



MAGPIE LANE WATER AND SEWER SERVICING REPORT

GULGONG NSW
CAM ENGINEERING
NOVEMBER 2023



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Document Control Sheet

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Limitations Statement

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Unless otherwise specified in this report, information and advice received from external parties during the course of this project was not independently verified. However, any such information was, in our opinion, deemed to be current and relevant prior to its use. Whilst all reasonable skill, diligence and care have been taken to provide accurate information and appropriate recommendations, it is not warranted or guaranteed and no responsibility or liability for any information, opinion or commentary contained herein or for any consequences of its use will be accepted by ADW Johnson or by any person involved in the preparation of this assessment and report.

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The Client should be aware that this report does not guarantee the approval of any application by any Council, Government agency or any other regulatory authority.

Executive Summary

ADW Johnson has been engaged by CAM Engineering to undertake an assessment of the water and sewer servicing requirements for a proposed Caravan site at 313 Magpie Lane, Galambine (Lot 1 DP 174385).

It is proposed to establish a caravan park on the site containing 240 long-term living sites, 147 short-term caravan sites, and other associated communal facilities. The estimated equivalent tenement (ET) yield for the development is shown in the table below.

Magpie Lane		0.67ET	0.5ET	
Type	Units	Long term	Short term	ET
Long term	240	161		161
Short term	147		74	74
Total	387	161	74	234

Water Servicing Assessment

Water reticulation assets fronting the hospital at 34 Goolma Road, Gulgong have been determined as the point of connection for the proposed Magpie Lane development. The scope of the water servicing assessment completed in this report comprises a:

- Water demand analysis;
- Reticulated supply analysis; and
- Storage and treatment analysis.

The expected water demand for the site is presented in the table below.

Water Demand Summary

Scenario	Demand (L/s)
Average Day Demand (ADD)	1.54
Peak Day Demand (95PDD)	5.40
Peak Hour Demand (PHD)	7.56
95PDD + Fire Flow (10 L/s)	15.40

The site will be supplied via 7.5km of water main to support the average daily demand (at peak occupancy) over an 8hr off-peak period between 10pm and 6am. As demands will be drawn during off peak periods existing supply pressures within Gulgong will not be adversely impacted.

A 600kL onsite water storage, disinfection and pH dosing system has been designed including allowances for:

- Average demand over 24hr period during peak occupancy (including an allowance for evaporation from the onsite pools);
- Emergency storage capacity based on 10hr at extreme week demand;
- Firefighting storage over 4hrs at 10L/s; and
- Dead storage.

Overall, this storage system will provide around 4 days of storage during average demand periods, to ensure alternate supply can be arranged should it be required due to extended down time on the reticulated network from Gulgong.

Sewer Servicing Assessment

Sewer loads for the development site are summarised in the Table below.

Summary of Sewer Loading

Magpie Lane	Wastewater flows						
	Units	ET	r	ADWF (L/s)	PDWF (L/s)	SA (L/s)	PWWF (L/s)
Long term	240	161	3.0	1.0	2.9	4.8	7.7
Short term	147	76	3.4	0.5	1.6	2.3	3.8
Total	387	237		1.4	4.5	7	11.6

It is proposed that the development will be serviced via a gravity sewer network draining to an onsite septic tank system. Filtered effluent storage tanks holding 72hrs of average dry weather flow at peak occupancy (approx. 368kL) will be provided. Due to the filtered effluent being stored in the tanks for extended periods, the effluent will be continuously aerated to ensure odours onsite are kept to a minimum.

The tank will release flow to an onsite pump station during the off-peak period between 10pm and 6am. The pumps will operate at 6L/s (approx. 4 x ADWF rate) and pump flow via approximately 6.75km of rising main to an existing pump station site on Goolma Rd, opposite the Hospital. Odour control will be provided at the pump station to ensure odours at the discharge point are kept to a minimum.

Impacts to Council water and sewer networks and treatment systems would need to be assessed and confirmed by Council. Any system upgrades would be undertaken as required to support expected water demands and sewer loads from this development.

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1.0 Background

This report supports a revised development application for the proposed development site at 313 Magpie Lane, Galambine (Lot 1 DP 174385). The site has the benefit of a planning approval for a tourist resort (DA 165/2007).

It is proposed to establish a caravan park on the site containing 240 long-term living sites, 147 short-term caravan sites and associated communal facilities. The site is remote from existing services and will require long lead in water and lead out sewer mains to connect the site to reticulation infrastructure within Gulgong.

CAM Engineering has advised that an assessment of water and sewer servicing requirements is required to support a revised development application to Mid-Western Council. ADW Johnson has been engaged by CAM Engineering to prepare this water and sewer servicing report.

1.1 STUDY AREA

The development site at 313 Magpie Lane, Galambine (Lot 1 DP 174385) is situated approx. 6.5 km to the south west of Gulgong. Access to the development will be established through a new access road off Magpie Lane. The development site is presented in **Figure 1**.

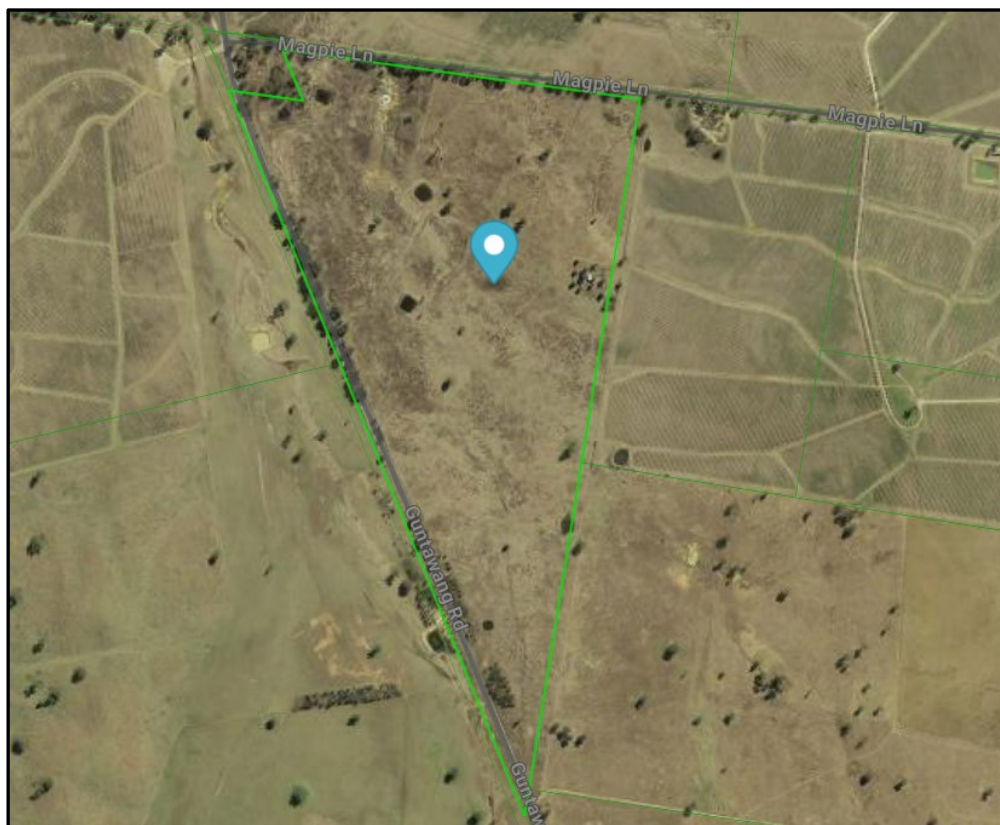


Figure 1 – Study Area.

Source: Mecone Mosaic

The site topography generally falls to the north-west, with elevations ranging from approx. 425 m to 450 m AHD.

1.2 PROPOSED DEVELOPMENT IN THE STUDY AREA

The proposed development involves the creation of a caravan park containing 240 long-term living sites, 147 short-term caravan sites and associated communal facilities. The development masterplan is presented in **Figure 2** below.

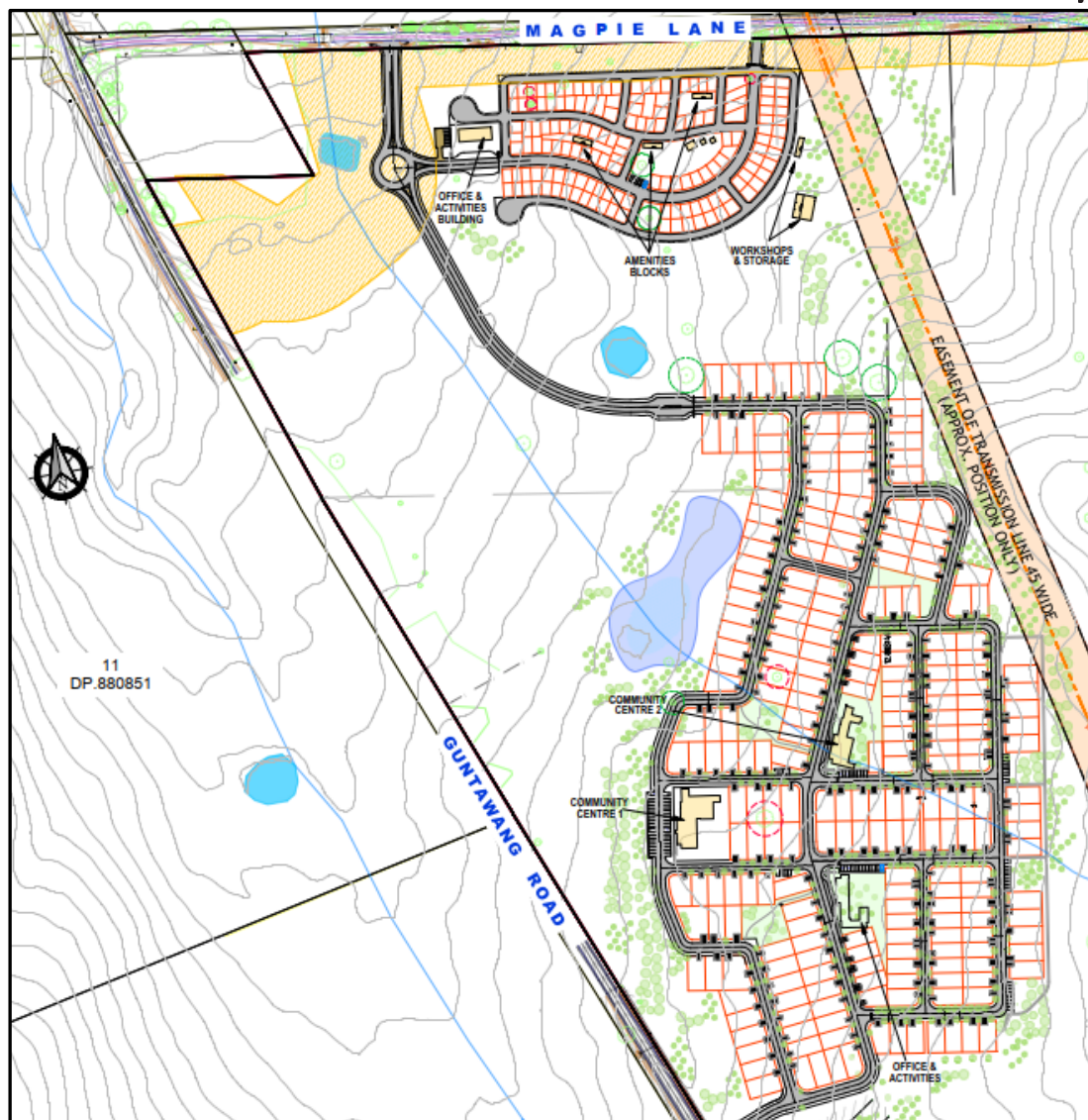


Figure 2 – Proposed Masterplan.

1.3 EXISTING WATER AND SEWER INFRASTRUCTURE

Council asset and operational data for the water and sewer networks were not provided to ADW Johnson for this assessment.

1.3.1 Water Servicing

Water reticulation assets have been identified outside of the hospital at 34 Goolma Road, Gulgong and these assets have been determined to be the point of connection for the proposed development at Magpie Lane.

1.3.2 Sewer Servicing

A sewer pump station has been identified across the road from the hospital at 34 Goolma Road, Gulgong. The pump station site has been determined to be the point of connection for flow from the proposed development at Magpie Lane.

The approximate point of connection to Council's water and sewer network is shown in **Figure 3** below.



Figure 3 – Point of connection to water and sewer networks.

1.4 FLOODING

The proposed development site has not been identified as being located in a flood affected area.

1.5 REFERENCES

The following design manuals have been utilised in undertaking the servicing assessment:

- Water Supply Code of Australia v3.1 (WSA 03-2011);
- Gravity Sewerage Code of Australia v3.1 (WSA 02-2014); and
- Sewage Pumping Station Code of Australia v3.1 (WSA 04-2022).

2.0 Assessment Scope and Limitations

2.1 ASSESSMENT SCOPE

The assessment scope is broken into two components:

- Water servicing assessment; and
- Sewer servicing assessment.

The scope of each servicing assessment is detailed further in the following sections.

2.1.1 Water Servicing

The water concept plans (refer **Appendix A**) show a new private lead-in water main connecting to the reticulated water main opposite the Hospital at 34 Goolma Rd, Gulgong. The new private water main will be located within an easement in favour of the developer within the verge of Goolma and Guntawang Roads to the development site at Magpie Lane. The scope of the water servicing assessment comprises:

- Water demand analysis – determining average day, peak day, and firefighting demands for the development;
- Reticulated supply analysis – hydraulic analysis of the supply system from the connection point to the site; and
- Storage and treatment analysis – assessment of onsite storage, treatment, and supply requirements.

2.1.2 Sewer Servicing

The sewer concept plans (refer **Appendix A**) propose a new private lead-in sewer rising main to service the development within the verge of Goolma and Guntawang Roads. The lead-in sewer main is proposed to connect into a new manhole adjacent to the existing sewer pump station opposite the Hospital at 34 Goolma Rd, Gulgong. The manhole will drain into the existing pump station. The scope of the sewer servicing assessment comprises:

- Sewer load assessment – determination of ultimate sewer loads;
- Treatment, and storage analysis – preliminary storage, treatment, and odour control requirements; and
- Pump station and rising main preliminary design – preliminary design assessment.

2.2 ASSUMPTIONS AND LIMITATIONS

The following assumptions have been utilised in the servicing assessment:

- No asset or operational data has been provided by Mid-Western Council for this assessment, aside from initial discussions regarding the potential for servicing the site off the existing reticulated water and sewer networks on Goolma Rd, Gulgong;
- It is understood from preliminary discussions with Council that the water and sewer network capacity is unknown, and water and sewer treatment plant constraints may exist; and
- On the basis of the above, and in order to reduce impacts on the existing water and sewer reticulation networks and treatment plant operations, an off-peak water and sewer system is proposed. The system would operate between 10pm and 6am to take advantage of times when the networks and treatment plants are not being used at their peak capacities.

The following limitations to the assessment are noted below:

- No assessment on reticulated water and sewer network and supply capacities has been made. ADW Johnson requires Council to provide additional information to support the assumptions made in this report.

3.0 Water Servicing Assessment

3.1 SYSTEM REQUIREMENTS

3.1.1 ET Assessment

It is proposed to establish a caravan park on the site containing 240 long-term living sites, 147 short-term caravan sites and associated communal facilities. The water ET in **Table 1** have been calculated using guidance provided in WSA 03-2011 v3.1.

Table 1 - Water ET

Magpie Lane		0.67ET	0.5ET	
Type	Units	Long term	Short term	ET
Long term	240	161		161
Short term	147		74	74
Total	387	161	74	234

3.1.2 Boundary Conditions

The boundary conditions at the proposed connection point have not been supply by Mid-Western Council. However, network pressure would increase to a static pressure when demand is low over the off-peak period between 10pm and 6am.

Indicated reservoirs elevations in Gulgong are around 520m AHD. As a result, it is estimated that static pressure during off-peak periods could be in the vicinity of 70-75m at the connection point on Goolma Rd (445m AHD).

For this report we have assumed that the network will support a fairly consistent low flow during the off-peak between 10pm to 6am. Peak flow from the development would be controlled by friction loss of the incoming pipe work between the development site and the connection point. Flows in the pipe are expected to max out at around 10L/s due to friction losses on the DN140PE rising main and this would help ensure networks would not be unduly impacted during this off-peak period. Flow would be controlled via a timed inlet control valve at the onsite reservoirs.

3.1.3 Water Demands

The water demands have been calculated generally based on WSA 03-2011 v3.1. Reduced annual consumption rates of 200kL/yr/ET have been allowed for following discussion with Hunter Water based on long term usage across their network. This consumption value has been cross checked against other similar style developments (~180kL/yr/ET) with a 10% buffer included for safety.

The water demand for the site is based on the current submitted DA layout plan comprising 250 long-term living sites, 150 short-term caravan sites and associated communal facilities and infrastructure. A summary of the water demands is presented in **Table 2**.

Table 2 - Water Demand Summary

Scenario	Demand (L/s)
Average Day Demand (ADD)	1.54
Peak Day Demand (95PDD)	5.40
Peak Hour Demand (PHD)	7.56
95PDD + Fire Flow (10 L/s)	15.40

A full summary of the water demand calculations is provided in **Appendix B**.

3.2 HYDRAULIC ASSESSMENT

A draft reticulation layout for the water servicing was generated concurrently with the hydraulic assessment. The proposed draft reticulation layout including storage and delivery system is presented in **Appendix A**.

3.2.1 Onsite storage system

Due to the location of the site being remote from the existing reticulation network, and Council's preference for the private system, an onsite storage system is proposed which will be supplied during off-peak demand period. This has been sized with sufficient back-up storage to support potential down times in the Council's reticulated supply system for maintenance. The storage system has been designed for:

- Average demand over 24 hr period during peak occupancy (including an allowance for evaporation from the onsite pools);
- Emergency storage capacity based on 10hr at extreme week demand;
- Firefighting storage over 4hrs at 10L/s; and
- Dead storage.

Table 3 – Onsite Storage system

Components of reservoir storage			
Operational storage	ADD	134	kL/d
Emergency storage	EWD	272	kL/10hrs
Fire storage	FFD	144	kL/4hr
Dead storage	5%	27	kL
	Total	577	kL

Overall, this system will provide around 4.5 days of storage during average demand conditions at peak occupancy, and will provide sufficient time for the site to arrange an alternate supply should it be required due to extended down time on the reticulated network from Gulgong.

3.2.2 Supply system

The proposed lead-in water main is designed to allow the onsite storage tanks to recharge at the average daily demand (during peak occupancy) over an 8hr off-peak period between 10pm and 6am. This will ensure existing customers within Gulgong are not impacted by reduced pressure from the additional demand. Council will need to confirm the existing treatment and supply system can manage this additional demand. The average daily demand is presented in **Table 4**.

Table 4 - Average daily demand

Average demand	Amount	
ET	234	ET
Average annual consumption	200	kL/y/ET
Average daily demand	128.2	kL
Pool (evaporation)	0.65	kL
Total	128.9	kL/d

The development will extract water from the network between 10pm and 6am when pressures at the connection point are at their highest. The peak flow rate the system is expected to deliver between 10pm and 6am is estimated in **Table 5**.

Table 5 – Max flow rate during off-peak period

Max flow rate (10pm-6am)	10	L/s
Length rising main	7500	m
Internal diameter (DN140 PE)	125	mm
Friction loss	60.8	m
Elevation	5	m
Total head	65.8	m

At a peak flow rate of 10L/s the onsite storage tanks would replenish over a period of around 3.6hrs. This is based on average daily demand at full occupancy. The proposed flow rate will ensure the onsite tanks can always be replenished over a single off-peak period, and ensure up to 4 days of back up storage is available if required.

To ensure isolation between the private supply and public network is provided a double backflow prevention valve and meter will be installed within a proposed private easement along Goolma Rd. The flows through the double isolation valve would be managed via a time-controlled inlet level control valve at the onsite storage tanks. Once the onsite storage tanks have filled, the inlet control valve would close and flows would stop.

The double isolation valve at the connection point will ensure the reticulated supply is separated from the private supply line to prevent contamination risks.

3.3 PRIVATE NETWORK REQUIREMENTS

As the proposed system is remote from the Council network and there are potential constraints to the availability of supply, an onsite storage and treatment system is required to support demand from the site over extended periods. It is proposed that an off-peak supply would be made to a series of onsite tanks. These tanks would require an ongoing disinfection, pH dosing and a monitoring system in compliance with the requirements of NSW health for the supply of drinking water.

3.3.1 Treatment system

A series of three 200kL tanks will be supplied with water from the Gulgong. Due to the distance from Gulgong, detention times will be high and chlorine residuals low. Likewise, as the tanks will hold water over a number of days, a disinfection system will be required to ensure the water is suitable to supply to onsite users. To facilitate this, the third tank in series will be configured as a chlorine contact tank with its contents constantly recirculated through the treatment system to maintain residual chlorine and pH whilst ensuring minimum and maximum residence times can be adhered to.

The proposed chlorine and acid dosing system will allow for online testing and dosing to ensure background chlorine and pH levels in the tanks meet Australian Drinking Water Guideline (ADWG) requirements for supply. Details of the system would be confirmed during detailed design.

3.3.2 Local network

Disinfected water would then be pumped into the private reticulation network as required to meet demand requirements and also provide up to 10L/s of capacity to support an onsite firefighting network. A series of fire hydrants would be located around the development to ensure minimum fire requirements can be achieved.

4.0 Sewer Servicing Assessment

4.1 SEWER LOADS

Sewer loads were calculated generally in accordance with WSA 02-2014. The sewer loads assume a private gravity sewer system will be implemented and are summarised in **Table 6** below.

Table 6 – Summary of Sewer Loading

Magpie Lane	Wastewater flows						
	Units	ET	r	ADWF (L/s)	PDWF (L/s)	SA (L/s)	PWWF (L/s)
Long term	240	161	3.0	1.0	2.9	4.8	7.7
Short term	147	76	3.4	0.5	1.6	2.3	3.8
Total	387	237		1.4	4.5	7	11.6

Notes:

*ADWF/ET has been reduced from 0.011L/s/ET to 0.006L/s/ET to take account of modern BASIX requirements

*SA has been reduced by 50% to account reduced wet weather inflows in private network

Refer to **Appendix B** for detailed load calculations.

As shown in **Table 6**, the peak wet weather flow has been calculated at approx. 12 L/s. This may be on the high side of the actual system peak flows for similar style developments, but will provide a buffer within the system, if required in the future. The average dry weather flow (ADWF) was calculated at approx. 1.4 L/s. The ADWF has been used to determine the storage system sizing and in determining the pump sizing.

4.2 ONSITE NETWORK

It is proposed that the development will be serviced via a private gravity sewer network (refer **Appendix A** for overview of the onsite sewer network). The gravity network will drain to an onsite septic tank system. The septic tank system will provide some anaerobic treatment and retain solids within the tank with sludge periodically removed as required. The filtered primary effluent will be retained in onsite storage tanks.

The filtered effluent storage tanks will have sufficient capacity to retain 72hrs of average dry weather flow at peak occupancy (approx. 368kL). Due to the filtered effluent being stored in the tanks for extended periods, the effluent will need to be continuously aerated to ensure odours onsite are kept to a minimum. The storage and delivery system will be fitted with a filtered vent.

The tank will release flow to a pump well which will deliver flow over an off-peak period between 10pm and 6am. The pumps will operate at 6L/s (approx. 4 x ADWF rate) which is the most appropriate rate for managing flow within the tank, while also optimising pump and rising main operational requirements.

Peak wet weather flow typically results from high intensity storm events and represent the maximum inflow rate expected at the storage system. Typically, these high intensity events can last for 1-2hrs, but on occasion these can occur for longer periods, particularly during flood conditions. The onsite storage system allows for around 9hrs at peak wet weather flow. This is considered an appropriate amount of emergency management storage for the development. Flows beyond this, would only occur during extreme flooding conditions where occupancy of the site is likely to be very low due to possible evacuation requirements.

4.3 PRELIMINARY WWPS AND RISING MAIN DESIGN

4.3.1 WWPS and Rising main design

Preliminary WWPS design has been undertaken utilising calculated sewer loads and anticipated incoming sewer depths. The preliminary WWPS design parameters are presented in **Table 7**.

Table 7 – Preliminary WWPS Design

WWPS 1	
Duty Flow:	6 L/s
Wet Well Diameter:	1.8 m
Surface Level:	~425 m
Incoming Sewer Invert:	~422 m
Wet Well Depth:	Approx. 4 m
Pump Station Pipework:	DN80 DICL

The optimal rising main size configuration has been determined and is presented in **Table 8**.

Table 8 - Preliminary Rising Main Design

Material	PE100
Size	DN140
Length (m)	6,750
Flow Velocity (m/s)	0.5
Duty Head (m)	44.4
Ultimate Detention Time (hrs)	15.6

The proposed rising main diameter balances detention times and frictional losses within the rising main. If a smaller rising main is selected the frictional losses will exceed available pump capacities, while large diameter mains will result in further reduced slime velocities, and longer detention times.

4.3.2 Detention Times/Odour Control

Due to the significant length of rising main, detention times in all options exceed the preferred maximum of 4 hours. The intent of limiting detention times within the rising main is to minimise odour from septic sewage at the discharge point and at intermediate air valves (if required).

Due to the extended detention times in the rising main, chemical dosing at the onsite pump station will be provided to ensure odours at the discharge are kept to a minimum. To further reduce odour impacts at the Goolma Rd Sewer Pump station, upgrades to the existing pump station venting system could be considered.

4.3.3 Downstream network impacts

It is proposed that a private rising main will run within an easement alongside the water main within the verge of Guntawang and Goolma Rd and discharge at the pumpstation on Goolma Rd. Whilst the capacity of the pump station is unknown, an off-peak system has been designed to take advantage of available capacity within the network between 10pm and 6am. At these times most of the local network will not be in use and capacity can be used by the Magpie Lane site.

Impacts on the Goolma Rd WWPS and the downstream treatment works would need to be considered by council and appropriate upgrades considered. However, the proposed off-peak option minimises impacts on the existing reticulated networks, as far as is practicable considering the expected loads from the proposed development site.

The 72hr onsite storage system will give council the opportunity to restrict flows during maintenance periods.

5.0 Easements and regulatory requirements

5.1 EASEMENTS

It is proposed that a 2.5m wide easement would need to be acquired along the verge of Goolma Rd, Guntanwang Rd and Magpie Lane for the private water main and sewer rising main. The easement would be in favour of the developer for ongoing maintenance and repairs on the private assets.

5.2 REGULATORY REQUIREMENTS

The following regulatory requirements have been identified for the proposed private water supply and sewer infrastructure. At a high level, it can be confirmed that the *Water Industry Competition Act 2006* and associated regulations are not applicable to either water supply or sewerage services as proposed. This is because services are being sought for a single property with no provision of water retail services.

Water Supply

Approval for construction of the private water supply main to be located within an easement on public land will require approval under Section 68 (Part B) of the *Local Government Act 1993* for Water Supply and Sewerage Work from Council. There are no specific approval requirements for construction of the on-property treatment infrastructure unless specified in a development consent. Water supply works will need to be designed and constructed in accordance with applicable sections of the *National Construction Code* and AS3500 and other associated Australian Standards.

Operators of businesses or facilities that provide drinking water or water for food preparation have a responsibility to make sure that supplied water will not harm human health. The *Public Health Act 2010* and regulation require private water supplier and drinking water suppliers to provide drinking water that is fit for human consumption. Under the Act, a 'private water supplier' means a person who supplies drinking water in the course of a commercial undertaking (other than that of supplying bottled or packaged drinking water), being a person who has not received the water from any supplier of drinking water referred to in the definition of a supplier of drinking water in section 5(1) of the Act, or in the form of bottled or packaged water.

'Drinking Water' means water that is intended, or likely, to be used for human consumption, or for purposes connected with human consumption, such as the washing or cooling of food, or the making of ice for consumption, or for the preservation of unpackaged food, whether or not the water is used for other purposes. 'Fit for human consumption' means comply with the requirements of the Australian Drinking Water Guidelines (ADWG).

Suppliers of drinking water must also:

- Develop and implement a quality assurance program (QAP) that complies with the Regulation;
- Comply with (i.e., implement) its QAP;
- Provide a copy of the QAP to the local NSW Public Health Unit; and
- Keep records relating to managing the safety of its drinking water supply.

Whilst treated drinking water will be sourced from the Council system, as previously mentioned, residence times in the supply main and storage tanks will result in a degradation in residual chlorine concentrations. As such, a disinfection system is proposed to ensure drinking water meets ADWG requirements.

Wastewater

Approval for construction of the private rising main to be located within an easement on public land will require approval under Section 68 (Part B) of the *Local Government Act 1993* for Water Supply and Sewerage Work from Council. In addition, a separate approval will be required under Section 68 (Part C) for construction of the septic tank and pump to sewer system (including the pump station). These approvals are typically required prior to issue of a Construction Certificate for the Development Consent.

Once works are completed, an Approval to Operate and System of Sewage Management is also required (Section 68 Part C of the *Local Government Act 1993*). This approval typically includes conditions for the safe and effective operation of the pump to sewer system including and mandatory inspection, monitoring, and reporting requirements.

6.0 Cost estimates

A preliminary construction cost estimate has been prepared to support this water and wastewater system design. The preliminary construction cost estimate, including high level allowances for preliminaries, lead in water and lead out sewer mains, and onsite water and sewer storage and treatment systems, is summarised in **Table 9**.

Table 9 –Preliminary Water and Sewer Construction Cost Estimates

Item	Estimated Cost
Preliminaries	\$0.31m
Private lead in sewer rising main	\$1.30m
Onsite sewer system	\$2.64m
Private lead in water main	\$1.52m
Onsite water system	\$0.99m
Estimated construction cost	\$6.76m

A detailed breakdown of the preliminary cost estimates is provided in **Appendix D**.

Appendix A

CONCEPTUAL WATER AND SEWER PLANS & HYDRAULIC GRADE LINES

TO GULGONG

MAGPIE LANE

SEWER RISING MAIN

"REFER"

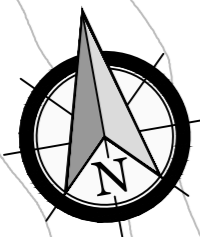
DETAIL 1"

OFFICE & ACTIVITIES BUILDING

AMENITIES BLOCKS

WORKSHOPS & STORAGE

EASEMENT OF TRANSMISSION LINE 45 WIDE (APPROX. POSITION ONLY)



11
DP.880851

GUNTAWANG ROAD

COMMUNITY CENTRE 2

COMMUNITY CENTRE

OFFICE & ACTIVITIES

DP.755431

107

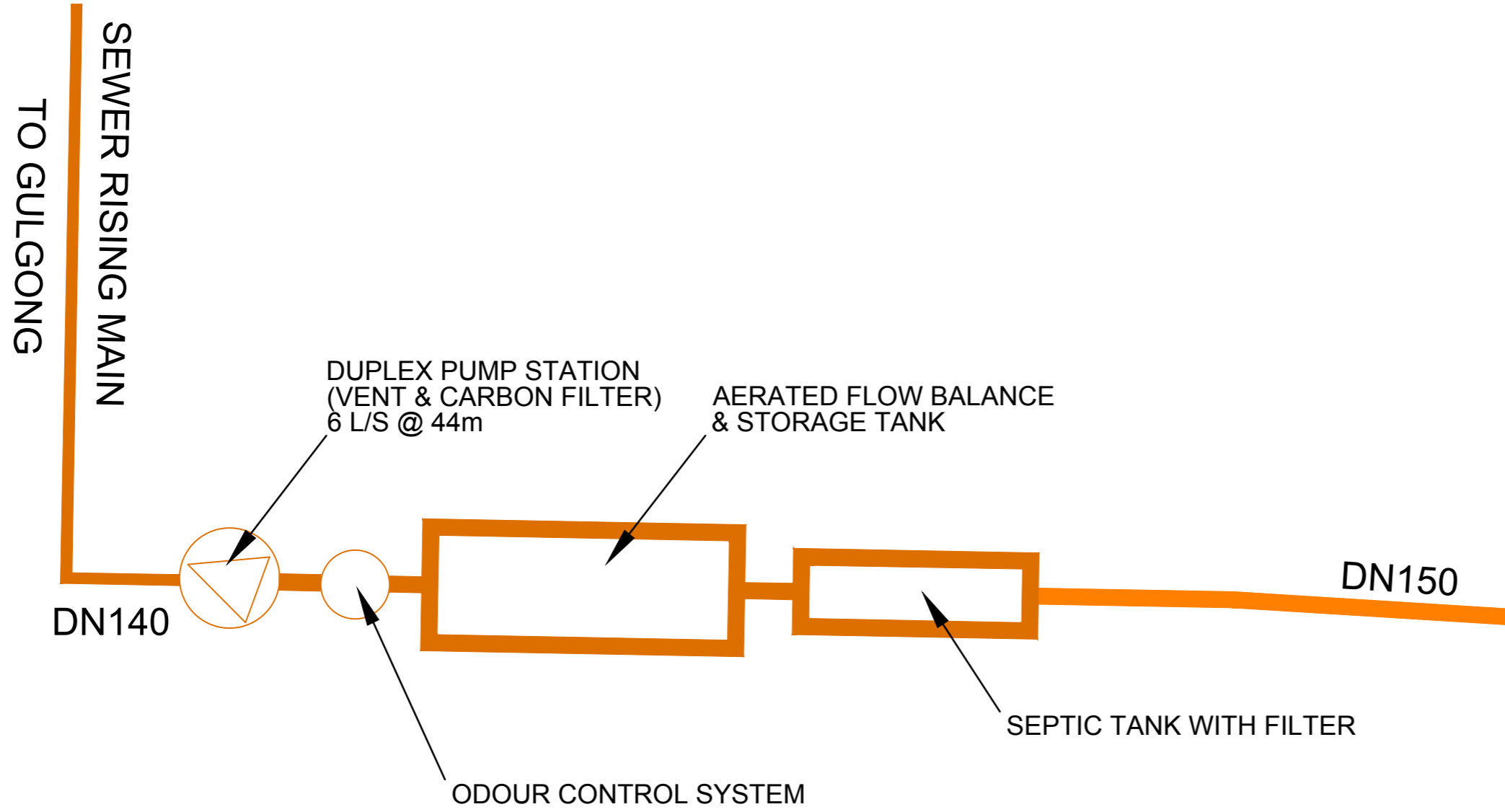
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100

LEGEND

- SITE BOUNDARY
- PROPOSED LOTS
- PROPOSED ROADS
- DCCB BOUNDARY
- CONTOURS
- GRAVITY SEWER LINE - PROPOSED
- SEWER RISING MAIN - PROPOSED
- ELECTRICAL TRANSMISSION LINE
- EASEMENT
- WATERCOURSE
- APZ BUFFER
- COMMON AMENITIES BUILDING
- IRRIGATION DAMS

12
DP.880851



DETAIL 1 - SEWER STORAGE TREATMENT & DISCHARGE SYSTEM
R.R. 1: 200

drawing title:
PROPOSED DEVELOPMENT OF LOT 1 DP.174385

location: 313 Magpie Lane, Galambine

council: Mid Western Regional

dwg ref: 240401-PSK-003-A

client:

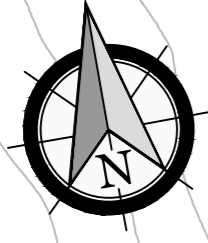


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hunter office ph: (02) 4978 5100
sydney office ph: (02) 8046 7411

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ver.	date	comment	drawn	pm	co-ordinate information	level information	scale (A1 original size)	notes
A	08.11.2023	INITIAL ISSUE	RC	M.E.	CO-ORDINATE SYSTEM: MGA 94	DATUM: N/A CONTOUR INTERVAL: N/A	0 50 100m SCALE: 1:2000 (FULL)	

working beyond expectations



11
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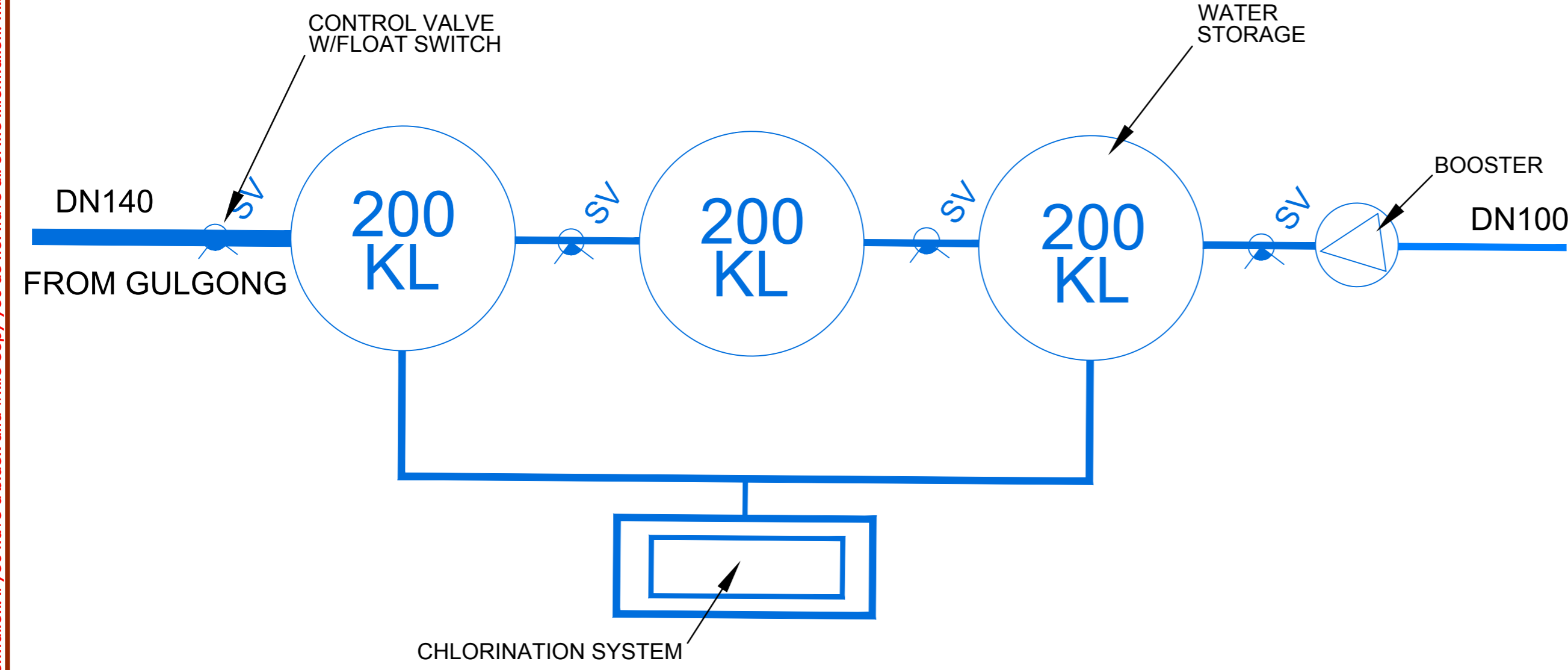
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LEGEND

- SITE BOUNDARY
- PROPOSED LOTS
- PROPOSED ROADS
- DCDB BOUNDARY
- CONTOURS
- WATER LINE - PROPOSED
- ELECTRICAL TRANSMISSION LINE
- EASEMENT
- WATERCOURSE
- APZ BUFFER
- COMMON AMENITIES BUILDING
- IRRIGATION DAMS



DETAIL 1 - WATER STORAGE, TREATMENT & SUPPLY SYSTEM
R.R. 1: 200

drawing title:
PROPOSED DEVELOPMENT OF LOT 1 DP.174385

location: 313 Magpie Lane, Galambine

council: Mid Western Regional

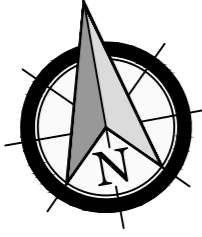
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client:

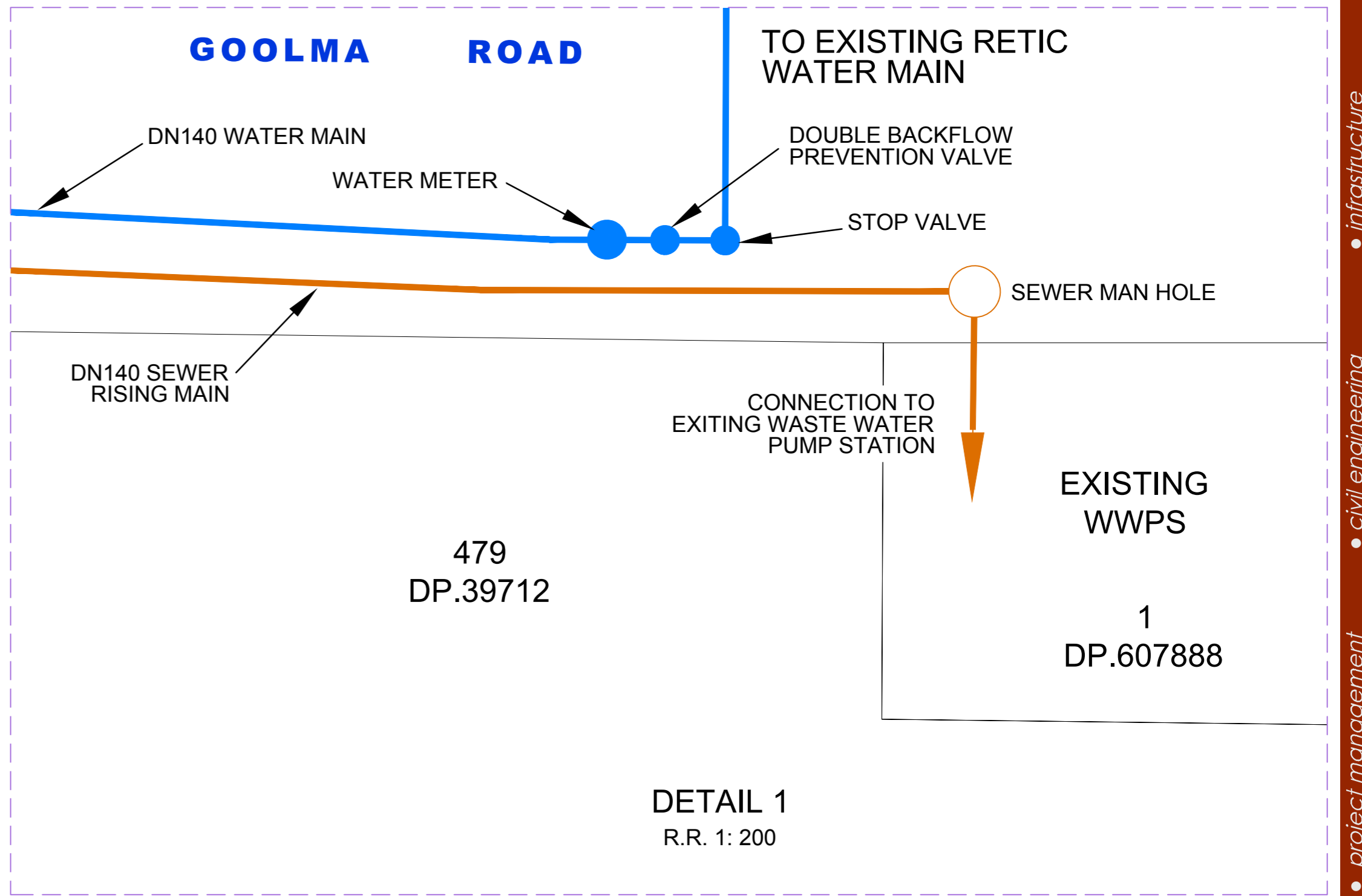
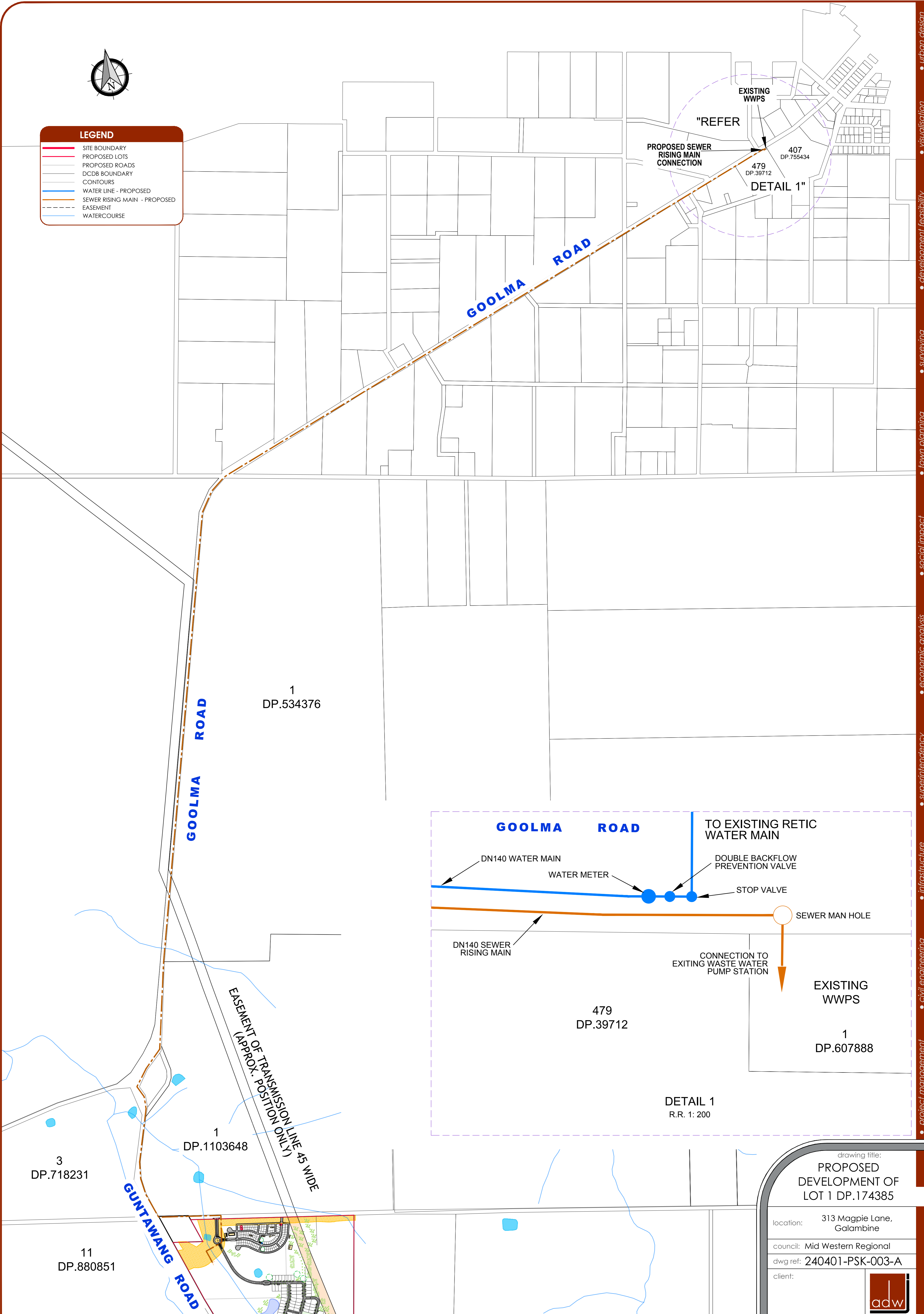
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ver.	date	comment	drawn	pm	co-ordinate information	level information	scale (A1 original size)	notes
A	08.11.2023	INITIAL ISSUE	RC	M.E.	CO-ORDINATE SYSTEM: MGA 94	DATUM: N/A CONTOUR INTERVAL: N/A	0 50 100m SCALE: 1:2000 (FULL)	



LEGEND	
	SITE BOUNDARY
	PROPOSED LOTS
	PROPOSED ROADS
	DCDB BOUNDARY
	CONTOURS
	WATER LINE - PROPOSED
	SEWER RISING MAIN - PROPOSED
	EASEMENT
	WATERCOURSE



Plotted By: Robert Cromarty Plot Date: 08/11/23 3:25:25PM. Cadd File: N:\240401\DWG\PLANNING\PSK\240401-PSK-003-A.DWG
 This plan includes coloured information. If you have a black and white copy you do not have all of the information. This note is coloured RED.

ver.	date	comment	drawn	pm	co-ordinate information	level information	scale (A1 original size)	notes
A	08.11.2023	INITIAL ISSUE	RC	M.E.	CO-ORDINATE SYSTEM: MGA 94	DATUM: N/A CONTOUR INTERVAL: N/A	0 50 100m SCALE: 1:2000 (FULL)	

drawing title:
PROPOSED DEVELOPMENT OF LOT 1 DP.174385

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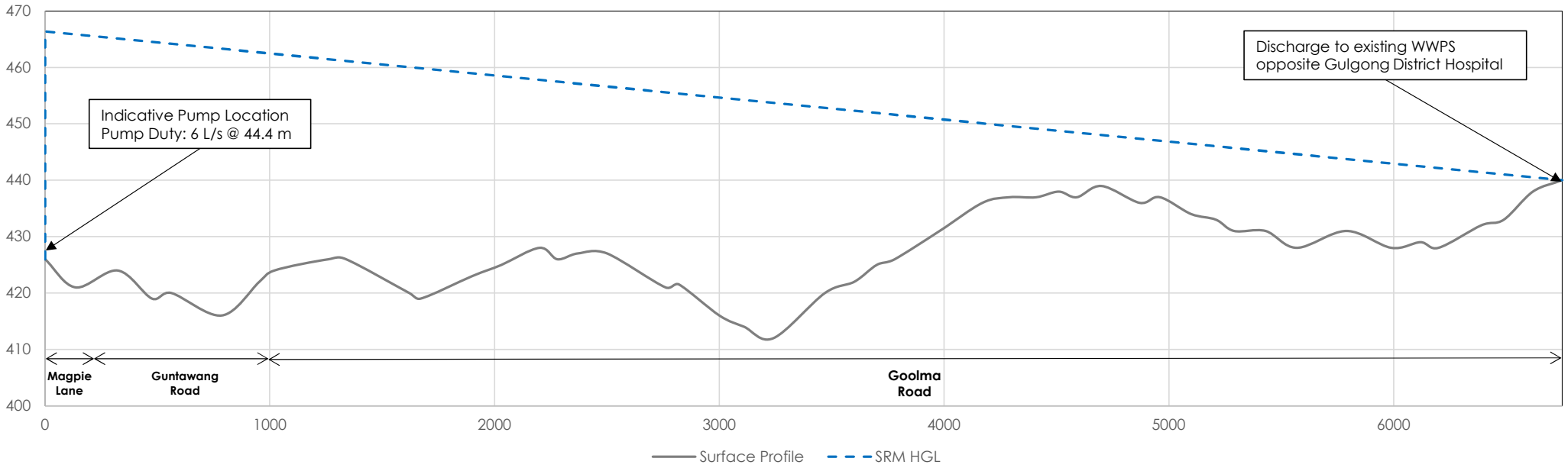
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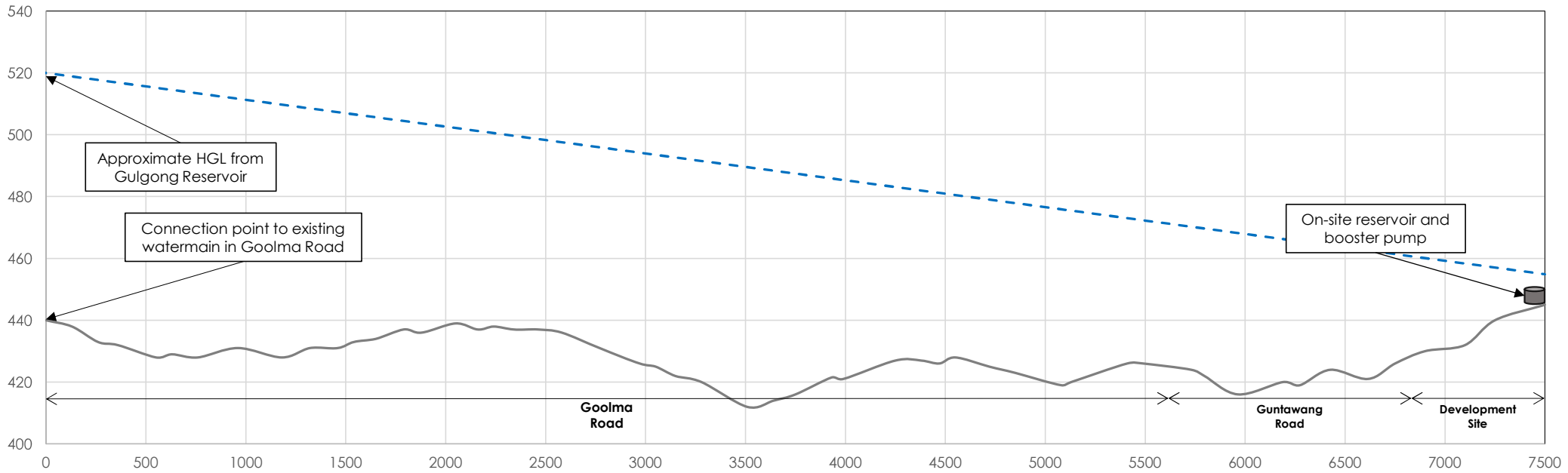
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 • economic analysis
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Proposed Rising Main Profile



HGL Analysis - Lead-In Watermain



Appendix B

CALCULATIONS

Average demand	ET	
ET	234	
Average annual consumption	200	kL/y/ET
Average daily flow	547.9	L/d/ET
Average daily rate	0.006	L/s/ET
Average daily rate	1.484	L/s
Average daily rate	128219	L/d
Average daily rate	128.2	kL/d
Average daily demand	128.2	kL
Pool	0.65	kL
Total	128.9	kL/d

1.491 L/s over 24 hrs

Average flow rate (10pm-6am)	4.47	L/s	over 8hr	10pm-6am
Length water main	7500	m	rising main	
Internal diameter	113	mm	internal	140 PE
Friction loss	15.4	m	head loss	
Elevation	5	m	elevation	
Total head	20.4	m	total head	

Max flow	10	L/s		
Length water main	7500	m	rising main	3.6 hrs at 10L/s
Internal diameter	113	mm	internal	
Friction loss	60.8	m	head loss	
Elevation	5	m	elevation	
Total head	65.8	m	total head	

Item	Elevation	
Gulgong Reservoir	520	m
Connection point on Goolma	445	m
Elevation of onsite reservoir	450	m

WWPS Preliminary Analysis

Project:	Magpie lane
Stage:	
Catchment Loads:	
Discharge location:	

Sewage Loads

ADWF (l/s)	1.47
Diversity factor 'r'	2.8
PDWF (l/s)	4.1
SA (l/s) * <i>assumes all residential</i>	7.35
PWWF (l/s)	11.5
Design WWPS load (l/s)	11.5
4 hours ADWF (gravity) (m3)	21.2

WWPS Parameters (10 starts per hour)

Station DN	1800
Design duty flow (l/s)	6.0
Surface level (mAHD)	425
Local 1:100 flood level (mAHD)	425
Estimated sewer entry level to well (mAHD)	422
TWL (mAHD)	421.85
MTWL (mAHD)	422
FAL (mAHD)	422.15
Required control volume (m3)	0.5
Required control depth (m)	0.30
BWL (mAHD)	421.55
Min pump submergence (mm)	500
Floor level (mAHD)	421.05
Station pipework DN	90
Station pipework velocity (m/s)	1.47
Velocity OK?	Check Velocity
Station minor loss (assumed K=4.65) (m)	0.51
Wet Well Emergency Storage (m3)	6.74

Rising Main - Assume DICL

SRM DN	DN140 PE
SRM ID (mm)	123
RM Velocity at duty (m/s)	0.50
Min desirable slime velocity (m/s)	0.93
Slime Velocity OK?	Check Velocity
Solids velocity OK?	Solids OK
SRM Length (m)	6750
IL highpoint (mAHD)	445.00
Design discharge (l/s)	6.0
Detention Time (hrs)	15.2
TWL (mAHD)	421.85
Pipe roughness TWL 'k' (mm)	0.00060
Friction factor 'f'	0.03217
Minor loss "k"	10
Minor loss (m)	0.1
Friction loss to discharge	22.9
Static lift (m)	23.15
Duty Head TWL (m)	46.2

Magpie Lane	Wastewater flows						
	Units	ET	r	ADWF (L/s)	PDWF (L/s)	SA (L/s)	PWWF (L/s)
Long term	240	161	3.0	1.0	2.9	4.8	7.7
Short term	147	76	3.4	0.5	1.6	2.3	3.8
Total	387	237		1.4	4.5	7	11.6

* Assumed that pool backwash will be backwashed during dry weather only

* ET loading = no. of units by ET loading rates - Section 64 Determinations of Equivalent Tenements Guidelines (2017)

* Reduce ADWF factor from 0.011 to 0.006 to account for BASIX reducing in demand between 1980s and now.

* Reduce SA by 50% to remove inflow from reticulated public networks

122757.1 L/d 4.3 L/s (over 8hrs)
 122.8 kL/d 5.7 hrs of pumping @ 6L/s
 245.5 kL/48hr
 368 kL/72hrs

Peak and extreme day demand	ET	
ET	234	
Average annual consumption	200	kL/y/ET
Average daily flow	547.9	L/d/ET
Average daily rate	0.006	L/s/ET
PDF	2.25	
Peak day	0.01	L/s/ET
Diversity	1.12	
Peak day demand	0.02	L/s/ET
Diurnal diversity factor	1.00	
Peak hour factor	2.02	
Factored peak Hr demand	0.03	L/sET
Factored peak Hr demand	7.56	L/s

Components of reservoir		Vol.	
Operational storage	ADD	129	kL/d
Emergency storage	EWD	272	kL/10hrs
Fire storage	FFD	144	kL/4hr
Dead storage	5%	27	kL
	Total	572	kL

95% PDD	ET	
ET	234	
Average annual consumption	200	kL/y/ET
Average daily flow	547.9	L/d/ET
Average daily rate	0.006	L/s/ET
PDF	1.8	
Peak day	0.01	L/s/ET
Diversity		
Peak day demand	0.01	L/s/ET
Diurnal diversity factor		
Peak hour factor	2.02	
Factored peak Hr demand	0.02	L/sET
Factored peak Hr demand	5.40	L/s

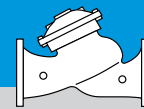
Tanks	200	kL
Total storage	600	kL
Storage @ ADD	4.7	days

95PDD + 10L/s FF	15.4	L/s
Firefighting storage	144	kL

Reservoir - Extreme week demand	7.56	L/s
Reservoir emergency storage	272.1	kL

Appendix C

TECHNICAL SPECIFICATIONS



LEVEL CONTROL VALVE

with Altitude Pilot

Model 750-80 EN/ES

Hydraulically operated control valve that controls reservoir filling and reservoir level. The valve shuts off at a pre-set reservoir high level and fully opens in response to an approximately one meter (3 ft) level drop, as sensed by the 3-Way altitude pilot mounted on the main valve.

BERMAD 700 SIGMA EN/ES series valves are hydraulic, oblique pattern, globe valves with a raised seat assembly and double chamber unitized actuator, that can be disassembled from the body as a separate integral unit. The valves hydrodynamic body is designed for unobstructed flow path and provides excellent and highly effective modulation capacity for high differential pressure applications. The valves are available in the standard configuration or with an Independent Check Feature code "2S". The 700 SIGMA EN/ES Valves operate under difficult operation conditions with minimal cavitation and noise. They meet size and dimensions requirements of various standards.



[Click here for control accessories](#)



HOME VIEW

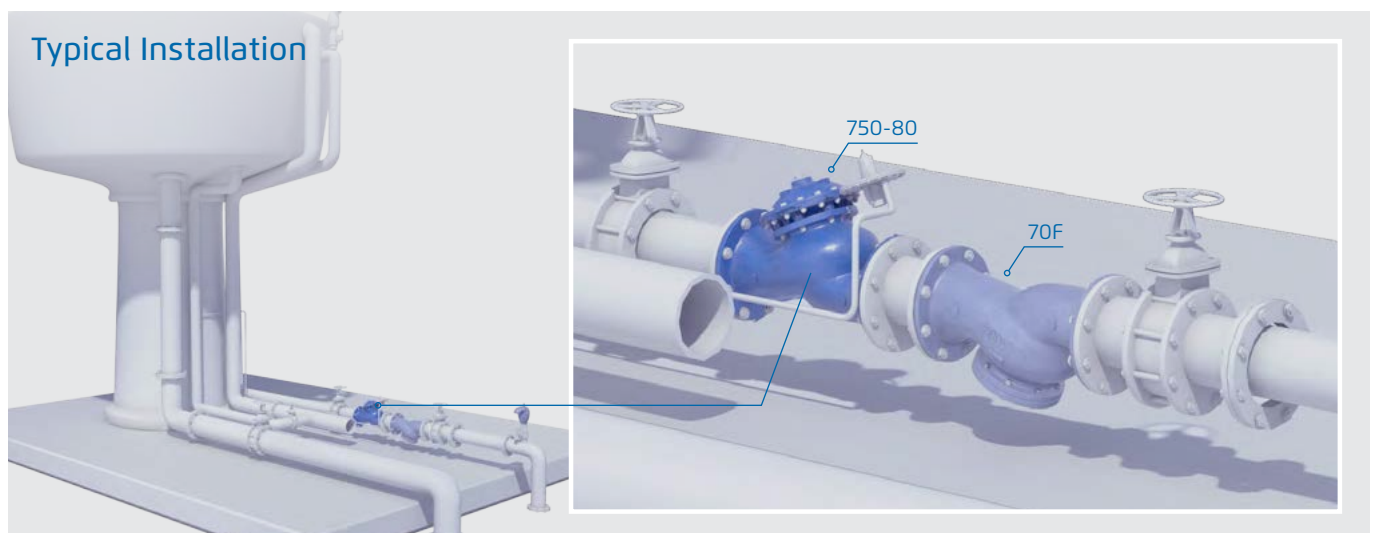
Features and Benefits

- Designed to - stand up to the toughest conditions
 - Excellent anti-cavitation properties
 - Wide flow range
 - High stability and accuracy
 - Drip tight sealing
- Double chamber design
 - Moderated valve reaction
 - Protected diaphragm
 - Optional operation in very low pressure
 - Moderated closing curve
- Flexible design - Easy addition of features
- Obstacle free flow pass
- V-Port Throttling Plug (Optional) - Very stable at low flow
- Compatible with various standards
- High quality materials
- In-line serviceable - Easy maintenance

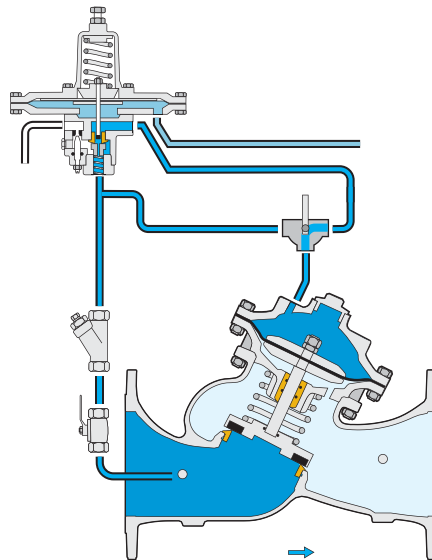
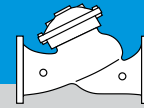
Major Additional Features

- Modulating altitude control – 750-82
- Pressure sustaining – 753-80-X
- Flow control – 757-80-XU
- Bi-directional flow – 750-87-X
- Full powered opening & closing – 750-80-BX
- Closing surge prevention – 750-80-49-X
- Bi-level altitude control – 750-86
- Level sustaining with high sensitivity pilot – 75A-83
- Independent Check Feature – 750-80-2S

See relevant BERMAD publication



All images in this catalog are for illustration only



This drawing refers to 1½ – 8"; 40-200 mm sized valves only. For other sizes please refer to the Model's IOM.

Main Valve

- Valve Patterns:** "Y" (Globe)
- Size Range:**
- EN Series:** 1½-16"; 40-400 mm
- ES Series:** 2½-24"; 65-600 mm
- Pressure Rating:** 25 bar; 400 psi
- End Connections:** Flanged (all standard)
- Plug Types:** Flat disc, V-port, Cavitation cage
- Temperature Rating:** 60°C; 140°F for Cold water applications
- Optional higher temperature:** Available on request

Standard Materials:

- Body & actuator:** Ductile Iron
- Bolts, nuts & studs:** Stainless Steel
- Internals:** Stainless Steel, Tin Bronze & Coated Steel
- Diaphragm:** Fabric-reinforced synthetic rubber
- Seals:** Synthetic rubber
- Coating:** Dark blue Fusion bonded epoxy

Control System

Standard Materials:

- Accessories:** Stainless Steel, Bronze & Brass
- Tubing:** Stainless Steel or Copper
- Fittings:** Stainless Steel or Brass

Pilot standard materials:

- Body & Cover:** Brass or Stainless Steel
- Elastomers:** Synthetic Rubber
- Spring:** Stainless Steel or Galvanized Steel Internal
- Parts:** Stainless Steel
- Diaphragm Covers:** Fusion bonded Epoxy Coated Steel or Stainless Steel

Altitude Adjustment Range:

Code	Meter	Feet
M1	2-6	7-20
M6	2-14	7-46
M5	5-22	17-72
M4	15-35	49-115
M8	25-70	82-230

Notes

- Shut-off level repeatability: 100 mm; 4"
- Re-opening level: approx. 1m; 3ft below shut-off level.
- Inlet Pressure, Outlet Pressure and Flow-rate are required for optimal sizing.
- Recommended maximum flow velocity: 6.0 m/sec; 20 ft/sec.
- Minimum operating pressure: 0.7 bar /10 psi. For lower pressure requirements consult factory.





Pump Stations Fibreglass

Built under ISO9001
Quality Management System
WSAA Appraisal No. 1319
Certified by a Registered
Composite Engineer




















Fibreglass Pump Stations

Aquatec's Fibreglass Pump Stations are manufactured as a one-piece construction to exact project specifications. Delivered to site as a complete unit with a simple installation process, Aquatec's Fibreglass Pump Stations are engineered to withstand internal and external loadings across all ground conditions.

Service Capabilities

Aquatec's end-to-end service model incorporates consultation, custom design, manufacture and delivery, commissioning, training and life cycle management. Our service model streamlines the time and costs associated with managing multiple suppliers to deliver a superior level of quality control.

-  Design & Drawing Services
-  Qualified Electricians
-  Project Management
-  Power Management
-  Procurement Officers
-  Quality Assurance Audits
-  Lifting & Excavation Briefs
-  Pre-testing, Commissioning & Compliance Checks
-  On-site Installation Training
-  Scheduling & Management of Final Testing & Commissioning
-  On-site Delivery Supervision
-  Accredited Operation & Maintenance Training
-  Guaranteed Seal Integrity
-  After Sales Service & Warranty
-  Qualified Mechanical Fitters

System Design

Aquatec's product designs have achieved benchmark status with State Governments, Local Water Authorities and Councils.

Hydraulic Designs

Aquatec takes an unbiased approach to hydraulic design to maximise pump efficiency and product longevity. Calculated in accordance with Water Authority requirements and the WSSA sewerage code.

Aquatec works closely with our clients to deliver expert knowledge across flows, friction loss, static lift, atmosphere, pipe sizing and air locks.

Design & Drawing Services

Aquatec's Design & Drawing Services deliver a full set of drawings customised to meet the unique needs of your project. Our Technical Consultants work closely with our clients to establish a detailed understanding of site conditions to determine Pump Station size, flow rate, head pressure, storage requirements and layout solutions.

Expert guidance across Australian Standards, WSAA and WHS regulations together with recommendations on the latest global innovations combine to deliver a customised solution for the long-term.

Key Optional Accessories

Aquatec offers a wide range of Optional Accessories to meet or improve on your project specifications. Our Technical Consultants will make recommendations for enhancements to your Fibreglass Pump Station based on budgets and the unique demands of your application.

- Key Optional Accessories include:*
- Fibreglass Storage Vessels
 - Lighting (internal / external)
 - Mixers
 - Flow Meters
(separate pits available)
 - Inlet Valves / Drop Pipes
 - Fans & Blowers
 - Scour Lines / Pump Out Points
 - In Series Pumping
 - Well Washers





Product Integrity

Government and Industry Bodies regularly consult with Aquatec for guidance on best practice product development and safety standards.

Fibreglass Pump Stations form an integral part of Australia's infrastructure and perform a vital service for the community. For the past 30 years, Aquatec's commitment to product integrity has remained central to our daily operations.

Manufacturing Process

Aquatec's Fibreglass Pump Stations are manufactured in a controlled factory environment under strict ISO 9001:2015 standards. The Pump Station mould designs are manufactured to exact specifications. Unlike cast in-situ Pump Stations, our product quality is not subject to weather, site conditions and associated time delays.

Quality Control

Aquatec holds JAS-ANZ third party accreditation, and our manufacturing process is subject to a series of strict Quality Control measures to achieve superior product quality:

- Controlled factory conditions
- Computerised winders for controlled wall thickness
- Checklists / hold points
- Third party engineer's certificates
- Transportation





Fibreglass Pump Stations

Design Innovation

Aquatec's Fibreglass Pump Stations offer considerable environmental benefits over pump stations poured in-situ.

Aquatec's ability to deliver our product to site as a one-piece unit minimises excavation periods and disruption to flora and fauna. Our Integral Valve Chamber requires less space in the overall design, resulting in a smaller environmental footprint.

Every Fibreglass Pump Station design considers a provision for additional storage vessels to safeguard the environment against the potential risk of effluent overflow.

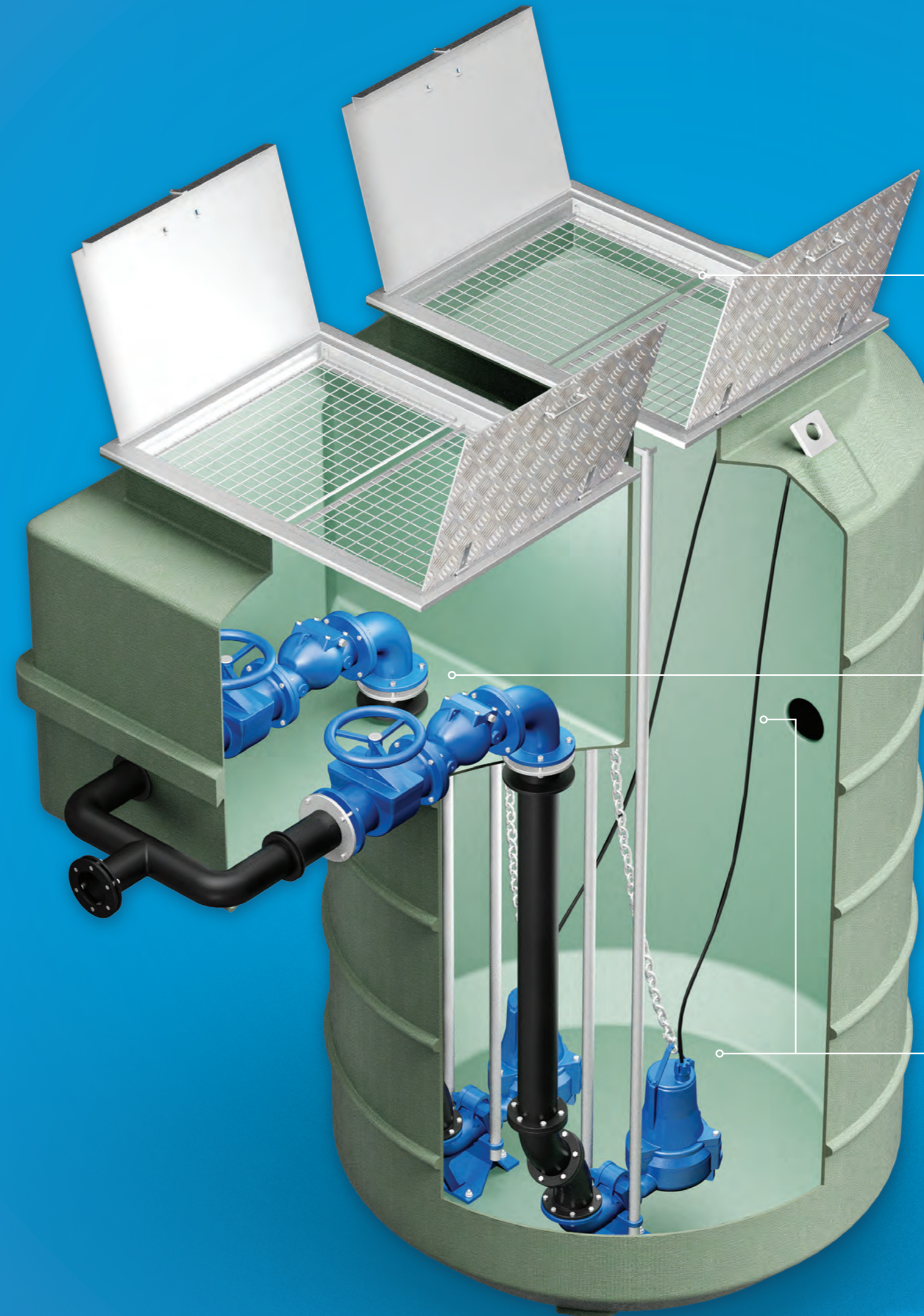
Guaranteed Seal Integrity

Aquatec's Fibreglass Pump Stations are manufactured as a completely sealed, one-piece vessel. All penetrations and wall fixings through the structure are carried out in the factory with compatible materials, allowing no chance of ingress or egress.

Product Range

Model Number	Diameter	Depth	Volume	Model Number	Diameter	Depth	Volume
AFPS12	1250mm	1-20m*	1,200-24,000L	AFPS30	3000mm	1-20m*	7,000-140,000L
AFPS15	1500mm	1-20m*	1,700-34,000L	AFPS33	3300mm	1-20m*	8,200-170,000L
AFPS18	1850mm	1-20m*	2,500-53,000L	AFPS35	3500mm	1-20m*	9,600-192,000L
AFPS20	2000mm	1-20m*	3,100-62,000L	AFPS40	4000mm	1-20m*	12,500-250,000L
AFPS22	2200mm	1-20m*	3,500-75,000L	AFPS45	4500mm	1-20m*	15,900-320,000L
AFPS25	2500mm	1-20m*	4,900-98,000L	AFPS50	5000mm	1-20m*	19,600-392,000L

*Deeper available on request



Access Covers

Available in 316 stainless steel, aluminium, galvanised or cast iron, Aquatec's wet well Access Covers feature a WHS approved safety grid as standard, providing an added lay flat safety fall arrest system for maintenance personnel.

External Maintenance Access

Aquatec's Fibreglass Pump Stations are designed so that most components within the wet well can be serviced externally without entering the chamber, eliminating the need for confined space entry permits and reducing safety risks for maintenance personnel.



Integral Valve Chamber

Aquatec's Integral Valve Chamber incorporates industry leading operational and safety benefits for maintenance personnel.

Engineered to eliminate the line-up of separate valve chambers, Aquatec's Integral Valve Chamber prevents differential ground settlement. The 90° dismantling elbows are located inside the integral valve chamber, facilitating the safe removal of pipework and valves for maintenance personnel without entering the wet well.

External Valve Chamber

Aquatec provide flexibility by offering a range of Fibreglass external valve chambers to accommodate large pipework. Our standard moulds are glassed in a controlled factory environment and delivered to site as a complete unit to increase time and cost efficiencies.



One-piece Chamber

The Pump Station base and sludge batter are mould formed as one piece to strengthen the overall structure, while the steep sludge batter is shaped to prevent solids build-up, eliminating dead zones behind pump pedestals. The top cover, walls and base are glassed together to provide an impervious, holistic structure. The Pump Station base is designed to withstand pump weights, vibrations and ground forces.

Filament Wound Construction

Aquatec's Fibreglass Pump Stations are constructed using a state-of-the-art computerised winder and manufactured with the highest-grade resins and continuous rovings to achieve benchmark standards of quality and integrity.





Fibreglass
Pump Stations



Telemetry, Monitoring & Control Systems

Aquatec's custom approach to Switchboards and Control Systems delivers a consistently high level of operational integrity.

In-House Design & Manufacturing

Designed to deliver on individual Water Authority and Council requirements, Aquatec's Control Systems are manufactured in-house to meet AS/NZS 61439 standards and AS/NZS 3000 wiring regulations. From small wall-mounted controls to advanced, freestanding multi-door controllers, our solutions achieve optimum equipment protection, service reliability, ease of operation and simplified maintenance.

Level Controls

Aquatec offers a variety of methods for level control, including float systems, hydrostatic pressure transducers, ultrasonic, radar and probes for specific applications or preferences.

Telemetry & Monitoring Systems

Tailored to adapt to the off-site host control unit, Aquatec's telemetry SCADA monitoring, phone dialing, sms and BMS systems cater for all types of applications.



Fibreglass
Pump Stations

Safety Features

Aquatec's Fibreglass Pump Station designs have received recognition from WHS Industry Bodies, Water Authorities and Councils for setting new standards in safety and serviceability.

Aquatec incorporates advanced safety features into the design of every Fibreglass Pump Station for the safety of installation and maintenance personnel.

Our product designs have dramatically reduced the likelihood of accidents by incorporating external maintenance and access methods.

External Maintenance Access

Aquatec's Fibreglass Pump Stations are designed so that most components within the wet well can be serviced externally without entering the chamber, eliminating the need for confined space entry permits and reducing safety risks for maintenance personnel.

Reduced Excavation Periods

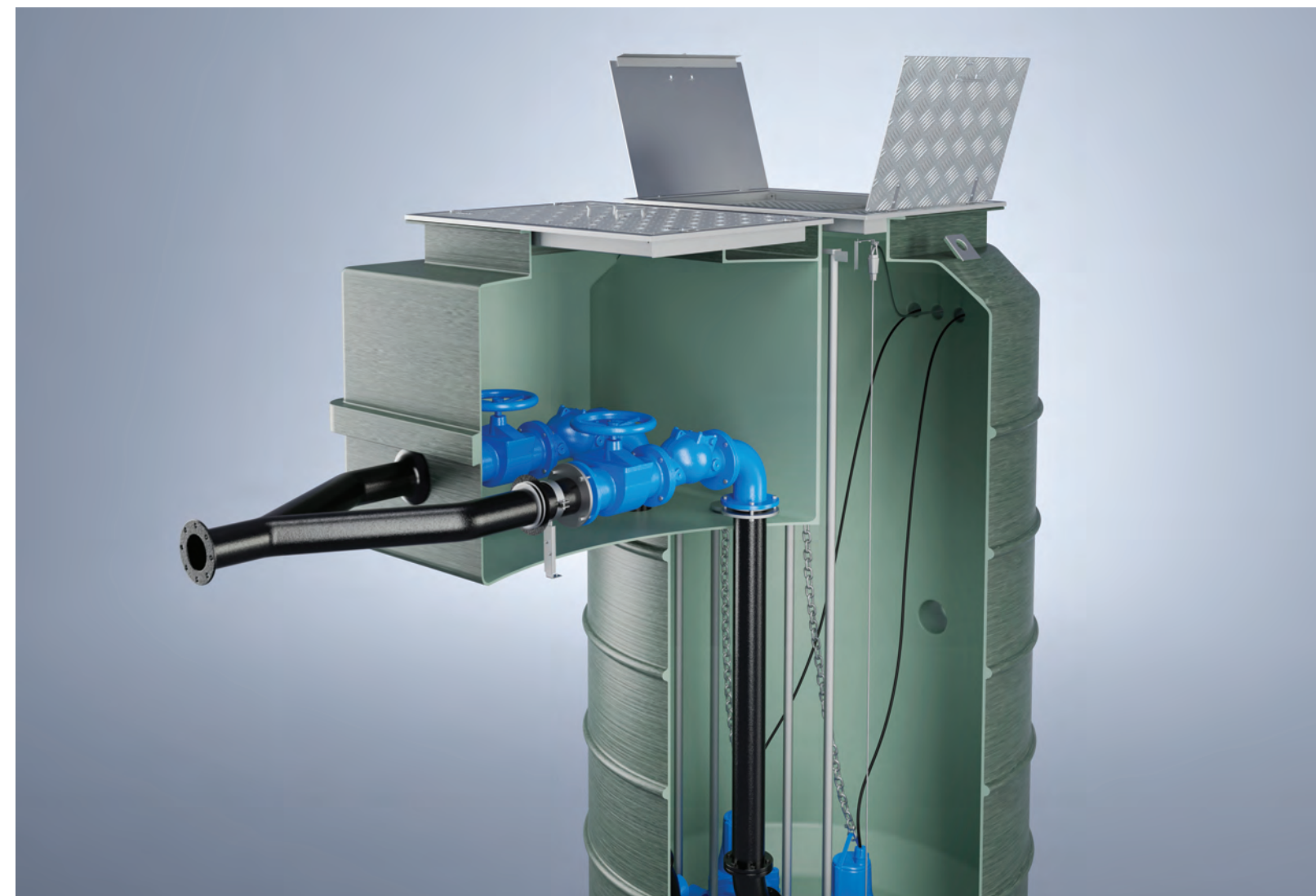
Site excavations are often left unnecessarily exposed for long periods of time, presenting serious safety risks for installation personnel. Aquatec's one-piece designs have the optional Integral Valve Chamber available to decrease installation time, reducing the excavation period required during installation.

Access Covers

Aquatec's wet well Access Covers feature a WHS approved safety grid as standard, providing an added lay flat, safety fall arrest system for maintenance personnel.

Engineered Lifting Points

Aquatec provides Rated Lifting Points in each Pump Station to ensure safe installation.



Safety Accessories

Aquatec's optional Safety Accessories offer added safety protection for maintenance personnel, supplied in accordance with WHS safety standards.

Lifting Devices

Aquatec offers a range of Lifting Devices to enable safe pump removal for maintenance personnel in accordance with WHS requirements.

Access Ladders & Landings

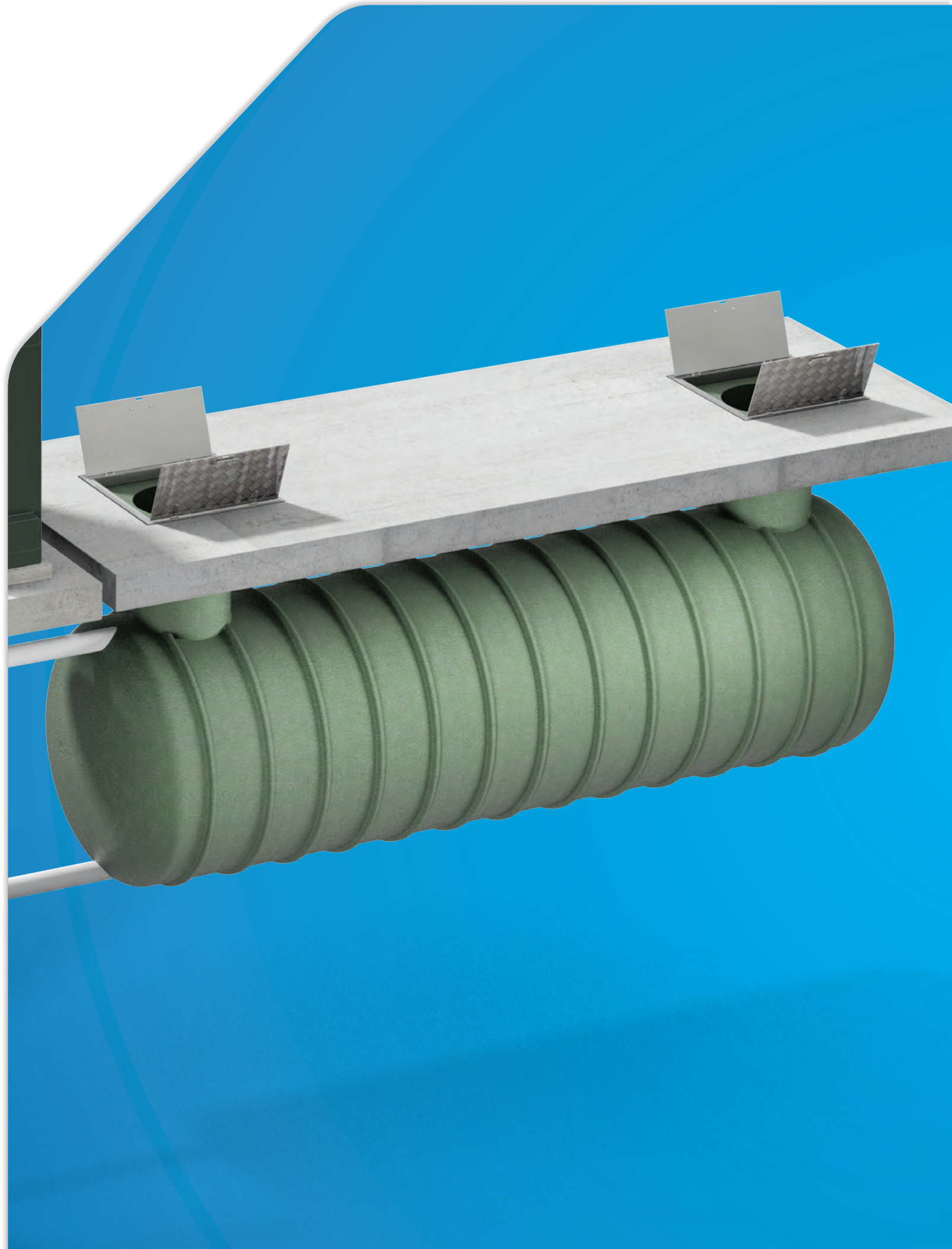
Available in 316 stainless steel, galvanised, powder coated, or glass reinforced plastic, Aquatec's Access Ladders and Landings are incorporated into product designs where internal well access is required.

Our Technical Consultants can advise on landing depths and sizes in accordance with WHS safety requirements. Aquatec's Ladders are available with non-slip knurled rungs for added safety protection.

Handrails

Aquatec's range of permanent and portable Handrails offer additional safety protection for maintenance personnel. Available in 316 stainless steel, galvanised steel, powder coated or aluminium, our Handrails are incorporated into Fibreglass Pump Station designs in accordance with AS 1657-1992 or Water Authority requirements.





Fibreglass Storage Vessels

Aquatec's pump stations can also be supplied with emergency storage vessels, providing additional storage capacity to handle critical in-flows.

Each vessel is fabricated as a completely sealed, one-piece unit for ease of delivery and installation on site, eliminating the possibility of ingress or egress and limiting environmental impact.

Our storage vessels are manufactured in a controlled factory environment under ISO 9001:2015 standards, and are WSAA appraised.

After Sales Service

Maintenance Training

Aquatec's Maintenance Training caters for existing personnel in need of additional assistance or new personnel unfamiliar with the operational and maintenance requirements of our Fibreglass Pump Stations.

Technical & Product Support

Aquatec's Technical and Product Support Service responds to any product or technical enquiry, including recommendations on safe-use of our products.

Service Warranty

Aquatec are committed to providing full after sales service, support and long term warranty on all components and workmanship.

HEADQUARTERS

2 Provincial Crescent,
Shepparton VIC 3630

Australia 1300 088 555
New Zealand 0800 756 543

info@aquatecenviro.com
aquatecenviro.com

SHEPPARTON

MELBOURNE

SYDNEY

NEWCASTLE

BRISBANE

ADELAIDE

PERTH

CHRISTCHURCH

Water Innovation Partners

Qty. Description

2 **APG.50.92.3**



Note! Product picture may differ from actual product

Product No.: [96835731](#)

Submersible grinder pump

Vertical single-stage cast iron submersible pump with integrated submersible 3-phase motor.

The pump is fitted with carrying handle and is supplied with a 10 m mains cable.

The pump is equipped with a hardened steel cutter system suitable for pumping wastewater and sewage in pressurised systems.

The pump has a double shaft seal and an intermediate oil chamber pre-filled with non-toxic special oil.

The motor is insulation class F and has long-life deep-groove greased-for-life ball bearings.

The pump has DN 50 discharge port and is ready for installation on an auto-coupling system or can be supplied with ring stand for free-standing installation or portable use.

Liquid:

Liquid temperature range: 0 .. 40 °C

Selected liquid temperature: 20 °C

Density: 1000 kg/m³

Technical:

Actual calculated flow: 6.91 l/s

Resulting head of the pump: 50.46 m

Type of impeller: CUTTER SYSTEM

Curve tolerance: ISO9906:2012 3B

Materials:

Pump housing: Cast iron
ASTM 35 B
EN-JL1040

Impeller: Cast iron
EN-JL1040
ASTM 35 B

Installation:

Pump outlet: DN 50



Company name:

Created by:

Phone:

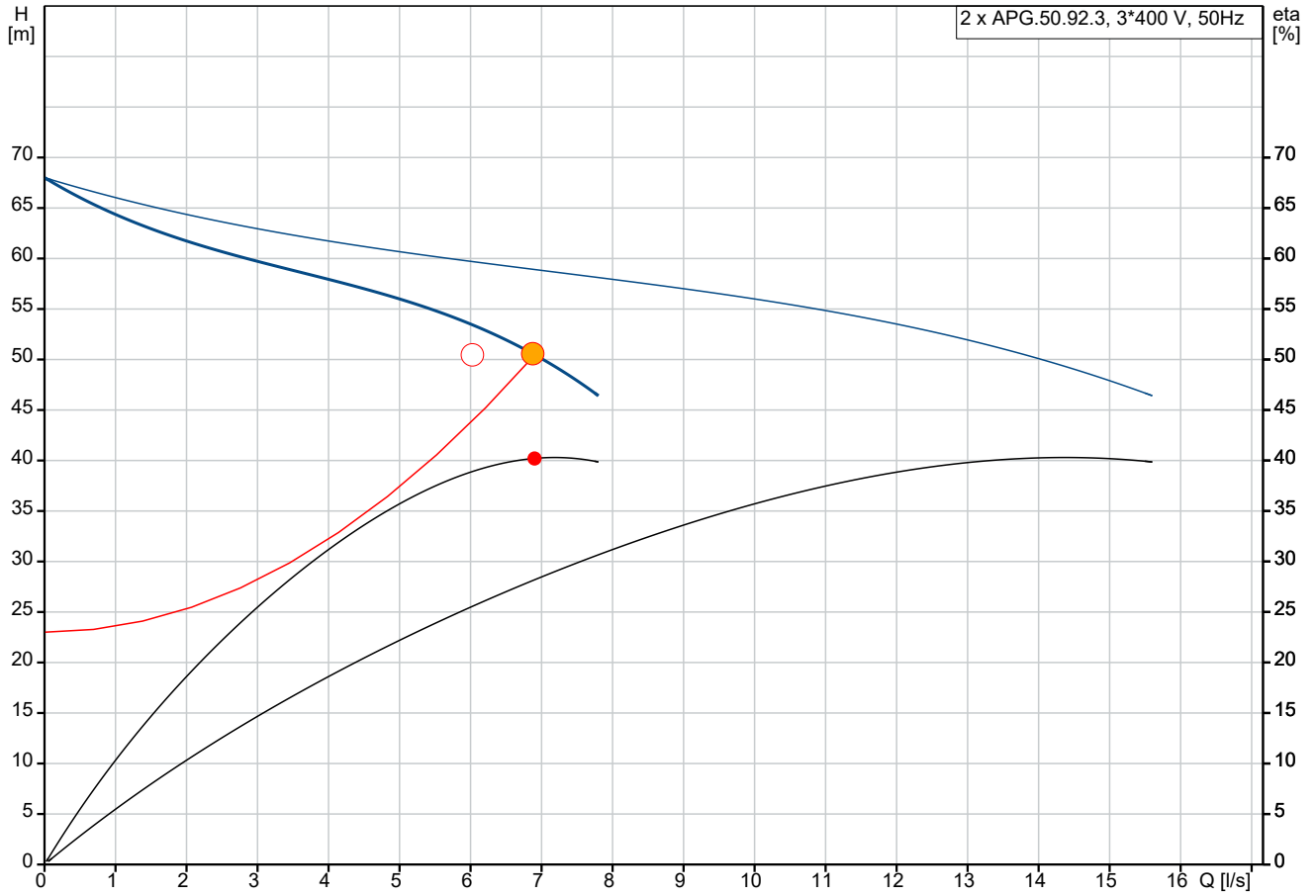
Date:

01/11/2023

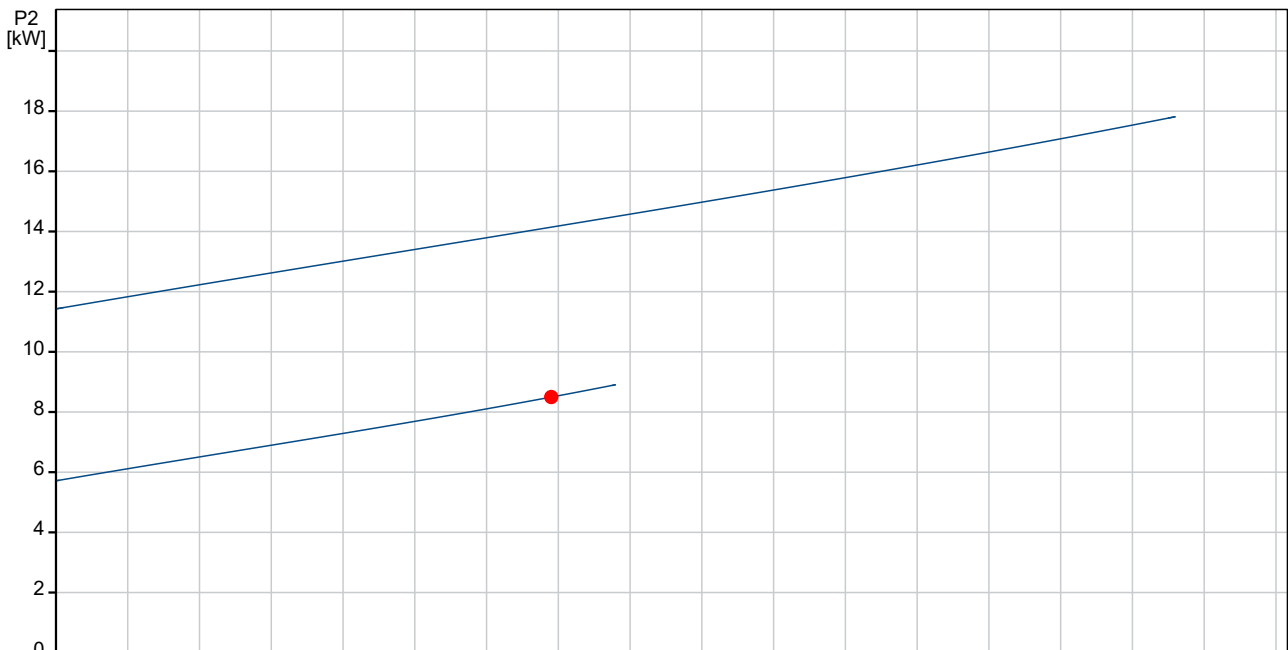
Qty. Description

2	Maximum installation depth:	10 m
	Electrical data:	
	Power input - P1:	11 kW
	Rated power - P2:	9.2 kW
	Mains frequency:	50 Hz
	Rated voltage:	3 x 400 V
	Rated current:	19.1 A
	Cos phi - power factor:	0.81
	Rated speed:	2900 rpm
	Enclosure class (IEC 34-5):	IP68
	Insulation class (IEC 85):	F
	Length of cable:	10 m
	Type of cable plug:	NONE
	Others:	
	Net weight:	116 kg
	Country of origin:	DE
	Custom tariff no.:	84137090620208297

96835731 APG.50.92.3 50 Hz

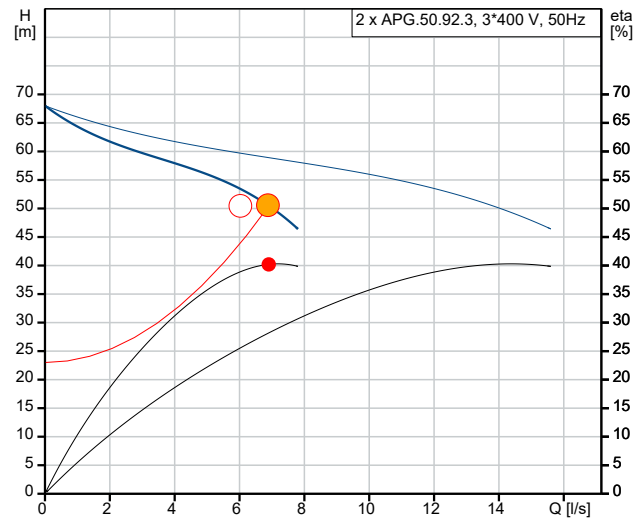


Q = 6.9 l/s
 H = 50.48 m
 n = 100 %
 Liquid temperature during operation = 20 °C
 Eta pump = 40.2 %

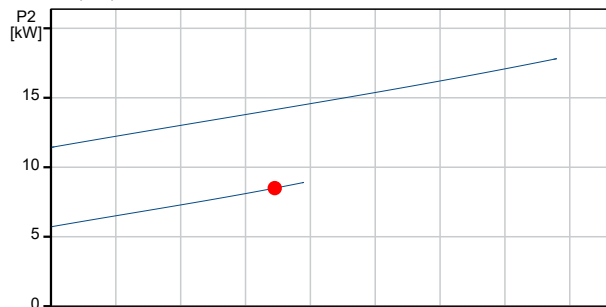


P2 = 8.498 kW

Description	Value
General information:	
Product name:	APG.50.92.3
Product No:	96835731
EAN number:	5700311560532
Price:	AUD 14100
Technical:	
Actual calculated flow:	6.91 l/s
Max flow:	8.58 l/s
Resulting head of the pump:	50.46 m
Head max:	68 m
Type of impeller:	CUTTER SYSTEM
Curve tolerance:	ISO9906:2012 3B
Model:	B
Materials:	
Pump housing:	Cast iron
Pump housing:	ASTM 35 B
Pump housing:	EN-JL1040
Impeller:	Cast iron
Impeller:	EN-JL1040
Impeller:	ASTM 35 B
Installation:	
Pump outlet:	DN 50
Maximum installation depth:	10 m
Inst dry/wet:	S
Installation:	vertical
Liquid:	
Liquid temperature range:	0 .. 40 °C
Selected liquid temperature:	20 °C
Density:	1000 kg/m ³
Electrical data:	
Power input - P1:	11 kW
Rated power - P2:	9.2 kW
Mains frequency:	50 Hz
Rated voltage:	3 x 400 V
Rated current:	19.1 A
Cos phi - power factor:	0.81
Rated speed:	2900 rpm
Enclosure class (IEC 34-5):	IP68
Insulation class (IEC 85):	F
Built-in motor protection:	CONTACT
Thermal protec:	external
Length of cable:	10 m
Type of cable plug:	NONE
Controls:	
Control box:	not included
Others:	
Net weight:	116 kg
Country of origin:	DE
Custom tariff no.:	84137090620208297

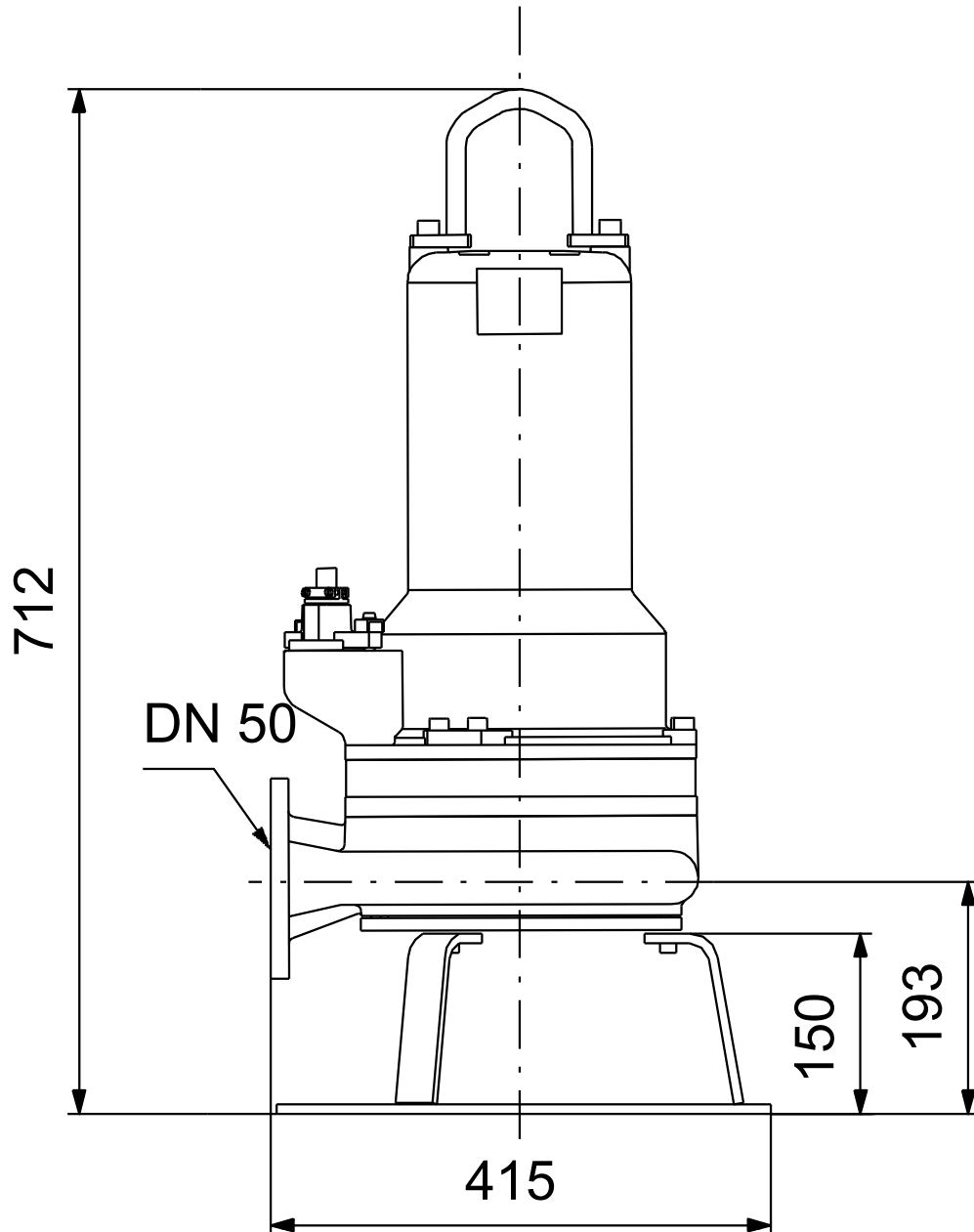


Q = 6.9 l/s
H = 50.46 m
n = 100 %
Liquid temperature during operation = 20 °C
Eta pump = 40.2 %



P2 = 8.498 kW

96835731 APG.50.92.3 50 Hz



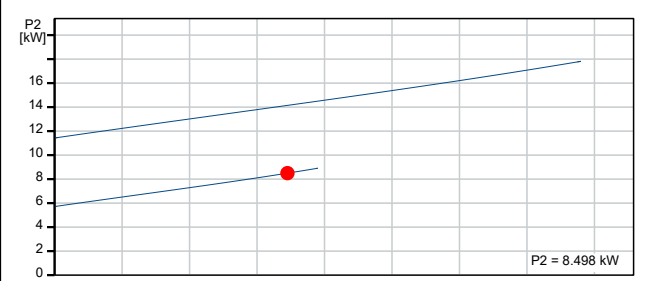
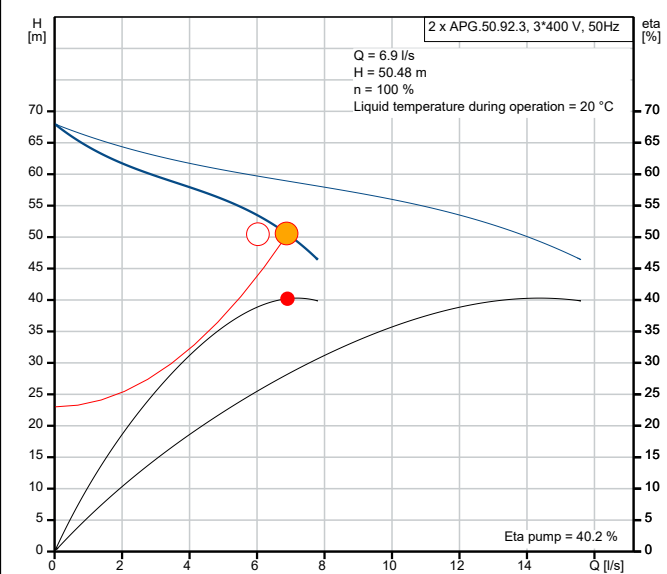
Note! All units are in [mm] unless others are stated.
Disclaimer: This simplified dimensional drawing does not show all details.

96835731 APG.50.92.3 50 Hz

Input	
Size by	Pump design
Journey	Sizing
Pump design	Submersible wastewater pumps
Your requirements	
Variable speed	No
Allowed undersize	5 %
Liquid temp. <= 40 °C	Yes
No of duty points	1
Cooling jacket required	Disregard
Select type of hydraulic	
Dry solids content	0 - 3%
Grinder	Yes
Channel impeller	Yes
SuperVortex impeller	Yes
Closed S-tube	Yes
Open S-tube	Yes
Select type of material	
Complete cast iron	Yes
Cast iron with stainless steel impeller	No
Cast iron motor with stainless steel pump housing and impeller	No
Complete stainless steel	No
Controller	
Preferred controller	External, supplied by Grundfos (Basic controller)
Monitoring	None
Level sensor type	Float switches
Preferred solution	Compact
Flashing beacon for external alarm indication	No
External mains switch for supply cable	No
Edit load profile	
Load profile	Full load
Period	Day
Operation hours per day	2.74 h/day
Operational conditions	
Frequency	50 Hz
Phase	1 or 3
Min. power limit for SD start	5.5 kW
Voltage	1 x 230 or 3 x 400 V
Life cycle cost	
Do you want to make a comparison?	No comparison
How detailed do you want your life cycle cost analysis?	Simple LCC analysis
	Pump A
Hit list settings	
Include cheapest solution	Yes
Max. hits per product group	4
Max. hits total	16
Energy price	0.31 AUD/kWh
Increase of energy price	6 %
CO2 emission intensity	0.8 kg/kWh
Calculation period	10 years

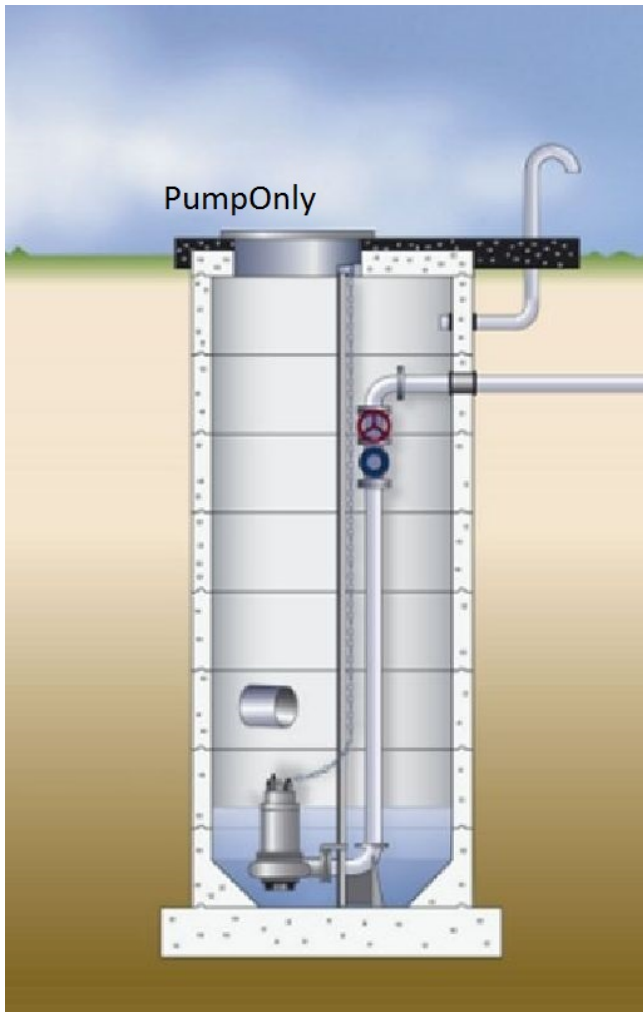
Load Profile	
	1
Flow (%)	115
Flow (l/s)	6.88
Head (%)	115
Head (m)	50.58
P1 (kW)	9.642
Eta total (%)	35.4

Sizing result	
Type	APG.50.92.3
Flow	6.91 l/s (+15%)
H geodetic	23 m
H total	50.46 m (+15%)
Flow total	21602 m ³ /year
Power P1	9.657 kW
Power P2 required in the duty point	8.498 kW
NPSH required	10 m
Eta pump	40.2 %
Eta motor	88.0 %
Eta pump+motor	35.4 % =Eta pump * Eta motor
Eta total	35.4 % =Eta relative to the duty point
Speed	2900 rpm
Energy consumption	8415 kWh/Year
CO2 emission:	6720 kg/Year
Price	32,823.00 AUD
Life cycle cost	68228 AUD /10Years



Energy consumption (kWh/Year)	8415
Quantity	1

Installation and Input



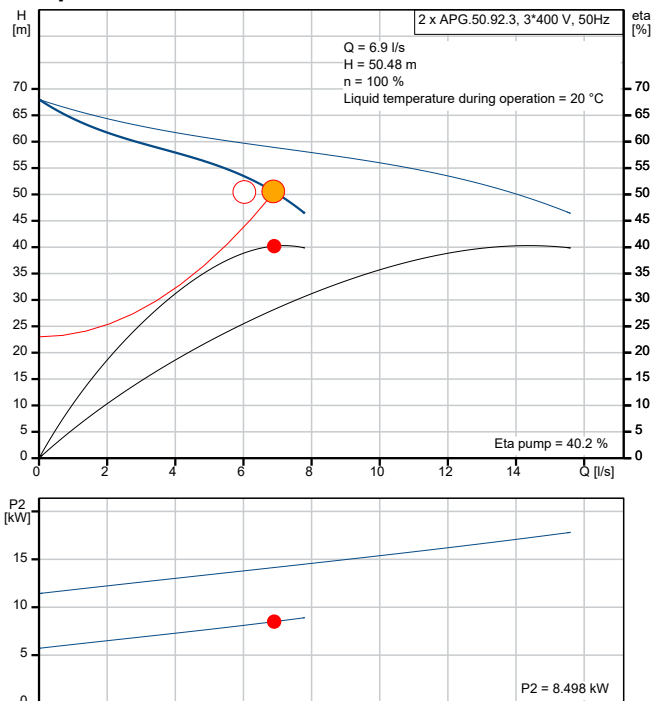
Sizing Results

Product number:	96835731
Type:	APG.50.92.3
Flow:	6.91 l/s (21602)
H total:	50.46 m (+15%)
Power P1:	9.657 kW
Power P2 required in the duty point:	8.498 kW
NPSH required:	10 m
Eta pump:	40.2 %
Eta motor:	88.0 %
Eta total:	35.4 %
Speed:	2900 rpm
Energy consumption:	8415 kWh/Year
Phase:	3
Voltage:	400
Frequency:	50 Hz
Current (rated):	19.1 A
Type of impeller:	CUTTER SYSTEM
Size, pump outlet:	DN 50
Maximum installation depth:	10 m
Enclosure class (IEC 34-5):	IP68
Insulation class (IEC 85):	F
Net weight:	116 kg

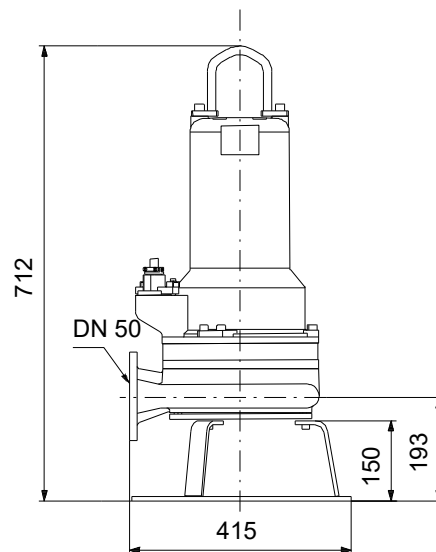
Load profile

	1
Flow (%)	115
Flow (l/s)	6.88
Head (%)	115
Head (m)	50.58
P1 (kW)	9.642
Eta total (%)	35.4
Time (h/a)	873
Energy consumption (kWh/Year)	8415
Quantity	1

Pump Curve



Dimensional Drawing



Water Management Solutions
Rainwater Tanks & Wastewater

RURAL TANKS STEEL CORRUGATED 26,000-365,000L

**BRUTE STRENGTH
INSIDE & OUT**

kingspan.com.au/ruraltanks



AUSTRALIAN MADE & OVER 85 YEARS OF EXPERIENCE



QUALITY ASSURANCE

Kingspan's Rhino rural tanks are manufactured in our Australian factory under a quality management system certified to ISO 9001. Our quality management system aims to benchmark ourselves against the best in the world.



**AT KINGSPAN, WE
PRIDE OURSELVES
ON OUR LONGEVITY,
EXPERIENCE,
CONTINUED
INNOVATION AND
UNRIVALLED
CUSTOMER SERVICE.**

Since 1934, we have manufactured quality, long-lasting water tanks and accessories. Today, Kingspan continues to be a market leader and trusted source of expert advice in rainwater harvesting and storage solutions for the residential, commercial and rural sectors.

Our Rhino rural tanks are available in tough ZINCALUME® Bluescope steel or in the full range of genuine COLORBOND® colours. Tanks range from 26,000 litres up to 365,000 litres. All tanks come with a unique 7 layer liner, making them ideal for rural applications.

All our tanks and their major components are Australian made. This means we can control and ensure the quality of every aspect of the tank from manufacturing to installation.

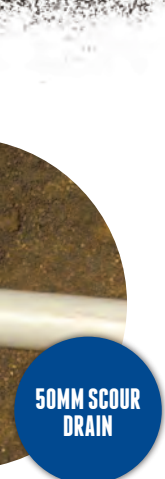
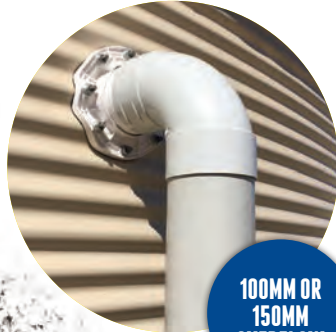
Global Expertise

Kingspan Water & Energy is a part of the Kingspan Group, a global business that has operations across a range of product divisions, including pre-insulated building panels, environmental technologies, and renewable energy technologies.



BRUTE STRENGTH INSIDE & OUT





INCLUDED

- AQUAMARK® Tank Liner
- Bluescope Steel Corrugated Wall & Roof Sheets
- Tank Inlet (Leaf Filter Basket or 50mm Inlet)
- 50mm Outlet & Ball Valve
- Removable Internal/External Ladder
- Lockable Access Hatch
- 100mm Bell Mouth Overflow
- Magnesium Anodes For Corrosion Protection
- 20 Year Conditional Warranty

OPTIONAL

- Additional Outlets & Valves (50mm/80mm/100mm)
- Fire Fighting Coupling (To Meet State/Territory Regulations)
- Removable Internal/External Ladder
- 50mm Scour Drain
- Dust & Vermin Proofing Seal
- Additional Inlets (Leaf Basket/50mm/80mm/100mm)
- Water Level Gauge
- Geo-fabric Underlay
- Termite Barrier
- Extra 100mm Bell Mouth Overflows
- 150mm Overflow
- HiFlow Deep Leaf Basket

FIRE FITTINGS



Storz



CFA



Camlock

TANK SIZES

Model	2.2mh tanks capacity		Tank Diameter	Pad Diameter
	Litres	Gallons		
RT-25	26,062	5,792	3.88m	5.5m
RT-40	40,723	9,049	4.85m	6.5m
RT-60	58,640	13,031	5.82m	7.5m
RT-80	79,816	17,737	6.79m	8.5m
RT-100	104,250	23,167	7.76m	9.5m
RT-130	131,941	29,320	8.73m	10.5m
RT-160	162,890	36,198	9.71m	11.5m
RT-200	197,097	43,799	10.68m	12.5m
RT-230	234,562	52,125	11.65m	13.5m
RT-275	275,284	61,174	12.62m	14.5m
RT-310	309,235	68,710	11.65m (2.9m h)	13.5m
RT-365	362,979	80,639	12.62m (2.9m h)	14.5m

NOTE: Sizes listed are gross capacities. Effective capacities vary depending on the size and position of inlets and outlets.



COLOUR RANGE

Kingspan Rhino rural tanks can be supplied in ZINCALUME® BlueScope steel, or the full range of genuine COLORBOND® colours.

The COLORBOND® steel colour swatches shown have been reproduced to represent actual product colours as accurately as possible. However varying light conditions and limitations of the printing process may affect colour tones.

		
ZINCALUME®	Pale Eucalypt®	Paperbark®
		
Woodland Grey®	Monument®	Dune®
		
Surfmist®	Windspray®	Jasper®
		
Classic Cream®	Cove®	Ironstone®
		
Manor Red®	Cottage Green®	Terrain®
		
Deep Ocean®	Evening Haze®	Gully™
		
Shale Grey™	Mangrove™	Wallaby™
		
Basalt™	Night Sky®	

The COLORBOND® steel colour swatches shown have been reproduced to represent actual product colours as accurately as possible. However varying light conditions and limitations of the printing process may affect colour tones.







REINFORCED HIGHLY DURABLE AQUAMARK LINER

Our tank liners are fabricated in our Western Australian factory and have been for over 20 years.

Our qualified liner fabricators use the latest welding techniques and state of the art machinery to produce liners of the very highest quality.

The Aquamark® Liner uses a unique 7 layer construction which offers great durability, flexibility and strength.

Once installed, you'll enjoy many years of trouble-free usage.

Water Potable Certified AS4020 Approved 	Polypropylene Recyclable 	Manufactured in Australia Proprietary Coating Process 	100% Lead & Phthalate Free 
---	---	--	---

HP TPO* Blend C

Offers abrasion resistance, thermal & UV durability and water potability.

HP TPO* Blend B

Delivers additional flexibility and stress crack resistance.

HP TPO scuff detection

Provides early abrasion detection and high levels of coating adhesion.

Reinforced multifilament scrim

Reinforced multifilament scrim for dimensional stability and strength.



LAYER 1: HP TPO* Blend C

LAYER 2: HP TPO* Blend B

LAYER 3: HP TPO scuff detection

LAYER 4: Reinforced multifilament scrim

LAYER 5: HP TPO scuff detection

LAYER 6: HP TPO* Blend B

LAYER 7: HP TPO* Blend C

*High Performance Thermoplastic Olefin (TPO)



RURAL FIRE TANKS

If you are building a tank in a bushfire zone, there are some things you need to be aware of. Our standard rural water tanks can be customised to meet relevant bushfire and fire-fighting requirements. State and local regulations vary by state so check with your relevant fire authority first.



RURAL FIRE TANK FITTINGS

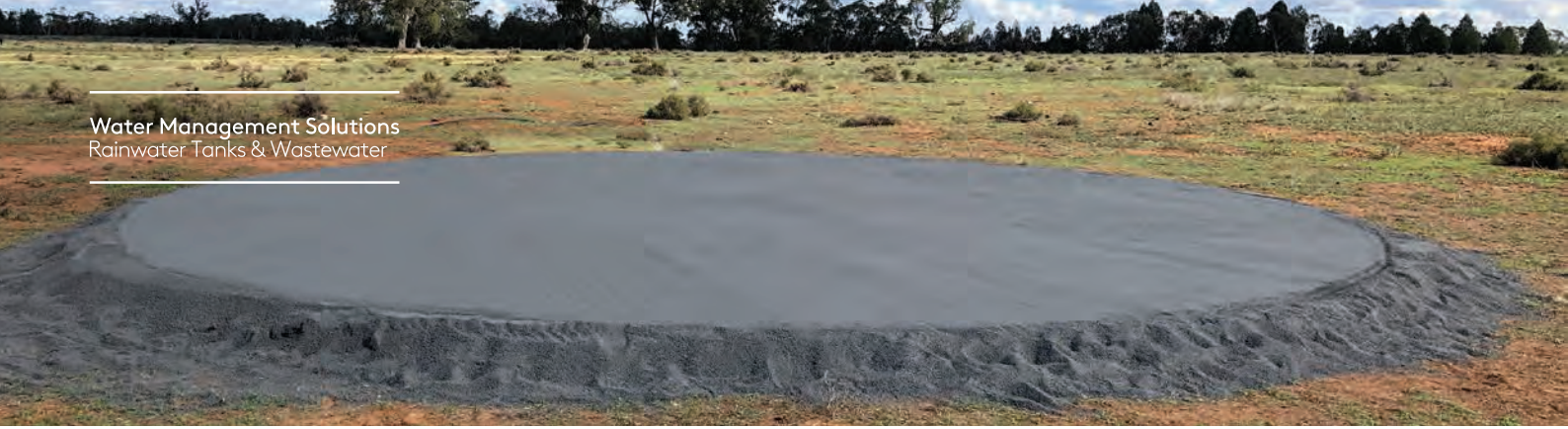
We're here to help

To make sure your property or site meet all relevant fire requirements, talk to the team today.

Commercial Projects

Fire Australia may require that your site has a full hydrant and sprinkler system. Speak to the team and we can help make sure you meet the requirements.





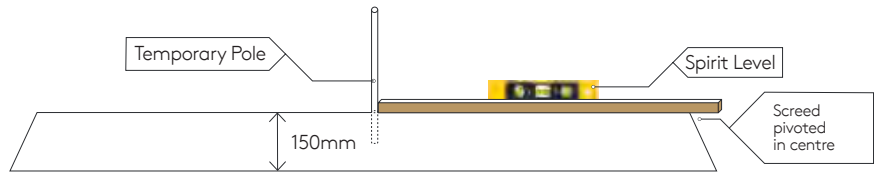
PAD PREPARATION

The preparation of the pad for a Kingspan Rhino tank is the responsibility of the customer. If crusher dust is not available in your area please insist on using screened sand from your local area (please do not use recycled sand as it may contain contaminants). It must be free of stick, stones and clay lumps (6mm diameter or less).

- Level Pad (+/- 10mm)
- Minimum thickness of pad is 150mm

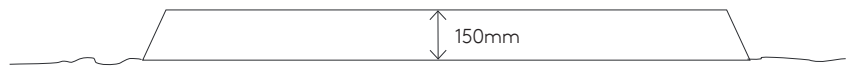
Suggested pad levelling technique

With a spirit level on top of a screed, level out the sand or crusher dust using a temporary pole in the centre of the pad as a pivot point.

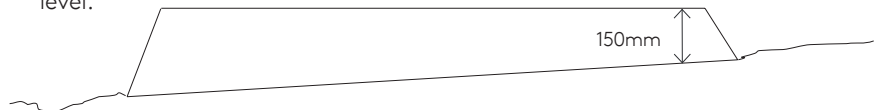


Most sites will fall into 3 main categories

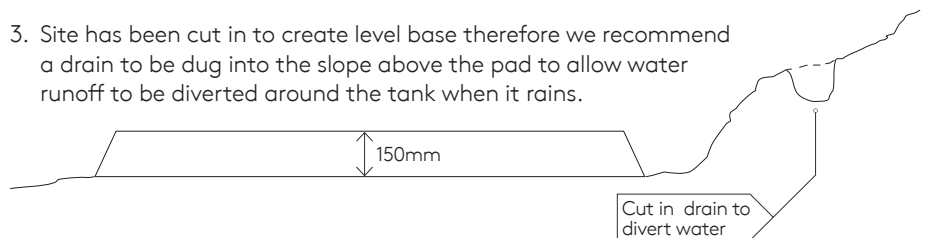
1. Level existing site therefore pad preparation is reasonably straight forward.



2. Slightly sloping site therefore pad needs to compensate slope to ensure it is level.



3. Site has been cut in to create level base therefore we recommend a drain to be dug into the slope above the pad to allow water runoff to be diverted around the tank when it rains.



Model	Gallons	Litres	Minimum Pad Diameter	Quantity of Sand/Crusher Dust at 150mm deep
RT-25	5,792	26,062	5.50m	3.5m ³
RT-40	9,049	40,723	6.50m	4.5m ³
RT-60	13,031	58,640	7.50m	6.0m ³
RT-80	17,737	79,816	8.50m	8.0m ³
RT-100	23,167	104,250	9.50m	10.0m ³
RT-130	29,320	131,941	10.50m	13.0m ³
RT-160	36,198	162,890	11.50m	16.0m ³
RT-200	43,799	197,097	12.50m	19.0m ³
RT-230	52,125	234,562	13.50m	22.0m ³
RT-275	61,174	275,284	14.50m	25.0m ³
RT-310	309,235	68,170	13.50m	27m ³ (250mm deep)
RT-365	362,979	80,639	14.50m	47m ³ (250mm deep)

Once the tank has been installed the customer is required to place an exclusion zone of a minimum of 20mm Blue Metal/coarse aggregate (no clay or concrete) around the base of the tank after installation to prevent erosion and deter rodents from digging around the base.

OTHER PRODUCTS AVAILABLE FROM KINGSPAN WATER & ENERGY



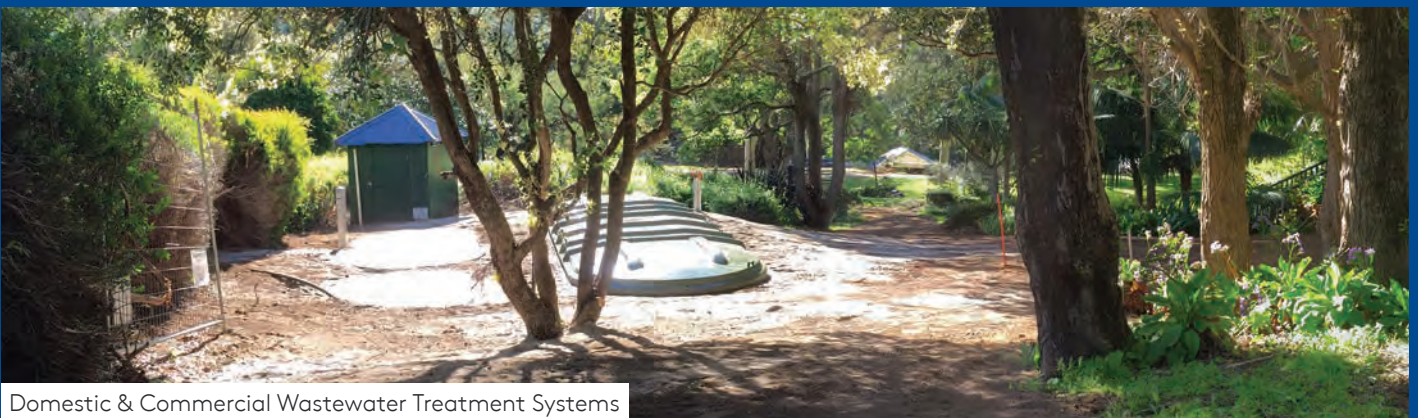
Kingspan Rhino Commercial Tanks



Made to Measure AQUAPLATE® Steel Water Tanks



TruckMaster® Portable Diesel Storage & Dispensing



Domestic & Commercial Wastewater Treatment Systems

If you are interested in any of our other products, contact Kingspan on **1300 736 562**, email **sales.au@kingspan.com** or visit **kingspan.com.au/water**

HOW MANY LITRES OF WATER CAN YOU HARVEST PER YEAR?

Use this formula to calculate how much rainwater you can harvest from your roof (catchment area):

Catchment Area m² × Annual Rainfall mm = Total Rainwater Harvested Litres

EXAMPLE: An average house & medium sized shed (350m²) in a region with an annual rainfall of 600mm can harvest 210,000 litres per year.

Kingspan Water & Energy Pty Ltd.

Perth
14 Ballantyne Rd
Kewdale WA 6106

Melbourne
55 Ricky Way
Epping VIC 3076

Deniliquin Warehouse/Depot
Lot 2 Wakool Road
Deniliquin NSW 2710

Brisbane
Unit 2/59 Link Drive
Yatala QLD 4132

Sydney
3 Herbert Place
Smithfield NSW 2164



T: 1800 632 410
F: 1300 736 582
ruraltanks@kingspan.com
kingspan.com.au/ruraltanks

We take every care to ensure that the information in this document is accurate at the point of publication, but with continuous product development, details are subject to alteration without notice.

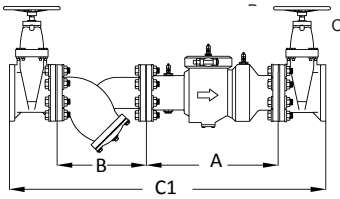




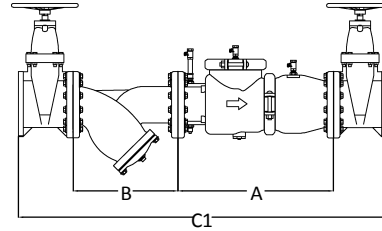
MODEL 350

65MM - 250MM DOUBLE CHECK VALVE ASSEMBLY

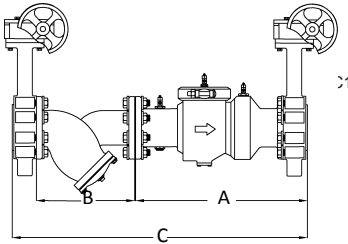
Dimensional Data (mm) are Subject to Manufacturing Tolerances and Change Without Notice



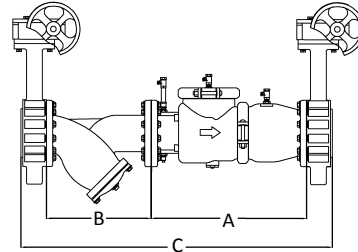
LCG
65, 80, 100, 150



LCG
200, 250



LCBLO
65, 80, 100, 150



LCBLO
200, 250

ENGINEERING SPECIFICATION - MODEL 350

- Designed for installation on potable water lines
- Protects against both backsiphonage and backpressure of polluted water into the water supply
- Assembly provides protection where a potential health hazard does exist (Medium Hazard)
- The Double Check Valve Backflow Preventer is Australian Watermark Approved (AZ/NZS 2845.1)
- The Double Check Valve Backflow Preventer rated is to 60°C
- The Double Check Valve Backflow Preventer is supplied with flanges to AS2129 Table E.
- The main body is epoxy coated Ductile Iron for sizes 65mm to 250mm
- The checks are accessible for maintenance without removing the device from the line

PRODUCT INFORMATION

MODEL 350 FEATURES

Max. Working Water Pressure	1200kPa
Max. Working Temperature	60 °C
Hydrostatic Test Pressure	2400kPa
End Connections	Flanges to AS2129

MODEL 350 MATERIALS

Main Valve Body	Ductile Iron ASTM A536 Grade 4
Access Covers	Ductile Iron ASTM A536 Grade 4
Coatings	Fusion Epoxy
Fasteners	Stainless Steel 304
Internals	Stainless Steel 304
Seal Ring	EPDM, Buna Nitrile
O-ring	Buna Nitrile
Springs	Stainless Steel 304

DIMENSIONS IN MILLIMETERS (approximate)

VALVE SIZE	A	B	C	C1	FLANGE TYPE	# OF BOLT HOLES
65	403	290	785	1073	TABLE E	4
80	403	320	815	1129	TABLE E	4
100	535	380	1019	1373	TABLE E/D	8
150	675	520	1307	1729	TABLE E	8
200	959	600	1681	2143	TABLE E	8
250	959	730	1825	2349	TABLE E	12

PRODUCT CODES

65-350L / 65mm DCV (TBL. E)
80-350L / 80mm DCV (TBL. E)
100-350L / 100mm DCV (TBL. E)
100-350LD / 100mm DCV (TBL. D)
150-350L / 150mm DCV (TBL. E)
200-350L / 200mm DCV (TBL. E)
250-350L / 250mm DCV (TBL. E)

ADDITIONAL CODE SUFFIX

LCBW	Wafer Valve & Line Strainer
LCG	Gate Valve & Line Strainer
LCBL	Lugged Valve & Strainer
LCBWO	Wafer Gear Operated Butterfly Valve & Strainer
LCBLO	Lugged Gear Operated Butterfly Valve & Strainer

STANDARDS COMPLIANCE

- Australian Watermark (AS/NZS 2845.1) Approved Lic. 1379
- Type Tested AS/NZS 4020 Lic. 20111
- UL Classified
- FM Approved



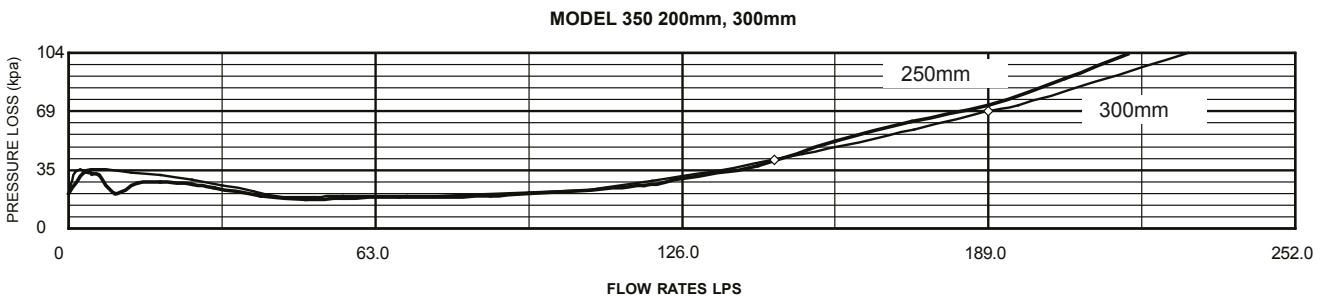
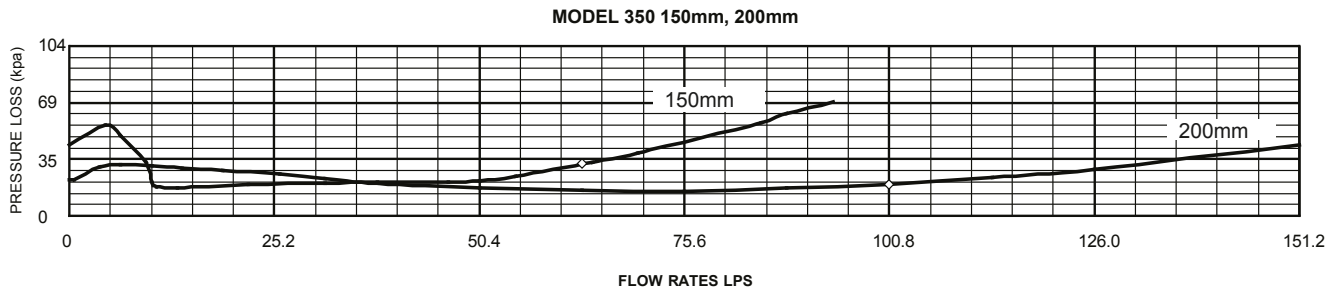
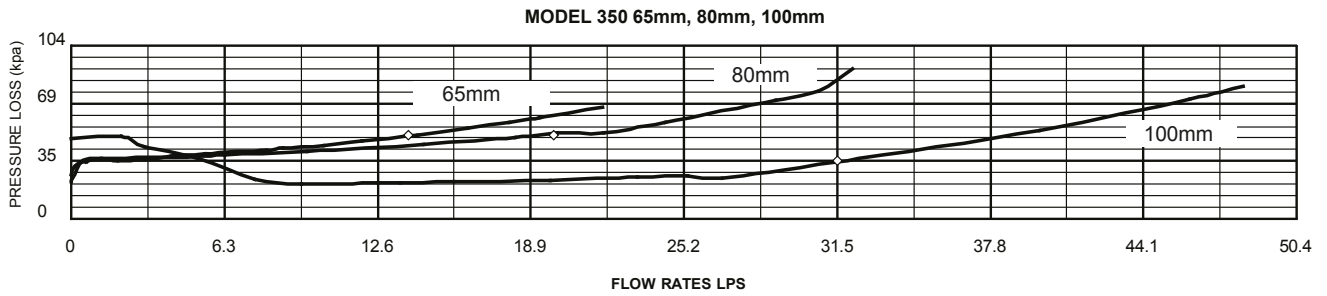


MODEL 350

65MM - 250MM DOUBLE CHECK VALVE ASSEMBLY

Dimensional Data (mm) are Subject to Manufacturing Tolerances and Change Without Notice

FLOW RATES AND PRESSURE LOSSES



Rated Flow (Established by approval agencies)

Please note : The pressure losses depicted in the tables are for the device only and not the complete assembly.

Installation and maintenance instructions for LILO XXL Rainwater Underground Tank

LILO XXL 20.000 - 65.000 l

Order No.:

20000 l: 391000 (391810+371018+371065)

25000 l: 391001 (391811+371018+371065)

30000 l: 391002 (391812+371018+371065)

35000 l: 391003 (391813+371018+371065)

40000 l: 391004 (391814+371018+371065)

45000 l: 391005 (391815+371018+371065)

50000 l: 391006 (391816+371018+371065)

55000 l: 391007 (391817+371018+371065)

60000 l: 391008 (391818+371018+371065)

65000 l: 391009 (391819+371018+371065)

LILO XXL infiltration tank

20.000 – 65.000 l: 391450 - 391459



The points described in these instructions must be observed under all circumstances. All warranty rights are invalidated in the event of non-observance. Separate installation instructions are enclosed in the transportation packaging for all additional articles purchased from GARANTIA.

Missing instructions must be requested from us immediately.

The tank must be checked for any damage prior to insertion into the trench under all circumstances.

Missing instructions can be downloaded on www.graf.info or can be requested from GARANTIA.

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1. General notes

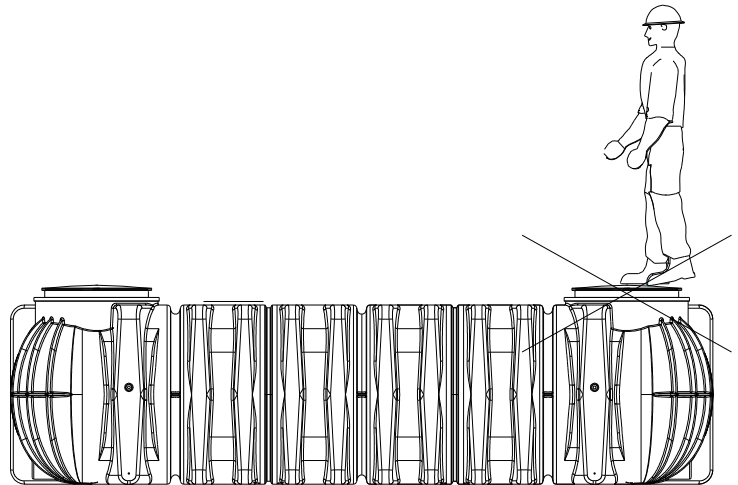
1.1 Security

The relevant accident prevention regulations according to BGV C22 must be observed during all work. Particularly when walking on the tanks, a 2nd person is required to secure the tank.

The relevant regulations and standards must additionally be taken into consideration during installation, assembly, servicing, repair, etc. Relevant notes can be found in the corresponding sections of these instructions.

During all work on the system or parts of the system, the entire system must always be rendered inoperable and secured to prevent unauthorised reactivation.

Except in the event of work carried out in the tank, the cover of the tank must always be kept sealed, as this otherwise constitutes a maximum risk of accident. The rain protection installed on delivery is merely transportation packaging. It cannot be walked on and is not child-proof; it must be replaced with a suitable cover immediately following delivery (telescopic dome shaft with corresponding cover)!



Only original GARANTIA covers or covers approved in writing by GARANTIA must be used.

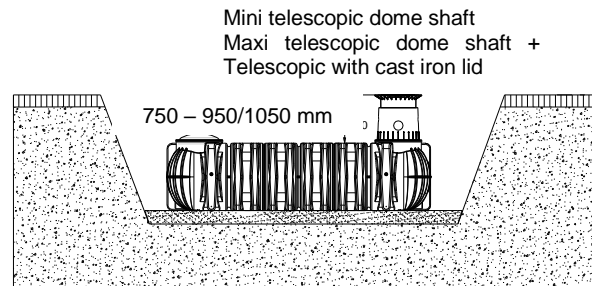
GARANTIA offers an extensive range of accessories, all of which are designed to match each other, and which can be extended to form complete systems. The use of accessories that have not been approved by GARANTIA results in the exclusion of the warranty/guarantee.

1.2 Identification obligation

All service water pipes and outlets must be identified in writing with the words "**Not drinking water**" or in the form of images (DIN 1988 Part 2, Para. 3.3.2.) to avoid inadvertent connection with the drinking water mains even after several years. Mix-ups, e.g., by children, may still occur even in the case of correct identification. All service water extraction points must therefore be installed with valves with **child-proof locks**.

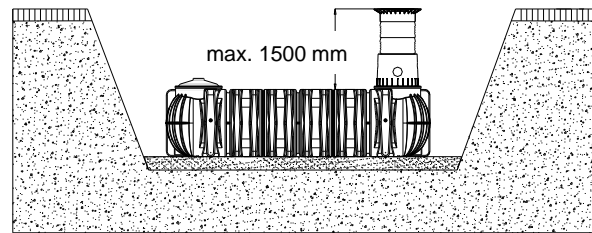
2. Installation conditions

Coverage heights with telescopic dome shaft in green areas.



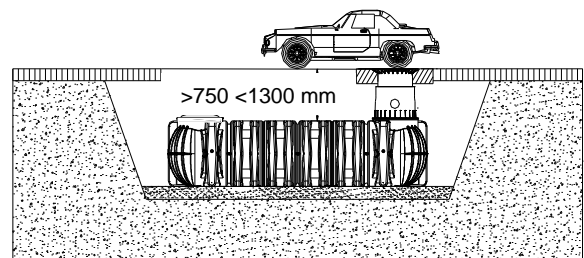
Maximum coverage heights with extension and telescopic dome shaft.

(in green areas only – not under passable areas)



Cover heights with cast iron telescopic dome shaft (class B) in area driven over by vehicles up to 3.5 tonnes.

(without groundwater and stratum water)

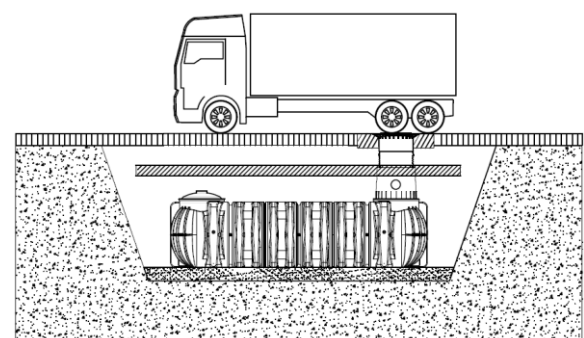


Cover heights with HGV-bearing telescopic dome shaft

(With cover class D – provided by customer), in area driven over by HGVs.

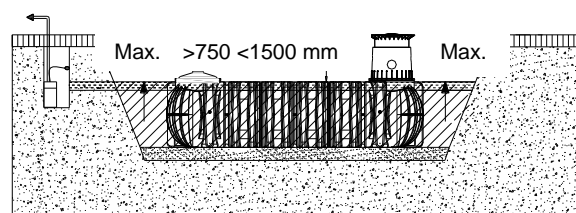
(Without groundwater and stratum water)

Please note: HGV can only be driven over if a self-supporting, (Steel)-reinforced concrete plate is installed



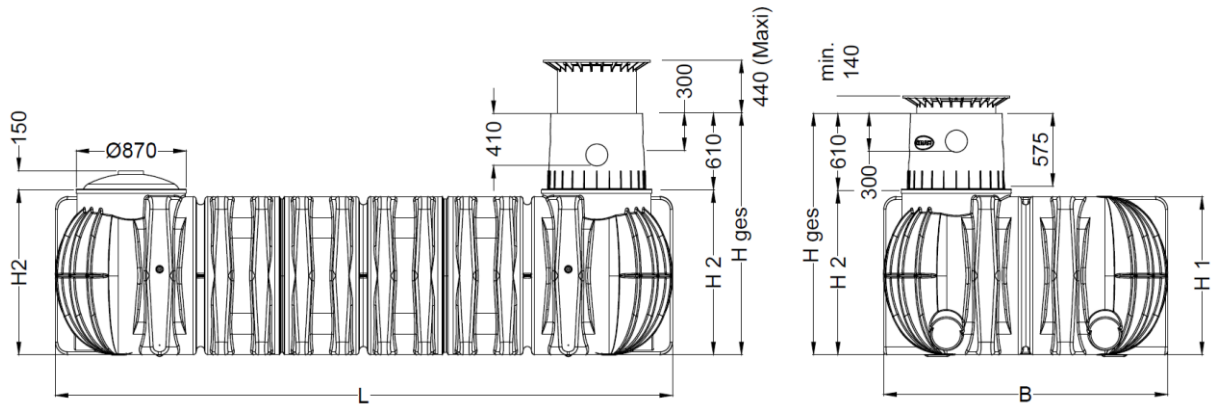
Coverage heights on installation in groundwater – the hatched area specifies the permissible immersion depth for the tank.

(Not under passable areas)



3. Technical data

3.1 Technical Data Lilo XXL



3.2 Overview tanks Lilo XXL

Tank	20.000 L	25.000 L	30.000 L	35.000 L	40.000 L
Art. No.	391000	391001	391002	391003	391004
Weight	890 kg	1105 kg	1355 kg	1570 kg	1750 kg
L	9405 mm	12005 mm	14265 mm	16510 mm	18430 mm
W	2250 mm	2250 mm	2250 mm	2250 mm	2250 mm
H ₁	1250 mm	1250 mm	1250 mm	1250 mm	1250 mm
H ₂	1300 mm	1300 mm	1300 mm	1300 mm	1300 mm
Htot*	1910 mm	1910 mm	1910 mm	1910 mm	1910 mm

Tank	45.000 L	50.000 L	55.000 L	60.000 L	65.000 L
Art. No.	391005	391006	391007	391008	391009
Weight	2000 kg	2180 kg	2395 kg	2645 kg	2825 kg
L	21030 mm	22935 mm	25195 mm	27795 mm	29700 mm
W	2250 mm	2250 mm	2250 mm	2250 mm	2250 mm
H ₁	1250 mm	1250 mm	1250 mm	1250 mm	1250 mm
H ₂	1300 mm	1300 mm	1300 mm	1300 mm	1300 mm
Htot*	1910 mm	1910 mm	1910 mm	1910 mm	1910 mm

* Htot = total height

4. Tank structure

① Cover

② Telescopic dome shaft
(Can be inclined by 5°)

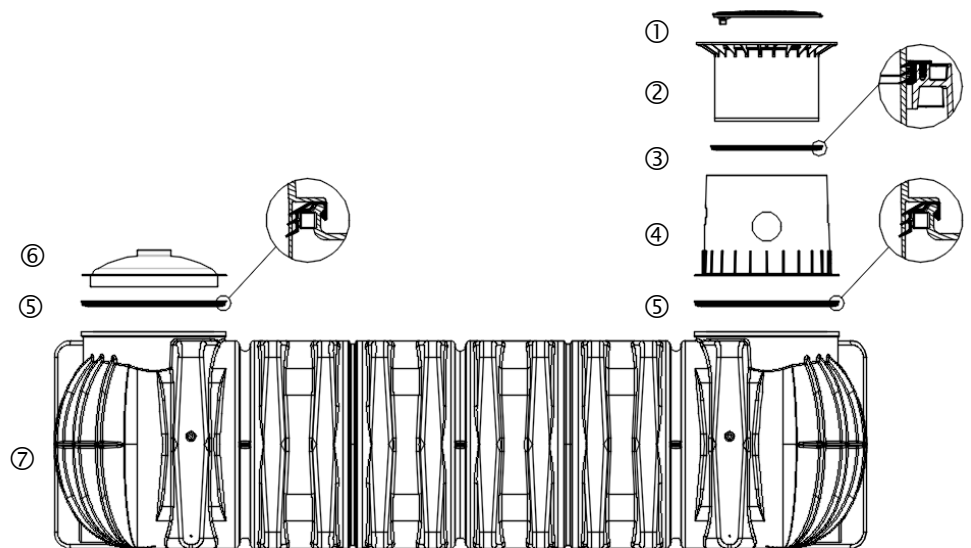
③ Profile seal

④ Tank dome
(Can be rotated by 360°)

⑤ Tank seal-Tank dome

⑥ Tank dome sealing plug

⑦ Lilo XXL tank



5. Installation and assembly

① Subsoil

② Telescopic dome shaft

③ Compacted foundation

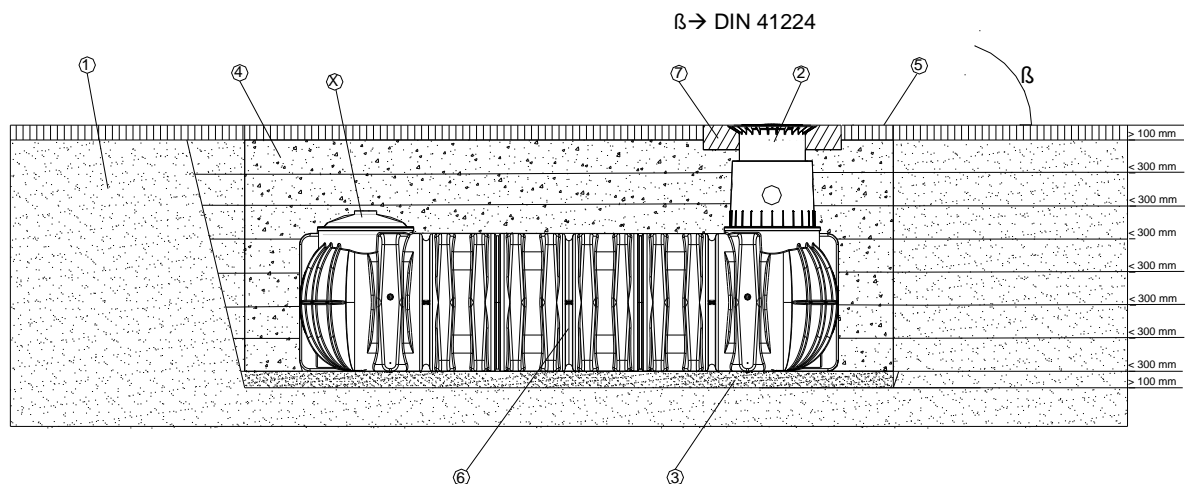
④ Surrounding (round-grained gravel, max. grain size 8/16)

⑤ Covering layer

⑥ LILO XXL Rainwater Underground Tank

⑦ Concrete layer for passable surfaces

B --> DIN 4124 from 1250 mm depth of the trench



5. Installation and assembly

5.1 Construction site

Under all circumstances, the following points must be clarified prior to installation:

- The structural suitability of the ground according to DIN 18196
- Maximum groundwater levels which occur and drainage capability of the subsoil
- Types of loads which occur, e.g. traffic loads

An expert ground report should be requested from the local planning authority to determine the physical characteristics of the subsoil.

5.2 Trench

To ensure that sufficient space is available for working, the base area of the trench must exceed the dimensions of the tank by > 100 mm on each side; the distance from solid constructions must be at least 1000 mm.

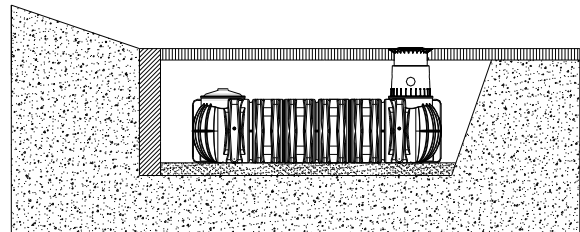
If the depth of the trench is > 1250 mm an embankment must be designed according to DIN 4124. The construction site must be horizontal and plane and must guarantee sufficient load-bearing capacity.

The depth of the trench must be dimensioned so that the max. earth coverage (see point 2 – installation conditions) above the tank is not exceeded. To use the system throughout the entire year, it is necessary to install the tank and those parts of the system which conduct water in the frost-free area. The frost-free depth is usually approx. 600 mm – 800 mm; precise information in this regard can be obtained from the responsible authority.

A layer of compacted, round-grain gravel (grain size 8/16, thickness approx. 100 - 150 mm) is applied as the foundation.

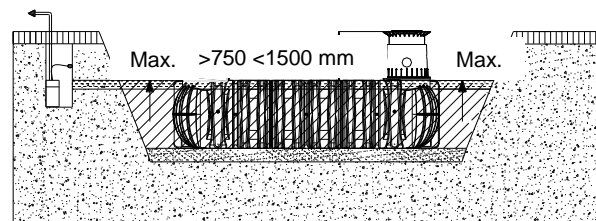
5.2.1 Slope, embankment, etc.

On installation of the tank in the immediate vicinity (< 5 m) of a slope, earthen mound, or slope, a statically calculated supporting wall must be erected to absorb the soil pressure. The wall must exceed the dimensions of the tank by at least 500 mm in all directions and must be located at least 1000 mm away from the tank.



5.2.2 Groundwater and cohesive (water-impermeable) soils (e.g. clay soil)

If it is anticipated that the tanks will be immersed deeper into the groundwater than is shown in the adjacent figure, sufficient dissipation must be ensured. (See table for max. immersion depth). Dissipation of the drainage water (e.g., via an annular drainage system) is recommended in the case of cohesive, water-impermeable soils.



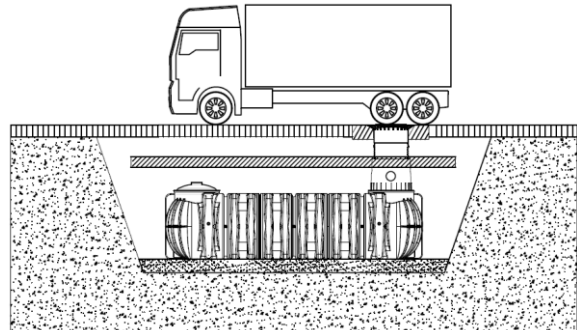
Tank	20.000 l - 65.000 l
max. immersion depth	1250 mm

5. Installation and assembly

5.2.3 Installation below HGV-bearing surfaces

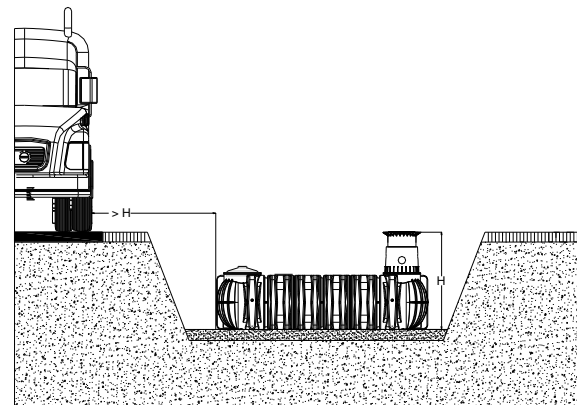
The shaft can only be driven over with HGV in conjunction with a self-supporting, iron-reinforced concrete plate. To ensure that no additional forces or effects of HGV-bearing are transferred to the tanks, the dimensions and strength of the concrete plate must be statically calculated.

If you have any questions in this regard, please contact your GRAF-Team.



5.2.4 Installation adjacent to surfaces used by vehicles

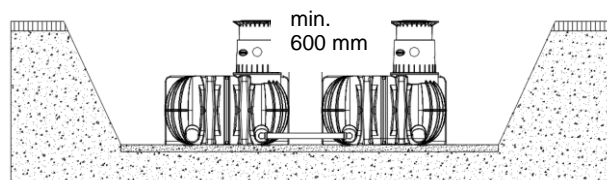
If the underground tanks are installed adjacent to surfaces which are used by heavy vehicles weighing over 3,5 t, the minimum distance away from these surfaces is at least the depth of the trench.



5.2.5 Connection of several tanks

Two or more tanks are connected via the assembly surfaces by means of GARANTIA special seals and basic pipes (to be provided at construction site).

The apertures must be drilled to the corresponding size using only the GARANTIA special crown bit. It must be ensured that the distance between the tanks is at least 600 mm. The pipes must project at least 200 mm into the tanks.



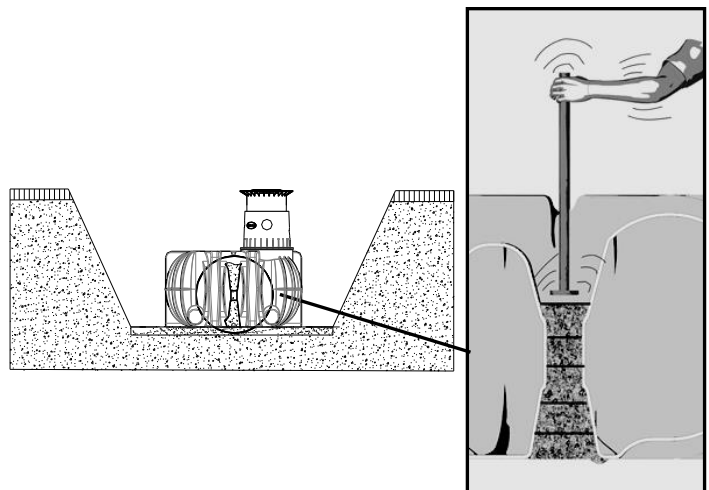
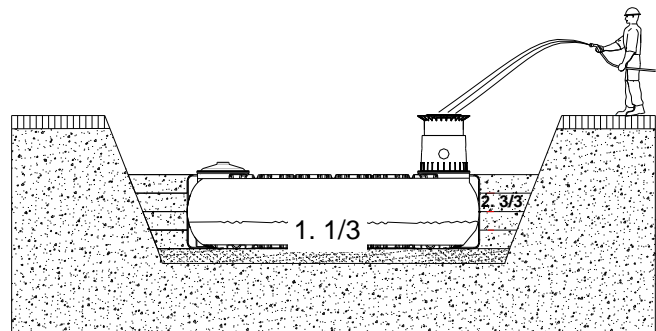
5. Installation and assembly

5.3 Insertion and filling

The tanks must be inserted, impact-free, into the prepared trench using suitable equipment. To avoid deformities, the tank is filled 1/3 with water before filling in the tank surrounding.

Afterwards the surrounding (round grain gravel, max. grain size 8/ 16) is then filled in layers of max. 30 cm steps and is compacted.

The individual layers as well as the medial support column must be well-compacted (Manuel tamper). Damage to the tank must be avoided during compaction. Mechanical compaction machines must not be used under any circumstances. The surrounding towards the trench must be at least 100 mm wide.

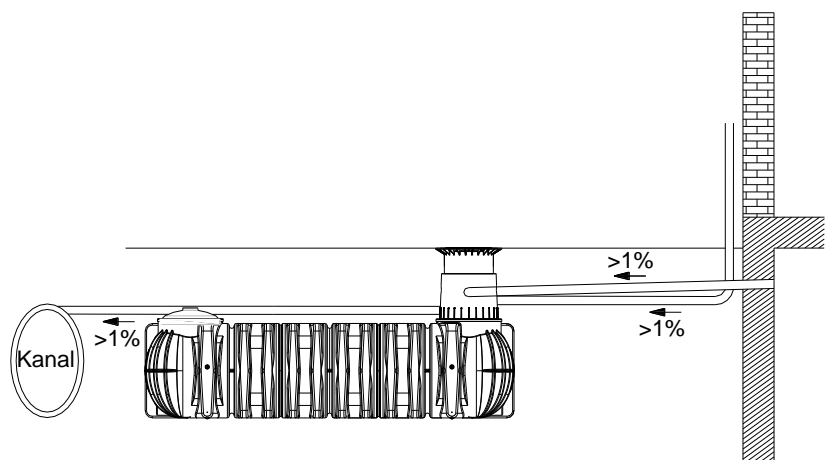


5.4 Routing connections

All feed and overflow pipes must be routed with a decline of at least 1 % in the direction of flow (possible, subsequent settling must be taken into consideration in this case). If the tank overflow is connected to a public sewer, this must be protected against reflux by means of a lifting station (mixed sewer) or reflux seal (pure rainwater sewer) according to DIN 1986.

All suction, pressure and control lines must be routed in an empty pipe, which must be routed as straight as possible, without bending to the tank with a decline. Necessary bends must be formed using 30° moulded sections.

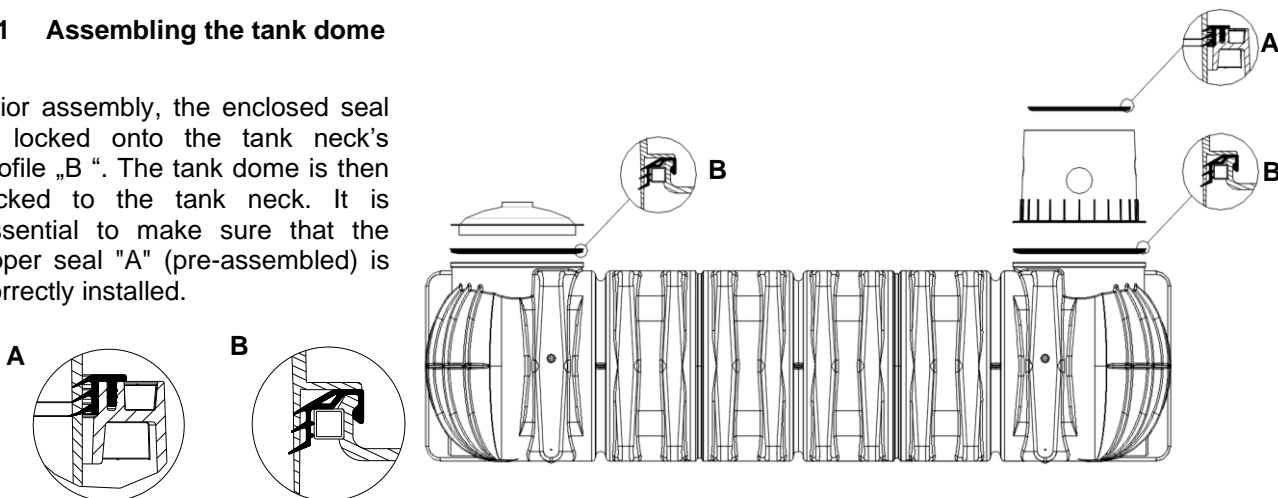
Important: The empty pipe must be connected to an aperture **above** the max. water level.



6. Assembling the tank dome telescopic dome shaft

6.1 Assembling the tank dome

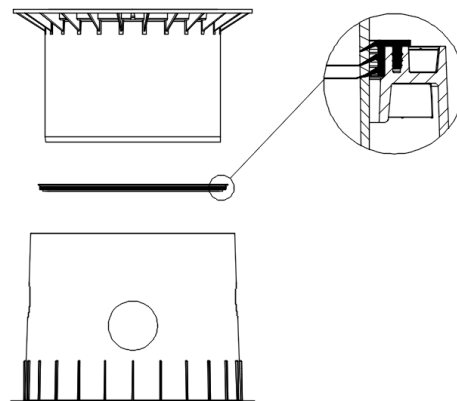
Prior assembly, the enclosed seal is locked onto the tank neck's profile „B“. The tank dome is then locked to the tank neck. It is essential to make sure that the upper seal "A" (pre-assembled) is correctly installed.



6.2 Assembling the telescopic dome shaft

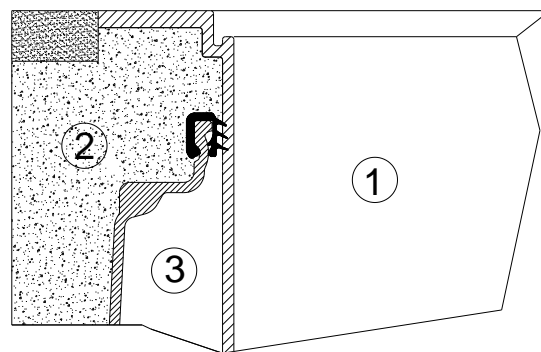
The telescopic dome shaft enables infinite adaptation of the tank to given site surfaces with earth coverage of between 750 mm and 950 mm (Mini telescopic dome shaft) or 750 mm and 1050 mm (Maxi telescopic dome shaft).

For assembly purposes, the enclosed profile seal (material EPDM) is inserted into the tank dome's sealing groove and is coated generously with soft soap (do not use mineral oil-based lubricants, as these attack the seal). The telescope is then greased, inserted and aligned with the surface of the site.



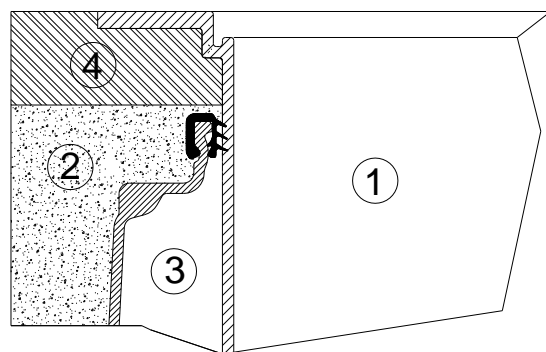
6.3 Telescopic dome shaft on which persons may walk

Important: To prevent loads from being transferred onto the tank, round-grain gravel ② (max. grain size 8/ 16) is filled in layers around the telescope ① and is evenly compacted. Damage to the tank dome ③ and telescope must be avoided during this step. The cover is then positioned and is sealed to prevent entry by children. **Tighten the threaded connection on the cover so tightly that it cannot be opened by a child!**



6.4 Telescopic dome shaft over which passenger cars may drive

If the tank is installed under areas used by passenger cars, the collar area of the telescope ① (colour anthracite) must be supported with concrete ④ (load class B25 = 250 kg/ m²). The layer of concrete to be installed must be at least 300 mm wide and approx. 200 mm high all around. The permitted coverage above the shoulder of the tank is min. **750 mm** and max. **1300 mm**. There are different possibilities for lengthening the tank dome (610 mm): telescopic dome shaft with cast iron lid or HGV (max. effective length 440 mm) as well as the Adapter (max. effective length 300 mm).



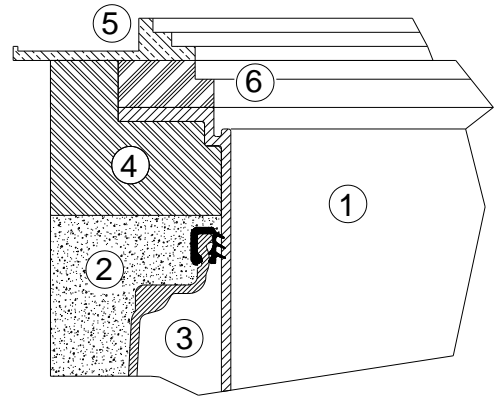
Attention: Use the cast cover under all circumstances.

6. Assembling the tank dome and telescopic dome shaft

6.5 Telescopic dome shaft for HGV loading

When installing below surfaces driven on by HGVs, the telescope is lined ① as described in 6.4. The concrete rings ⑥ (diameter 600 mm) and a cast frame ⑤ with star-shaped load distribution are then installed to support the cast cover. The cast frame must have a contact area of approx. 1 m². To extend the shaft, the telescopic dome shaft for HGV loading with class D cover, provided by the customer (max. useful length 440 mm), and the spacer (max. useful length 300 mm) can be used.

Please note: Can only be driven over with HGV, if a self-supporting, steel-reinforced concrete plate is installed!



7. Assembly of the adapter

7.1 Assembling the extension

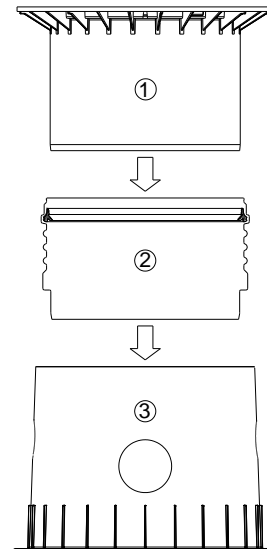
For larger coverage heights an extension is needed. To insert the extension into the tank dome, soft soap is needed. Into the highest groove of the extension the profile seal is inserted and greased generously. Afterwards push the telescopic dome shaft into the extension and adapt it to the planned area surface.

max. earth-cover 1500 mm

① Telescopic dome shaft (can be inclined by 5°)

② Extension

③ Tank dome (can be rotated by 360°)



8. Lilo XXL Infiltration Tank

8.1 Lilo XXL-Infiltration Tank

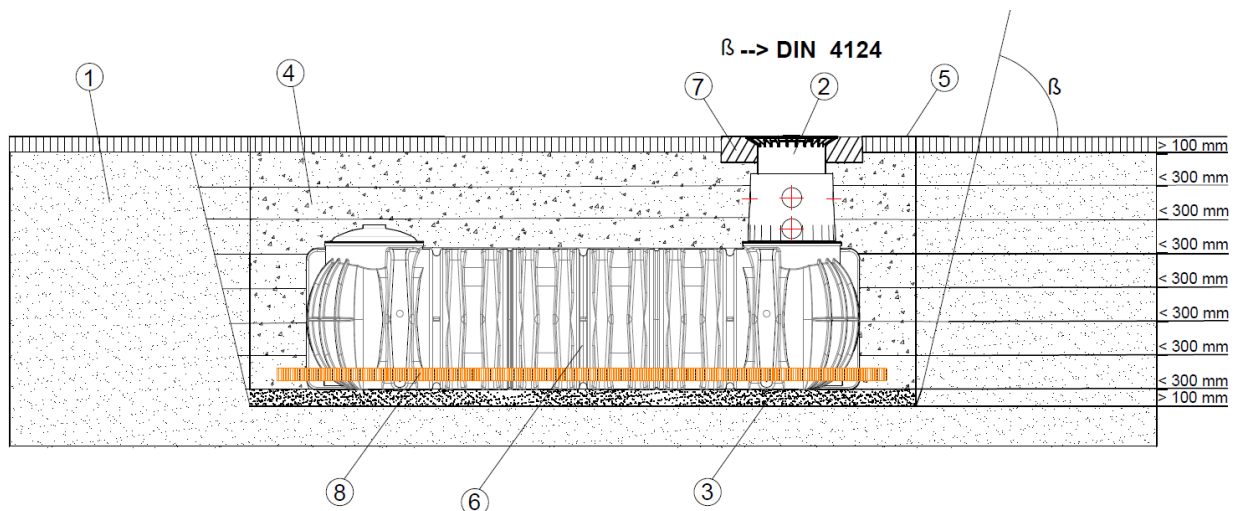
The LILO XXL tank is also available for using for the infiltration of rainwater. The GRAF team would be pleased to help you to determine the correct size for your building project. Pre-filtering of the rainwater with a suitably sized filter is required for seamless operation of the Lilo XXL infiltration tank. For this purpose, external pre-filters are available in the GRAF product range for cleaning and filtering rainwater up to inlet and outlet dimensions of DN300. Internal filters with connecting dimensions of up to a maximum of DN150 are also available.

Both internal and external pre-filters can be used. However, the filters must be sized correctly for the collection of dirt and coarse materials, and the emergency overflows of the filters must by-pass Lilo XXL infiltration tank.

8.2 Installation and assembly

Note: In order to ensure the calculated infiltration performance, make sure that there is sufficient working space. Therefore, the base area of the trench should exceed the dimensions of the tank on each side by > 500 mm.

- | | |
|--|--------------------------------------|
| ① Soil | ⑤ Covering layer |
| ② Telescopic dome shaft | ⑥ Lilo XXL infiltration tank |
| ③ Compacted base layer | ⑦ Concrete layer for driven-on areas |
| ④ Surround (round gravel, max. grain 8/16) | ⑧ Point drainage for infiltration |
- β** --> DIN 4124 from trench depth of 1250 mm



8.3 Preparing and shortening the drainage pipes

The channel drainage that is required must be cut to size from the supplied roll of drainage pipe on site. The following sections are required for assembly:

- Ⓐ 4x 0.5 m connection sewer pipes (pre-installed)
- Ⓑ 2x 1.2 m connecting piece, lateral (drainage pipe must be cut to size)
- Ⓒ 2x longitudinal section, long side (drainage pipe must be cut to size)
- Ⓓ 4x drainage branches (included in scope of delivery)

The scope of delivery also includes four drainage branches Ⓓ for connecting the surrounding point drainage to the front end. First the four connections to the slide-in unit Ⓐ and the two lateral connections Ⓑ are cut from the supplied roll of drainage pipe. The remainder of the roll is cut into two longitudinal sections of equal length Ⓒ.

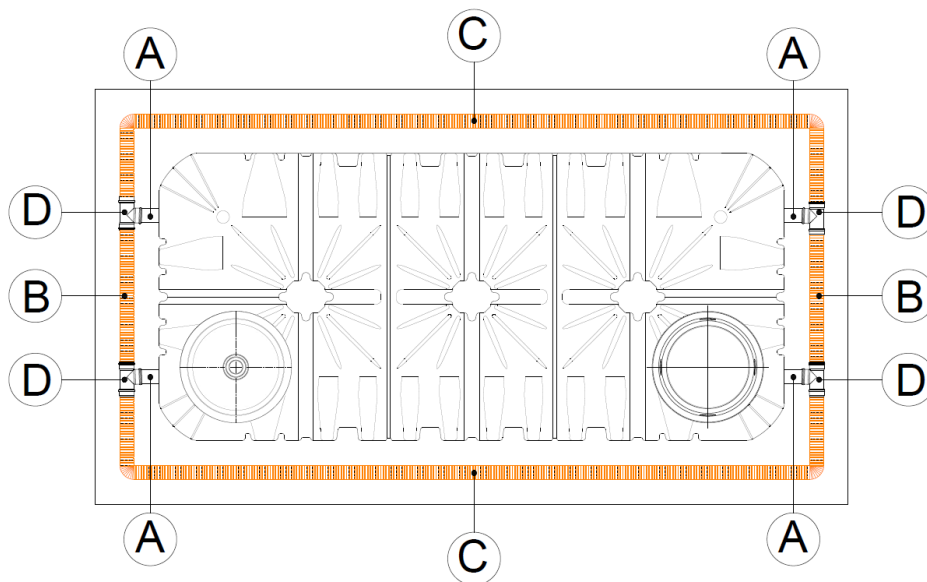
The longitudinal pieces which are produced Ⓒ are now placed into the trench along the long side on the right and left of the Lilo XXL infiltration tank.

8. Lilo XXL Infiltration Tank

8.4 Assembling the drainage accessories

The Lilo XXL infiltration tank is supplied with four inserted DN150 special seals on the lower front-end. The drainage branches ④ are pushed onto the outer ends of the connecting sewer pipes ①. Two of the four drainage branches ④ are connected to each other laterally using the prepared connection ②. Note that the connectors are inserted to a maximum of 100 mm. The ends of the laid longitudinal sections ③ are then also inserted into the drainage branches ④.

- ① 4x 0.5 m connection sewer pipes (pre-installed)
- ② 2x 1.2 m connecting piece, lateral (drainage pipe must be cut to size)
- ③ 2x longitudinal section, long side (drainage pipe must be cut to size)
- ④ 4x drainage branches (included in scope of delivery)

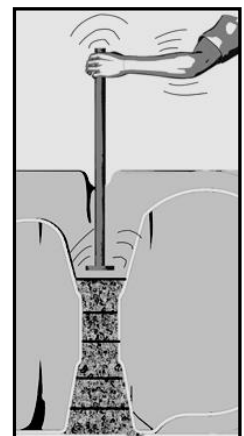


8.5 Filling

Side filling must be carried out using permeable and granular material (e.g. round-grained gravel with max. grain size of 8/16). Filling must take place in small steps, and particularly in the vicinity of the centre support columns the filling material must be properly compacted (see figure with hand tamper). Be careful to avoid damaging the tank when compacting. Mechanical compacting machines must not be used under any circumstances.

8.6 Laying connections and fitting the cover

The installation steps for laying the connections which are needed can be found in chapter 5.4. The installation of the tank dome, intermediate sections and the various covers is also described in chapters 6 & 7.



9. Inspection and servicing

The entire system must be checked for leaks, cleanliness, and stability at least every three months.

The entire system should be serviced at intervals of approx. 5 years. In this case, all parts of the system must be cleaned, and their function checked. Servicing should be carried out as follows:

- Drain the tank completely
- Clean surfaces and internal parts with water
- Remove all dirt from the tank
- Check that all internal parts are firmly seated.

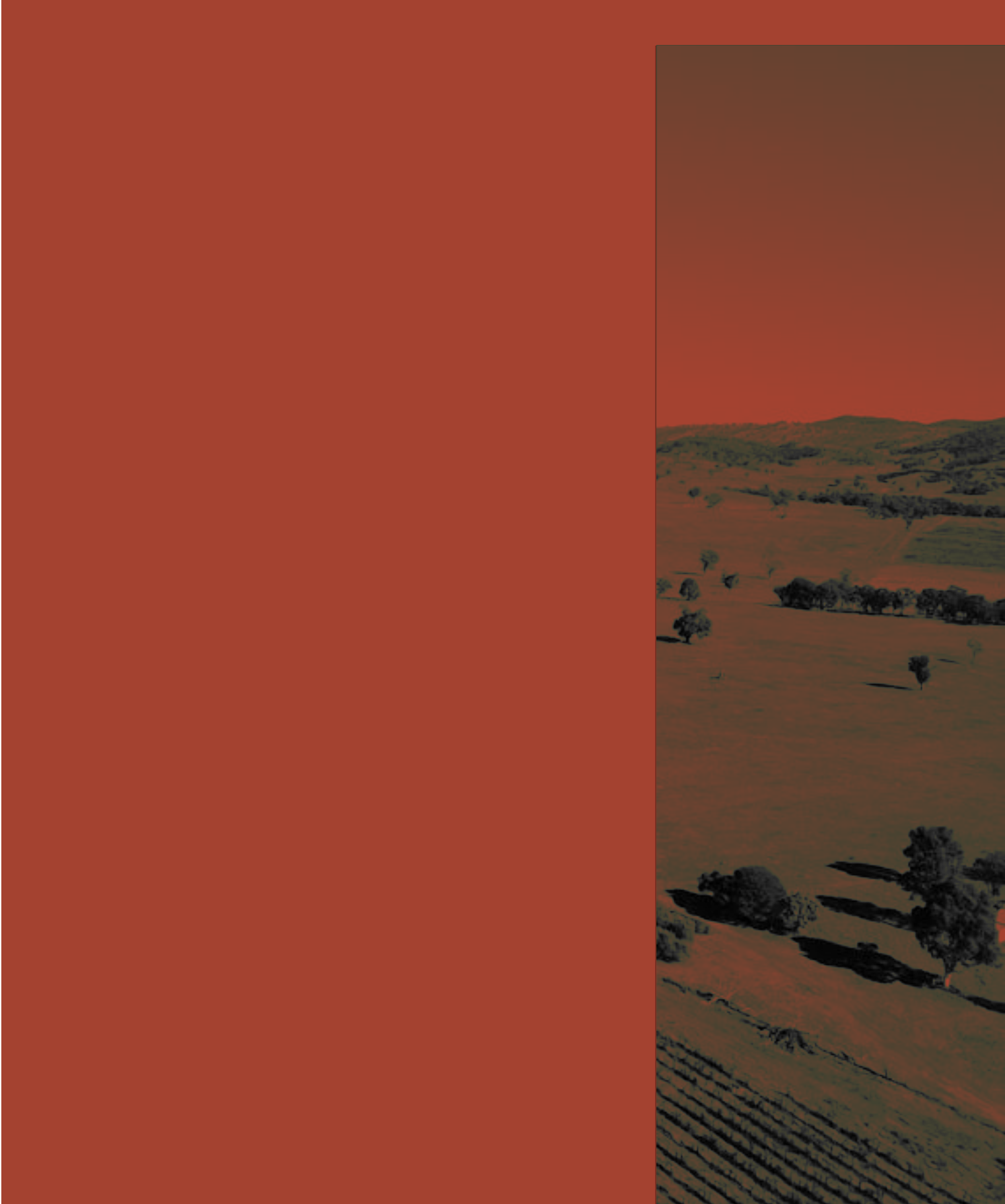


Appendix D

COST ESTIMATES

Preliminaries	Qty	Unit	Amount
Site Establishment	Item	Lump Sum	\$ 85,000
Site Disestablishment	Item	Lump Sum	\$ 85,000
CEMP,SMP,TMP and QMP	Item	Lump Sum	\$ 139,685
Sub Total			\$ 309,685
Sewer Rising Main	Qty	Unit	Amount
Service Location	Item	Lump Sum	\$ 8,100
DN150 Valves / Flowmeters	Item	Lump Sum	\$ 80,420
DN150 Fittings	Item	Lump Sum	\$ 9,520
Supply DN150 PVC pipe	6750	m	\$ 239,828
Install DN150 PVC	6750	m	\$ 804,749
DN150 Open Cut Road Crossing	10	m	\$ 1,140.00
Drill Culvert crossing	20	m	\$ 20,820.00
Drill past Trees	100	m	\$ 94,420.00
WAE	6750	m	\$ 7,830
Testing and commissioning	6750	m	\$ 31,050
Sub Total			\$1,297,876
Sewer Pump Station, Septic tank and storage	Qty	Unit	Amount
Wet well 1.8m dia	Item	Lump Sum	\$ 238,500
Pumps	2	Lump Sum	\$ 22,340
Pit and Conduit System	Item	Lump Sum	\$ 7,300
LV Station Power Supply	Item	Lump Sum	\$ 10,620
Switchboard	Item	Lump Sum	\$ 49,375
PLC / Telemetry Hardware	Item	Lump Sum	\$ 14,438
PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 28,450
Installation/Cabling (Electrical)	Item	Lump Sum	\$ 10,738
Odour Control	Item	Lump Sum	\$ 80,000
Septic tank and underground storage tanks	Item	Lump Sum	\$ 1,560,000
Preparation and submission of Operation and Maintenance Information	Item	Lump Sum	\$ 4,800
Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000
Preparation and submission of Work as Constructed Information	Item	Lump Sum	\$ 7,200
Sub Total			\$2,041,760

Lead in Watermain	Qty	Unit	Amount
Service Location	Item	Lump Sum	\$ 5,700
DN150 Valves / Flowmeters	Item	Lump Sum	\$ 60,780
DN150 Fittings	Item	Lump Sum	\$ 10,640
Supply DN150 PVC pipe	7500	m	\$ 266,475
Install DN150 PVC (Trench type B)	7500	m	\$ 918,150
DN150 Open Cut Road Crossing	10	m	\$ 1,140.00
Drill Culvert crossing	20	m	\$ 20,820.00
Drill past Trees	100	m	\$ 94,420.00
WAE	7500	m	\$ 8,700
Grass seeding	16875	m2	\$ 133,313
Sub Total			\$1,520,138
Onsite water treatment, storage and supply system	Qty	Unit	Amount
Private 1.5m dia 2 Pump(s)	Item	Lump Sum	\$ 76,250
Pumps	2	Lump Sum	\$ 10,630
Pit and Conduit System	Item	Lump Sum	\$ 3,875
LV Station Power Supply	Item	Lump Sum	\$ 6,120
Switchboard	Item	Lump Sum	\$ 68,000
PLC / Telemetry Hardware	Item	Lump Sum	\$ 16,120
PLC / Telemetry / Scada Engineering and Software Development	Item	Lump Sum	\$ 31,720
Pressure Transmitter/Gauge Board	Item	Lump Sum	\$ 11,875
Installation/Cabling (Electrical)	Item	Lump Sum	\$ 11,987
Pre commissioning and commissioning	Item	Lump Sum	\$ 8,000
Work as Constructed Information	Item	Lump Sum	\$ 7,200
Disinfection system	Item	Lump Sum	\$ 80,000
200kL storage tanks	Item	Lump Sum	\$ 225,000
Gravel pavement	250	m2	\$ 20,000
Sub Total			\$576,777
Reticulation Watermains	Qty	Unit	Amount
DN100 Valves	Item	Lump Sum	\$ 41,590
DN100 Fittings	Item	Lump Sum	\$ 5,040
Supply DN100 PVC pipe	5500	m	\$ 97,708
Install DN100 PVC (Trench type B)	5500	m	\$ 266,200
WAE	Item	Lump Sum	\$ 6,380
Sub Total			\$416,918
Sewer Gravity Mains	Qty	Unit	Amount
Supply DN150 PVC pipe	5370	m	\$ 64,440
Construct DN150 PVC (Trench type 3)	5370	m	\$ 458,598
Maintenance Shafts	60	Each	\$ 72,000
WAE	5370	Each	\$ 6,229
Sub Total			\$601,267
Estimated construction cost			\$ 6,764,421



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