



Government
of South Australia



DESIGN MANUAL

for

Pressure Sewer Systems

FOR USE BY CONSULTANTS

April 2010

Table of Contents

1.0	INTRODUCTION.....	1
2.0	DESIGN GENERAL	2
2.1	Design Objectives	2
2.2	Limited Numbers of Pressure Sewer Technology	2
2.3	The Design/ Approval Process.....	3
2.4	Design Components	5
2.5	Installation of Pumping Units in Public Places.....	6
2.6	Designing for Highly Fluctuation Loads	6
2.7	Single Pumping Unit/ Property's	7
3.0	RETICULATION DESIGN.....	8
3.1	Design Targets	8
3.2	Design Methods for Reticulation Systems.....	8
3.3	Reticulation Mains General	9
3.4	Pipes	11
3.5	Valves and Fittings	12
3.6	Reticulation Zones	13
3.7	Odour Control	13
3.8	Flushing Points.....	14
3.9	Flushing Program.....	14
3.10	Boundary Kits	15
3.11	Residential Connection	15
3.12	Reticulation Drawings	15
3.13	Discharge Point to SA Water Sewers	16
3.14	Bill of Quantities.....	17
3.15	Directionally Drilled Section	18
3.16	Non Residential Connections.....	18
3.17	Standards and Regulations.....	18
4.0	ON THE PROPERTY DESIGN.....	19
4.1	Design Objectives	19
4.2	Typical Pressure Sewer Layout	19
4.3	Pumping Unit Requirements.....	22
4.4	Pumps and Pump Protection	24
4.5	Alarms and Controls	26
4.6	Positive Covenants.....	26
4.7	On the Property Drawings	26
4.8	Household Audits.....	27
4.9	Generator Options.....	27
4.10	Spa's.....	27
4.11	Swimming Pools	28

5.0	TESTING AND COMMISSIONING	29
5.1	Reticulation Pipe Testing.....	29
5.2	Reticulation Design Testing.....	29
5.3	On Property Testing.....	29
5.4	Commission of Pumps	29
6.0	NEW SUBDIVISIONS	30
6.1	Conditions Applying to New Subdivisions.....	31
6.2	Procurement of Pumping Units.....	32
6.3	Size of Pump/Collection Tank.....	33
6.4	Design of Reticulation Mains	34
6.5	Connection of Building to Pumping Unit	34
7.0	MAINTENANCE OF SYSTEMS.....	35
7.1	Notification of Alarm.....	35
7.2	Response Procedures	35
7.3	Proof of Identity	35
7.4	Access to the Pumping Unit.....	35
7.5	Spare Pumps.....	36
8.0	HOME OWNERS MANUAL	37
8.1	Requirements of Designer.....	37
8.2	New Subdivisions	37
8.3	Existing Developments	37
8.4	Spare Copies of the Home Owners Manual.....	37
8.5	SUPPORTING THE HOME OWNERS MANUAL	37
9.0	COMMUNITY CONSULTANTION.....	39
10.0	INFORMATION TO BE PROVIDED TO SA WATER	40
Attachment N^o1	Terminology used in this manual	42
Attachment N^o2	Preferred Pressure Sewer Technology Supplier	45
Attachment N^o3	Comparison of potential technologies	46

1.0 INTRODUCTION

This design manual has been prepared to provide a guide to those person(s)/ organisation(s) contemplating the use of pressure sewer systems in South Australia. It sets out how the South Australian Water Corporation (SA Water) wants those pressure sewer systems to be designed and what the Designer will need to initially provide for SA Water to gain approval to construct a pressure sewer system in the first instance.

This document is one in series of documents that link and form the overall direction and procedures in the adoption and installation of Pressure Sewer Systems in SA. Person(s)/ Organisation (s) seriously contemplating the use of this technology also needs to read:

- The SA Water Policy Statement on Pressure Sewer Systems.
- The SA Water Technical Specification on Pressure Sewer Systems.
- The Home Owner's Manual,

SA Water has a strong preference for conventional gravity sewerage systems as the means for providing sewerage services, but will agree to the installation of pressure sewer systems being used as a viable alternative under the following circumstances.

- The Pressure Sewer System has been determined to represent a significantly lower cost alternative (whole of life basis) than the more conventional gravity based system.
- There are potential inflow and infiltration problems in a particular area that the adoption of pressure sewer system will overcome.
- Existing individual properties or small clusters of properties on the edge of existing developments have not been able to be economically serviced by the existing sewerage system in that area.
- Particular environmental constraints applying in an area that cannot be met in the construction of a more conventional sewerage system.
- There are specific requirements to minimise the construction inconvenience to existing residents by using technologies that can be installed using directional drilling or other trenchless technologies.

Adoption of any pressure sewer system will require the approval of SA Water therefore the Proponent/ Developer for such a system will be required to initially demonstrate how it will meet the above requirements as well clearly setting out:

- Any potential environmental impacts.
- The existing regional servicing strategy covering the area where pressure sewer is being proposed for.
- The compatibility of the proposed wastewater infrastructure, with adjacent land areas, surrounding land zoning and the general development profile of the area where the sewerage system is to be installed.

2.0 DESIGN GENERAL

2.1 Design Objectives

The primary goals/ objectives required of any pressure sewer installation in South Australia will be to:

- Ensure the reticulation and property mains remain clear of any solids accumulation.
- Retain the sewage in the mains for a minimum time to avoid it becoming septic and thus difficult to treat.
- Ensure that the pressure head in the pipeline does not exceed the duty head.
- Ensure that vacant properties can be connected with relative ease at a latter date.
- Ensure the on property installation results in minimal inconvenience to the resident, by having a once on and off the property approach from the installation to the commissioning of the pumping unit.
- Ensure the involvement of the property owner in the design of the property layout in an attempt to meet their reasonable expectations, whilst still complying with the general thrusts of this design manual.
- Ensure there is minimal general inconvenience in the areas where the system is being installed.
- Ensure the system will operate satisfactory when only a minimal number of properties are connected. This needs to be particularly focussed on in new subdivisions, where development may take some time to reach the critical numbers the system was designed on.
- Minimise overall costs to the community in the installation of the sewerage system whilst still meeting the design objectives and requirements for the particular technology.
- Ensure the technology is supported by appropriate maintenance arrangements so that the installation of such a system will not disadvantage those that have pressure sewer systems in comparison with conventional gravity systems.

2.2 Limited Numbers of Pressure Sewer Technology

The number of pressure sewer technologies available in the market place has been increasing. Recognising the impracticality of supporting all of these technologies, SA Water will at any time only support a limited range of authorised technologies. This will avoid the high additional costs in:

- Holding a large range of spare pumps and spare parts. SA Water wants to be in a position, where a spare pump can be readily stored on the repair vehicle rather than having to travel to a set store and select the appropriate pump from a range of technologies in the store.
- To minimise overall staff training/ familiarisation with the different technologies.
- Differing commission/ warranty processes for the different technologies.
- General record tracking procedures needing to be different for each technology.
- Administration costs and other general costs.

SA Water will not accept handover of any unauthorised pressure technology.

SA Water will periodically let supply tenders for the procurement of the pumping units and currently SA Water holds contracts with the companies shown on Attachment 2. Any designer will need to familiarise themselves with this technology, and the preferences of that Technology Supplier in terms of valves/ fitting etc. Contact details of the current Technology Suppliers are provided in that Attachment.

2.3 The Design/ Approval Process

The Proponent/ Developer (and their system Designer), of a pressure sewer system, will need effectively to go through the following two stage process to gain SA Water Approval.

1) Hold an initial meeting with SA to agree the key parameters for a study of the potential technologies that can be used to service the development.

The Developer and/or the developer's designer are required to bring the following to that initial meeting:

- A clear indication of the preferred type of pressure sewer technology for the particular application.
- A preliminary pressure sewer layout drawing.
- The Designer's preliminary notes, including preliminary estimates of actual pump heads likely to be incurred at the individual homes.
- A summary of capital and operational costs, clearly demonstrating that pressure sewer will be more cost effective than conventional gravity sewerage, based on a 25 year NPV basis. All assumptions made in that process need to be identified, and it must also include the Developer's contributions towards the on-property costs. Refer to Attachment N^o 3.
- Details of the flows likely to be discharged into SA Water's sewerage system and these should also set out all of the stages of

the particular development, so that a discharge point can be determined into SA Water's sewers.

- Details of the Designer's experience with pressure sewer systems, including examples of where they have designed these systems before.
- Adjoining land zonings.
- Topographic considerations, including catchment boundaries and contour information.
- Past and future development profiles, including land release projections, etc.
- Likely study area description.
- Any other information that may be pertinent to the proposed development and future surrounding developments.

Following the initial meeting, SA Water will indicate in writing if pressure sewer systems can be pursued in the Development Application.

2) Second meeting with SA Water so that final approval to use pressure sewer technology in the Development Application will be given conditional, upon:

- The production of a final design that meets the design requirements, as set out in the design manual.
- A hydraulic computer model of the pressure sewer system, which identifies and confirms pipe sizes, and details the anticipated pressures at the differing contour points for the development.
- Proof that no odour will be generated in relation to sewage discharged from the pressure sewer system, and further verification that the quality of effluent produced will not add difficulties to the treatment plant. This includes details of any in main treatment or odour suppression equipment.
- Confirmation of the pumping units to be used in the development, and the number of spare units being provided. These units will need to meet the requirements spelt out in this design manual, and SA Water's Technical Specification.
- Environmental impacts of the proposal.
- How the remainder of the subdivision is to be serviced, if the application is only for part of the development.
- Details of flushing points and the preparation of a flushing program during the growth of the development. The frequency of this flushing needs to be indicated, in the form of a full flushing program.

- Details of pipes, valves and fittings.

Final Approval will be given by SA Water in writing.

2.4 Design Components

The pressure sewer system moves sewerage from a pumping unit, located on the property, through a series of reticulated mains to a designated discharge point. The system can be effectively divided into two distinct parts, these being:

- The on-property works.
- The reticulation mains.

2.4.1 The On-Property Component

This is defined as that part of the system that is upstream of the boundary kit, to the Connection Point (IP) on the inlet (dwelling side) of the pumping unit. These works comprise:

- The supply and installation of an individual pumping unit that has been approved for the purpose.
- The supply and installation of the sewer IP.
- The supply and installation of the property delivery line.
- The supply and installation of the alarm control panel.
- The connection of the pumping unit to the property power-board.
- The connection to the household sewerage drains.

The pumping unit comprises of the following key elements:

- A dedicated sewerage pump, which can be either a positive displacement pump or a centrifugal pump.
- A leak-proof collection tank that is round in shape and made of lightweight materials. The round shape allows installation by auger, and the lightweight materials eliminate the need for lifting equipment.
- Anti-buoyancy measures to prevent the collection tank floating out of the ground. This is typically some form of concrete ring beam.
- An alarm system, that warns if the pump has failed and the storage volume in the pumping unit is increasing.
- A grinder unit, to reduce all of the incoming sewerage to watery slurry capable of being passed through smaller diameter pipelines.
- Pump protection devices, to guard against overheating, overpressure or no-flow conditions.

- Valves, to ensure the pumping unit can be isolated at any time.

The household drains are not part of the pressure sewer system, but are part of the overall household sewerage system.

2.4.2 The Reticulation Component

This is defined as the mains from the discharge point, to and including the boundary kit on the property. The works include:

- The supply and installation of the reticulation mains, in the designated location, in the road reserve.
- The supply and installation of isolating and air valves in the reticulation mains, to facilitate the ongoing operation of these mains.
- The supply and installation of Boundary Kits, just inside the property.
- The supply and installation of flushing points in the reticulation mains.
- The marking of the lines.
- The supply and installation of odour suppression equipment (where required).
- The connection to the discharge point.

The pressure system needs to be discharged to a point where the receiving system has sufficient capacity to receive the discharges from the pressure sewer systems, and transport it to the sewage treatment plant.

2.5 Installation of Pumping Units in Public Places

Where the pumping units are to be installed on what is public property the lids to these structures are required to be locked in place to prevent entry by non-authorised personnel. A standard SA Water master keyed lock is to be used to achieve this, commensurate with SA master keying arrangements.

Alternative locking systems may be considered by SA Water and details are to be agreed before the proposal proceeds.

2.6 Designing for Highly Fluctuation Loads

Where the loads on the pumped mains, particularly rising mains may fluctuate considerably during the year the Designer needs to give effective consideration to the use of dual and different sized mains. Typical examples of this type of application will be, caravan parks and camping areas particularly in beachside areas, where the population will seasonally vary considerably as well as for special areas of events.

A small rising main can in these instances be adopted for small winter type discharges with a larger main that can be used singularly or in tandem for higher summer loads. The Designer must clearly demonstrate how their design deals with any fluctuating loads.

2.7 Single Pumping Unit / Property

As a general principle pressure sewer systems will be installed on the basis of one pumping unit per property for residential connection.

2.8 Single Technology per Development

Within each specific development for which a design has been created, the Designer needs to clearly identify what type (brand) of pumping units that design has been based on. This also must be clearly marked on the reticulation drawings.

Once that design has been approved, only that type of technology will be used in that design area for both installation and design purposes. SA Water may however choose to replace the technology over time for reasons of its own determination but will only do so after it has assured itself (by independent audit) that the proposed new technology is compatible with the existing reticulation systems. Installers of new systems will not be permitted to install a pumping unit other than that which is shown on the reticulation drawings they are constructing to.

3.0 RETICULATION DESIGN

Having defined the reticulation network as that area that covers from and including the boundary kit on the property to the system discharge point (s), this section sets out the design aspects that must be covered in relation to these systems.

3.1 Design Targets

The overall design of the pressure sewer system must meet the following design targets:

- The minimum velocity for self cleaning of the mains will be 0.6m/s. If the proponent believes this figure is not appropriate to their technology then they should submit details to SA Water on a revised figure indicating the basis of this new minimum velocity.
- The diameters of the pipes should ensure that the sewage is stored in the pipelines for the minimal time possible. Ideally the sewage should have spent no more than six to eight hours in the pressure sewer lines. This retention time may vary depending upon the exact location, and could in long lines or significant systems require in-main treatment or the inclusion of odour suppression equipment. It is a requirement that where sewage is determined to be older then the requirements above the matter will be raised at the second meeting as set out in section 2.3.
- The total head (as measured at the pump during operation) needs to be less than the stated duty head for the pumping unit as stated by the Technology Supplier. In a few isolated instances this may prove difficult and any exceptions need to be negotiated with SA Water.
- Where possible the system should be designed to allow sections to be repaired with minimal disruption to residents in the overall area.
- The system should be designed in zones to allow for the progressive installation of the pumping units as the mains are constructed.
- The system should allow for external flushing/ suction of the mains to keep them clean.

3.2 Design Methods for Reticulation Systems

The design methodology needs to be such that it is capable of determining with accuracy, the following:

- Peak loads as caused by normal diurnal loading.
- Peak loads caused as a result of fluctuating loads in holiday areas or for special one off events.
- Minimal loads in fluctuation flows such as holiday areas or for special events.

The determination of peak loads (i.e. the maximum number of pumps likely to be operating at one time) in the reticulation system can be via the Rational Method, Probability Method, or other approved methods. The proposed method needs to be agreed with the Technology Supplier for the particular development and agreed at the initial meeting as set out in section 2.3. As part of the approval process the Designer will need to clarify:

- Actual flows achieved in other locations and compare these with these predicated by the model. This includes an exploration of any discrepancies.
- The Designer's relative experience with the method adopted.
- Any assumptions made in the design.

3.3 Reticulation Mains General

The construction of the reticulation mains is to occur in accordance with the detailed procedures set out in SA Water's Technical Specification, but key factors to be considered in the design and tendering stages are as follows.

3.3.1 Depth and Location of Pipework

The pipe will be laid to a depth where there is a minimum 450mm of cover over the pipeline in the footpath, a minimum cover of 600mm in the sealed roads, and 750mm in unsealed roads. Open drains are to have 600mm of cover over the pipe, and where erosion is occurring might need to be backfilled or covered with concrete.

Where excavation is to occur in rocky material that is not readily dislodged by the trenching machines (or a larger model of these machines), the minimum depth requirements may be waived in favour of alternative protection methods. Each case must be assessed and approved by SA Water.

3.3.2 Road Crossings

Where the road is a sealed surface, the pipeline may be installed using under-road (directional) drilling techniques or equivalent. For unformed roads, excavation can be by either open trench excavation or under-boring of the road.

An additional non-return valve is to be used where a road crossing is required to service a property. This valve should be located near the pipe joint and there should be no pipe joints under the road area.

3.3.3 Property Connections

The property (boundary valve kit) is to be connected to the reticulation mains at the same time the reticulation mains are being installed. Connection will be from the reticulation main to the Boundary Valve Arrangement, with the installation of that valve pit forming a part of the reticulation construction work. Where there is a vacant lot on the location of the Boundary Kit is to be agreed with the property owner or Developers as appropriate.

3.3.4 Air Valves

The reticulation system may require the use of air valves and details in respect to their use (or non-use) must be provided to SA Water with the proposed design. They also should be of a type nominated by the Technology Supplier (to ensure compatibility with the pumping units). The issue of the release of odours from these needs to be noted in the design with sufficient notes on this aspect provided for SA Water to draw reassurance that this will not prove to be a significant problem.

3.3.5 Pipe Allocation

The pipeline will be laid in a fixed SA Water location in the road reserve as laid out in “Services in Streets”. In general however the route chosen should cause the minimum disruption to the area involved.

3.3.6 Crossing other Services

The mains should where practical cross other services, particularly in-ground services at as close to right angles as can be practically achieved, whilst remaining in the fixed allocations.

3.3.7 Sewer System Extensions

Pressure sewers may be used for extensions to existing sewerage systems where these meet the requirements set out in section 1.0. In these instances where the pressure sewer is extended beyond any currently reticulated area connection, it will not be compulsory to connect to that sewerage extension. However residents may be charged a sewer rate on the basis that the property can be served. Others in the proximity wanting to connect at a latter date may require another system extension be involved in that extension. All such extensions will be dealt with on a case by case basis.

3.3.8 Design Calculations

Design calculations showing the friction losses and the estimated static heads for the pumps are to be included in any submission to SA Water on the proposed pressure sewer systems. SA Water may require that some reticulation main sizes be altered if it believes the heads on the pumps are likely to be too high or additional future system extensions may be required.

Given that the pump's life will be ultimately governed by its duty head as well as the mechanical aspects of the pump, there must be no alterations to reticulation pipe sizes, (as shown on the design layout) once the plans are approved, without a full certification of any changes by the system designer and these alterations must be noted on the plan and countersigned by the Designer. Pipe designs are to be based upon commercially available pipe sizes and delays in delivery will not be an acceptable reason for altering any pipe sizes.

3.4 Pipes

Detailed information, in respect to the pipe materials is set out in SA Water's Technical Specification, but key aspects that need to be factored into the design components are as follows.

3.4.1 Residential Pipe Materials

The property delivery lines will be:

- 40mm Polyethylene pipe.
- The pipe will be Class PN 16.
- The pipe should be supplied in long rolls, such that in most cases the only joints on the property should be to the pumping station and to the boundary kit.

3.4.2 Reticulation Pipe Materials

The reticulation mains are to be:

- Of varying diameter (50mm – 125mm) polyethylene pipes, with a preference for sizes that are easily available. When and if larger sizes become available in longer rolls, these will also be considered.
- Class PN 16 pipe (unless otherwise stated in dedicated areas).
- A minimum length of 100 m in the pipe rolls.

Alternative pipe materials are to be approved in writing by SA Water.

3.4.3 Pipe Colours

Only black polythene pipe is to be used for pressure sewer systems, any black pipes with a coloured stripe are not to be used under any circumstances.

When available, the pipe colour is to be cream, or black with a cream stripe.

3.4.4 Joining the Pipes

All pipes are to be joined by mechanical couplings or electro fusion techniques, in accordance with the manufacturer's requirements. SA Water will also consider butt welding of the pipes by persons with the appropriate qualifications, equipment and experience.

3.4.5 Marking the Pipes

The location of pressure sewer pipes are to be marked as per the Technical Specification, so that they can be found at a later date for maintenance purposes.

3.4.6 Pipe Protection

Backfilling of the reticulation mains is to be in accordance with WSA 01(current edition), the Polyethylene Pipeline Code. The trench excavation will need to be wide and deep enough to allow for the sand filling around the pipe.

Alternative methods are to be approved in writing by SA Water

3.4.7 Repairs to Mains

Where repairs are required, these will be achieved either through either crimping of the pipe or the isolation of a section of the pipe using the various isolating valves (property and reticulation system).

3.4.8 Subsequent Connections

Where subsequent connections into the pipe are required, these will be achieved by either:

- The use of pipe saddles, generally where live connections are contemplated.
- Isolation of the pipe section and insertion of the new connection. This will require a temporary shut down of the mains.

3.5 Valves and Fittings

The reticulation system must incorporate a number of designated isolating valves to facilitate any repairs to the reticulation system that might be required at a latter date. Any proponent of a pressure sewer system should include in their design only those valves

supported by the Technology Supplier as being suitable for use with the technology. In this manner, the Technology Supplier takes the full responsibility for this design aspect.

The valves and fittings to be used on the pipelines need to be compatible with polyethylene pipe, the class of pipe used and the Australian Standards applying to both the valves and the pipelines. The types of valves should also be readily available in the commercial marketplace, and they also need to comply with the relevant standards for such valves and fittings.

3.6 Reticulation Zones

Where the design is for large ongoing development/ subdivision, the design can be carried out in designated zones, leading away from the connection point (or discharge point) to the existing reticulation system. Those zones will be defined by the connection/ discharge point(s) and a series of isolation valves, or dead end lines.

In this manner, it will be possible to connect the properties in one zone, once the reticulation mains in that zone have been completed. The schedule for the ongoing development of the next zone in the subdivision (particularly when developed in set stages) will provide a guide as to whether the system in the original zone should be sized to accommodate this extension, or if a second pressure main needs to be laid to connect this next zone. All zones should be clearly marked on the design drawings.

If a second main is required to be laid for subsequent or adjacent zones, then this second main shall be laid at the same time as the first pressure main, so that disruption will be minimised.

Reticulation zones will not usually be used on smaller projects.

3.7 Odour Control

SA Water would prefer that the design of the pressure sewer system avoid the need for odour suppression measures. However, where there are unique system features, such as a long rising main to the treatment plant, or it is not possible to design the reticulation system to avoid the need for odour suppression, or in-main treatment then the Designer (for the pressure sewage system) must detail all odour control arrangements to be used, and carry out the design of these odour control devices, including identifying any chemicals to be used and the quantities to be consumed annually. The operational costs of these odour control measures must be included in the NPV analysis and also be transparent to SA Water.

SA Water has no particular preference for the type of odour suppression arrangements other than:

- They need to be effective for the instances required.
- They should be consistent with other SA Water odour control arrangements, but only if they are effective.

3.8 Flushing Points

The reticulation main will need to contain a number of flushing points, where water can be added or sewage extracted from the system in sufficient volumes to allow the cleaning of the reticulation network, particularly during the construction phases. Typically, this will involve the connection of a mobile tanker to the flushing point to achieve this flushing action. Details of how these flushing points are to work must be submitted as part of any development submission, based upon pressure sewer systems.

The flushing points are to have Camlock connections, and should be sufficiently rugged in nature to avoid easily breaking through normal operational use. Details are included in SA Water's Technical Specification.

3.9 Flushing Program

This program effectively is about how often the above flushing points need to be used and the nature of the usage, i.e. when they are used is it for flushing water through the mains or the extraction of sewage from the system. Any pressure sewer system design needs to include a flushing program that sets out the frequency of any flushing that must be carried out to ensure the system remain viable.

Flushing programs are particularly critical in new developments/ subdivisions where the pressure system will struggle a little until the development of the subdivision reaches that critical or minimal number of homes connected that make the overall design work effectively. Accordingly any new development submission must include the following in relation to the flushing program that will be applied to the subdivision:

- The frequency of flushing, based on the number of houses connected at any time, within the subdivision being served. Some form of table will be required here to provide a guide to maintenance activities. If the flushing requirements for the subdivision are too onerous then SA Water may refuse handover until they become less onerous.
- The Designer's signature must be attached to the enclosed flushing program in the Development Application stating that the program has been designed by them.
- The minimal numbers that the design for the subdivision has been based upon.
- Subdivision estimated growth rate that has been assumed i.e. the time span till when this minimum number of connected homes will be reached.

Where homes are being connected whilst the construction activity is still occurring, the Constructor / Pipelayer will be responsible for all flushing activities until handover has been accepted by SA Water who will then take over responsibility for Flushing.

3.10 Boundary Kits

The Boundary kit is to comprise the following:

- An isolation valve.
- Flow direction valve.
- Flushing Point

The above are to be included inside a valve box, capable of withstanding occasional foot traffic and be located no further inside the property than 1 metre.

3.11 Residential Connection

The resident's plumber will be required to connect to the Connection Point on the inlet side of the collection tank. That connection is not to be made until the pump has been commissioned, based upon town water.

In existing homes, residents will be advised when they can connect, and they will also be required to render their existing septic tanks safe, as per SA Water's requirements. For new homes, the owner is required to provide the Authority with a minimum of eight weeks prior notice of when the unit will be required. That unit will be installed after the construction works have been completed, and before the residents move in. The household drainage lines need to be tested, to ensure that no construction debris have been left in these lines before a connection to the pumping unit will be made.

3.12 Reticulation Drawings

The reticulation drawings must as a minimum show the following:

- A Plan Drawing in accordance with SA Water Sewer drawing practices, of the proposed location and route of all pipelines, indicating the location, relative to the property boundary. Tie lengths are to be used.
- Pipe sizes (and pipe class if there are any deviations from the minimum class as set out in section 3.3).
- The location of other services in close proximity, where these are known, and where these may need to be crossed.
- The location of any proposed flushing points, isolating valves etc. Tie lengths should be used where possible.
- Reference to any survey pegs or property boundaries that mark the pipelines proposed location.
- Sections to be directionally drilled.
- The location of lateral spurs to connect properties.
- Boundary of any zones (where applicable).

- A unique number and references to the property design drawings.
- Nature of host soils expected, such as soil, rock, sand, water charged ground.
- A Longitudinal Section Drawing in accordance with SA Water Sewer drawing practices, showing the ground profile and depth of the main and services crossing the reticulation pipework. Grading of the reticulation main is not required.

The Designer should ensure the drawings do not become too cluttered with detail and if necessary they should create an additional plan onto which notes and tables are moved.

The drawing scales referred to in TS 130 shall be adhered to.

Ultimately these design drawings will become the As Constructed drawings for the reticulation system and will be amended to record:

- Length of Mains Laid
- Bored Sections
- Any deviation to pipeline route
- Actual pipe details
- Actual host soils encountered
- Depths of pipeline
- Actual location of all fittings and markers.
- Lateral Spurs
- Location (approximate) of any marker posts to be used, to show the location of the pipelines.

The above drawings are to be submitted on A1 sheets, together with an A3 reduction. In addition the drawings are to be submitted in an electronic format compatible with SA Water's GIS system.

3.13 Discharge Point to SA Water Sewers

Typically the discharge from the pressure system will be one of the following:

- A sewage treatment plant
- A pumping station in gravity reticulation systems.
- A maintenance hole in the gravity reticulation system.

The pressure system needs to be discharged to a point where the receiving system has sufficient capacity to receive the discharges from the pressure sewer systems and transport it to the sewage treatment plant. This termination or discharge point may have been specified by SA Water based upon flow details provided by them.

If the receiving systems capacity is insufficient during peak periods then a controlled discharge structure can be constructed to store peak system discharges allowing these to discharge to the receiving sewer at a controlled rate and take advantage of the systems off peak capacity.

Such structures will be constructed on the basis of:

- Costs
- System capacity
- Odour suppression of any stored sewage (if required)
- Ability to periodically clean the retaining structure

This discharge point may become a source of odour depending upon the age of the sewage being discharged and accordingly odour suppression devices may be fitted at the discharge point. This will be based upon:

- Designers estimated age of the sewage at the discharge point.
- Actual experience at the discharge point with the Designer responsible for this performance as part of the normal defects liability maintenance.

3.14 Bill of Quantities

Accompanying every reticulation design there should be a list of quantities that should set out the following:

- Lengths and sizes of pipelines.
- Numbers of isolating valves and sizes.
- Number of air release valves and sizes
- Number of non return valves
- Number of valve boxes/ boundary kits
- Number of pumping units
- Number of flushing points
- Any special material or fittings required
- Length to be directionally drilled

This will be used to organise material where many of these are being provided by SA Water. Where the design is for an existing area or an extension of the current sewered area, then this bill of quantities will be used for the schedule of rates in the installation contract.

3.15 Directionally Drilled Section

Rather than using open cut excavation, directional drilling or similar may be used to avoid the need to cut concrete drive ways, to move around a number of structures or to avoid doing damage to flora planted on the road verge. The system design should indicate on the plan areas where the sewer is to be constructed using directional drilling. The Designer should also identify this in the areas bill of quantities.

3.16 Non Residential Connections

As part of the reticulation design the system designer needs to determine the nature of the pumping unit to be installed on non-residential properties. In many instances the nature and size of these pumping units will need to be expertly matched for the non –residential applications. These can then be entered into the quantities and ordered with the other pumping units so there are no unforeseen delays.

3.17 Standards and Regulations

All designs will be carried out in accordance with SA Water Design Regulations and the relevant Australian Standards for all pipes and fittings. If those carrying out the design believe there is any conflict with these standards and SA Water Technical Specification then these matters should be raised to the attention of the SA Water Project Manager.

Similarly, all designs will need to accommodate any local (Council) planning requirements and the Designer is expected to visit the site and determine these requirements, as well as any likely resident concerns.

4.0 ON THE PROPERTY DESIGN

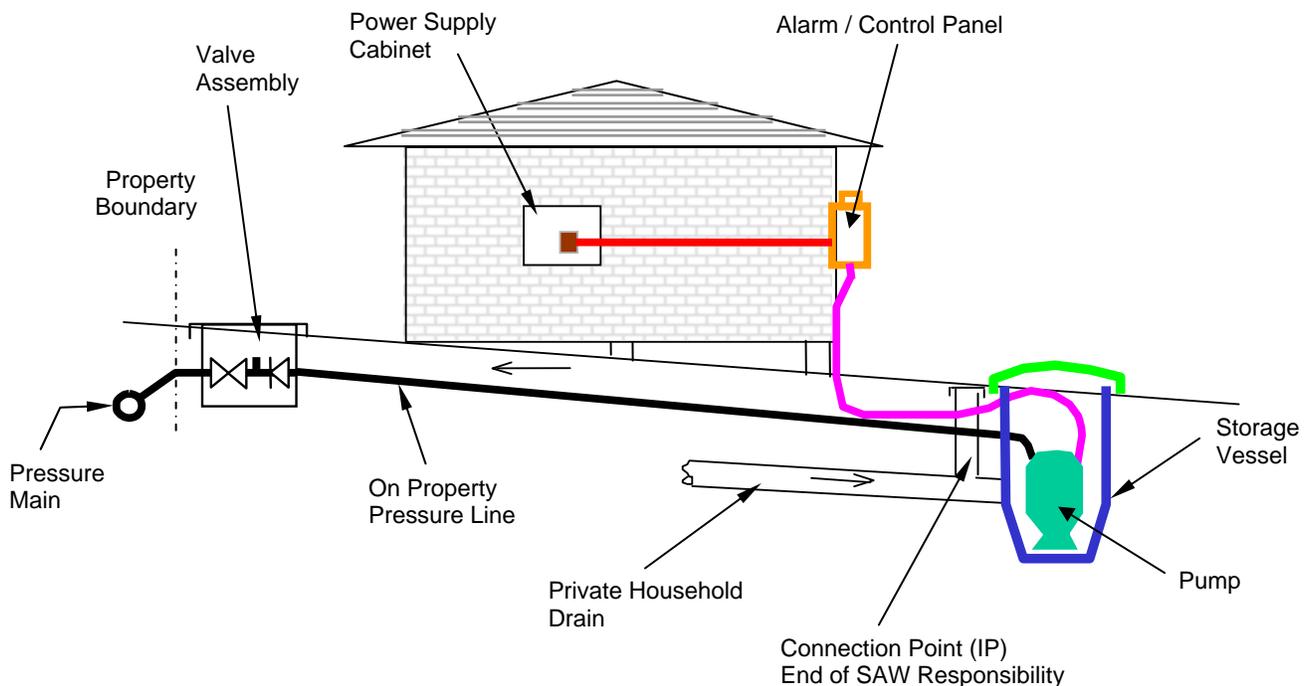
4.1 Design Objectives

The design of the on property component of the system must meet the following key objectives:

- The design for the property should be mindful to not compromise the future development of the property.
- The design should be done in consultation with the property owner including giving them sufficient warning of the meeting.
- The installation of the pumping unit should be in a clear line of site with the alarm/ control panel.
- The on property design should involve a full audit of the household electrical power board and household drains.
- No roof or surface water should be allowed to enter the system.

4.2 Typical Pressure Sewer Layout

In a Pressure Sewer System, each individual property within the area serviced by that pressure sewer system would have its own pumping unit installed. This pumping unit will collect all of the household sewerage, and then discharge that wastewater into a centralised reticulation system that operates under pressure. The typical property layout is shown below.



The basic property system layout will incorporate the following features:

- Pumping Station
- Property Delivery Line
- Upstream House Drainage Lines
- Connection to the Property Power Board
- Installation of an Alarm/Control Panel
- Connection to the Boundary Kit

The basic principles applying to the property design are:

- The typical residential design will be based upon a standard unit that will be purchased and installed by SA Water or the Pressure Sewer Proponent/ Developer. Non standard pressure units will typically be used in cases where:
 - The property being serviced is non-residential.
 - The host soils are rock or it is difficult to install a new unit. In these cases a squatter unit may be installed in the hole of the existing on site system – eg septic tank.
 - Other site specific needs.

Whilst noting the above it should be stressed that unless there are valid specific reasons for a different sized unit, SA Water will be reluctant to depart from the use of a standard unit.

- The property design will not occur until the property's building application has been approved and construction has commenced in the case of new developments or vacant land.
- An audit of the existing power and household drains is to occur in the case of an existing home.
- The property owner must be given ten days prior notice of the meeting with the Designer and the meeting is to occur on the property, for which the design is intended. The ten-day period can be reduced, if requested by the property owner, to fit in with their general availability.
- The fundamental design and installation goal is to cause the minimum possible disturbance to the persons living on the property, or about to move onto the property in terms of:
 - The location of the pumping station and the proposed route of the property delivery line.
 - The equipment used for the installation works.
 - The time taken to install the pressure system.

- Working on the property just the one time (i.e. no repeated visits in the short term if possible).
 - Future household extensions
- All pipelines are to be laid approximately 1.0m from the side and or rear property boundaries and their route is to run parallel to that boundary.
 - Where the properties are large and this requirement is unreasonable, the property delivery line will be laid essentially perpendicular to the reticulation mains, but should essentially be a straight line. It will be laid in a position sympathetic with the current property usage.
 - The total head on the pump in the property, when operational, should not exceed the designed duty point head. If this happens SA Water will view this occurrence as a potential shortening of the effective life of the pump and will reject the design without appropriate justification.
- An audit of a number of properties will be conducted in any proposed installations wherein the actual discharge heads will be measured to confirm that the design criteria have been met and this will include further pressure testing of the pipe.
- The pumping unit must be installed within a direct line of sight of the pressure sewer alarm/control panel.
 - The electrical connection for the pumping unit is to be on a separate circuit to the rest of the household electrical connections, and clearly and professionally labelled as such.
 - Where there are unique features to the property, such as in ground structures or prized gardens, the property delivery line can be laid along a route agreed with the property owner. In general the main should be laid so as to not compromise future household extensions.
 - One pumping unit per property is to be used for residential applications of pressure sewer, but the one pumping unit can service more than one building providing it has sufficient capacity.
 - Where the property has separate greywater and blackwater lines, the pumping unit will be laid on the blackwater connection and the greywater line is to be upgraded to conform with AS/ NZS 3500 part 2 and joined to the blackwater line upstream of the Connection Point.
 - If there is insufficient gradient to allow this to happen the designer should in the first instance, explore if the preferred technology supplier has a longer (deeper) collection tank. If this solution cannot be made to work then a second standard pumping unit is to be installed.
 - The pumping unit should be installed as close as practical to the building contributing the majority of flow contributions on the property, when the property has multiple dwellings.
 - For industrial/ commercial properties (or body corporate applications) (i.e. those generating large volumes of wastewater) multiple pump

arrangements (per pumping station) and/ or multiple pumping stations are to be used and the System Designer will provide details on the appropriate units to be used for these applications. As a general rule, each separate dwelling in a Community Title development will require a separate pumping unit.

- An overflow relief gully (ORG) is required in accordance with AS/ NZS 3500 part 2, to prevent internal overflows. This is to be included by the property owner's plumber, and must not be covered once the pump is operational. It will also include an inspection opening.
- In flood prone areas (i.e. inside the 1 in 100 year floodplain) the overflow relief gully is to be designed to incorporate a lid to eliminate the entry of flood water into the pressure sewer system, during such events.
- For properties with large spas or swimming pools, special arrangements will be required to prevent these triggering an alarm or an overflow by exceeding the sewerage pumping station's capacity. These will be accommodated on a case by case basis.
- The alarm panel must be fixed either to the wall of the house or on a stand alone post. It must be at a level that is a minimum of 400mm above the 1 in 100 year flood level, where applicable.
- Where the property is impacted by the 1 in 100 year flood level, the venting of the pumping unit is to be provided to a minimum of 400mm above the designated flood level.
- The boundary valve kit is to be a maximum of 1.0 metres inside the property boundary and to be on the same side of the property as the property delivery line (where this is known). There is a need to link with the on-property designs, in the reticulation construction.
- Where there are multiple units on the property, the above principles of locating the units close to the buildings will essentially remain the same; excepting that where practical, the units will also be laid out in such a manner that any property delivery line (joining these units) is minimised in its overall length, or multiple connections are to be used (see section 6.13).

4.3 Pumping Unit Requirements

The complete details in respect to the pumping station are set out in the SA Water's Technical Specification, but key elements that need to be noted in the design of the system are as follows.

4.3.1 Minimum Storage Requirements

The pumping station is to have a minimum effective storage of 600 litres, with a minimum emergency storage of 400 litres when the pump is installed.

Where rock excavation is a problem in the installation areas, SA Water requires that the collection tank be of a shallower depth, to minimise the excavation in rock. Where power interruptions or other unique features might require additional storage over and above the set minimal requirements, the pumping unit storage requirements will be determined on a case-by-case basis, and will be marked separately on any design plans for the areas, as well as any associated specifications.

4.3.2 Specific Collection Tank Requirements

The collection tank will need to meet the following minimum criteria, with more specific criteria set out in SA Water's Technical Specification TS130:

- The collection tank is to be made of lightweight materials, so that it can be installed without a crane (or other significant lifting equipment). This is required to allow these units to be installed in already developed properties, where access for lifting equipment might prove difficult.
- The collection tank should be round in shape, to facilitate installation by auger and hence minimal damage to the property and disturbance to the resident(s) living in the property.
- Have a shape, or external mouldings, that assist with any anti-buoyancy provision. Such provisions must be able to readily bond with the structure, to ensure they will continue to act as an anti-buoyancy device for the life of the pumping station.

4.3.3 Collection Tank Lid

The lid should be capable of being locked. SA Water is not looking to install locked lids in the first instance on the private property applications, but would like this provision where it encounters problems with unauthorised entry.

4.3.4 Anti-buoyancy Features

To prevent any potential of the pumping units floating, the following needs to be applied in relation to all pressure sewer pumping unit installations in South Australia:

- The pumping station is not to be installed in a ground depression where rainfall runoff water would normally pond.
- A concrete ring beam or ballast is to be poured around the base of the collection tank. The size of the ballast will be in accordance with the Technology Supplier's requirements.

4.3.5 Serial Numbers

The pumping station is to have a serial number, which can be recorded in the property installation information and As Constructed drawings. The preferred format for these numbers is set out in the SA Water Technical Specification.

4.3.6 Multiple Pumps or Multiple Pumping Stations

On non-residential properties, such as motels, industrial outlets and clubs, either multiple pump or multiple pumping stations might be required. These will need to be designed by appropriately experienced persons, and have support from the Technology Supplier that the proposed unit/s is/ are applicable to the particular need. The provisions of section 3.16 will also apply

4.4 Pumps and Pump Protection

The complete details (in respect to the pumps) are set out in SA Water's Technical Specification, but key elements that need to be noted in the design of the system are set out in the following sections.

4.4.1 Pump Duty Points

Within SA Water's area of responsibility, the pump will need to be capable of meeting the following minimum duty points.

- Head = 45m (required for topographical reasons).
- Flowrate = 0.45l/s

Typically, the rated or design head should be taken as the maximum head the pump should be designed to accommodate, i.e. the total static head, plus the friction losses that will occur in the designed reticulation system. Higher heads are, nevertheless, permissible with differing technologies.

A flowrate of 0.45l/s should be taken as the minimum flowrate the pump should be capable of discharging under normal operating requirements. Higher duty flows are permissible, and might be mandated for some specific applications.

4.4.2 Grinder Units

The pump is to be equipped with a grinder unit, whose long-term performance needs to be well demonstrated. The grinder should be capable of dealing with all of the materials that it can be readily anticipated to be normally discharged into a sewerage system.

4.4.3 Pump Protection

The pump is to be provided with protection devices to protect the pump against the following possible scenarios:

- No flow through the pump.
- Overpressure protection, and one that facilitates the effective and systematic clearing of the system after the system has been subjected to a significant power outage.
- Thermal overload.
- Low Voltage Protection

Refer to the SA Water Technical Specification TS130 for further details on this.

4.4.4 Pump Operating Levels and Controls

The pumping unit should, at minimum, incorporate the following control devices:

- **Pump on switch**, which should be set as low as possible, i.e. at a level to minimise the volumes of sewage stored in the pumping station after the pump ceases to operate.
- **Pump off switch**
- **Alarm switch**
- **Redundant switch/es** should the initial pump on switch fail.

(Refer SA Water Technical Specification TS130 for greater detail.)

4.4.5 Single Phase Operation

The pumping units are intended to be incorporated into the residential power board. They must, therefore, be capable of being operated on single-phase power, without the need to augment a standard residential power supply.

4.4.6 Pump Performance Track Record

The SA Water is looking for a pump that can demonstrate a minimum significant performance period (i.e. track record of performance as a pressure sewer pumping unit). 10 years would be considered as meeting this significant period requirement.

4.5 Alarms and Controls

The pump is to have both an audible and visual alarm. The audible alarm should be capable of manual silencing. The alarm control panel needs to be appropriate to the conditions into which it is being installed and the specific requirements in respect to this control panel and set out in the SA Water Technical Specification.

4.6 Positive Covenants

Every property serviced by a Pressure Sewer System will have an endorsement placed on the property title, which would be registered

- by the developer in conjunction with the deposit of the sub-division creating the allotment.
- by SA Water upon installation of the Pressure Sewer System on existing vacant or developed allotments. The property owner will be required to enter into an agreement in terms of the attached agreement form as the first step of this process.

This will be in the form of either by Encumbrance or Section 7 Search and requires owners to enter into a Maintenance Agreement with SA Water. (Refer to SA Water Technical Specification TS130).

4.7 On the Property Drawings

Following the initial meeting with the property owner, the Designer is to prepare an A4 drawing of the proposed on-property layout. This drawing at minimum must show the following:

- Details of the property, including address, owner, GPS location (to 1.0m accuracy) of the pump sump etc.
- Location of the pumping unit, relative to the dwellings, including tie lengths to any suitable reference points.
- The pipeline route, including ties at any change of direction, in the pipeline.
- The location of the boundary valve arrangement and overflow relief gully.
- A unique number relating this drawing to the reticulation drawings.
- Any unique features in the house, which have impacted the design such as gardens/ structures.
- The location of the septic tank on an existing house.
- The location of the house power board.
- The proposed location of the alarm panel.
- Any proposed directional drilling and the approximate depths of lines.

The layout drawing is to be in plan view only as it will be assumed the property main will be minimum depth. Where this is incorrect, the plan view will show the locations, where the depth has varied at 2m intervals along the line marked on the plan.

It is intended that this property layout drawing will become the property As Constructed drawing, providing that there are minimal variations to the design. It should also be in an electronic format compatible with SA Water's GIS system.

4.8 Household Audits

Where the connection is to an existing dwelling a formal audit will need be conducted on the following components:

- The property power board to which the pump is to be connected on a separate circuit.
- The household drains to ensure both the adequacy of these and that no stormwater is gaining access to the system.

These audits should be carried out before the on property design work is commenced and will need to be carried out by appropriately qualified electricians and plumbers. If the audit finds that there is work to be done on either of these two connections (to bring them to compliance with current Standards requirements) the Installer/ Designer will provide SA Water with a detailed list of these works. Particular caution needs to be taken in case of the power board containing asbestos and the appropriate asbestos removal/ modification procedures must be followed.

4.9 Generator Options

The pumping unit is to be capable of being operated by a generator should power be lost for a protracted period of time. The Designer needs to indicate in their submission the overall power reliability for the area the pressure sewer system is being adopted for. Where frequent power failures occur the pumping unit is to be fitted with a plug to assist with this generator operation.

4.10 Spa's

The size of (volume contained) the spa will essentially determine what is required to discharge from the spa without fear of setting off the high level alarm in the Alarm/Control panel or generating overflows from the Overflow Relief Gully.

Spa's with less than 250 litres in normal operating volume: These require no special provisions be made and as such they can be treated as a standard household water using appliance.

Spas between 250 litres and 700 litres capacity in normal operating volume: These may require that some additional measures be fitted to the pumping unit to avoid system alarms annoying neighbours unnecessarily. Typically these could involve the following and will be dealt with on a case by case basis:

- Restricting the discharge rate of the Spa into the pressure unit.
- Other approved measures.

Spas with a normal operating volume in excess of 700 litres: These will require that differing flow restriction devices be added to the system. Typically these will involve the following and will be dealt with on a case by case basis:

- Providing some form of upstream storage with a limited discharge rate to more closely match that of the pressure sewer unit.
- Providing a larger pressure sewer collection tank.
- Time delays on the alarm.
- Other approved measures.

Spas with a backwash facility: These will be dealt with the same as for a swimming pool.

An alternative to the above might be to regulate the outlet of the spa to limit the flowrate that can be discharged from the spa. Where such an arrangement is permanently installed this might overcome the need for any of the actions above, but it will mean that the spa will take longer to empty.

4.11 Swimming Pools

The intention here will be to provide sufficient storage when the discharge from the pool backwash pump exceeds 0.45l/s, and the pump operates for sufficient time to fill the pressure sewer pumping unit to a level, that causes an alarm to be generated. An additional storage with a controlled discharge of less than 0.45l/s will be placed between the pool's discharge pump and the sewerage pumping station in these instances, unless the pool pump's discharge can be regulated to below 0.45l/s.

The interconnection of the swimming pools into the property system will be designed on a case by case basis, but all property owners will need to provide.

- Pump backwash/ discharge rate in L/s.
- Duration of time the backwash is operated for.
- What arrangements will the owner make to empty the pool, if it ever becomes necessary to do that.

SA Water also has a strong preference that cartridge filters be used in all new pools to avoid sand getting, into the pumping units.

5.0 TESTING AND COMMISSIONING

Testing needs to be conducted for the on-property works as well as for the reticulation system and will occur in accordance with the detailed procedures set out in SA Water's Technical Specification. The designer needs to be aware that the design will not be formally signed off until these test have been signed off on.

5.1 Reticulation Pipe Testing

The testing certification for the reticulation pipelines will need to include:

- Verification that the lines have been cleaned by the use of compressed air.
- Verification that the lines have been flushed clean (using water) and have been left full.
- Verification that the sealed pipes have been raised to the maximum operation pressures for Class PN16.0 polythene pipe, as laid out in the relevant Australian Standards.

5.2 Reticulation Design Testing

Pressure gauges are to be placed on the discharge side of the pumps, and the pressures recorded should not exceed the design head. These tests will be carried out at all properties.

5.3 On Property Testing

The tests required for the on-property testing is to include:

- Leakage Test
- Simulated Power Failure Test
- A time-based operational test
- An alarm test
- A Pump Protection Test
- Visual Inspection

5.4 Commission of Pumps

Once the tests are completed then the pump is to be formally commissioned with the warranty to commence from that date.

5.5 New Homes

New homes need to be checked to ensure that there is no construction debris left in the household drains before connection to the pumping unit.

6.0 NEW SUBDIVISIONS

Within new subdivisions it is recognised that many of the properties may not have a building on them for a number of years and that the on property pumping units cannot be installed until the construction of that new property is effectively completed. It is also recognised that the Developer will generally cease their involvement with the subdivision when all of the properties are sold, and this could be before any of the properties are actually built upon. Arrangements need to be made for SA Water to organise the installation of the pumping units, in these instances where the Developers involvement terminated before the property installations are completed.

Developers proposing to use pressure sewer systems in new subdivisions will need to recognise however that:

- *The prior approval of SA Water needs to be attained to construct a pressure sewer system as per section 2.3 of this Design Manual*
- *Many of the pressure sewer pumps have differing discharge characteristics and as such a system designed for one particular pressure sewer technology may not accommodate an alternative technology. Hence a single technology must be used within a particular subdivision.*
- *SA Water is only maintaining a limited number of pressure sewer technologies as per section 2.2 and these are detailed in the Authorised Items list.*
- *The system needs to be designed to accommodate the growth rate for the subdivision and this needs to be clearly demonstrated, in the design submission.*

Any Development Application also needs to clearly spell out.

- *The role the Developers wishes to play in the development of the subdivision.*
- *The exact technology the subdivision sewerage system has been based upon.*

If the Developer still wants to use a technology not supported by SA Water, then SA Water may refuse handover and the Developer will need to convince SA Water and other regulatory agencies such as the Health Department that an appropriate maintenance regime has been put in place to service the subdivision.

6.1 Conditions Applying to New Subdivisions

Where it has been identified that a pressure sewer system would be applicable and approved for a particular development. In these instances the Developer will be required to be responsible for (but not necessarily be limited to) the following:

- All costs associated with the design and construction of the pressure sewer system, including any changes required to the existing sewerage system. This includes supply and install, the reticulation mains and delivery line to the boundary kit (including the installation of the Boundary Kit) for individual properties within the subdivision, in accordance with this design
- Organise for the installation of the pumping units through SA Water at the Developer's cost or carry out this installation themselves, in accordance with the SA Water Technical Specification. Alternative to the Developer installing these units the on property works may be bonded at the release of the final plan for subdivision and will result in SA Water taking responsibility for the installation of the on property works. The bond will be based on the SA Water's fees and charges for installation of pressure sewer pumping unit. The installation fee, which shall be calculated annually and advertised in SA Water's fees and charges, shall cover:
 - The costs to provide the pumping units
 - The costs of the installation work on the property
- The Developer will also need to provide SA water with spare pumping units the number of these being the greater of 2.5% of the number of pumping units to be installed or 3 units shall be provided to SA Water as spare units. For very small subdivisions SA Water may reconsider this number to 2
- Payment of a Sewerage Developer Contribution.
- Provide sufficient notice to SA Water (minimum 16 weeks) when using SA Water's procurement service.
- Place an instrument on the title of the property (either by Encumbrance or Section 7 Search) requiring owners to enter into a Maintenance Agreement with SA Water. (Positive Covenant)
- Landowners (of the individual subdivided lots) are to make an application to SA Water with submission of a Development Application for a dwelling to include the installation of the pumping units.
- Provide to SA Water the As Constructed drawings in a format acceptable to SA Water

- Provide SA Water with all “on property” designs where these occurred during the development phase.

Payment of the bond (if applicable) is required prior to release of the final plan for a subdivision or construction certificate.

6.2 Procurement of Pumping Units

The Developer may, if proposing to design, supply and install pumping units in accordance with this policy, adopt the following procurement methodologies:

- Purchase from SA Water the pre-requisite number of pumping units as SA Water will normally have a prior established contract with one or more of the Technology Suppliers.
- Purchase the pumping units directly themselves from a nominated Technology Supplier. SA Water will provide details of the Technology Supplier.
- The Developer may submit to SA Water for consideration an alternative technology. SA Water approval for the alternative technology must be obtained prior to any installation commencing. The Developer would be responsible to purchase and install any such approved technology. Approval however will be subject to a range of conditions, and considerations as set out below.

Any alternative pumping technology proposals will need, as a minimum, to include the following:

- Only one technology is to be used through the whole proposed development and/or local area. The technology must be acceptable to SA Water who should not have to support a large number of differing technologies for maintenance purposes.
- Verification that the technology is approved by appropriate Government Departments/ Agencies.
- Verification (where appropriate) the pumping unit meets the appropriate minimum collection tank size as defined in SA Water’s Technical Specification.
- Verification that the proposed system will meet all of the requirements of SA Water’s Technical Specification,
- Verification that the pumping units have an appropriate duty point that can satisfactorily discharge into the SA Water reticulation system without causing difficulties for that part or any part of the system. In this regard SA Water brings to the Developer’s attention that a system designed for (or utilising) one pressure sewer system design may not be compatible with other pressure sewer technologies.

- Indemnify SA Water that the design is compatible with SA Water's sewerage system in the catchment.
- Confirmation that the design of the reticulation within the development has been carried out by persons with appropriate qualifications and experience in pressure sewer systems (and details to be provided in writing).
- Provide sufficient number of units to allow the whole of the proposed section (as per the Development Application) of the subdivision to be connected to the sewerage system. Spare pumping units for maintenance purposes will need to be provided in accordance with Section 6.1.
- Verification that the collection tanks are capable of accommodating SA Water's preferred technology if they are an alternative to the pressure sewer pumping units that SA Water normally maintains. This is to allow SA Water to replace the unit whenever needed from SA Water's other reserve of spare units (which are a different technology). If this cannot be achieved the Developer could be required to provide a greater number of spare units.
- Provision of training systems for SA Water officers and property owners on how to maintain the units as provided.
- Provision of specialist tools, manuals etc for the units in order that they be maintained.
- Provision of an updated Home Owners Manuals to home owners if the new technology requires different instructions.
- Provision of an adequate number of flushing points, isolating valves and air valves as determined by SA Water.
- Ensure that the alternative technology has a minimum warranty period of 5 years. The warranty shall be in favour of SA Water.
- If the warranty cannot be transferred to SA Water then the Developer will need to maintain the units until the warranty has expired.

SA Water may still refuse to accept the proposed technology if it deems that this additional technology will add significantly to its costs of maintaining the pressure sewer systems. The Developer therefore needs to have an acceptable alternative long term maintenance arrangement (to the appropriate regulatory agencies) that can be utilised should SA Water refuse to take handover.

6.3 Size of Pump/Collection Tank

The pump/collection tank will meet the minimum requirements of SA Water's Technical Specification (or as specifically designed for non residential connections). SA Water approval of the proposed collection tank size will be required.

6.4 Design of Reticulation Mains

Whilst the Developer will be responsible for the design of the proposed pressure sewer reticulation service, that design will be subject to formal approval by SA Water. The need for appropriate design is critical to the success of the individual units, the overall pressure sewer system and it's functioning as part of the SA Water reticulation system.

6.5 Connection of Building to Pumping Unit

Only installers accredited by the Technology Supplier shall be permitted to install the pumping unit and delivery lines. The home owner's plumber will be responsible for laying the line between the dwelling and the Connection Point (GIP), immediately upstream of the collection tank, but the final connection into the pumping unit may only be made by an accredited installer.

SA Water will advise on accredited plumbers in response to the Building Application, so that they can work with the homeowner's/ developers builder and install the pumping unit subject to the Builder's timetable. The homeowner will be advised as part of the response to the Building Application to ensure appropriate notice. The Builder is to be responsible to ensure that appropriate notice is provided to the Installer and SA Water will not be responsible for any delays in the installation process.

7.0 MAINTENANCE OF SYSTEMS

SA Water will have a full home owner's manual, which will set out (in detail) the maintenance arrangements, but the basic arrangements that need to be factored into the design are as set out below.

7.1 Notification of Alarm

Where an alarm is activated, the following is to occur:

- Resident to cancel audible alarm
- Resident to contact SA Waters 24 hour call centre
- Nature of alarm to be determined in that call
- Resident to minimise wastewater generation (until repaired)

7.2 Response Procedures

Response proceeding will mirror these for conventional gravity sewerage systems as periodically defined in the SA Water Customer Service Standards. In unusual situations, i.e. where there is a prolonged power outage, SA Water will organise for a portable generator to be connected to the power unit once a day, to pump out the unit.

7.3 Proof of Identity

All repair personnel will be provided with photographic identification, and will not enter onto the property to carry out works without first showing this identification to the resident. If there is no one at home, then the property may be entered for the repairs, but an appropriate notification (including Repairer and SA Water contact numbers) should be left in the mailbox to state that the repairs have been carried out.

The resident will be informed that repairs will only be in response to a call, and they should turn away any individual that does not have photographic identification, and immediately inform SA Water and the Police.

7.4 Access to the Pumping Unit

The pumping station should incorporate provisions for the removal of the pump (and other mechanical devices), without the need to enter the pumping station. The intention is to avoid the creation of a confined-space working environment. Any Development Proposal should indicate how this is achieved with their proposed project.

In addition to the above, the nature of the opening to the collection tank and its lid must be such that a basic lifting device can be easily fitted above the opening, to facilitate the removal of the pump. Where possible, vehicular access to the pumping unit is to be

provided, and the Developer should be indicating this requirement in the property requirements/ covenants.

7.5 Spare Pumps

SA Water will maintain a stock of spare pumps for the maintenance of the pressure sewer systems. These spare pumps will allow for the changeover of defective units with one of these spares, and a number need to be kept to allow for the time taken to repair the unit.

Where the controls and pressure switches are external to the pump, an additional 2% of the total number of these items will also be required. The Developer will be required to make a contribution towards these spares, as well as the rates set in SA Water's fees and charges, as advised at the initial meeting set out in 2.3 and section 6.

8.0 HOME OWNERS MANUAL

The home owner's manual will set out:

- What is to be done if an alarm sounds?
- Emergency contact numbers for the property resident to contact SA Water
- What to do if there is a broken main.
- What can and cannot be safely discharged into a pressure sewer system.
- Access requirements for maintenance personnel.
- Background on the pressure sewer system.
- What to do when going on holiday.

8.1 Requirements of Designer

SA Water will provide the Designer with a copy of the manual, which the Designer should check and advise SA Water of any changes they believe should be made for the particular application. These issues should be raised at the meetings with SA Water set out in section 2.3.

8.2 New Subdivisions

The Developer will be required to provide a copy of the home owner's manual to any person who makes a land purchase from them. In addition SA Water will require the Developer also provide general information on pressure sewer systems to potential land purchasers. SA Water will have available a basic information package that the Developer may draw upon.

8.3 Existing Developments

SA Water will provide copies of the homeowner's manual to all property owners in a backlog area or existing town if that town has a pressure sewer system installed. This will follow significant community consultation.

8.4 Spare Copies of the Home Owners Manual

Spare copies of the home owners manual along with copies of the property layout drawings will be able to be purchased from relevant SA Water offices during business hours.

8.5 Supporting the Home Owners Manual

SA Water will from time to time update the home owner's manual so that when additional copies are purchased these will be the latest version of the manual. Should a

significant error to be found, then copies of the revised manual will be issued immediately to all property owners with these pressure sewer systems installed.

In addition SA Water will maintain and constantly update a more detailed home owner's information package on its web site that will include all of the information in the home owner's manual plus a range of more detailed information, not specifically required for the day to day operation of the pumping unit.

9.0 COMMUNITY CONSULTATION

For new properties the future property owner will be advised of the presence of a pressure sewer system from the discovery process for the property (either by Encumbrance or Section 7 Search). The Developer will also be required to advise potential land owners that the property will be served by a pressure sewer system.

A series of brochures and contact numbers will be available (for those persons purchasing the property) to better understand what the pressure sewer system is about.

For existing towns or backlog areas, a consultative meeting will be held to explain:

- What pressure sewer systems are, and why there are to be used here.
- What it means for the residents.
- What it will cost the residents.
- Other as appropriate.

Other key elements of the consultative process including the process to serve properties are:

1. Initial letter to residents (existing homes), or letter in response to an application (new homes), setting out who is to be the Installer/ Contractor on the project, plus their contact numbers.(Letter by SA Water)
2. Installer to contact the property owner, and meet on-site to discuss the layout, identify greywater/ blackwater needs, etc. (Action Installer)
3. For existing homes, the results of any property audits are to be provided to property owner, where after the property owner must be given at least 10 working days notice to allow them to engage their own trades people.
4. Copy of layout/ installers drawing for property owner's signature. (Action Installer)
5. Prior notification (5 days) to resident before works commence on site. (Action Installer)
6. Introduce staff to the property resident at the commencement of work, and commence work. Property resident provided with 24 hour a day emergency contact numbers. (Action Installer)
7. Final inspection of property, with resident invited to participate. (Action Installer)
8. Hand over a copy of the homeowner's manual, as well as discussing (with the resident) the instructions in that document on how to use the system. (Action Installer)
9. Emergency contact numbers to be affixed to the Alarm/Control panel.

10.0 INFORMATION TO BE PROVIDED TO SA WATER

It is intended that a file be maintained on the pressure sewer installations, and thus a significant amount of information will be required in the installation of this system. Details of that information to be provided to SA Water in the installation of pressure sewer systems is set out in SA Water's Technical Specification, but key aspects that need to be factored into the design and analysis are the provision of the following information:

10.1 Reticulation Mains

- As Constructed plans, in Plan view, showing all of the usual information, such as location of line, fittings, and points of connection from residential property etc.
- As Constructed plans, in Longitudinal Section view, showing the ground profile, services crossed, and depth of the reticulation main. Grading of the main is not required.

The above drawings are to be submitted on A1 sheets, together with an A3 reduction. In addition the drawings are to be submitted in an electronic format compatible with SA Water's GIS system.

- The sections of the pipelines that have been directionally drilled.
- Date construction completed for a reticulation zone. Date made operational.
- Dates boundary kits installed on the property
- Pipe Head tested/ verified.
- Pressure test results/ verified.
- Date property connection line was laid.

10.2 Residential Information

- As Constructed plans, based upon the property design (highlighting any deviation from original design), done with the property resident. These drawings are to be submitted on A4 sheets and in an electronic format compatible with SA Water's GIS system
 - Details of the property, including address, owner, GPS location (to 1.0m accuracy) of the pump sump etc.
 - The date work commenced on the property.
 - The date/s the work was completed and that the Installer left the property.
 - The date the pump made operational.
 - Results of the pressure test on the pump.
 - Date and number of the pump commissioning certificate.

- Serial number of pump.
- Serial number of pump station.

TERMINOLOGY USED IN THIS MANUAL

Commonly used terms throughout this design manual and all of the documents, to ensure a consistency in the interpretation of the documents, are:

- **Total Pump Head** – This is the actual static head, plus the frictional losses, that the pump has to meet in discharging the collection tanks' contents. The final or total pump head is determined from field measurement, to confirm previous design calculations of the pump head.
- **Alarm/Control Panel** – Small box that houses either or both the electrical controls for the pressure sewer pumping unit and the alarm control system for the pumping unit. Composition of what this box includes can vary from Technology Supplier to Technology Supplier.
- **Alarm Volume** – This is that volume that is stored in the on-property collection tank, before the alarm for the collection tank activities.
- **As-Constructed** drawings – These are the drawings indicating the final as completed information of the reticulation mains and the residential on property lines.
- **Boundary Valve Kit** – This is a valve box at the property boundary, incorporating an isolating valve, flow directional valve and an inspection tee-piece.
- **Collection Tank** – This is the watertight container in which the on-property pump is located, and is typically made from plastic compounds or fibreglass.
- **Designer** – This is the individual responsible for the design of either the pressure sewer reticulation system or the on-property design (or both).
- **Drainage Line** – This refers to the household sewerage drainage pipework above the pumping unit.
- **Emergency Volume**- This is that volume, which is stored in the pressure sewer collection tank, from just above the alarm activation level to just before the overflow relief gully begins to discharge.
- **Flushing Point** – This is a formal point to which a large supply of water can be connected to the pressure sewer reticulation system to flush out the reticulation pipelines, or alternatively, where sewage can be removed from the system by vacuuming it into the truck.

- **High Level Alarm** – This is both an audio and visual alarm system, activated when the level of the sewage stored in the on-property pressure sewer collection tank reaches the alarm volume level.
- **Installer** – This is the company/ individual responsible for carrying out all of the on-property works.
- **Low Pressure Sewer Scheme** – This is a different name, also often used to describe pressure sewer schemes.
- **On-property Works** – These are the total works to be carried out on the residential/ commercial/ industrial property, and include any excavation, installation, compaction and restoration associated with the following:
 - The pumping unit
 - The property delivery pressure line
 - Wiring of the pumping unit to the property power board
 - Connection of existing property sewerage lines to pumping stations.
- **Overflow Relief Gully (ORG)** – This is a control overflow device, to prevent overflows occurring inside the dwellings on the property by ensuring that overflows, as such, occur outside of the dwelling and is to be in accordance with AS/ NZS 3500 part 2.
- **The Pipelayer** – This is the company/ individual(s) responsible for constructing the off-property works, such as the reticulation mains or the lateral spurs. This company/ individual(s) might or might not also be the Installer
- **Pressure Sewer Reticulation System** – the series of pipelines laid in the streets connecting the properties to either a treatment plant, or some designated discharge point in an existing sewerage system.
- **Pressure Sewer Systems** – This is a specialist system, wherein all of the property sewage is connected to an on-property pumping station (or series of pumping steps). This dedicated pumping unit incorporates a grinder to reduce the sewage to a watery slurry in the first instance. The pumping station then discharges through small diameter pipelines laid at minimum depth.

SA Water’s pressure main reticulation systems rely on the pressure generated by the pump to move sewerage from the property to the treatment plant, or the set discharge point in a gravity reticulation network.
- **Property Delivery Pressure Line** – The pipeline that connects the on-property pumping station to the boundary valve kit.

- **Pressure Zone** – This is a collection of properties that are capable of being isolated from upstream and downstream areas during the construction phase, and is clearly marked as such on the reticulation drawings. These zones are used to allow one area to become operational whilst the upstream areas' reticulation mains are still being constructed.
- **Pumping Units (or Station)** – This includes the pumps, collection tank, alarm system, pump pressure switches, etc and is installed on the property.
- **PSS** - This is an acronym used for pressure sewer system.
- **Lateral Spur** – This is the continuation of the property delivery line from the boundary kit to the reticulation system pipeline, and includes any road crossings (where applicable).
- **Technology Supplier** – This is the company that supplies the pumping units. This company may be the manufacturer of the technology, or an appointed agent of the manufacturer.

Attachment N°2

PREFERRED PRESSURE SEWER TECHNOLOGY SUPPLIER

The following pressure sewer Technology Suppliers are currently under contract to SA Water.

Technology Supplier

Company Name:	DETAILS
Date Contract Expires:	
Contact Name:	ARE
Contact Phone N°:	
Contact Fax N°:	AVAILABLE FROM
Contact E-mail:	
Contact Webpage:	SA WATER
Contact Address:	

COMPARISON OF POTENTIAL TECHNOLOGIES TO BE USED TO SEWER A TOWN

The economic evaluation of any proposed pressure sewer system shall be completed on a total whole-of-life cost basis, taking into consideration all costs to the Developer, the community and SA Water over the operational life of the system. A Net Present Value (NPV) analysis over a 20-year period shall be undertaken for all pressure sewer applications. SA Water will only approve Pressure Sewer System as an appropriate sewage system if it can be shown that such a system is clearly the least costly solution (in NPV terms), when compared to a conventional gravity sewerage system and meets the criteria discussed in Section 1.0.

Capital Cost to Developer

These are the capital costs associated with the construction of pressure sewer reticulation mains, lateral spurs and installation of the boundary kits, installation of any odour control facilities (if required), and the augmentation of downstream infrastructure.

In addition to this are the capital costs associated with the supply and installation and commissioning of the pumping units and the delivery pressure lines on the properties.

The costs of these will be included in SA Water's annual fees and charges, with appropriate indexation.

The pressure sewer pumps are to be assumed to have a life of 25 years for this cost comparison, and the replacement costs need to be incorporated in the NPV analysis. It is only the pump core that will need replacement, and if the Developer is purchasing the units through an SA Water supply tender, the costs of these spare pumps are to be included in the units. Pressure probes and pressure sensors external to the pumps are to be assumed to have a life of 15 years.

These are to be compared with the full capital costs of a conventional gravity system to the Developer.

Community Costs (Capital and Operational)

The additional costs for the community to be included into both the pressure sewer system and the conventional gravity system are:

- Power \$20/annum (pressure sewer)
- Costs to connect to conventional sewerage system estimated to be \$2,000 per property on average but some modification for particular circumstances.
- Costs to connect to pressure sewer system \$450 per property
- The costs to rectify or repair on-property mains and overcome tree root intrusion into these mains. (Conventional sewerage)

SA Water Capital Costs

SA Water will, as a result of the utilisation of pressure sewer systems, have reduced costs, in terms of the size of the treatment plant (maximum 2 -3 ADWF), and similarly for its' sewage pumping stations and downstream infrastructure. SA Water will provide to the Developer at the initial meeting on pressure sewer systems, or shortly thereafter, a per-property cost figure to cover these reduced capital costs to SA Water's downstream or future infrastructure.

This will also include the costs associated with any system infrastructure not required (such as pumping stations) as a result of the adoption of PSS.

SA Water Operation and Maintenance Costs

SA Water will provide to the Developer, at the initial meeting, typical operational and maintenance costs for gravity sewerage systems, excluding treatment and downstream infrastructure costs. These will cover all costs:

- To rectify any broken mains or mains choked with obstacles.
- Clean up on property and off property overflows, including those internal to the property.
- Keep manholes located and clear.
- Periodic clearing of roots from the line.
- After-hours, on-call arrangements.
- EPA fines for overflows.
- Inspection and repairs for system pumping stations noting that the regular inspection of these stations can often be a significant cost.
- Power costs for pumping stations attached to the development, as opposed to downstream pumping stations.

SA Water will also provide a guide as to the estimated reduction in operating costs per property, based upon reduced pumping of inflow and infiltration, and the reduced treatment plant costs based upon this reduced treatment of increased flows, due to the same inflow and infiltration.