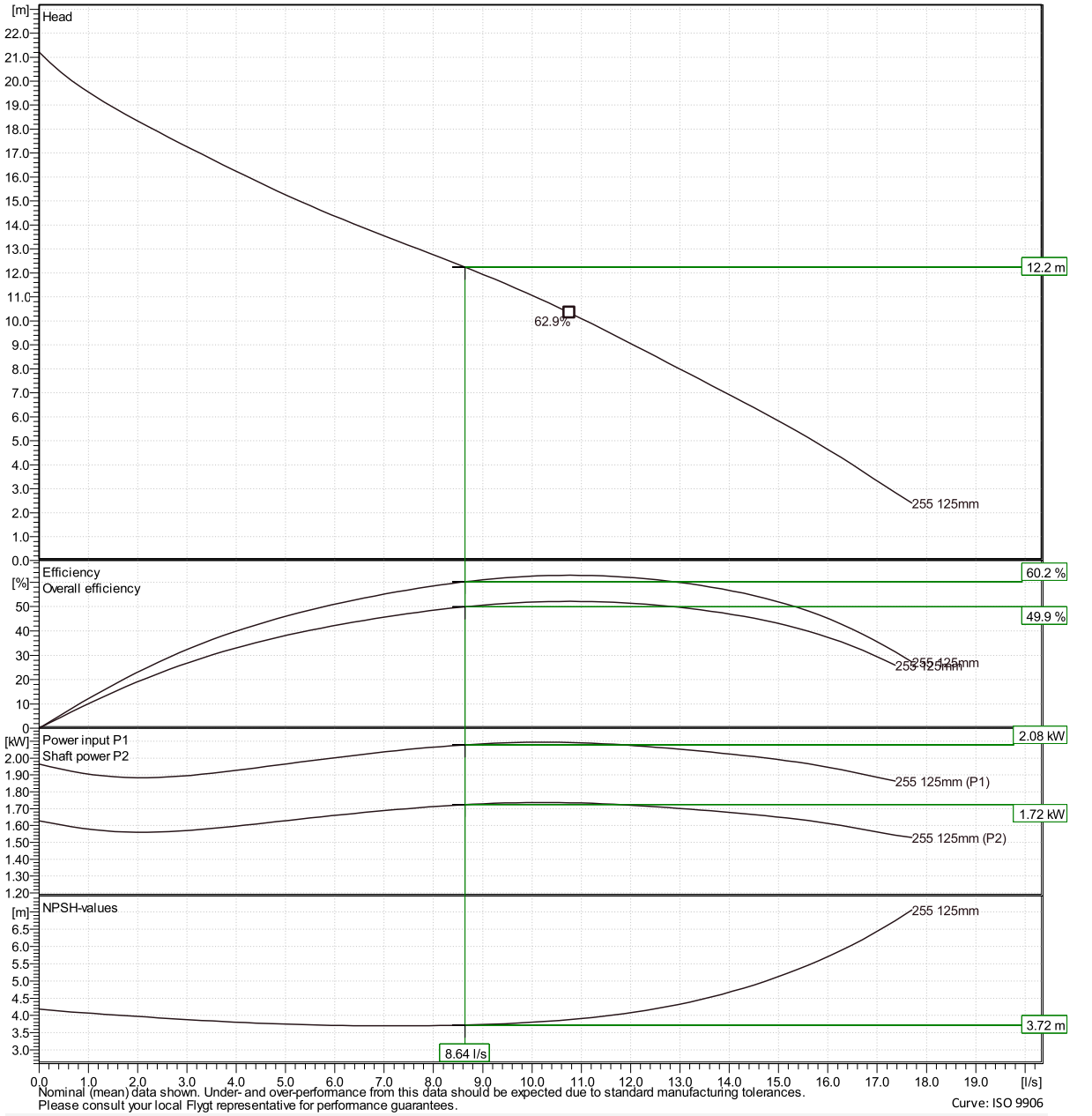
NP 3085 SH 3~ Adaptive 255

Performance curve

Duty point

Flow	Head
8.64 l/s	12.2 m

Curves according to: Water, pure Water, pure [100%],277 K,999.9 kg/m³,1.5692 mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

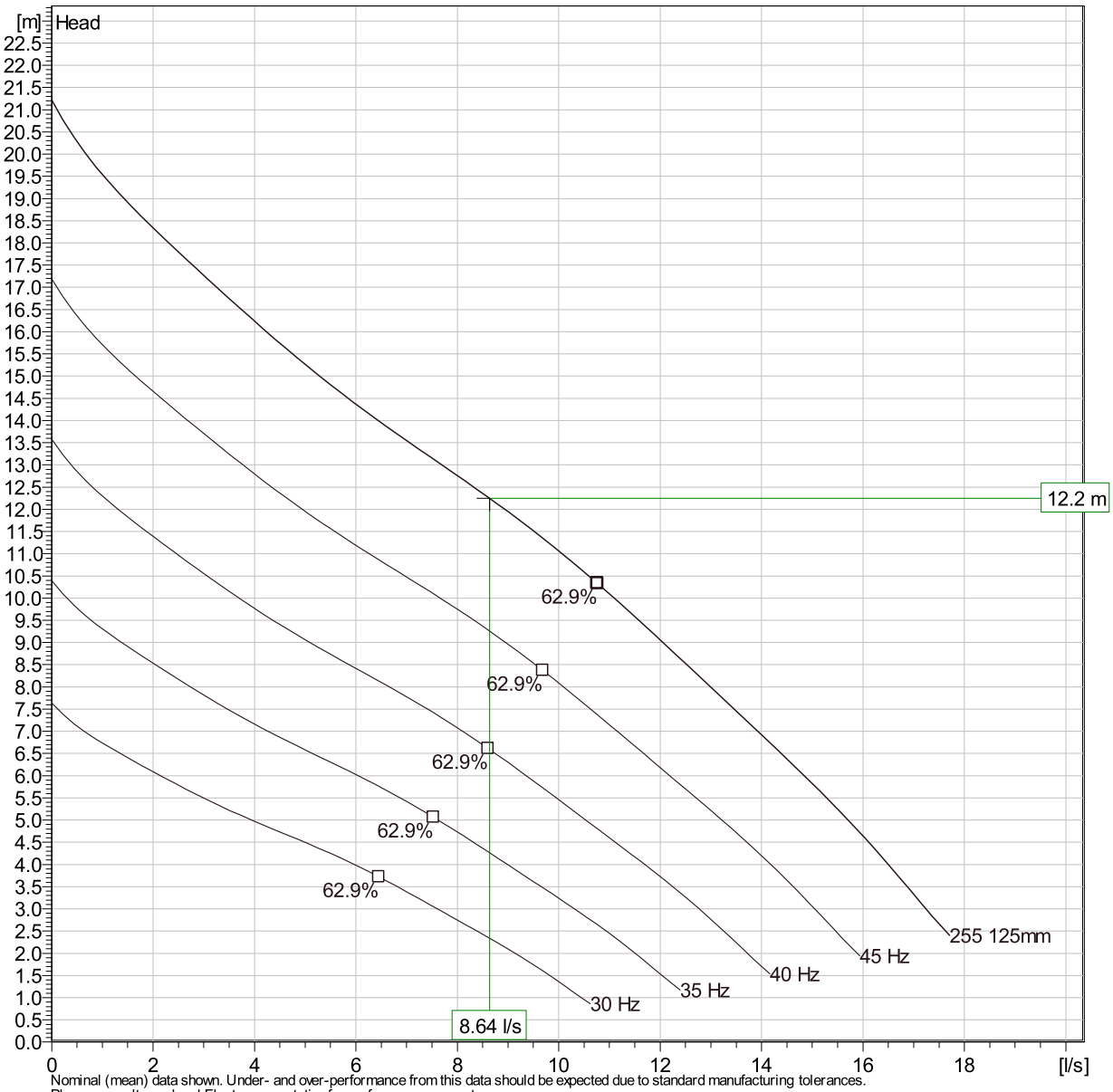
Curve: ISO 9906

Xylect-20111898	Peter Carroll		
	Created on 4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

Duty Analysis

Curves according to: Water, pure [100%] ; 277K; 999.9kg/m³; 1.5692mm²/s



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Operating characteristics

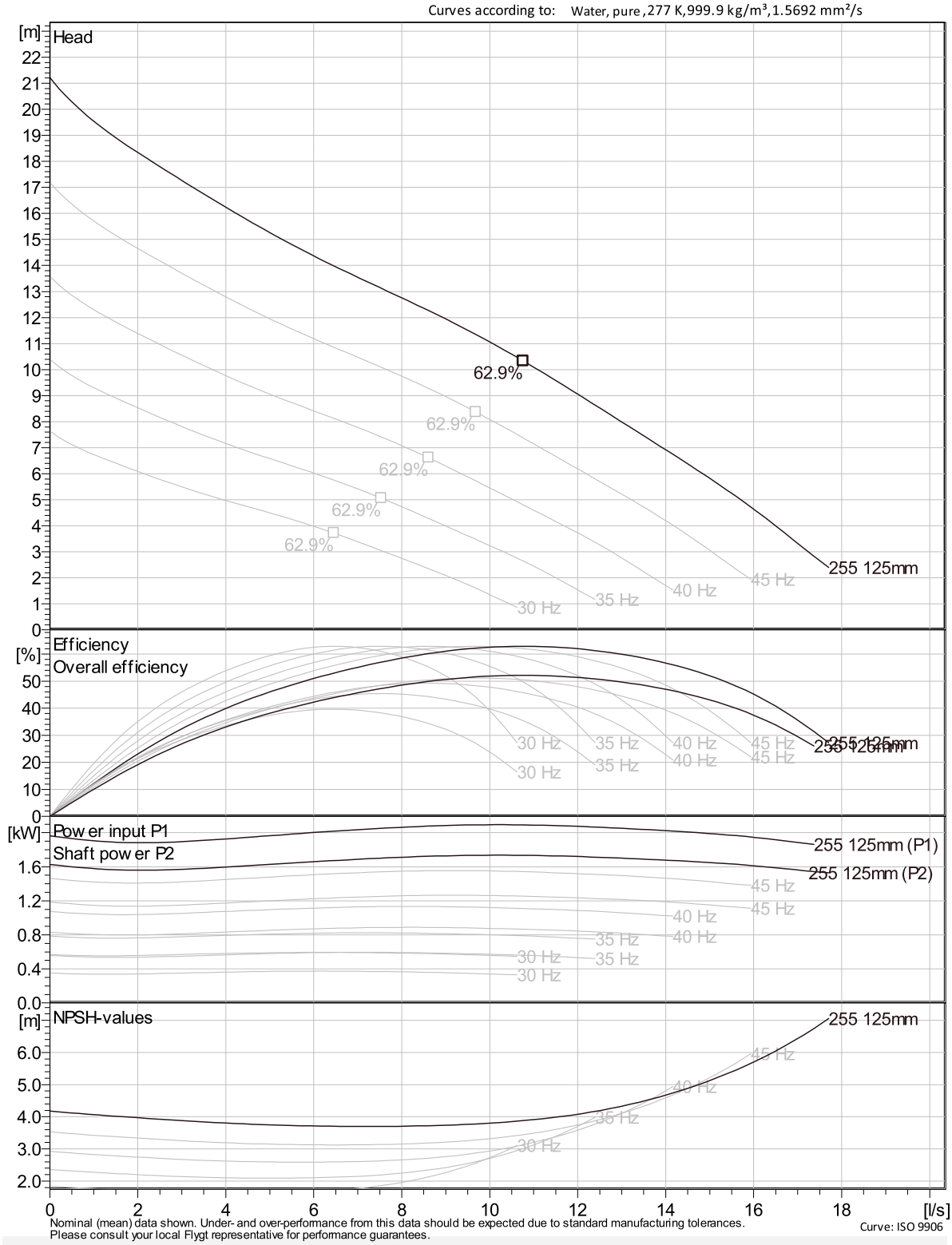
Pumps / Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Spec. Energy	NPSHre
	l/s	m	kW	l/s	m	kW		kWh/m³	m
1	8.64	12.2	1.72	8.64	12.2	1.72	60.2 %	0.0668	3.72

Project		**Created by**	Peter Carroll		
Block	Xylect-20111898	**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

VFD Curve

Curves according to: Water, pure ,277 K,999.9 kg/m³,1.5692 mm²/s



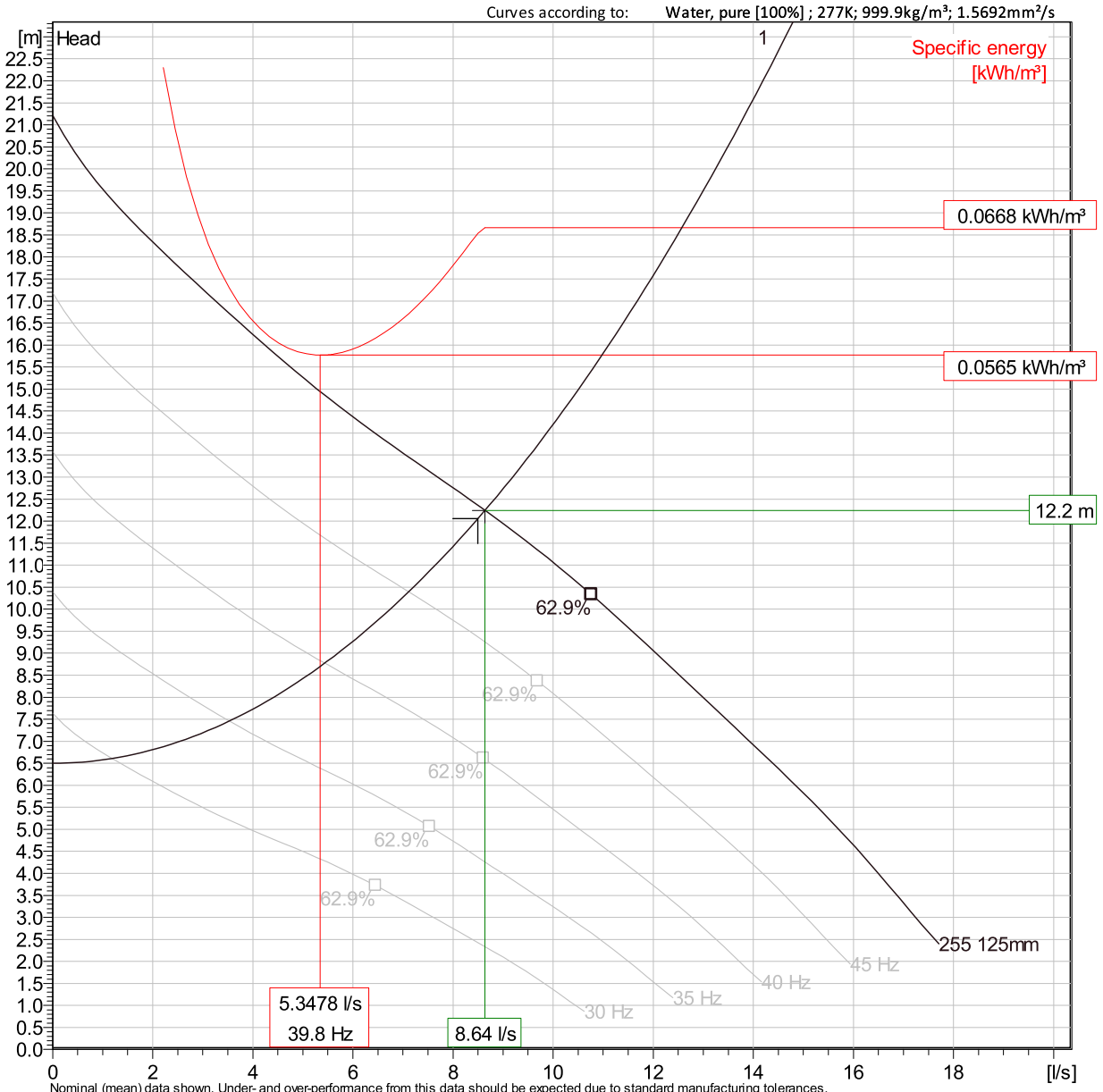
Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

Curve: ISO 9906

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

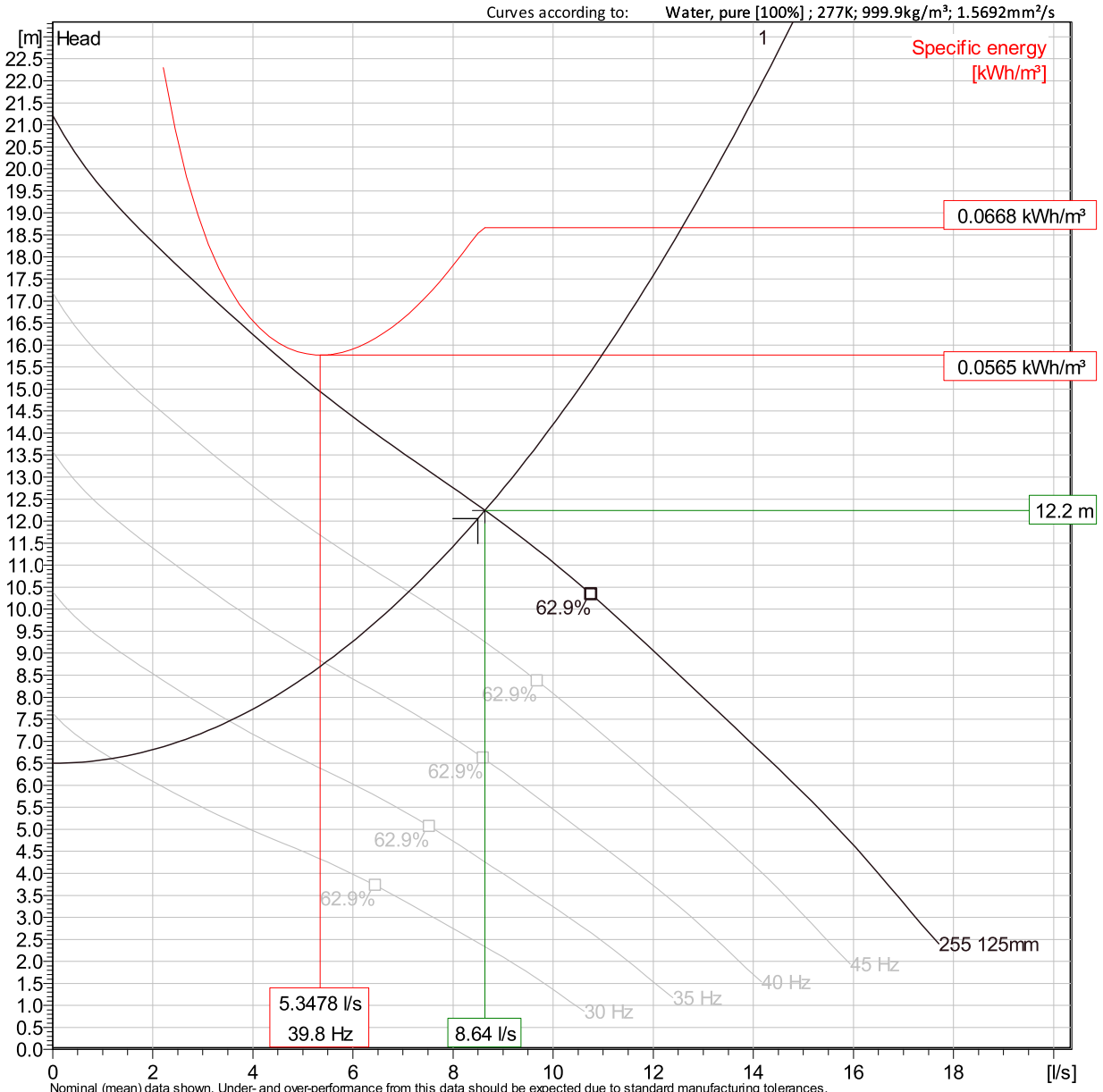
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	50 Hz	8.64	12.2	1.72	8.64	12.2	1.72	60.2 %	0.0668	3.72
1	45 Hz	7.11	10.4	1.25	7.11	10.4	1.25	58.2 %	0.0598	3.13
1	40 Hz	5.44	8.77	0.861	5.44	8.77	0.861	54.3 %	0.0565	2.59
1	35 Hz	3.53	7.46	0.559	3.53	7.46	0.559	46.2 %	0.0619	2.12

Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

VFD Analysis



Nominal (mean) data shown. Under- and over-performance from this data should be expected due to standard manufacturing tolerances.
Please consult your local Flygt representative for performance guarantees.

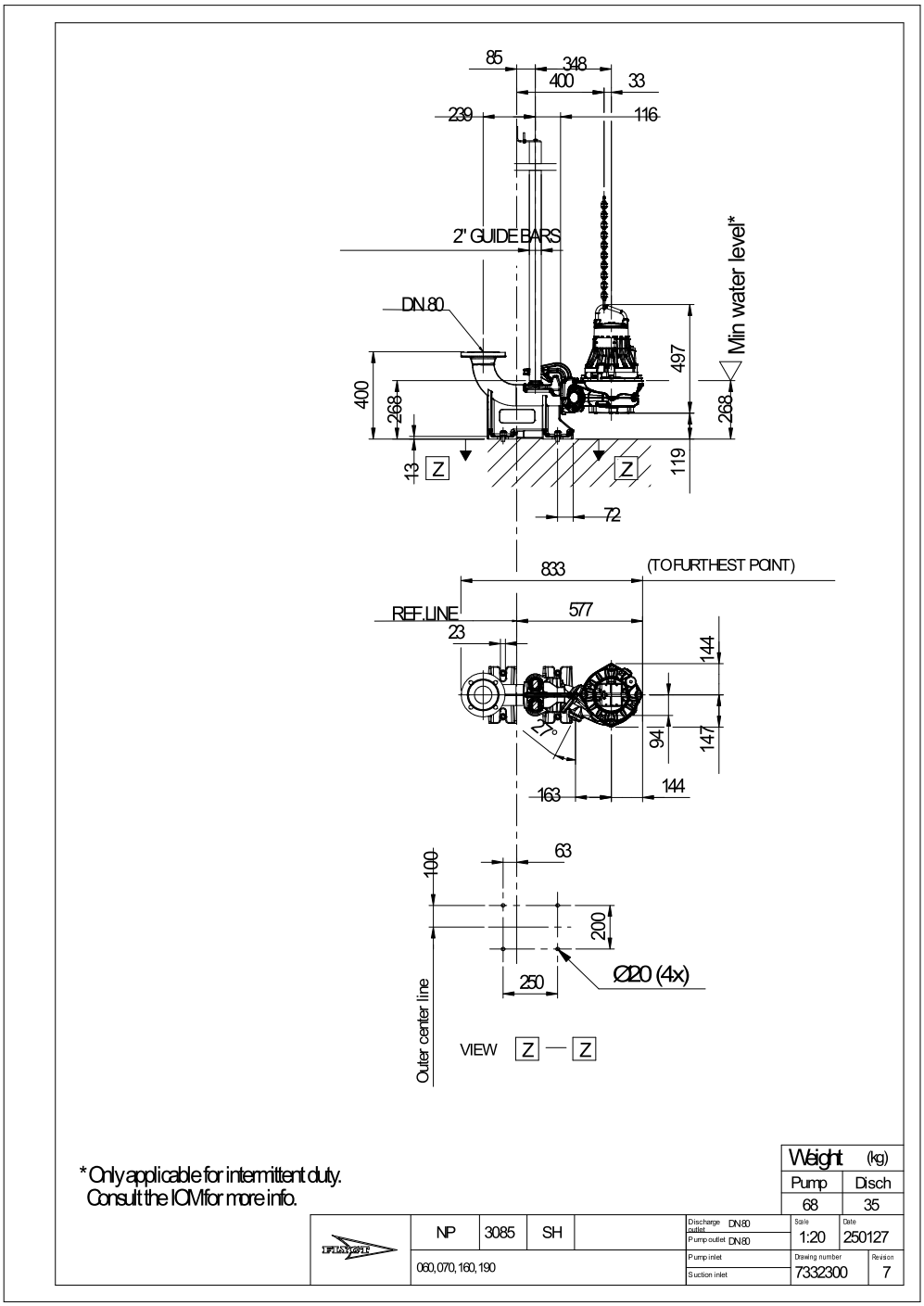
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		l/s	m	kW	l/s	m	kW		kWh/m³	m
1	30 Hz	1.19	6.61	0.337	1.19	6.61	0.337	22.9 %	0.129	1.75

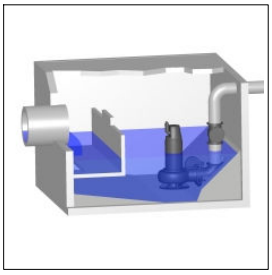
Project	Xylect-20111898	**Created by**	Peter Carroll		
Block		**Created on**	4/7/2025	**Last update**	4/7/2025

NP 3085 SH 3~ Adaptive 255

Dimensional drawing



Project	Xylect-20111898	**Created by**	Peter Carroll
Block		**Created on**	4/7/2025 **Last update** 4/7/2025



Friction loss calculation

Pumped fluid Water, pure	**Static head** 6.5	**Layout** Wet well installation
Flow 8.5 l/s	**Number of pumps** 1	**Calculation model** Colebrook-White
Viscosity 1.569 mm²/s	**Nature of system** Single head pump	

Type	Ø (mm)	? or L	Qty.	v (m/s)	k (mm)	ΔH (m)
Ø = Diameter v = Velocity k = Pipe roughness ΔH = Head loss						
Common discharge side pipe - Metal / Stainless steel						
PN 10 / DN 80 (84x2,0 mm) / K factor for Wastewater acc. DWA-A110						
Pipe length	80	10 m	1	1.691	0.5	0.6092
Elbows	80	0.3	1	1.691		0.04372
Non-return valves	80	0.9	1	1.691		0.1312
T-piece	80	0.4	1	1.691		0.0583
Valve	80	0.3	1	1.691		0.04372
Total friction head						**0.8861**
Common discharge side pipe - Plastic / PE100 (HDPE) PE 4710						
SDR 11 (PN 16) / DN 125 (140x12,7 mm) / K factor for Wastewater acc. DWA-A110						
Pipe length	114.6	503 m	1	0.8241	0.5	4.677
Total friction head						**4.677**
Friction loss head						5.563 m
Total static head						6.5 m
Total head						**12.06 m**

McBERNS

INNOVATIVE SOLUTIONS

WELL WASHERS



Why choose a McBerns Well Washer?

- Eliminates fat & grease build up on infrastructure & Walls
- No power required
- Operates with mains pressure water
- Uses less than 100 lts water per/day
- Cleaner level sensor probes
- Reduces overflows caused boy fogs
- Reduces odour
- Reduces confined space entries
- Reduces infrastructure corrosion
- Reduces maintenance
- Improved safety at pump stations
- Reduces customer complaints
- Healthier environment
- Optional pre-programmed with 5 cleaning cycle durations

McBerns Well Washers

The Well Washer has been in the Australasian marketplace for 25 years and is still the preferred method in keeping pump stations fat free. The AutoWellWasher™ will reduce maintenance in wet wells and tanks that accumulate fats,oils and greases (FOGs). Our design uses town water or recycled treated effluent at mains pressure to keep pump stations clean.

It can be installed using existing telemetry or with our pre-programmed timing device that activates towards the end of the pump out cycle.

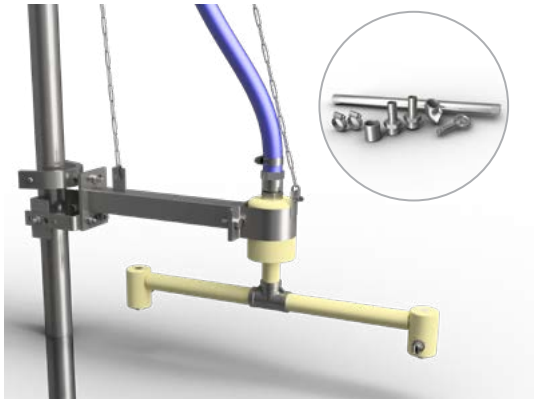
Installing a wellwasher will eliminate large fatty build-up in pump stations, this then reduces blockages in pumps and downstream sewers. The level sensors remain clean so the pumps work more efficiently, reducing the risk of overflows due to FOG build-up. It has also been shown to significantly reduce sulphide corrosion on concrete walls, pumps and other internal infrastructure components. There are fewer confined space entries required, only when essential maintenance tasks are needed.

The Well Washer is wholly designed and manufactured in Australia and has Australian, United States & International Patents.

'The total water usage for a single washer is as little as 100 litres per day.'

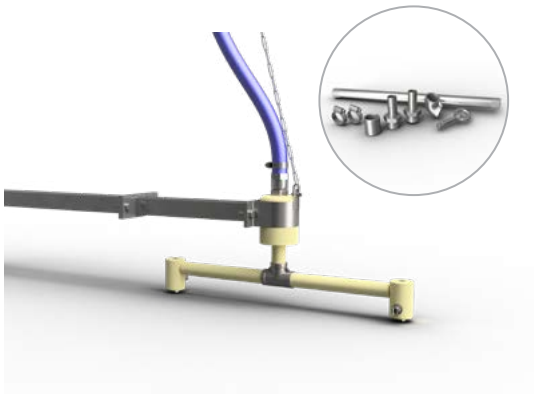
The principle behind the design is simple: The Well Washer cleans the fat and grease away before it solidifies.





Well Washer Kit Guide Rail Mount

Part Number:	WWKITGRMOUNT
Description:	Kit includes washer, brackets and install hose & fittings
Application:	Eliminates fat & grease build up on infrastructure and walls
Material / Finish:	Austlon, 316 S/S
Dimensions:	Taking the infrastructure into account we can design to specific requirements
Weight:	6 kg
General Specifications:	40/60 PSI, 30 l/min, 5-6m (Diameter)



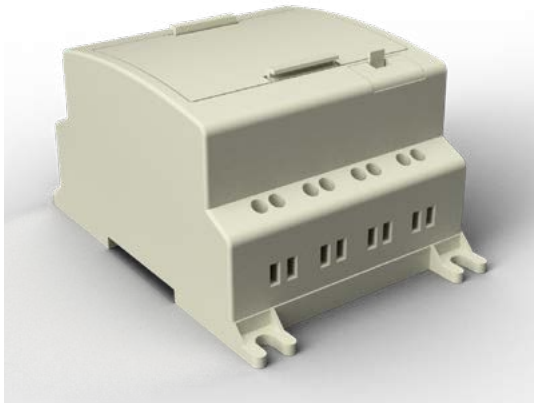
Well Washer Kit Wall Mount

Part Number:	WWKITWALLMOUNT
Description:	Kit includes washer, brackets and install hose & fittings
Application:	Eliminates fat & grease build up on infrastructure and walls
Material / Finish:	Austlon, 316 S/S
Dimensions:	600mm to 900mm Diameter
Weight:	6 kg
General Specifications:	40/60 PSI, 30 l/min, 5-6m (Diameter)



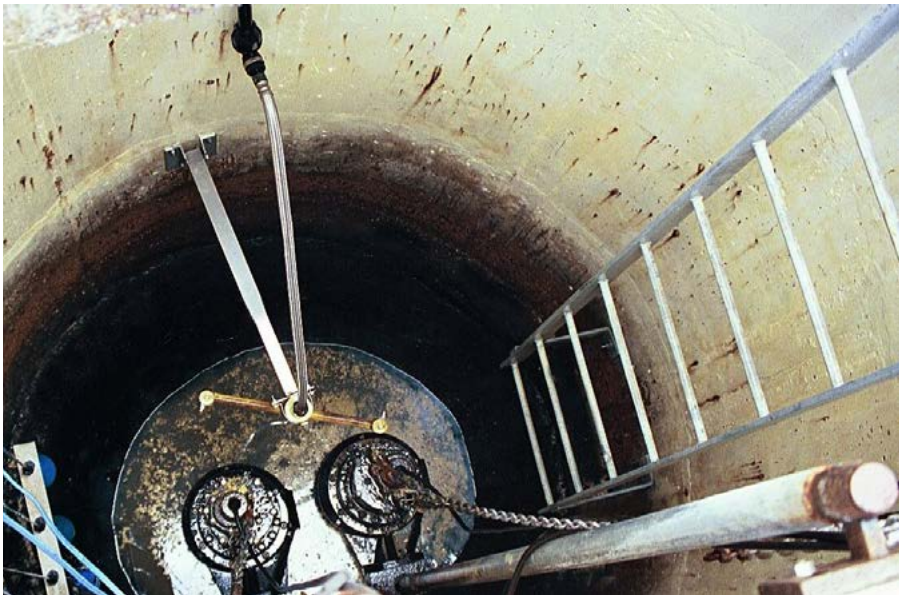
Optional Solenoid Valve

Part Number:	WWSOLENOID
Description:	Optional Solenoid Valves for water supply
Application:	Once energised allows water to flow to wellwasher
Material / Finish:	Glass reinforced nylon
Dimensions:	600mm to 900mm Diameter
Weight:	500 g
General Specifications:	Continuous operation 100% ED c/w LED connector plug IP65

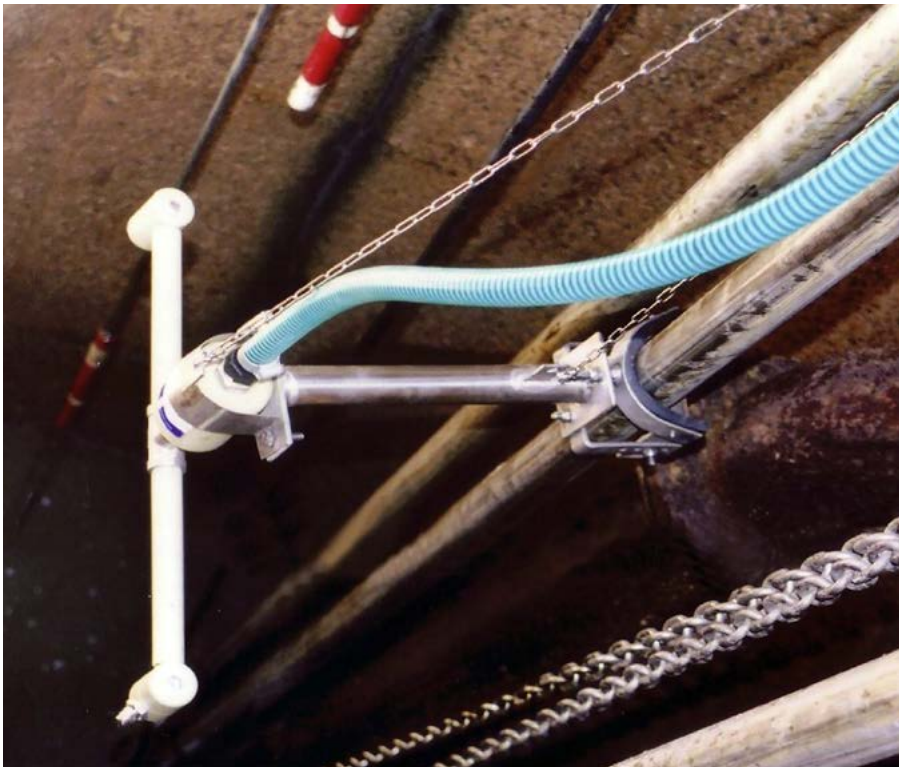


Optional Pre-Programed Allen-Bradley Micro810 Smart Relay

Part Number:	WWTIMER
Description:	Pre programmed with 5 cleaning cycle durations
Application:	Water Conservation, Minimise manual control
Material / Finish:	PVC
Dimensions:	600mm to 900mm Diameter
Weight:	500 g
General Specifications:	Less than 100 L daily









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MCBERNS PTY LTD
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Email: mail@mcberns.com

Noel Southern: 0411 745 458
Paul O'Kane: 0459 396 157
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aquate

Scan for more information

Aquate Commercial Pump Station

Technical Guide WW 10

Aquate Pump Stations are ideal for civil infrastructure applications where sewage or stormwater needs to be discharged into a reticulation network or wastewater treatment plant.



Applications

From residential subdivisions, schools, factories and commercial developments to stormwater networks, our complete range of pump stations is the solution for any sewer, stormwater or trade waste application.

Approvals/Standards

Concrete components designed and manufactured to AS/NZS 4058:2007 Precast Concrete Pipes

AS/NZS 1546:1 2008 – tank certification

AS/NZS3000 – electrical controller

AS/NZS 3500.2.2021 Sanitary plumbing and drainage

Built under ISO9001:2008 QA System

We are the supply partner of choice for New Zealand's civil construction industry, specialising in water and infrastructure based solutions.

HYNDS WASTEWATER

Aquate Pump Stations are ideal for civil infrastructure applications where conventional gravity systems are impractical or not cost effective.

Introduction

Hynds offers a wide range of high performance and durable Aquate packaged pump stations. These systems include chambers, pumps, level controls, control equipment, piping and valves etc. Aquate Pump stations are manufactured in Hynds Precast Factories and available in either concrete or polyethylene.

Our dedicated design team at Aquate provide a complete design and specification for consulting engineers and contractors. No matter what challenges your project presents, Aquate's expert engineers will work with you step by step to custom design the perfect pump station solution. Safety in design, environmental risk mitigation and ease of maintenance for servicing is always front of mind.

Hynds' dedicated Project Manager oversees the entire pump station project, including supply, on site installation, commissioning and quality assurance. Together with Aquate's world standard design service, the whole process from design through to installation is seamless.

Residential Aquate Pump Systems are also available for domestic applications.

See our website for more information: www.hynds.co.nz/product/aquate-residential-pump-station/

Features & Benefits

1. Flexible design: Aquate Pump Stations are designed to provide the required on-site storage and optimal pump performance.
2. Easy installation: The systems are prefabricated in the factory providing easy installation on site.
3. High quality pumps: Brands include Flygt, Grundfos, Domo and Zenit. Pumps are designed to meet the site specific requirements.





Technical data

Aquate Model No.	AQ1200	AQ1500	AQ1800	AQ2050	AQ2500	AQ3000
Internal diameter (mm)	1200	1500	1800	2020	2550	3000
Max chamber depth (m)	4.8	4.8	6.0	6.0	8.0	10.0
Min. riser sections (mm)	300	300	300	300	300	300
Valve chamber diameter (m)	1.2	1.2	1.5	1.5	1.8	1.8
Min volume wet-well (L)	2000	3500	5000	7000	10000	17000
Volume per additional metre depth (L)	1130	1760	2550	3100	5100	7050
Maximum pipework size (mm)	100	150	200	250	300	300

Control Panel

Hynds Aquate Pump Stations come complete with an electrical controller. This can be located on the pump chamber or installed at a nearby building. Features include:

- Single or three phase option
- Simplex or duplex pump operation
- Lockable IP 65 rated enclosure
- Visual and audible pump failure alarm system
- High level alarm
- Over pressure protection
- Pump motor protection against variable electricity supply
- Performance data recorded

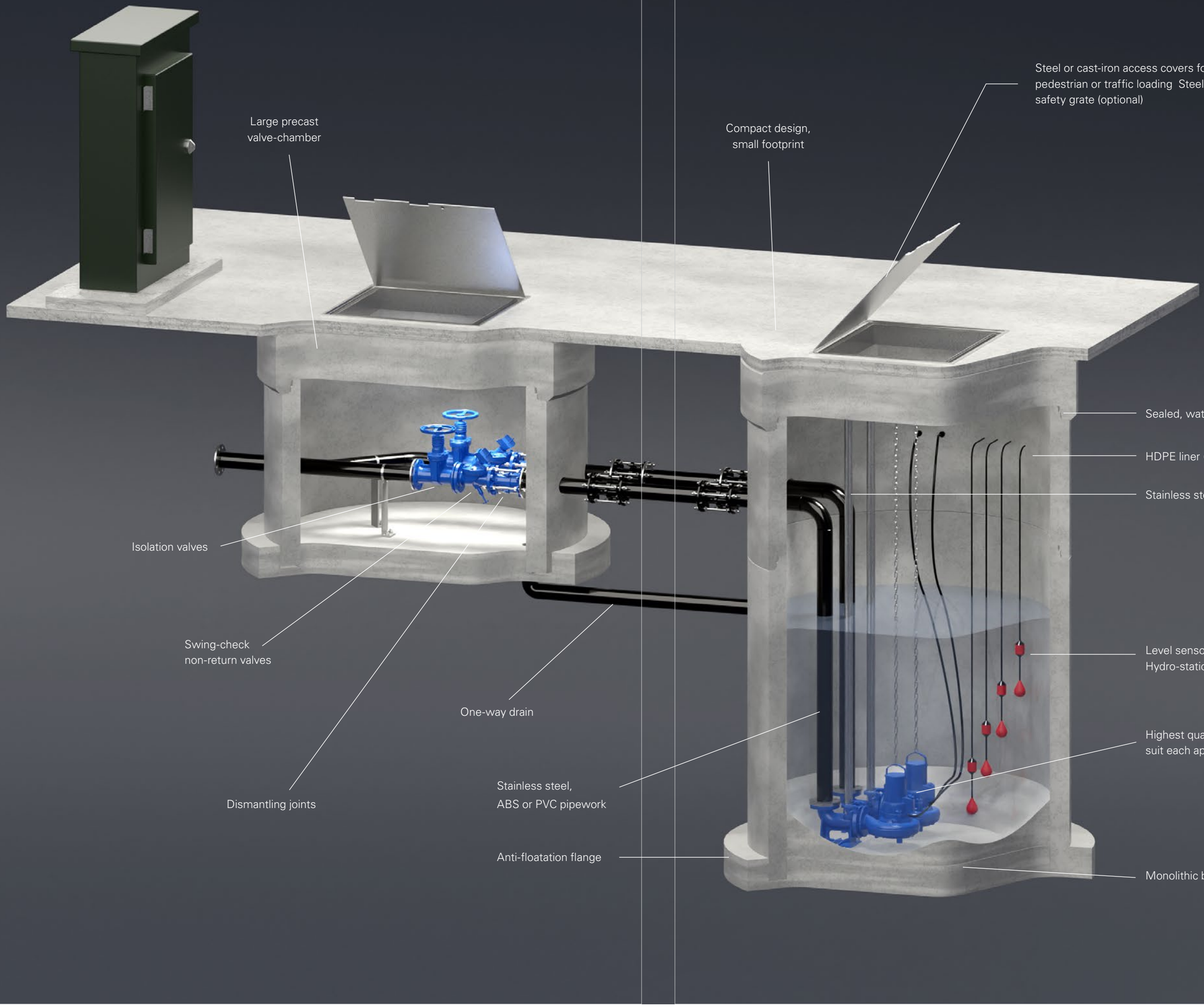


Options

- Web Based monitoring
- Float switches, hydrostatic transducers or ultrasonic level sensors
- Steel cabinets
- Hour run and start count
- Integration into a SCADA System
- Mag Flow Meter
- Alarm telemetry (SMS alarms), radio transmission, or outputs to BMS






Large precast valve-chamber
Compact design, small footprint
Steel or cast-iron access covers for pedestrian or traffic loading Steel safety grate (optional)
Sealed, water-tight lid and riser sections
HDPE liner (optional)
Stainless steel guide-rails and fixings
Level sensors – float switches, Hydro-static sensors
Highest quality pumps designed to suit each application
Monolithic base
Anti-floatation flange
Stainless steel, ABS or PVC pipework
Dismantling joints
One-way drain
Swing-check non-return valves
Isolation valves

Options cont...

- Auto well-washer for automatic station cleaning
- Odour filters
- Internal linings to prevent corrosion
- Lifting arm socket to simplify maintenance procedures
- Storage tank for emergency storage



Back up and support

Hynds has service agents throughout New Zealand. In the unlikely event of an alarm activation there is typically sufficient storage in the tank for 24 hours of normal operation. In the event of an alarm, either Hynds or the Local Council's Utility Services Team can provide onsite service.

Design Assistance

A dedicated Aquate Design Team will assist engineers design the ultimate pump station for their project.

The following information will need to considered to complete the full design:

- Expected daily wastewater volumes
- Emergency storage requirements
- Private or Council owned
- Static lift of rising main
- Length of rising main
- Special requirements for the controller (see options available)
- Depth of inlet pipes
- Pedestrian or traffic loading

Based on the information provided, Aquate will supply a design and specification including :

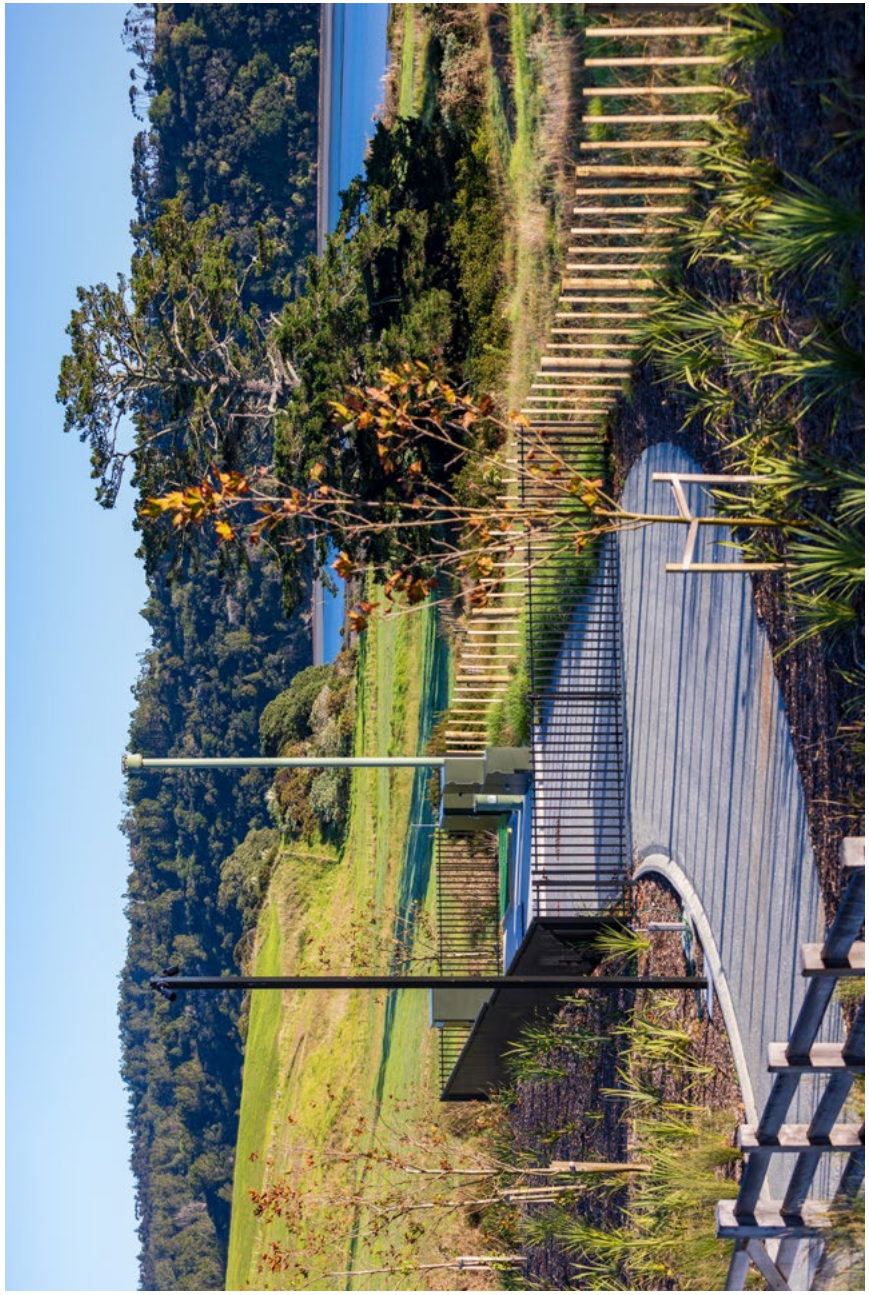
- Size of wet-well required
- Emergency storage tank if required
- Pump model and design
- Rising main sizing
- GA drawings of the pump station and valve chamber

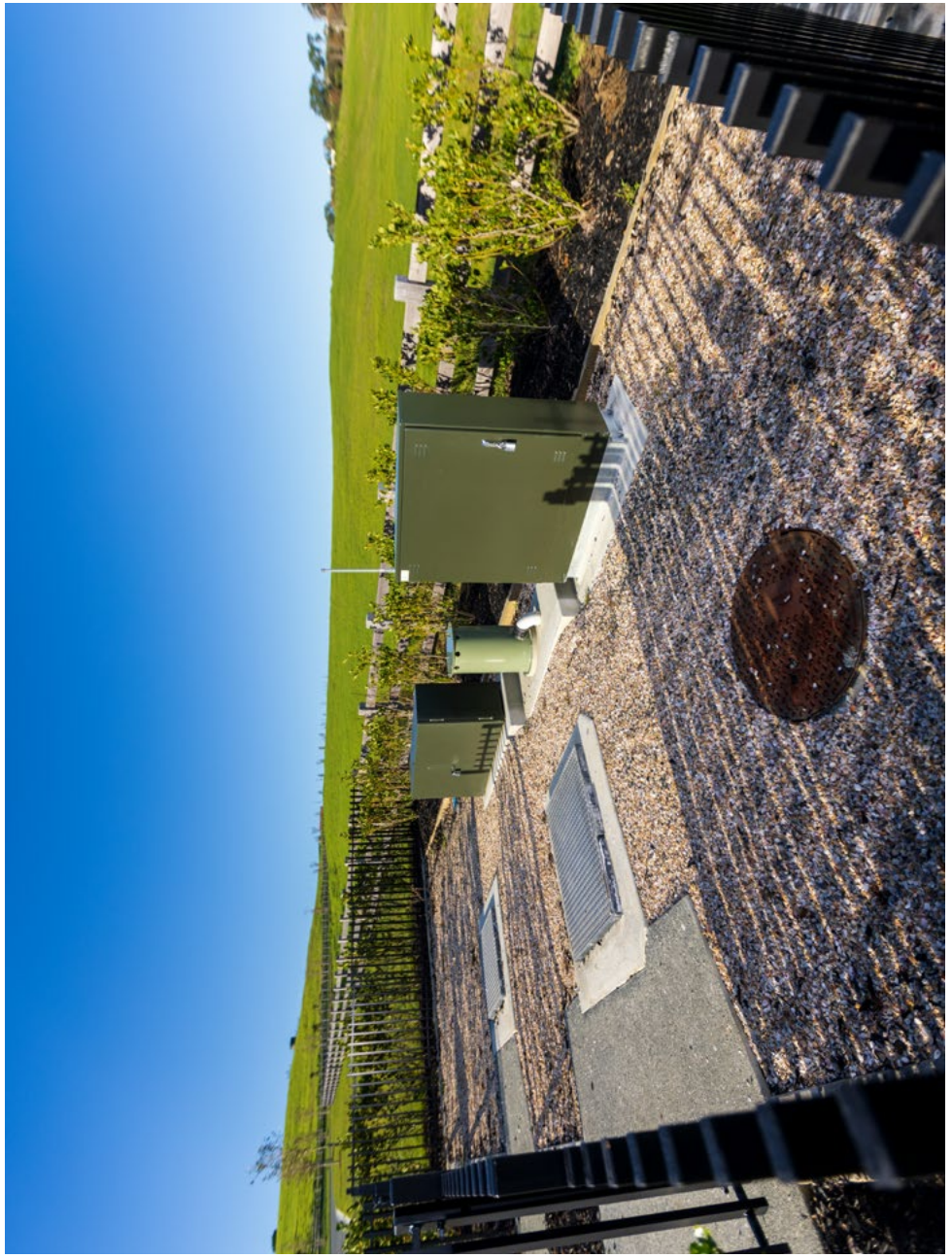
Contact

Contact our Project Manager to discuss your project

E: John.Bradford@hynds.co.nz

M: 027 538 9724





Branches Nationwide *Support Office & Technical Services 0800 93 7473*

Disclaimer: While every effort has been made to ensure that the information in this document is correct and accurate, users of Hynds product or information within this document must make their own assessment of suitability for their particular application. Product dimensions are nominal only, and should be verified if critical to a particular installation. No warranty is either expressed, implied, or statutory made by Hynds unless expressly stated in any sale and purchase agreement entered into between Hynds and the user.

Scan for more information

Hynds Retention Tank with Mul-T-Level™ Outlet

Technical Guide D5.15

Hynds strong and reliable retention tanks are available in Ring Joint Pipe Internal Base or Flange Base manhole types.



Applications

- Stormwater retention & detention
- Sewer storage

Product Attributes

- Versatile Mul-T-Level™ outlet
- Highly durable
- Simple installation
- Various design layouts and large capacity options available
- Water tight
- Proven history

Approvals/Standards

- AS/NZS 4058:2007 Precast concrete pipes (pressure and non-pressure)

Quality

- ISO 9001:2008 Quality Management

Hynds strong and reliable retention tanks are available in Ring Joint Pipe, Internal Base or Flange Base Manhole types.

Design Specifications and Applications

RJ Retention Tank

- Generally used when the location permits the installation of a long narrow tank.
- Comprised of Hyspec reinforced concrete rubber ring joint pipes.
- Usually includes a spigot-plugged pipe, standard intermediate pipes and a collar-plugged pipe.
- The spigot and collar plugs are factory cast to ensure water tightness and integrity.
- A manhole offtake is factory fitted to one or more pipes to provide easy access for maintenance.

IB or FB Retention Tank

- Generally used in compact site conditions where relatively small volumes is required.
- Comprised of Hynds internal base or flange base manhole risers and a precast concrete lid.

Mul-T-Level™ outlet

- Enables the tank to be used for both detention and retention.
- Both the RJ and IB/FB retention tanks have a standard 100 or 150mm diameter PVC slip coupler and Mul-T-Level™ outlet cast-in or fitted during manufacturing.
- The required retention/detention volume is set by an orifice hole (of specified diameter) being drilled on the Mul-T-Level™ outlet at a pre-determined height.

General Specifications

- Manufactured from Hyspec spun concrete pipes, using the centrifugal spinning process.
- When the tank is installed in an aggressive environment, such as tidal areas, sewerage or mild acid solutions, the use of a special grade concrete is recommended. Contact Hynds Technical Team for more information.
- Retention tanks are available in various class types to suit specific site conditions, loading and applications.
- The diameter and length of the retention tank is dependent on:
  - Storage volume required
  - Site configuration and access equipment available
- Inspection and maintenance access is provided by a fitted inspection chamber or manhole riser starter.
- PVC slip couplers are fitted to end plugs to provide inlet and outlet connections to the retention tank.
- Non-standard couplers or starter types can be cast-in on request.
- Orifice holes are drilled at levels to suit the design requirements.
- Standard lids are available for access risers in the RJ type tanks.
- A light or heavy duty cast iron cover and frame will fit direcly onto the 600mm diameter access riser.
- The 1050 mm diameter access riser requires a 1050 mm diameter manhole lid, which can be fitted with the cast iron manhole frame and cover.
- The IB or FB tanks require a lid, which can be fitted with a cast iron frame and cover to suit the riser diameter.
  - Note: Lid thickness is dependent on loads and application
  - Refer to Table 1 for RJ tank capacities and Tables 2 and 3 for IB/FB tank capacities.

TABLE 1 **RJ type retention tank**

Nom Pipe Diameter and Joint Type	Pipe Effective Length (m)	Nom Vol per Pipe Length (m^3)	Nom Vol per Pipe Length (Litres)	Suggested Offtake Dia (mm)	Lifting plugged pipe anchor req.	Handling intermediate pipe anchor req.
675RJ	2.440	0.72	720	600	A1	A2
750RJ	2.440	0.92	920	600	A1	A2
825RJ	2.436	1.14	1140	600	A1	A2
900RJ	2.448	1.38	1380	600	A1	A2
975RJ	2.440	1.67	1670	600	B1	B2
1050RJ	2.440	1.94	1940	600	B1	B2
1200RJ	2.440	2.58	2580	600	B1	B2
1350RJ	2.454	3.31	3310	600/1050	B1	B2
*1600RJ	2.440	4.51	4510	1050	C1*	B2*
1800RJ	2.438	6.13	6130	1050	C1	C2
1950SRJ	2.440	7.05	7050	1050	C1	C2
2100SRJ	2.397	8.02	8020	1050	C1	C2
2300SRJ	2.735	11.01	11010	1050	C1	C2
2550SRJ	2.470	12.18	12180	1050	C1	C2

Key

- **A1** *1 Tonne*
  2 no. in plug
  1 no. in pipe
- **A2** *1 Tonne*
  2 no. in pipe
- **B1** *2.5 Tonne*
  2 no. in plug
  1 no. in pipe
- **B2** *2.5 Tonne*
  2 no. in pipe
- **C1** *5 Tonne*
  2 no. in plug
  1 no. in pipe
- **C2** *5 Tonne*
  1 no. in pipe

Notes:

- *All dimensions refer to Class 2 (X) pipes*
- *Outlet 75 mm minimum above bottom invert of pipe*
- *Overflow 125mm below top*
- **1600 Ø retention tanks require both B2 & C1 type lifting clutches for offloading and installation*
- *See Fig 6 for 3 point lift on typical plugged end pipe*

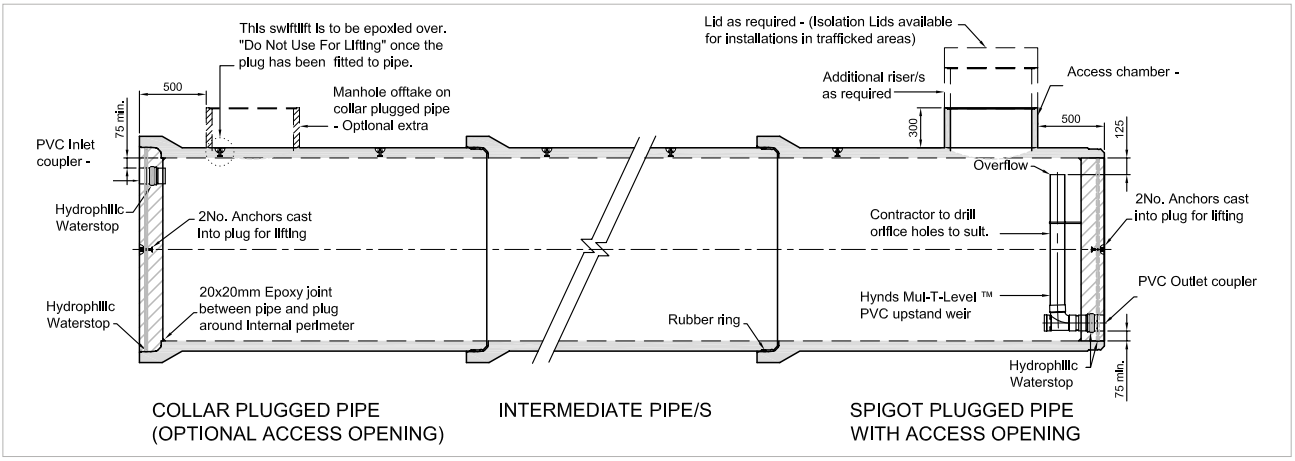


FIG. 1 General layout of typical RJ type retention tank with Mul-T-Level™ outlet

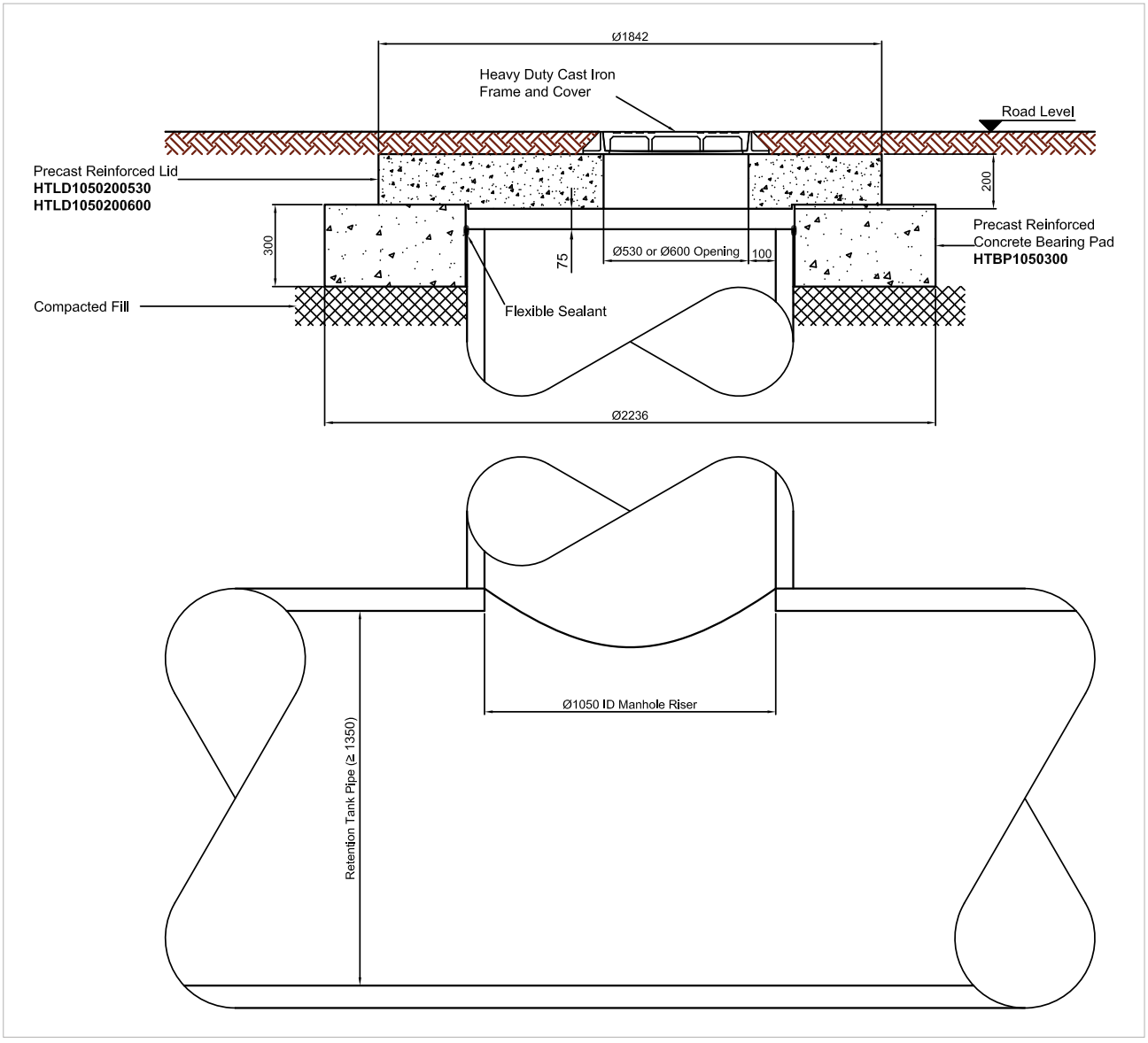
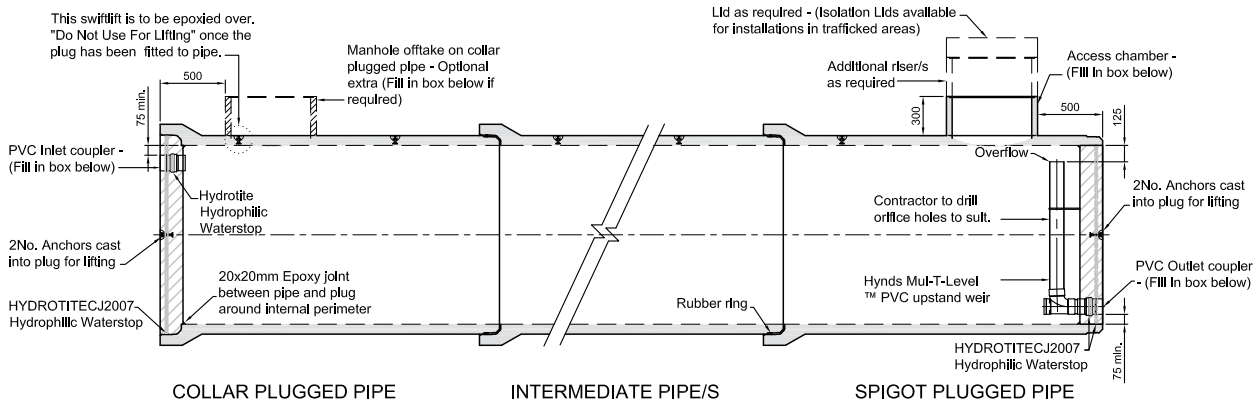


FIG. 2 Recommended detail for roadway installation



PIPE Ø

Min Recommended Ø 675mm

PIPE CLASS

TOTAL No. OF PIPES (Incl. ends)

COVER TO INVERT

Inlet	Outlet

PVC INLET FITTING Ø

Pipe Ø	Standard Fitting Ø	Ø Required
Ø675 to 1200mm	Ø100mm	
Ø1350 to 3000mm	Ø150mm	

PVC OUTLET FITTING Ø

Ø Pipe	Standard Fitting Ø	Ø Required
Ø675 to 1200mm	Ø100mm	
Ø1350 to 3000mm	Ø150mm	

ACCESS CHAMBER - OUTLET SIDE Ø

Ø Pipe	Standard Offtake Ø	Ø Required
Ø675 to 1200mm	Ø600mm	
Ø1350 to 3000mm	Ø1050mm	
Ø1350 to 3000mm	Specify	

ACCESS CHAMBER - OPTIONAL INLET SIDE Ø

Ø Pipe	Standard Offtake Ø	Ø Required
Ø675 to 1200mm	Ø600mm	
Ø1350 to 3000mm	Ø1050mm	
Ø1350 to 3000mm	Specify	

JOB DETAILS

QUOTE No.

CO No.

I AUTHORISE **HYNDS PIPE SYSTEMS LTD** TO PROCEED WITH THE MANUFACTURING OF THIS PIPE SPECIAL AS DETAILED ABOVE. I ACKNOWLEDGE THAT ANY SPECIALS, ONCE MANUFACTURED, ARE DEEMED TO BE MY (CONTRACTOR'S) PROPERTY & ARE NON REFUNDABLE. STORAGE & HANDLING FEES WILL BE INCURRED FOR PRODUCTS THAT ARE NOT DELIVERED/COLLECTED WITHIN 1 MONTH OF THE DATE AGREED AT THE TIME OF ORDER. PRODUCT NOT DELIVERED/COLLECTED WITHIN 3 MONTHS OF THE DATE AGREED WILL BE DESTROYED AT MY EXPENSE.

NAME :- ..... SIGNATURE :- .....

DATE :- .....

FIG. 3 RJ Retention Tank Order Form

Internal base type

TABLE 2 Internal base retention tank

Riser Height (mm)			**450**	**600**	**900**	**1200**	**1500**	**1800**	**2100**	**2400**
O/A Height Incl 150mm Thick Lid			580	730	1030	1330	1630	1930	2230	2530
O/A Height Incl 200mm Thick Lid			630	780	1080	1380	1680	1980	2280	2580
Effective Depth (mm)			225	375	675	975	1275	1575	1875	2175
Nominal Diameter	**A = Riser OD** (m)	**B = Riser ID** (m)	**IB Capacity** (m3)							
1050	1.194	1.066	0.20	0.33	0.60	0.87	1.14	1.41	1.67	1.94
1200	1.347	1.207	0.26	0.43	0.77	1.12	1.46	1.80	2.15	2.49
1400	1.524	1.372	0.33	0.55	1.00	1.44	1.88	2.33	2.77	3.22
1500	1.677	1.523	0.41	0.68	1.23	1.78	2.32	2.87	3.42	3.96
1650	1.842	1.676	0.50	0.83	1.49	2.15	2.81	3.47	4.14	4.80
1800	2.007	1.829	0.59	0.99	1.77	2.56	3.35	4.14	4.93	5.71
2050	2.236	2.036	0.73	1.22	2.20	3.17	4.15	5.13	6.10	7.08

Effective Depth (mm)			**–**	**–**	**625**	**925**	**1225**	**–**	**–**	**2125**
Nominal Diameter	**A = Riser OD** (m)	**B = Riser ID** (m)	**IB Capacity** (m^3)							
2300	2.58	2.30	–	–	–	3.84	–	–	–	8.83
2550	2.85	2.55	–	–	3.19	–	6.26	–	–	10.85

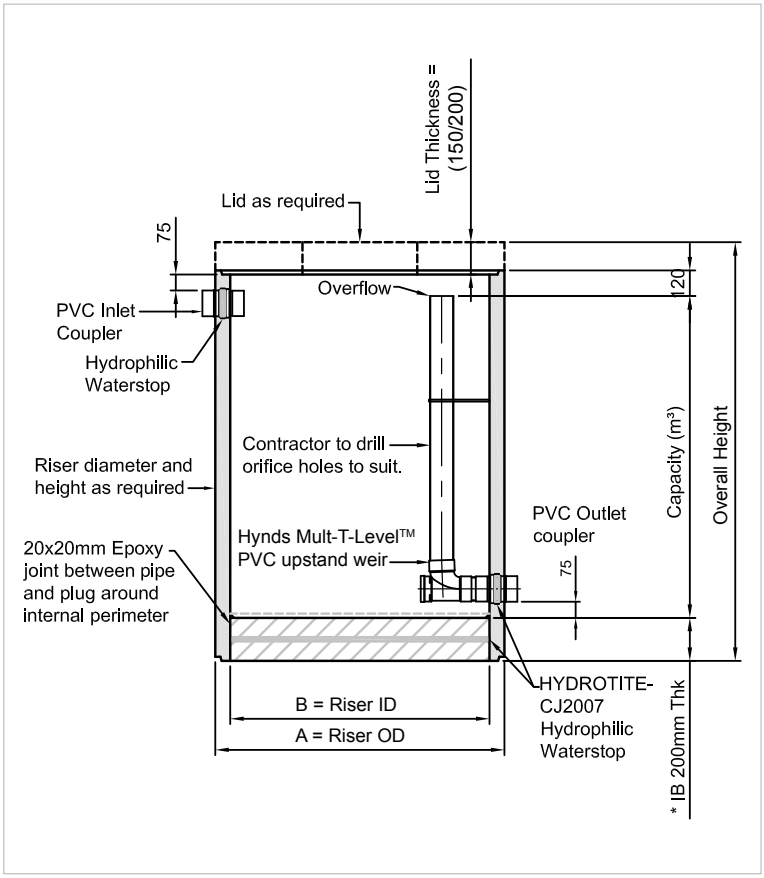


FIG. 4 Internal base

Flange base type

TABLE 3 **Flange base retention tank**

Riser Height (mm)			**450**	**600**	**900**	**1200**	**1500**	**1800**	**2100**	**2400**
O/A Height Incl 150mm Thick Lid			530	680	980	1280	1580	1880	2180	2480
O/A Height Incl 200mm Thick Lid			580	730	1030	1330	1630	1930	2230	2530
Effective Depth (mm)			225	375	675	975	1275	1575	1875	2175
Nominal Diameter	**A = Riser OD** (m)	**B = Riser ID** (m)	**FB Capacity** (m^3)							
1050	1.194	1.066	0.20	0.33	0.60	0.87	1.14	1.41	1.67	1.94
1200	1.347	1.207	0.26	0.43	0.77	1.12	1.46	1.80	2.15	2.49
1400	1.524	1.372	0.33	0.55	1.00	1.44	1.88	2.33	2.77	3.22
1500	1.677	1.523	0.41	0.68	1.23	1.78	2.32	2.87	3.42	3.96
1650	1.842	1.676	0.50	0.83	1.49	2.15	2.81	3.47	4.14	4.80
1800	2.007	1.829	0.59	0.99	1.77	2.56	3.35	4.14	4.93	5.71
2050	2.236	2.036	0.73	1.22	2.20	3.17	4.15	5.13	6.10	7.08

Effective Depth (mm)			–	–	**625**	**925**	**1225**	–	–	**2125**
Nominal Diameter	A = Riser OD (m)	B = Riser ID (m)	FB Capacity (m^3)							
2300	2.58	2.30	–	–	–	3.84	–	–	–	8.83
2550	2.85	2.55	–	–	3.19	–	6.26	–	–	10.85

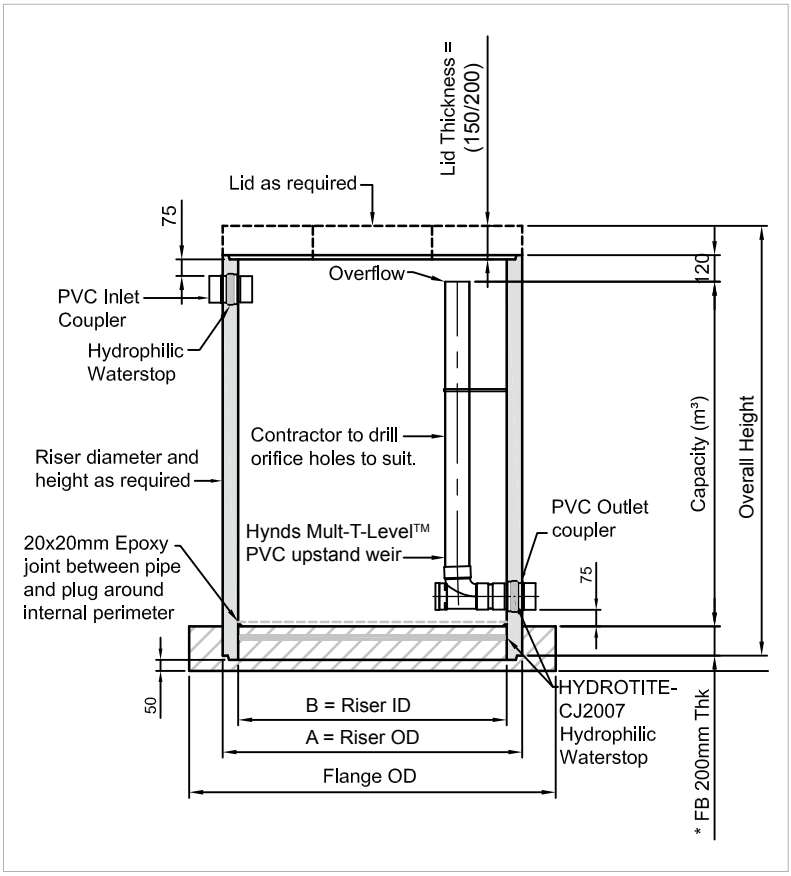


FIG. 5 Flange base

Installation

Mul-T-Level™ outlet

- Installation is simple and normally carried out by a drain layer using the same equipment and procedures as for the installation of concrete pipelines, or manholes.

RJ Retention Tank

- Similar installation to reinforced concrete rubber ring jointed pipes (including bedding requirements) and are dependent on site conditions and loading.
- Once the pipe sections have been installed and backfilled, the additional access risers are epoxied to the starter risers and brought up to the finished levels.
- The installation is then completed by fitting the required lids.
- The contractor must then drill the orifice holes at the required design levels.

Note: *Refer to Figure 1 for a general layout of a typical RJ type tank.*

RJ Retention Tank – Roadway Installation

- To minimise the effects of traffic, isolation of the manhole lid from the access riser is recommended.
- The depth of the modified flange base and riser must be kept to a minimum to enable maximum distribution of load above the tank.
- Refer to Figure 6 for 3 point lift of typical plugged end pipe.

IB or FB Retention Tank

- Similar installation to concrete manholes.
- Foundations should be prepared with compacted hardfill to prevent excessive settlement.
- Once the IB or FB tank is backfilled, the installation is completed by fitting the relevant concrete lid with the appropriate cast iron frame.



FIG. 6 Point lift of typical plugged and pipe

Disclaimer: While every effort has been made to ensure that the information in this document is correct and accurate, users of Hynds product or information within this document must make their own assessment of suitability for their particular application. Product dimensions are nominal only, and should be verified if critical to a particular installation. No warranty is either expressed, implied, or statutory made by Hynds unless expressly stated in any sale and purchase agreement entered into between Hynds and the user.

Hyliner AKS HDPE Lining

Technical Guide D1.12

HyLiner AKS HDPE is used as corrosion protection lining in precast and cast in-situ concrete elements or structures to increase durability and reduce the risk of abrasion.



Applications

- Corrosion protection lining for precast concrete pipes in sewer pipelines
- Corrosion protection lining for in-situ concrete structures in wastewater treatment plants
- Abrasion protection lining in high abrasion environments
- Broad range of application in both precast and cast in-situ concrete

Product Attributes

- Available in white (sewer applications) and black (where high UV resistance is required)
- 12 mm long anchors are integrally formed with the sheet
- Factory QA tested and welding of joints is 100% quality tested onsite

Quality

- ISO 9001:2008 Quality Management Standard

We are the supply partner of choice for New Zealand's civil construction industry, specialising in water and infrastructure based solutions.

HYNDS PIPE SYSTEMS

HyLiner AKS HDPE is used as corrosion protection lining in precast and cast in-situ concrete elements or structures to increase durability and reduce the risk of abrasion.

Lining systems are able to bridge discontinuities in pipe or structure walls unlike other coating systems that rely on the integrity of the surface and quality of the surface preparation and the installer's expertise for functionality.

HyLiner AKS HDPE is a thermoplastic lining used to reduce the risk of sulphide attack or corrosion in sewage applications.

The high density polyethylene *(HDPE)* lining suits both precast and in-situ applications. Firmly anchored to the concrete surface of the pipe or structure, the lining requires only welding of joints to form a durable, chemically resistant concrete protection membrane with high abrasion resistance.

Installation

Installation procedures vary depending on the product:

Spun concrete pipe

The liner is inserted into the pipe prior to the completion of manufacture, with the pipe spinning process completed with the liner installed. This ensures that all the anchor knobs are well embedded in the spun concrete prior to the concrete curing and hardening.

Wet cast concrete pipe

The liner is securely attached to the inner mould before placement of reinforcement and casting of the pipe. The pipe once cast is cured in the normal manner using heat to accelerate the hardening process.

Precast concrete

This follows a similar process to the wet cast concrete pipe whereby the liner is attached to the mould prior to casting of the element.

In-situ concrete

This follows the same process as for precast concrete whereby the liner is attached to the formwork prior to casting of the concrete.

Installation Detail

In the case of concrete pipes, the liner need only be applied to the pipe's internal surface above low flow level during normal operating conditions as shown in fig 3.

Where 360° cover is required, the liner is fitted with an overlap at the invert (50 mm min) as shown in fig 4 & 5. This joint is not usually welded as it allows any accumulation of moisture from external hydrostatic pressure to dissipate from behind the liner.

Where the fluid contents are themselves aggresive, such as trade waste discharges, a longitudinal weld can be provided to seal the pipe invert.



FIG. 1 Where 360° cover is required, the liner is fitted with an overlap at the invert (50 mm min)

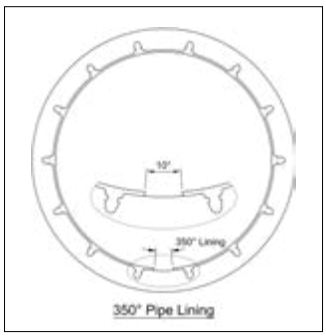


FIG. 3 Most concrete pipes only require the liner applied to the pipe's internal surface above low flow level during normal operating conditions.

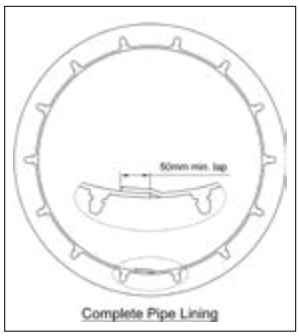


FIG. 2 Invert overlap in a 1050Ø pipe.

Jointing

A continuous lining system is created through the use of extrusion welding carried out by trained, qualified operators. Generally overlapped welds are recommended.

Various details for welded joints for precast concrete pipes and components are shown in Figures 4 to 6. Other details for site installation and fixing of brackets are shown in Figures 7 to 12.

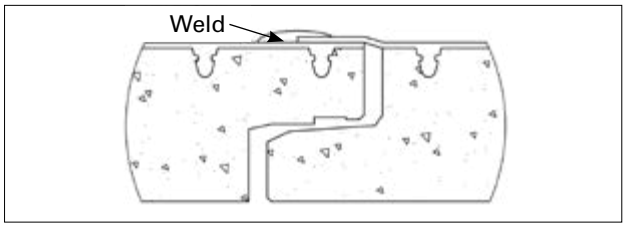


FIG. 4 HyLiner lined SRJ pipe (Lapped Joint)

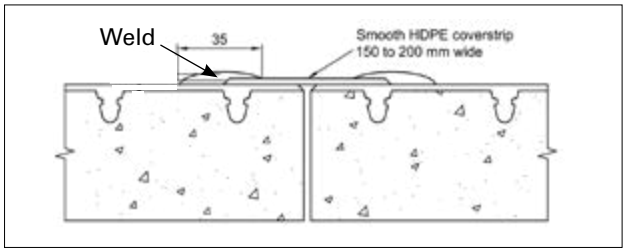


FIG. 5 Cover strip with 2 overlap welds

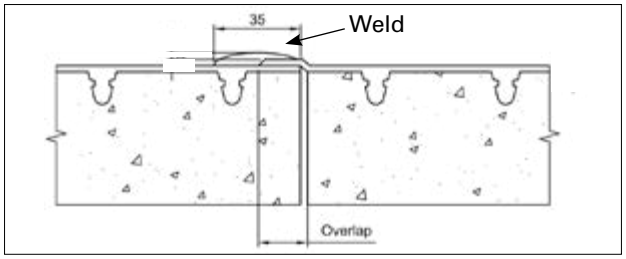


FIG. 6 Single overlap weld

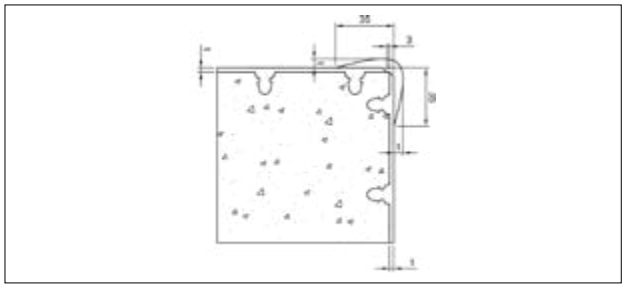


FIG. 7 Outside Corner Weld

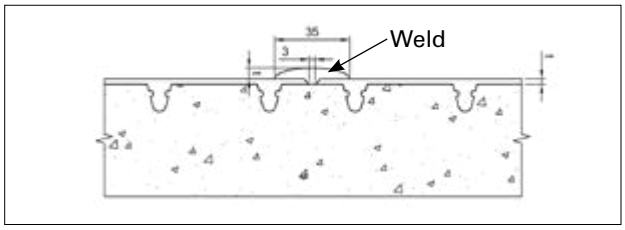


FIG. 8 Flat Extrusion Butt Weld

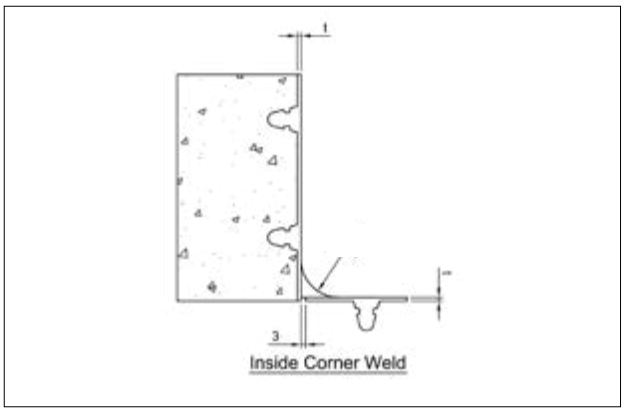


FIG. 9 Inside Corner Weld

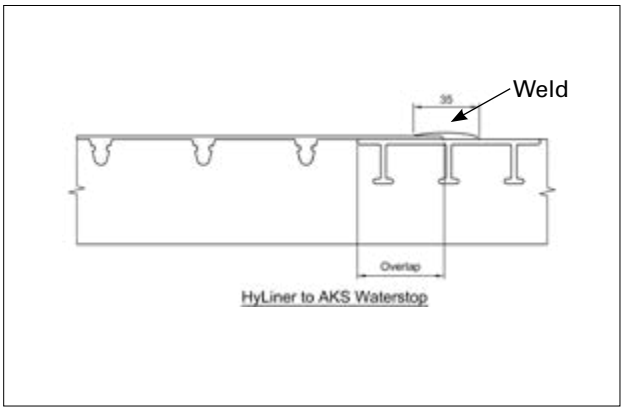


FIG. 10 HyLiner to AKS Waterstop

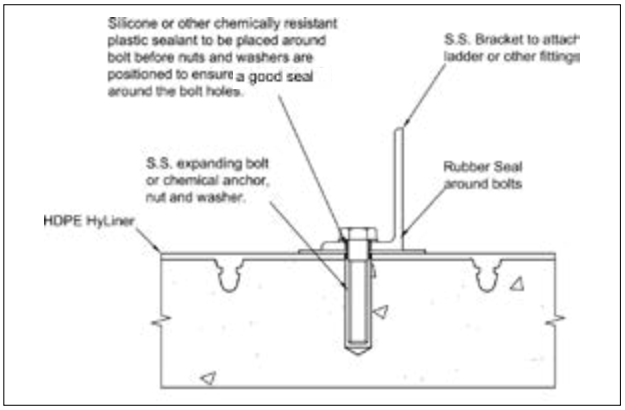


FIG. 11 Sealing of Brackets and Fittings to HyLiner Lined Structures

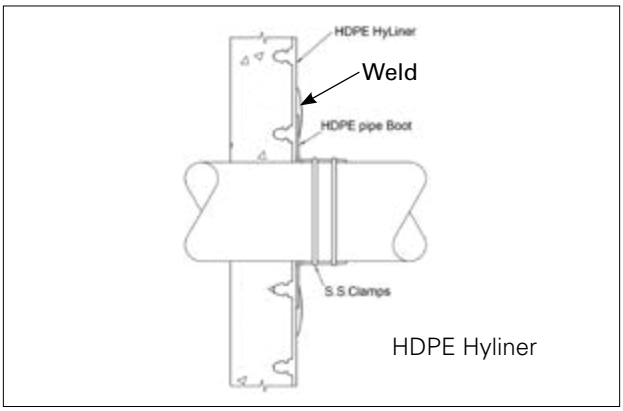


FIG. 12 Pipe Penetration Detail

Quality Control

In-plant quality control for the manufacture of the liner includes waviness, surface finish, knob shape and alignment, crimp height and depth of knobs, sheet thickness, density and tensile values.

Quality checks after casting into precast concrete pipes and components include effective anchor embedment, liner positioning on the product and spark testing for pin holes or damage.

All joints and the liner are spark tested after jointing is completed on site. This ensures the quality of the joints and identifies any damage in the liner as a result of handling and installation.

Abrasion resistance

HyLiner AKS HDPE has a good abrasion resistance when compared to other materials. A typical abrasion test value for HDPE liners is 0.3mm after 400 000 cycles *(Kirschmer, O., "Problems of Abrasion in Pipes", Steinzeugin Formationen, 1966, No 1, pp3-13)*.

Wear rates are very slow even under continuous flow of abrasive slurry. Most drainage applications would have intermittent exposure to abrasion.

Suitable Structures for Lining

HyLiner AKS HDPE is suitable for installation in spun and wet cast concrete pipes from 1050–3000 mm diameter.

HyLiner AKS HDPE is also suitable for lining a range of other concrete structures:

- Manhole risers and lids
- Rectangular or square precast concrete chambers and lids
- Precast concrete channels and lids
- Precast concrete pumpstations
- Insitu concrete structures such as tanks and chambers



FIG. 13 2300 Diameter Manhole Riser

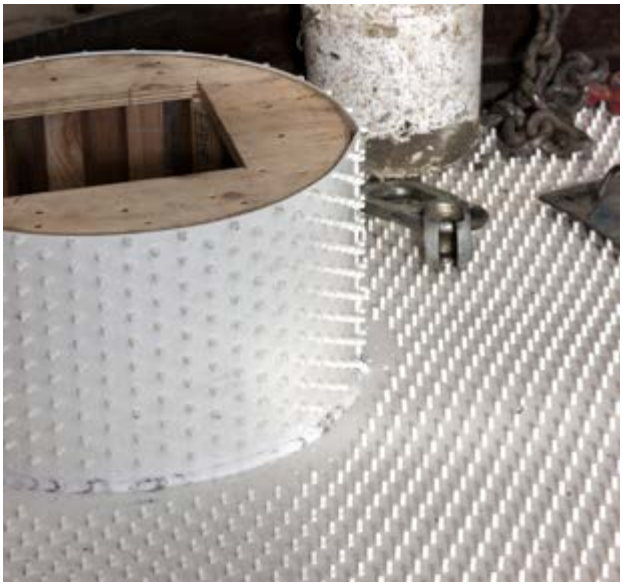


FIG. 14 Liner being installed for a manhole lid

Disclaimer: While every effort has been made to ensure that the information in this document is correct and accurate, users of Hynds product or information within this document must make their own assessment of suitability for their particular application. Product dimensions are nominal only, and should be verified if critical to a particular installation. No warranty is either expressed, implied, or statutory made by Hynds unless expressly stated in any sale and purchase agreement entered into between Hynds and the user.

Technical Data Sheet

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

BluSeal Anchor Knob Sheet (AKS) is supplied and installed as a fully sealed and welded robust chemically resistant concrete protection lining.

BluSeal AKS is a synthetic membrane of HDPE sheet with integral anchors which are cast into concrete to form a flexible and durable corrosion protection lining. BluSeal AKS is used to protect concrete surfaces in chemically aggressive environments in sewerage tunnels, treatment works, pump stations, manholes and chemical retention bunds. It comes in a range of colours and thicknesses and can be applied to new and existing structures for protection or enhancement.

Application Advantages

- Fully welded homogenous lining
- Complete before 28-day concrete cure
- Factory assured thickness and absence of pinholes
- Retro-fitted lining is moisture compatible with assured bond

Lifecycle Advantages

- 100 year design life
- Membrane drainage eliminates negative pressure
- Chemical and impact resistant
- High anchor pull-out resistance
- Potable Water use to AS/NZS 4020:200
- Low coefficient of friction in lined conduits

About the Product

BluSeal AKS is supplied and installed as a fully sealed and welded, chemically resistant concrete protection system. The system includes propriety details for sealing around penetrations and against non-HDPE surfaces. Skilled applicators can fabricate the product into various shapes to suit irregular concrete formwork. All seams and joins are extrusion welded and then tested by spark or vacuum box testing. BluSeal AKS is designed and installed by approved applicators to international standards which are outlined in a manufacturer's installation manual. The elasticity of the membrane allows free drainage and relief of any hydrostatic pressure build-up in underground structures. The membrane can be cast into new structures or retrofitted by cement grouting onto the prepared surface of existing structures. AKS lined structures have an outstanding track record in aggressive environments, demonstrating a design life in excess of 100 years for the most demanding applications.

Application solutions

- Segmental sewer tunnels
- Inlet works and bioreactor tanks in WWTP
- Pump stations and manholes
- Tunnel waterproofing
- Chemical retention bunds
- Piles and foundation lining in aggressive ground conditions
- Sewer pipelines
- Slide pads on pipe plinths
- Concrete protection for industrial applications

Project Specification Clause

HDPE CORROSION PROTECTION LINING - The HDPE CPL membrane used for this project shall be supplied and installed as a fully sealed and welded robust continuous membrane system. It shall be a factory produced product that has independent testing to validate the performance outlined in the technical data table on the following pages. BluSeal AKS supplied by Bluey Technologies or equivalent shall be acceptable.

Project Examples

Sewerage treatment plants, sewer pump stations, sewer manholes, trunk sewer mains, chemical processing plant bunds and trenches, gas pipelines (pipe plinths).

A brand of MBCC GROUP

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

Application Specification

PREPARATION

1.1 BluSeal AKS must be installed onto formwork under the direction of an approved, specialised applicator who will plan layout configurations of sheets and weld seam locations. The applicator may also prefabricate some corner or seam sections and pipe penetration pieces offsite.

1.2 At joins in sheets the edge knobs are removed from one edge and the sheet is overlapped by 50mm to prevent egress of concrete fines and to provide a sound foundation for welding the seams.

1.3 Formwork shall be cleaned and free of defects. Form release oils are not necessary where BluSeal AKS is applied. Formwork should be designed to avoid leaking.

1.4 The sheets must be tensioned over the form within the yield elongation limit, prior to securing to the forms.

1.5 BluSeal Formtak can be used to assist in holding the sheet against timber formwork. Securing against the formwork is by nailing or stapling through the sheets at edges where extrusion welds will cover later or into edges that will be redundant and trimmed after the pour.

1.6 On circular forms, the sheets are wrapped and tensioned around and secured at the overlap by wires around the knobs and/or temporary speed welding along the seam.

1.7 In precast concrete applications the moulds may be designed to secure the membrane at the edges.

1.8 When BluSeal AKS is applied to an existing structure all corroded concrete and contaminants must be removed, leaving a surface profile greater or equal to CSP4 in accordance with ACI guidelines.

1.9 Treat or replace exposed reinforcement in accordance with ACI guidelines.

1.10 Refer to Bluey Technical Notes for recommendations regarding proving grout bond strength and design criteria.

APPLICATION

2.1 Always pour concrete or grout at a cooler ambient temperature than the temperature when the sheets were applied to the formwork. This will ensure the membrane is taut on the forms.

2.2 Anticipated maximum concrete temperature or accelerated curing temperature should not exceed 60 degrees Centigrade. Contact Bluey to discuss exceptions.

2.3 When grouting the sheets onto an existing structure, only grouts approved by Bluey such as BluCem HS200 shall be used, and mixing and placement shall be strictly in accordance with Bluey instructions. Fast set grouts, such as BluCem HE80, are recommended to be used for retrofitting the membrane in short time frames where assets must be returned to service quickly.

2.4 When grouting the membrane to floors, plan pours at times of the day where temperature changes before initial set of the grout are minimal. Avoid these pours in direct sunlight.

2.5 Concrete mix design, mixing, placement and compaction of concrete should follow standard civil construction practice to minimise voids and ensure full encapsulation of the anchors on the membrane.

2.6 Extrusion welding and weld testing at seams will be undertaken by approved applicators and in accordance with installation guidelines provided by the manufacturer and generally in accordance with DVS 2227. This includes proper preparation of the sheet surfaces to be welded and daily destructive seam peel tests sampled from trial welds. Welding technicians shall have formal industry training in extrusion welding techniques.

2.7 Non-destructive testing of completed welds will be either by vacuum box or spark testing.

2.8 Repairs and patching will be completed by extrusion welding over small defects or applying a minimum 200mm diameter patch over larger defects, with a minimum 80mm edge distance to the defect.

2.9 Destructive pull testing of anchors should be avoided.

2.10 Encapsulation of anchors can be easily checked by tapping across the surface of the membrane to detect any hollow sounds that indicate voids under the membrane. If voids are detected, they can be filled by injection of BluCem HS200 high flow grout through the lining. Repair by extrusion welding over the injection hole.

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

Product Data

Please refer to Important Notice on following page

Length of Knobs (nominal)	12mm
Knobs per m²	1230
Pull-off Resistance	>700N per knob or 850kPa (short term loading)
Membrane Thickness	2.0mm to 10mm*
Roll Widths	Up to 3.2m
Colours	Black for UV exposed applications and light colours (such as white) for underground or covered structures.

TESTED CHARACTERISTIC	STANDARD	RESULT			
Density	ASTM D 505/D 792	≥940kg/m³			
Carbon Black Content**	ASTM D 1603	2.0 - 3.0%			
Carbon Black Dispersion**	ASTM D 5596	Category 1 or Category 2			
ESCR (NCTL)	ASTM D 5397	>300 hours			
OIT	D 3895	>100 minutes			
Coefficient of Linear Expansion	ASTM E 831	1.1 - 1.4E-4cm/cm/deg C			
Tensile Properties (Sheet Material)	ASTM D 6693-04	Yield Stress 15MPa	Break Stress 27MPa	Yield Elongation 12%	Break Elongation 700%
Shore Hardness	DIN 53505	>50 Shore D			
Tear Resistance	ASTM D 1004	120N/mm			
Puncture Resistance	ASTM D 4833	300N/mm			
Dimensional Stability	ASTM D 1204	<2.0% change			
Water Absorption	ASTM D 570	<0.09%			
Flammability	UL94***	V0			

** Average minimum thickness to ASTM D 5199. Minimum thickness membrane made to order*

*** Black AKS only*

**** Plastics flammability standard released by Underwriters Laboratories of the USA*

BluSeal AKS

HDPE CONCRETE PROTECTION MEMBRANE

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IMPORTANT NOTICE

This Technical Data Sheet is provided for general information and instruction only. The properties and characteristics set out herein represent typical testing results under laboratory conditions. Results of actual product characteristics may vary slightly. Site-specific and project-specific conditions may affect product performance, including without limitation: surfaces, environmental conditions, contact conditions, storage conditions, storage timeframes, weather, and climatic or seasonal conditions. Not all product parameters are batch tested as part of the manufacturing quality control process, and performance may vary between batches.

If Bluey gives any express written product warranty in relation to the product, that warranty is subject to the foregoing qualifications, despite anything to the contrary in any other document. All other representations, advice, suggestions or promises regarding the product's performance or its implementation, whether verbal or in writing, and whenever given, including in the course of any field services, are expressly disclaimed. Without limiting the foregoing, Bluey will have no liability for loss or damage of any kind if any application specifications are not followed.

The foregoing is not intended to exclude any warranties or guarantees which by law cannot be excluded. Subject only to the foregoing provisions of this Notice, and to the extent permitted by law, Bluey disclaims all liability for loss or damage of any kind suffered as a result of or in connection with the product or its implementation. If such liability cannot be wholly excluded, Bluey's liability will, to the extent permitted by law, be limited to the replacement of the product itself or the direct cost of replacement of the product itself (not including any collateral or consequential loss or damage of any kind).

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ABB MEASUREMENT & ANALYTICS | PRODUCT GUIDE

ProcessMaster electromagnetic flowmeter

The perfect fit for the oil and gas industry



ABB has responded to the oil and gas industry's need for a rugged, reliable electromagnetic flowmeter

Measurement made easy

ProcessMaster flowmeters – perfect for the oil and gas industry

Expertise in measurement technology

ABB's high pressure electromagnetic flowmeters are reliable, accurate and easily maintained. Customers worldwide have benefited from our application-oriented know-how and comprehensive service.

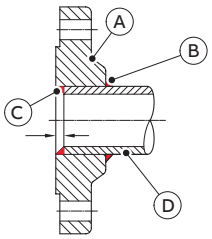
To learn more about our extensive portfolio, visit www.abb.com/measurement.

Designed specifically for oil and gas

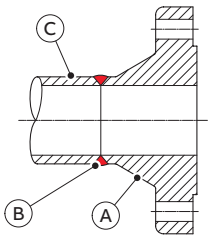
We have added a two-tier, high-pressure version to our comprehensive range of electro-magnetic ProcessMaster flowmeters. It is available with either weld neck or slip-on flanges with RTJ and raised face connections.
There are differences between X-Ray and dye penetrant test. For weld neck design we offer both dye penetrant and X-Ray tests; for slip-on design we offer only dye penetrant test.

Applications

- Slurries such as drilling mud
- Mixtures of fluids such as oil/water plus sand or produced water plus sand
- Injection fluids including sand and chemical additives for lubrication and corrision prevention
- Sludge or sludge-like wastewater from produced water treatment
- Operating conditions such as high pressure or entrained gas in the fluid
- Harsh environmental conditions such as heat, moisture or vibration and explosive or corrosive atmospheres



Ⓐ Slip-on flange Ⓑ Fillet weld (outside) Ⓒ Fillet weld (inside) Ⓓ Pipe



Ⓐ Weld neck flange Ⓑ Butt weld Ⓒ Pipe

Robust design for long life

The ProcessMaster flow sensor is designed for reliability in the demanding operating conditions found in oil and gas industry applications.

- Long lasting sensor lining materials withstand abrasion and corrosion, resulting in longer sensor service life and minimal maintenance requirements
- No additional pressure drop caused by protrusions into the pipe
- Optional self-cleaning measuring electrodes prevent issues caused by build-up of deposits
- Double sealed measuring electrodes minimize the risk of leakage and enhance reliability
- Optional all-316 stainless steel construction for corrosive offshore atmosphere
- Optional fully-welded sensor made from 316 material
- Protection of internal sensor components against moisture and vibration with potted Ex sensor

Range of certificates and test reports

- 3.1 material certificates and/or PMI certificates
- Certificates for non-destructive testing, X-Ray and/or dye penetration test
- Welder qualifications and procedures
- Hydrostic pressure testing

Specification

Accuracy	Standard: 0.4 % of rate Enhanced: 0.2 % of rate
Nominal size range	DN 25 to 400 (1 to 18 in)
Nominal pressure	ASME CL 600 to 2500
Lining	Hard rubber, ETFE
Electrodes	Stainless steel, Hastelloy C
Process connection	Steel, stainless steel
IP rating	IP67, IP68
Fluid temperature	–25 to 130 °C (–13 to 266 °F)
Power supply	100 to 230 V AC, 24 V AC/DC
I/Os	Current, pulse status output
Communication *	HART protocol, PROFIBUS PA, FOUNDATION Fieldbus
Sensor housing material	Stainless steel 316
Transmitter housing material	Stainless steel
Wetted parts material	Option for NACE
Ex approvals	ATEX/IEC Zone 1.2, FM/cFM Cl1 Div.1, Cl1 Div.2
Marine approval	DNV
Verification	ScanMaster

*** Acknowledgements**
HART is a registered trademark of FieldComm Group, Austin, Texas, USA.
PROFIBUS is a registered trademark of PROFIBUS and PROFINET International (PI).



FEP630 high pressure magnetic flowmeter



FEP610 high pressure magnetic flowmeter

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Email: instrumentation@gb.abb.com

abb.com/flow

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PG/FLOW/011-EN Rev. A 03.2020

BLACKBOX

Technical Specifications:



Blackbox 130 is a compact low-cost intelligent controller that allows users to locally program the unit and give a readout of level. Economical and simple to program and operate, users benefit from extremely accurate and reliable digital echo processing with access to the dB and dBR range of transducers, measuring from 125 mm (4.9 in) right through to 40 m (131.2 ft).

PHYSICAL: MOUNTING OPTION SPECIFIC

Mounting Option:	Standard Wall Mount:	Large Wall Mount:
Controller Body Dimensions:	130 mm x 150 mm x 63.5 mm (5.1 in x 5.9 in x 2.5 in)	130 mm x 180 mm x 85 mm (5.1 in x 7.09 in x 3.3 in)
Weight:	Nominal 0.7 kg (1.4 lb)	Nominal 0.8 kg (1.7 lb)
Enclosure Material/ Description:		ABS Base with polycarbonate lid, flammability rating UL 94 HB
Cable Entry Detail:	Underside fitted with 3 x M20, nylon cable glands suitable for 6 mm to 12 mm (0.2 in to 0.5 in) cable	Underside fitted with 3 x M20, nylon cable glands suitable for 6 mm to 12 mm (0.2 in to 0.5 in) cable
Transducer Cable Extensions:	2-core screened (2 conductor 20 AWG screened)	
Nominal Separation:	1,000 m (3,280 ft), for greater separation distances please contact us	

ENVIRONMENTAL

IP Rating:	IP66/67
Max. & Min. Temperature (Electronics):	-20 °C to +55 °C (-4 °F to +131 °F)
Flammable Atmosphere Approval:	All Blackbox units must be mounted in a safe area. Compatible with approved dB Transducers
CE Approval:	See EU Declaration of Conformity in the manual
UL Approval:	UL Listed. UL Listed to Canadian Safety Standards. Certificate Number E257330.

PERFORMANCE

Accuracy/Repeatability:	0.25% of the measured range or 6 mm (0.2 in), *whichever is greater*
Resolution:	dBMACH3 0.3 mm (0.01 in), dB3 0.5 mm (0.02 in), dB6 and dB10 1 mm (0.04 in), dB15 1.5 mm (0.06 in), dB25 2.5 mm (0.1 in), and dB40 5 mm (0.2 in).
Min. & Max. Range:	Dependent on Transducer. Nominally 125 mm to 40 m (4.9 in to 130 ft)
Echo Processing:	DATEM (Digital Adaptive Tracking of Echo Movement)
Rate Response:	Fully Adjustable

OUTPUTS

Analog Output:	Isolated output of 4-20mA or 0-20mA into 1 kΩ (user programmable and adjustable) 0.1% resolution
Digital Output:	RS232 for programming and data extraction
Volt Free Contacts, Number, & Rating:	2 form "C" (SPDT) rated at 2 A at 240 V AC
Display:	2 x 12 alpha numeric

PROGRAMMING

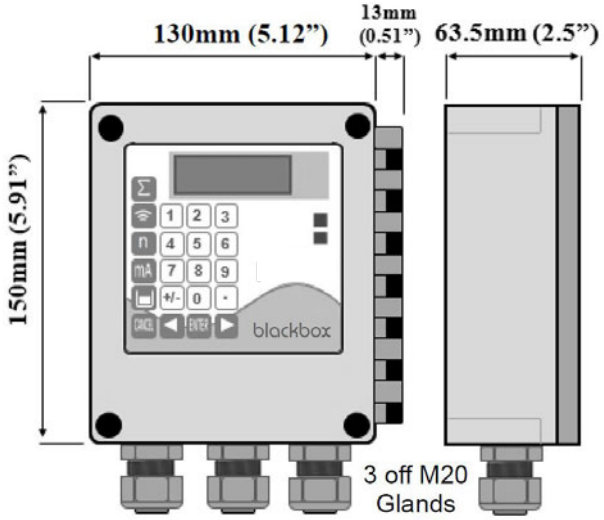
On-board Programming:	Via RS232 using supplied software
PC Programming:	Via RS232 using supplied software
Programming Security:	Via Passcode (user selectable and adjustable)
Programmed Data Integrity:	Via non-volatile RAM
Remote Programming:	Via RS232 using optional handheld calibrator

SUPPLY

Power Supply:	115 V AC +5% / -10% 50/60 Hz, 230 V AC +5% / -10% 50/60 Hz, 10-28 V DC, 10 W maximum power (typically 5 W)
Fuses:	50mA at 230 V AC, 100mA at 115 V AC

REMOTE COMMUNICATIONS

Power Supply:	Power supplied via Blackbox RS232 interface



Blackbox Drawing Front and Side

pulsar MEASUREMENT

INFO@PULSARMEASUREMENT.COM

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Registered No.: 3345604 England & Wales

Delivering the Measure of Possibility

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Rev 4.0

dB ULTRASONIC TRANSDUCERS



Technical Specifications:

The dB Transducer Series is a range of non-contacting ultrasonic transducers for level, volume, and flow measurement. Available in a variety of models and compatible with all Pulsar controllers so that you have a specific solution to suit your application requirements.

PHYSICAL: TRANSDUCER SPECIFIC

Model:	Dimensions:	Dia Face:	Weight:	Measurement Range:	Frequency:	Beam Angle:
dB3	78 (D) mm x 115 (H) mm (3.1 in x 4.5 in)	19 mm (0.7 in)	1.1 kg (2.4 lb)	125 mm to 3 m (4.9 in to 9.8 ft)	125kHz	<10°
dB6	86 (D) mm x 106 (H) mm (3.4 in x 4.2 in)	30 mm (1.2 in)	1.1 kg (2.4 lb)	300 mm to 6 m (11.8 in to 19.7 ft)	75kHz	<10°
dBS6	86 (D) mm x 106 (H) mm (3.4 in x 4.2 in)	45 mm (1.8 in)	1.1 kg (2.4 lb)	200 mm to 6 m (7.9 in to 19.7 ft)	50kHz	<10°
dB10	86 (D) mm x 106 (H) mm (3.4 in x 4.2 in)	45 mm (1.8 in)	1.1 kg (2.4 lb)	300 mm to 10 m (11.8 in to 32.8 ft)	50kHz	<10°
dB15	86 (D) mm x 122 (H) mm (3.4 in x 4.8 in)	60 mm (2.4 in)	1.2 kg (2.6 lb)	500 mm to 15 m (19.7 in to 49.2 ft)	41kHz	<8°
dB25	105 (D) mm x 142 (H) mm (4.1 in x 5.6 in)	78 mm (3.1 in)	1.4 kg (3.1 lb)	600 mm to 25 m (23.6 in to 82 ft)	30kHz	<6°
dB40	205 (D) mm x 223 (H) mm (8.1 in x 8.8 in)	160 mm (6.3 in)	6 kg (13.2 lb)	1.2 m to 40 m (3.9 ft to 131.2 ft)	20kHz	<5°

PHYSICAL: ALL TRANSDUCERS

Sensor Body Material:	Valox 357 U and syntactic foam face
Cable Lengths:	Standard = 5 m, 10 m, 20 m, or 30 m (16.4 ft, 32.8 ft, 65.6 ft, or 98.4 ft). Optional: up to 150 m (492 ft) maximum (increments of 10 m (32.8 ft) only)
Maximum Separation:	500 m (1,640 ft)
Mounting Connection:	BSP or 1" NPT

ENVIRONMENTAL

Enclosure Protection:	IP68 / NEMA 6P
Max. And Min. Temperature (Electronics):	Standard: -40° C to +90° C (-40° F to +194° F) Hazardous area versions: -40° C to +75° C (-40° F to +167° F)

APPROVALS

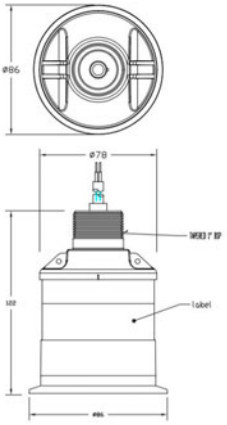
CE Approval:	2014/30/EU to EMC & 2014/34/EU ATEX Directives. Standards applied: EN 60079-0:2012+A11:2013/ EN 60079-11:2012 / EN 60079-18:2009 / EN 60079-26:2007 / EN 61326-1:2013
ATEX Approval:	Standard ATEX EEx m II T6 or optional EEx ia IIC T6. FM/FMC approval.

TRANSDUCER OPTIONS

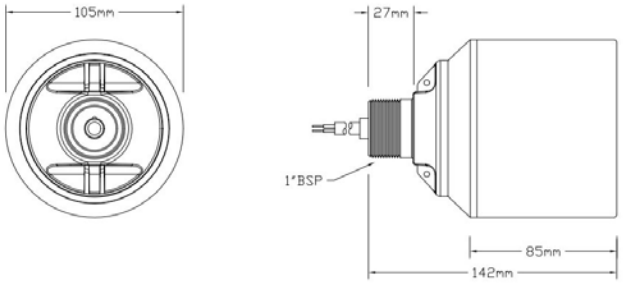
Model:	dB3	dBs6	dB6	dB10	dB15	dB25	dB40
PVDF		✓	✓	✓			
Front Threaded / PVDF	✓	✓	✓	✓			
Submergence Shield	✓	✓	✓	✓	✓	✓	
Flanged DIN/ANSI		✓	✓	✓	✓		
Foam Face		✓		✓	✓	✓	✓
Sanitary Flange		✓	✓	✓			
Intrinsically Safe of All the Above	✓	✓	✓	✓	✓	✓	✓

PERFORMANCE

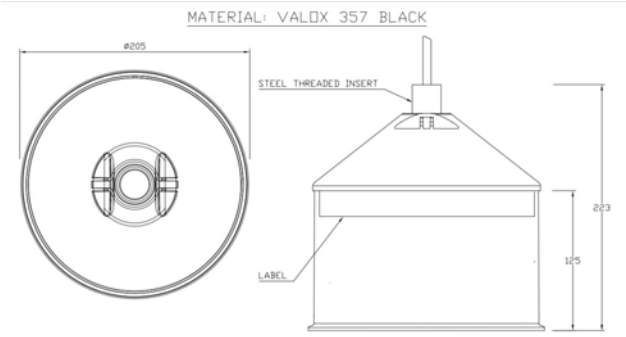
Accuracy:	0.25% or 6 mm (0.2 in) whichever is greater
Resolution:	0.01% or 2 mm (0.08 in) whichever is greater
Temp. Compensation:	Automatic, internal temperature sensor, ± 0.5 °C/°F



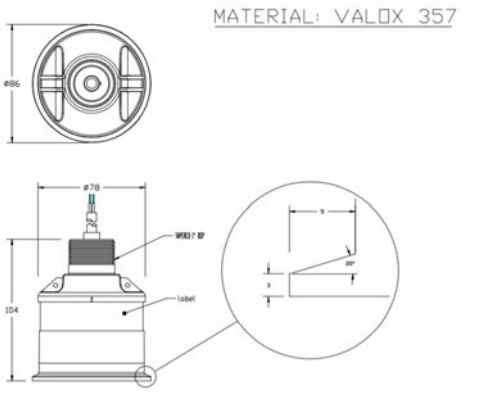
dB15 Transducer Drawing



dB25 Transducer Drawing



dB40 Transducer Drawing



dB6 & dB10 Transducer Drawing

pulsar MEASUREMENT

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Rev 7.0

xylem
Let's Solve Water

Technical Specification

891480_17.0



ENM 10

Level switch

FLYGT
a xylem brand

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1 Product Description

1.1 Product design

Usage

ENM-10 is a level regulator for level control applications. The level regulator starts and stops a pump or activates an alarm device when the liquid level reaches the regulator.

Materials

Denomination	Standard version	Ex version
Regulator casing	Polypropylene	Polypropylene with black conductive casing
Bend relief	EPDM rubber	NBR-PVC rubber
Cable sheath	PVC	NBR-PVC rubber

The plastic components are welded and screwed together.

1.2 Technical data

Application limits

Feature	Value
Liquid temperature	Minimum 0°C (32°F) Maximum 60°C (140°F)
Liquid density	Minimum 0.65 g/cm^3 Maximum 1.5 g/cm^3

Electrical specifications

Feature	Value
Degree of protection	IP68, 20 m (65 ft), 2 bars
Interrupting capacity of micro switch	AC, resistive load, 250 V 10 A AC, inductive load, 250 V 3 A cos ϕ = 0.5 DC, 30 V 5 A
Interrupting capacity of gold-plated micro switch	AC, resistive load, 250 V 10 A AC, inductive load, 250 V 3 A cos ϕ = 0.5 DC, 24 V 10 mA

Voltage limits are subject to local regulations.

Density ranges

Density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
0.65 – 0.80	194 (7 10/16)	100 (4)
0.80 – 0.95	177 (7)	100 (4)
0.95 – 1.10	162 (6 3/8)	100 (4)
1.05 – 1.20	142 (5 9/16)	100 (4)
1.20 – 1.30	133 (5 1/4)	100 (4)
1.30 – 1.40	130 (5 2/16)	100 (4)

Density g/cm^3	Regulator length mm (in.)	Diameter mm (in.)
1.40 – 1.50	126 (5)	100 (4)

Weight

A regulator with standard density and 20 m cable weighs approximately 2 kg (4.5 lb).

1.3 Cables

Lengths

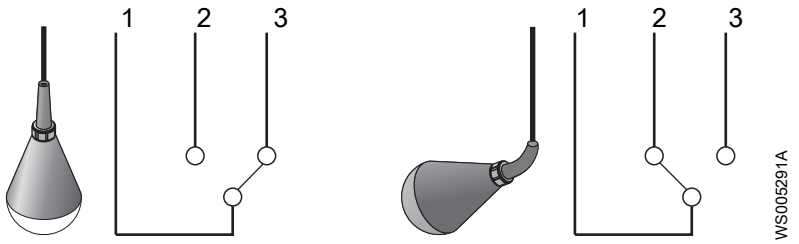
For liquids with specific density between 0.95 and 1.10 g/cm^3, the following cables are available:

Version	Lengths m (ft)
Standard	• 6 m (20 ft) • 13 m (42 ft) • 20 m (65 ft) • 30 m (100 ft) • 50 m (167 ft)
Ex	• 6 m (20 ft) • 13 m (42 ft) • 20 m (65 ft) • 30 m (98 ft) • 50 m (164 ft)

Diameter

The cable diameter for all product variants is 6.7 mm (0.26 in), +/- 0.2 mm (0.00787 in).

Color codes



Cable	1	2	3
Color	Grey	Black	Brown

1.4 Approvals and standards

Standard approvals

LVD approval according to EN61058
CSA approval: Certificate Number 1330172
Cl. I Zone 0, Gr. IIC
CL.I Div.1 Gr A, B, C and D
Cl.II Gr. E, F, and G

Ex approvals

IECEx ia IIC T4 Ga: -20°C≤Ta≤60°C
IECEx NEMKO 09.0008
ATEX II 1G Ex ia IIC T4 Ga

NEMKO 10 ATEX 1082

Applied standards for ATEX and IEC

- EN 60079-0:2012 / IEC 60079-0:2011
- EN 60079-11:2012 / IEC 60079-11:2011

Intrinsically safe circuits are required for the automatic control system. Use a Zener barrier, for example, part number 84 01 07.

The electrical connections must comply with the Ex regulations of the national submitter.



2 References

2.1 Chemical resistance tables

The tables show the degree of resistance the level regulator has to different chemicals at two different temperatures. The density of the liquid determines the buoyancy of the regulator.

Acids

Acid	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetic acid 50%	1	2	0	0
Acetic acid 75%	2	2	0	0
Benzoic acid	2	2	0	0
Boric acid 5%	0	–	0	0
Butyric acid	2	2	2	2
Chromic acid 10%	0	2	2	2
Citric acid	0	1	0	0
Hydrobromic acid 5%	1	2	0	0
Hydrochloric acid 10%	0	1	0	1
Hydrochloric acid 37%	1	2	0	2
Hydrocyanic acid 10%	0	0	1	2
Hydrofluoric acid 5%	0	2	0	1
Hypochloric acid	1	2	2	2
Maleic acid	2	2	2	2
Nitric acid 5%	1	1	1	1
Nitric acid 65%	2	2	2	2
Oleic acid	1	2	2	2
Oxalic acid 50%	1	1	1	2
Phosphoric acid 25%	0	0	1	2
Phosphoric acid 85%	0	0	1	2
Sulphuric acid 10%	1	2	1	2
Sulphuric acid 78%	2	2	2	2
Tannic acid	0	0	0	0
Tartaric acid	1	1	1	1

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Alkalis

Alkali	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Ammonium hydroxide	0	–	0	0
Calcium hydroxide	0	0	0	0

Alkali	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Potassium hydroxide	1	2	0	0
Sodium hydroxide	1	2	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Salts

Salt	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Aluminum chloride	0	0	0	0
Calcium sulphate	0	0	0	0
Calcium chloride	0	0	0	0
Calcium nitrate	0	0	0	0
Copper chloride	0	0	0	0
Copper sulphate	0	0	0	0
Ferric chloride	0	0	0	0
Ferrous sulphate	0	0	0	0
Magnesium chloride	0	0	0	0
Potassium sulphate	0	0	0	0
Potassium nitrate	0	0	0	0
Potassium carbonate	1	1	1	1
Potassium bicarbonate	0	0	0	0
Sodium sulphate	0	0	0	0
Sodium chloride	0	0	0	0
Sodium nitrate	0	0	0	0
Sodium bicarbonate	0	0	0	0
Sodium carbonate	0	0	0	0
Tin chloride	1	1	1	1
Zinc sulphate	0	0	0	0
Zinc chloride	0	0	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Oils

Oil	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Castor oil	1	1	1	1
Coconut oil	0	–	0	2
Corn oil	2	2	2	2
Diesel oil	2	2	2	2
Linseed oil	2	2	2	2
Mineral oils	2	2	2	2
Olive oil	1	1	1	1
Silicone oils	0	0	0	0

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Solvents and miscellaneous

Chemical	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetone	2	2	2	2
Aniline	2	2	1	2
Benzene	2	2	2	2
Butyl alcohol	2	2	0	1
Carbon tetrachloride	2	2	2	2
Chlorobenzene	2	2	2	2
Chloroform	2	2	2	2
Ethyl alcohol	2	2	0	1
Ethyl ether	2	2	2	2
Ethyl acetate	2	2	2	2
Ethylene dichloride	2	2	2	2
Ethylene chloride	2	2	2	2
Formaldehyde 37%	1	2	0	0
Gasoline	2	2	2	2
Kerosene	2	2	2	2
Methyl alcohol	2	2	0	0
Methyl ethyl ketone	2	2	2	2
Methylene chloride	2	2	2	2
Nitrobenzene	2	2	2	2
Phenol	2	2	2	2
Toluene	2	2	2	2
Trichlorethylene	2	2	2	2
Turpentine	2	2	2	2
Xylene	2	2	2	2

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

Gases

Gas	PVC cable		NBR/PVC cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Carbon dioxide	0	0	0	0
Carbon monoxide	0	0	0	0
Chlorine – wet	2	2	2	2
Hydrogen sulfide	0	0	1	1
Sulphur dioxide – wet	1	1	2	2

0 = No effect. 1 = Minor to moderate effect. 2 = Severe effect. – = No available information.

2.2 Product range

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable[1]	Approvals	For market
582 88 00	0.65–0.80	Blue	20	1	CE	International
582 88 01	0.80–0.95	Blue	20	1	CE	International
582 88 02	0.95–1.10	Blue	6	1	CE	International
582 88 03	0.95–1.10	Blue	13	1	CE	International
582 88 04	0.95–1.10	Blue	20	1	CE	International
582 88 05	1.05–1.20	Blue	20	1	CE	International
582 88 06	1.20–1.30	Blue	20	1	CE	International
582 88 07	1.30–1.40	Blue	20	1	CE	International
582 88 08	1.40–1.50	Blue	20	1	CE	International
582 88 09	0.65–0.80	Gray	20	3	CSA/CE	Canada
582 88 10	0.80–0.95	Gray	20	3	CSA/CE	Canada
582 88 11	0.95–1.10	Gray	6	3	CSA/CE	Canada
582 88 12	0.95–1.10	Gray	13	3	CSA/CE	Canada
582 88 13	0.95–1.10	Gray	20	3	CSA/CE	Canada
582 88 14	1.05–1.20	Gray	20	3	CSA/CE	Canada
582 88 15	1.20–1.30	Gray	20	3	CSA/CE	Canada
582 88 16	1.30–1.40	Gray	20	3	CSA/CE	Canada
582 88 17	1.40–1.50	Gray	20	3	CSA/CE	Canada
582 88 18	0.65–0.80	Gray	20	1	CSA/CE	Canada
582 88 19	0.80–0.95	Gray	20	1	CSA/CE	Canada
582 88 20	0.95–1.10	Gray	6	1	CSA/CE	Canada
582 88 21	0.95–1.10	Gray	13	1	CSA/CE	Canada
582 88 22	0.95–1.10	Gray	20	1	CSA/CE	Canada
582 88 23	1.05–1.20	Gray	20	1	CSA/CE	Canada
582 88 24	1.20–1.30	Gray	20	1	CSA/CE	Canada
582 88 25	1.30–1.40	Gray	20	1	CSA/CE	Canada
582 88 26	1.40–1.50	Gray	20	1	CSA/CE	Canada
582 88 36	0.95–1.10	Gray	30	3	CSA/CE	Canada
582 88 37	0.95–1.10	Gray	50	3	CSA/CE	Canada
582 88 38	0.95–1.10	Gray	100	3	CSA/CE	Canada
582 88 39	0.95–1.10	Gray	150	3	CSA/CE	Canada
582 88 51	0.95–1.10	Red	65	2	CE	International
582 88 52	0.95–1.10	Red	6	2	CE	International
582 88 53	0.95–1.10	Red	13	2	CE	International
582 88 54	0.95–1.10	Red	20	2	CE	International
582 88 57	0.95–1.10	Red	20	2	CE	Canada
582 88 70	0.65–0.80	Blue	20	3	CE	International
582 88 71	0.80–0.95	Blue	20	3	CE	International
582 88 72	0.95–1.10	Blue	6	3	CE	International
582 88 73	0.95–1.10	Blue	13	3	CE	International

[1] See *Type of cables* on page 9.

Version	For density (g/cm^3)	Color of level switch	Length of cable (m)	Type of cable[1]	Approvals	For market
582 88 74	0.95–1.10	Blue	20	3	CE	International
582 88 75	1.05–1.20	Blue	20	3	CE	International
582 88 76	1.20–1.30	Blue	20	3	CE	International
582 88 77	1.30–1.40	Blue	20	3	CE	International
582 88 78	1.40–1.50	Blue	20	3	CE	International
582 88 79	0.95–1.10	Blue	65	1	CE	International
582 88 80	0.95–1.10	Blue	30	1	CE	International
582 88 81	0.95–1.10	Blue	50	1	CE	International
582 88 82	0.95–1.10	Gray	30	1	CSA/CE	Canada
582 88 83	0.95–1.10	Gray	50	1	CSA/CE	Canada
582 88 86	0.95–1.10	Red	30	2	CE	International
582 88 87	0.95–1.10	Red	50	2	CE	International
582 88 90	0.95–1.10	Blue	30	3	CE	International
582 88 91	0.95–1.10	Blue	50	3	CE	International
582 88 92	0.95–1.10	Red	6	2	CE	Japan
582 88 93	0.95–1.10	Red	13	2	CE	Japan
582 88 94	0.95–1.10	Red	20	2	CE	Japan
582 88 95	0.95–1.10	Blue	6	1	CE	Japan
582 88 96	0.95–1.10	Blue	13	1	CE	Japan
582 88 98	0.95–1.10	Blue	50	1	CE	Japan
594 79 10	0.95–1.10	Blue	70	3	CE	International
594 79 13	0.95–1.10	Blue	100	3	CE	International
594 79 18	0.95–1.10	Blue	150	3	CE	International
594 79 19[2]	0.95–1.10	Blue	20	3	CE	International
594 79 20[2]	0.95–1.10	Gray	20	3	CSA/CE	International
594 79 21 [2]	0.95–1.10	Transparent	6	3	CE	For demonstration only.
594 79 40[2]	0.95–1.10	Black	6	3	ATEX/IECEx[3]	International
594 79 41[2]	0.95–1.10	Black	13	3	ATEX/IECEx[3]	International
594 79 42[2]	0.95–1.10	Black	20	3	ATEX/IECEx[3]	International
594 79 49[2]	0.95–1.10	Black	30	3	ATEX/IECEx[3]	International
594 79 50[2]	0.95–1.10	Black	50	3	ATEX/IECEx[3]	International

Type of cables

Type of cable	Jacket	Color coding of wires
1	Blue polyvinyl chloride (PVC)	Grey/Brown/Black
2	Red PVC	Grey/Brown/Black
3	Black nitrile rubber (NBR)/PVC	Grey/Brown/Black

1 See *Type of cables* on page 9.
2 Designed for low current, slow movements and oil. Includes micro switch with gold plated contacts.
3 Zener barrier 84 01 07 required.

Xylem |'zīləm|

1) The tissue in plants that brings water upward from the roots;
2) a leading global water technology company.

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The original instruction is in English. All non-English instructions are translations of the original instruction.

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891480_17.0_en-US_2020-07_TS_ENM 10

Appendix E – Service Provisions

Tuatahi First Fibre

PO Box 27050
Garnett Avenue 3257
0800 Fibre LTD
tuatahifibre.co.nz

6 November 2024

CONDITIONAL ACCEPTANCE BY TUATAHI FIRST FIBRE LIMITED AS TELECOMMUNICATIONS OPERATOR

Development: Station Road, Matamata.
Legal Name: All the land shown in the below Proposed Scheme Overview Plan
Tuatahi First Fibre ID: SUB-MA-1001-01

1. Tuatahi First Fibre Limited (TFF) confirms that a TFF telecommunications connection will be made available for each site in the development, **providing the developer was to sign an TFF Installation Agreement.** Upon approval of this agreement, TFF will undertake to become the telecommunications operator of the telecommunications reticulation in the proposed public roads for Station Road (the "**Subdivision**"), to provide network connections to all lots (circa 525 lots), in the Subdivision (the "**Reticulation**").

2. The Reticulation will be installed in accordance with:

   (a) the requirements and standards set by the Matamata Piako District Council and advised to TFF via the Council's website; and

   (b) the requirements of the Telecommunications Act 2001 and all other applicable laws, regulations and codes (as amended).

3. The Reticulation will be installed by our preferred provider to TFF's satisfaction.

4. TFF will be the owner, operator and maintainer of the Reticulation.

5. One or more retail service providers will be available to supply telecommunications services over the completed Reticulation when service is available, provided that TFF shall not be responsible if the retail service provider's offer to supply such telecommunications services or the number of such providers varies from time to time.

SIGNED for and on behalf of **TUATAHI FIRST FIBRE LIMITED** by:

Signature: 

Name: Dan Fenwick – Business Development Manager



NOTES
1. All works to be in accordance with Matamata-Piako District Council standards.
2. Co-ordinates in terms of NZ Geodetic Datum MT Eden 2000.
3. Levels in terms of the New Zealand Vertical Datum 2016.
4. Benchmark IT I DPS 29677 RL: 65.51.
5. Boundaries are subject to final survey.

LEGEND
- EX BDY
- PR BDY
- AVERAGE LOT SIZE 350m²
- AVERAGE LOT SIZE 500m²
- AVERAGE LOT SIZE 800m²
- RETIREMENT VILLAGE
- COMMERCIAL ZONE

Rev	Description	By	Date
A	DRAFT	MKS	10/2024

	By	Date
Survey	MAVEN	05/2024
Design	MKS	10/2024
Drawn	MKS	10/2024
Checked	DJM	10/2024

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

Project
STATION ROAD MATAMATA FOR MATAMATA DEVELOPMENTS LTD

Title
PROPOSED SCHEME OVERVIEW PLAN

Project no.	289001
Scale	1:6000 @ A3
Cad file	C150-SCHEME.DWG
Drawing no.	C150 Rev A

Tuatahi

From: [redacted]
To:
Subject: Electricity Supply To: 127 Station Road, Matamata
Date: Tuesday, 12 November 2024 10:56:41 am
Attachments: ATT00001.png
image001.png
C150-SCHEME.pdf

Our privacy policy is here. It tells you how we may collect, hold, use and share personal information.

Hi Tim,

Electricity Supply To: 127 Station Road, Matamata

An upgrade will be required to provide a suitable connection point for residential Lots 1 - 525 and 1 commercial stage of this development.
There will be a cost to complete this work.

Please contact a Powerco Approved Contractor for a price and design. Conditions may apply. These conditions will be advised as part of the quotation from the Contractor. Standard connection fees will apply once this upgrade work has been completed.

Please be advised the information contained herein is current as of the date of this letter but could be subject to change over time.

Many thanks,

Zoe Huygen
Project Manager Support

www.powerco.co.nz

Powerco is a member of the Utilities Disputes Scheme, a free and independent service for resolving complaints about utility providers.

From: Tim Hawke [redacted]
Sent: Wednesday, 6 November 2024 4:19 pm
To: Resource Consents [redacted]
Subject: Ashbourne Subdivision - Power Provision request

[EXTERNAL EMAIL] DO NOT CLICK links or attachments unless you recognize the sender and know the content is safe.

To Whom in concern,

We are currently preparing a resource consent package for the residential subdivision located at 127 Station Road in Matamata. Please find attached our latest scheme plans. The development will include 8 residential stages with a total of 525 residential lots and one commercial stage for the commercial hub. The commercial hub will likely include a café, an early childhood centre, corner dairy and some other general retail stores and parking facilities and it will have a combined site area of 1 hectare. We would like a confirmation letter to confirm power can be supplied to service this development.

Tim Hawke
Senior Engineer
NZDE (Civil) MENZ

MAVEN WAIKATO LIMITED
[redacted]
www.maven.co.nz
Level 1, 286 Victoria Street, Hamilton Central



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