WASTEWATER MANAGEMENT

44-55 Trench Avenue
Jamisontown

Prepared for:

Matt Woods Design
1/160 Rochford St
Erskineville NSW 2043

SLR Ref: 610.19103-R01
Version No: -v0.2
November 2019

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Grd Floor, 2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Matt Woods Design (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.19103-R01-v0.2	20 November 2019	Peter Cupitt	Paul Delaney	Paul Delaney
610.19103-R01-v0.1	20 November 2019	Peter Cupitt	Paul Delaney	Paul Delaney

CONTENTS

CONTENTS

TABLES

CONTENTS

FIGURES

APPENDICES

1 Introduction

The proposed mixed catering development at 44 to 55 Trench Avenue, Jamisontown currently has a single residential property serviced by a traditional septic system. The proposal is to refurbish the house into an 80 seat dining space and create a new outdoor covered pergola dining with 100 seats. It is anticipated 200 patrons would use the facility Monday to Friday and 400 patrons Saturday to Sunday. The facility would include a commercial kitchen and café. The café would operate daily and the commercial kitchen on the weekend.

Sewerage infrastructure discharging effluent to Sydney Water's reticulation will need to comply with the following Water Services Association Australia Codes:

(1) WSA 02-2002-2.2 Sewerage Code of Australia (Sydney Water Edition 1 Version 4) and;

(2) WSA 04-2005-2.1 Sewage Pumping Station Code of Australia (Sydney Water edition 2012).

Sewage treated and disposed of on site must comply with the Protection of the Environment Operations Act 1997 (POEO Act) administered by the Environmental Protection Agency (EPA).

SLR has prepared an assessment of sewage collection, treatment, irrigation, conveyance and transport options at the site with knowledge of the local and receiving environment. Preliminary capital and operating cost estimates have been prepared for each option to assist in the decision-making process. The rates were based on supplier quotations and Hunter Water Corporation sewage infrastructure costing guidelines.

2 Sewage Management Alternatives

SLR has identified the following options to manage sewage on the site post development:

1. Gravity feed to a receiving manhole at the rear of the Nepean Shores development
2. Gravity feed to a site based submersible pumping station at the rear of the property with a rising main to a receiving manhole at the rear of the Nepean Shores development
3. Gravity feed to a site based submersible pumping station at the rear of the property with a rising main to a receiving manhole in Jamison Road
4. Gravity feed to an onsite package sewage treatment plant or septic system with a treated effluent storage tank and on-site irrigation system
5. Gravity feed to a storage tank at the rear of the property which includes odour control and pump out bunding. Sewage to be pumped out and transported to Penrith Sewage Treatment Plant (STP) by tanker.

The annual running costs and maintenance have been estimated based on similar projects. An NPV over 20 years was prepared for each option and pros and cons prepared for comparison. Costs associated with design and construction would be based on projects of a similar nature and infrastructure cost estimates based on Hunter Water databases and supplier quotations.

3 Site Description

The site is a 2.34Ha parcel of land is located at 44-55 Trench Street, Jamisontown, NSW. The rich silty loam soils indicate the property is located within the floodplains of the Nepean River and would have been subject to frequent inundation prior to the construction of Warragamba Dam. The site soils are ideal for crops. The following figure shows the two locations where site-based soil profile tests were carried out.

Figure 1 Site based soil test locations

The orange orchid is located within silty loams overlaying loamy sands. The grassed area to the rear of the property contains loamy soil with light clay found at a depth of 400mm. Over 100mm of rain had fallen one week prior with no evidence of surface pooling. This is consistent with the highly permeable soils reported on site. Both zones would be ideal for surface irrigation.

The site has gentle grade of approximately 2% from the street frontage to the rear. This is ideal for gravity reticulation of sewage from the proposed buildings to sewerage infrastructure such as pumping station, treatment plant or storage positioned at the rear of the property.

4 Compliance Documentation

The property is located within the Sydney Water catchment. All sewerage infrastructure connected to their infrastructure must comply with:

(1) Water Services Association Australia WSA 02-2002-2.2 Sewerage Code of Australia (Sydney Water Edition 1 Version 4);

(2) Water Services Association Australia WSA 04-2005-2.1 Sewage Pumping Station Code of Australia (Sydney Water edition 2012).

These documents will be used to design the grade, size, cover, materials of pipework, temporary sewage storage facilities, odour control, on site treatment, pumping, manhole connections, retention duration limits, overflows etc.

If the sewage is to be treated and released on site, the EPA stipulates water quality objectives for discharge according to the Environment Operations Act 1997 (POEO Act).

5 Sewage Loadings

5.1 Design Flow

Design flow estimations are required for designing sewerage pipes, pumping stations and onsite sewage treatment facilities. The 'design flow' is the peak flow to be managed by the sewer system. It is composed of the following components:

The design flow = peak dry weather flow (PDWF) + groundwater ingress (GWI) + rainfall dependent inflow (IIF)

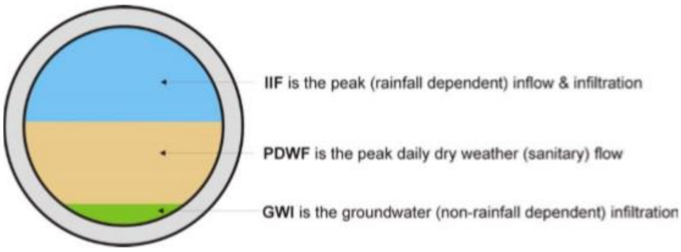


Figure 2 Typical constituents of sewage flow

Rainfall dependent inflow occurs when floodwaters enter the sewerage network through sewer overflows, 'Illegal' drainage pit connections, downpipe connections, leaks around manholes etc. Groundwater ingress occurs when groundwater enters the pipe through failed rubber rings.

For this analysis it will be assumed that infrastructure within the site will be fully sealed to prevent GWI and IIF. The design flow will therefore only be designed to contain the peak dry weather flow (PDWF) which is defined as the most likely peak sanitary flow in the pipe during a normal day. For infrastructure leaving the site an IIF will be included as traditional manhole designs and rubber ring pipe is required according to WSA 02-2002-2.2 Sewerage Code of Australia (Sydney Water Edition 1 Version 4.

Sydney Water has developed a relationship between the average dry weather flow (ADWF) and the PDWF based on the gross development area of the property i.e;

PDWF = d x ADWF

Where $d = 0.01(\log A)^4 - 0.19(\log A)^3 + 1.4(\log A)^2 – 4.66\log A + 7.57$

Based on an area of 2.34Ha the multiplication factor (d) equals 6.0. Meaning sewage flow spikes six times the average flowrate can be expected at peak times of operation. The following sections detail the flow rates to be designed for.

5.1.1 Facility pattern and sewage generation

In the Sydney catchment, the design flow is related to the number of equivalent persons (EP) where one EP generates approximately 180L of sewage per day or 0.0021 L/s in average dry weather flow. Sydney Water has gauged commercial kitchens, cafes and function centres and has deduced the equivalent number of EP's for each classification, namely;

Table 1 WSA02 Table A1 EP for synchronous discharges

Classification	EP per unit	Remarks
Clubs	0.25	Use the maximum number of occupants for which the facility was designed
Cafeteria	8	Meal preparation
Restaurant	8	Meal preparation

Based on discussions with the applicant, the following will form the basis for sewage loading calculations:

- The house will be refurbished into an 80-seat dining space
- An outdoor covered "Pergola" dining space will seat 100 patrons
- 200 patrons will visit Monday to Friday
- 400 patrons will visit Saturday and Sunday

5.1.1.1 Weekday sewage generation

During the week days the café and 80-seat dining space would be frequented by 200 patrons. The following sewage volume and rates are expected during the week days:

Table 2 Weekday design flow

Classification	Quantity	EP per unit	EP total	Patrons	Sewage per patron (L)	Daily volume (L)	Average Dry Weather Flow (L/s)	Peak Dry Weather Flow (L/s)
Design (seats)	80	0.25	20	200	18	3,600	0.042	0.25
Café kitchen	1	8	8	n/a	n/a	1,440	0.017	0.10
TOTALS			**28**	**200**	**18**	**5,040**	**0.06**	**0.35**

5.1.1.2 Weekend day sewage generation

During the weekends both the café and restaurant kitchens would be operating and the 80-seat dining space and 100 seat outdoor pergola would be frequented by 400 patrons. The following sewage volume and rates are expected during each weekend day:

Table 3 Weekday design flow

Classification	Quantity	EP per unit	EP total	Patrons	Sewage per patron (L)	Daily volume (L)	Average Dry Weather Flow (L/s)	Peak Dry Weather Flow (L/s)
Design (seats)	180	0.25	45	400	20.3	8100	0.09	0.57
Café kitchen	1	8	8	n/a	n/a	1440	0.017	0.10
Restaurant kitchen	1	8	8	n/a	n/a	1440	0.017	0.10
TOTALS			**61**	**400**	**20.3**	**5040**	**0.13**	**0.77**

5.1.2 Infrastructure design flow and volumes

- For a gravity pipe design the conduit will need to convey the PDWF
- For an onsite treatment plant will be designed to process the ADWF
- A pumping station will need to convey the PDWF
- A storage system will need to contain the average weekly volume.

The following table summarises the infrastructure design flows and volumes to be used in this analysis.

Table 4 Flow rates and volumes used for design

Flow regime	Value	Applicable infrastructure
ADWF weekday	0.06 L/s	STP
ADWF weekend	0.13 L/s	STP
PDWF weekday	0.35 L/s	-
PDWF weekend	0.77 L/s	Pumping station, gravity pipe
Weekday daily volume	5 kL	Tanker frequency, STP
Weekend daily volume	11 kL	Tanker frequency, STP
Total weekly volume	47 kL	Storage, tanker frequency

6 Sewage Management Options

6.1 Gravity Pipework Servicing Solution

Gravity drainage is always the most reliable solution to convey sewage. Very flat terrain, property access, water bodies, clashes with infrastructure, discharge points and other variations in the local landscape may preclude or limit the viability of a gravity system. A field inspection identified the closest manhole to the site at the rear of the Nepean Shores development. Another was located in Jamison Road, refer **Figure 3**.

Figure 3 Closest manholes to the development

The spare capacity for direct connection to these manholes is unknown without a formal application to Sydney Water to gain access to their hydraulic models. However, the capacity can be estimated based on the contributing EP, pipe diameter and grade. Sydney Water recommends the application of 3.5 persons per tenement. There are 174 tenements in the development which equates to 609 EP. Based on the following table from the Sydney Water sewer design code, the pipe diameter is likely to be DN225 which would have a spare capacity of 1000EP.

Table 5 EP capacity limitations for reticulated sewers (ref: WSA02 table 4.4)

Pipe Size (mm)	Maximum Allowable EP (Sydney Water)
150	600
225	1600
300	3200

➔ There is likely to be sufficient capacity in the receiving manhole to accept the proposed development flow.

6.1.1 Gravity pipeline route (following property boundaries)

A pipeline along the property boundary is the ideal route as it does not affect adjoining neighbours and would not require neighbour endorsement or an easement.

Figure 4 Gravity pipeline route along property boundaries

A long section following the property boundary confirms gravity drainage is not possible along this route.

Figure 5 Long section along the property boundaries

➔ Gravity drainage along the property boundary is not feasible.

6.1.2 Gravity pipeline route (traversing neighbouring properties)

The topography is such that gravity drainage is only possible if neighbouring properties are traversed. Where sewers are located within private property, easements are usually created for the water agency to gain access for future operations and maintenance activities. Construction over the sewer is usually restricted. Due to the high density, Sydney Water does not normally require an easement for sewers less than 300mm in diameter. The decision to permit the installation of a sewer main without an easement does rest with Sydney Water and each is considered on a case by case basis. Compensation is not normally required without an easement. Compensation is required for above ground assets such as manholes at a rate of $400 per chamber. Based on the pipeline route in **Figure 6,** three manholes would be required in neighbouring properties. The manholes would be located within 1.5m of the property boundary and on abrupt changes in direction. The maximum allowable distance between manholes is 120m. Appendix A contains advice from Sydney Water concerning easements and property acquisition.

Figure 6 Recommended gravity pipeline route

A monotonically decreasing grade is possible along the route shown in **Figure 6**. Three properties would be affected. The corresponding long section can be seen in **Figure 7.**

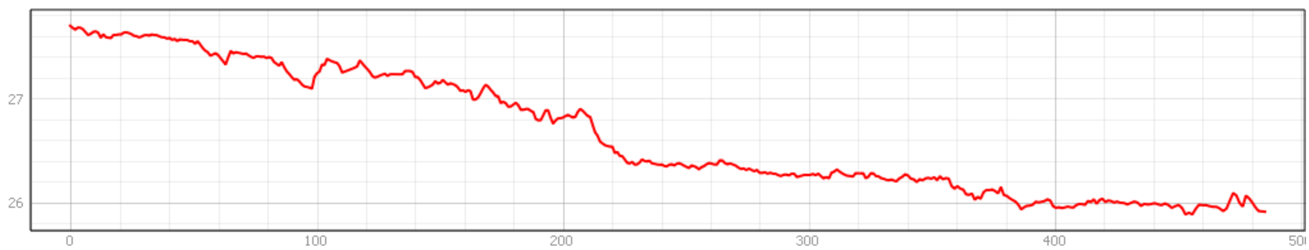


Figure 7 Surface long section along preferred route

The following table summarises the possible grade of the sewer based on estimates of the depth to invert. Sydney Water requires a minimum cover of 750mm for pipes subject to vehicular loads in private properties for new developments. It is assumed Wilson Lane behind the Nepean Shores development is subjected to vehicle loading as is the access to the proposed development.

The EP capacity and grade is limited by the pipe diameter according to the following tables:

Table 6 EP capacity limitations for reticulated sewers (Sydney Water WSAA)

Pipe size (mm)	Maximum allowable EP
150	600
225	1600
300	3200

Table 7 Minimum pipe grade versus pipe diameter (Sydney Water WSAA)

Pipe size (mm)	Maximum allowable EP
150	0.59
225	0.37
300	0.27

When applied to the site, the following table summarises the results.

Table 8 Estimate of gravity pipe grade based on standard pipeline covers

Location	Surface RL m AHD	Estimated depth to invert (m)	Invert RL m AHD	Elevation difference	Pipe length	Average pipe grade
Wet area discharge	27.70	975mm (750cover+225pipe)	26.73			
Receiving manhole	25.97	975mm (750cover+225pipe)	25.00			
Gravity pipeline from the proposed building to an existing manhole at the rear of the Nepean Shores development				1.73m	484m	0.36%

The average grade of a sewer pipeline would be approximately 0.36%. This grade is less than permitted for both DN150 and DN225 pipelines (**Table 7**). It will therefore be necessary to reduce the cover on site by adopting special embedment techniques and utilisation of alternate pipeline materials or install a DN300 diameter pipe. The latter is only permissible if the pipeline from the Nepean Shores development is DN300 or larger which is unlikely.

A cover of 450mm is possible under the access roadway to the site, consisting of 150mm of concrete overlain by 300mm of road base which would provide a 450mm of cover. Appendix B contains the design requirements for concrete encasement of pipelines. Pipeline subject to pedestrian loads elsewhere on the site would need to be Mild Steel sleeved or the ground be mounded by 300mm over the pipe. Assuming the former the following table summarises the expected grade.

Table 9 Estimate of gravity pipe grade with special pipe embedment and pipe types

Location	Surface RL m AHD	Estimated depth to invert (m)	Invert RL m AHD	Elevation difference	Pipe length	Grade
Site	27.70	675mm (450cover+225pipe)	27.03	A local topographical survey of the pipeline route will verify compliance with the minimum grade of 0.37% for DN225 pipelines.		
Receiving manhole	25.97	975mm (750cover+225pipe)	25.00			
Gravity pipeline from the proposed building to an existing manhole at the rear of the Nepean Shores development.				2.03	484m	0.42%

The minimum allowable grade for DN225 pipe is 0.37%. The expected grade exceeds the minimum requirements. The special treatment detailed above will need to be maintained until a cover of 750mm is achieved in the neighbouring properties. Ground truthing through ground based survey would be required to verify the LiDAR topographical data.

6.1.3 Gravity pipeline Infrastructure requirements

For this project it is recommended DN225 uPVC pipe sleeved in DN250 MSCL with infill grouting is required to combat zones of reduced cover. Under the access road on site the pipeline will need to be concrete encased with a 150mm concrete cover. uPVC SN8 DN225 rubber ring joint pipe would be used elsewhere to connect to the receiving manhole behind the Nepean Shores development. The pipeline will traverse three adjacent properties.

6.1.4 Additional site works required to verify a gravity drainage solution

As the grades associated with installing a gravity pipeline to the closet receiving manhole are marginal, the following site verification checks are required:

(1) Survey of the proposed pipeline route from the proposed development to the receiving manhole at the rear of the Nepean Shores development to authenticate the LiDAR ground levels.

(2) Lift the manhole lid at the rear of the Nepean Shores Development and verify the pipe diameter and level of the invert in mAHD.

(3) Lift the manhole lid in Jamison Road and verify the pipe diameter and level of the invert in mAHD.

(4) Liaison and endorsement from affected properties. Note that this solution is advantageous for servicing of adjoining properties and may be well supported.

6.1.5 Gravity Solution Capital Costs

The following table summarise the expected costs associated with the installation of a gravity pipe solution:

Table 10 Gravity solution capital costs

Item	Quantity	Unit	Rate	Total
DN225 PVC including MSCL sleeving gravity pipe in select sections	484	m	$172	$83,322

Item	Quantity	Unit	Rate	Total
Easement costs (manholes)	3	item	$400	$1,200
Connection to sewer	1	item	$2,732	$2,869
Concrete encasement	10	m	$683	$7,173
Preconstruction records, WAE drawings, line sheets, acceptance testing	484	m	various	$6,124
Establishment & disestablishment costs	1	item	$8,608	$8,608
Contract award sum subtotal	**Costs excluding design & construction management**			**$109,000**
Pre-construction design and PM	Costs prior to construction			$21,450
Construction management	Costs to manage the construction			$11,000
Project contingency	Allowance for market fluctuations			$36,300
Project estimate (rounded)				**$180,000**

6.1.6 Gravity Solution Operating Costs

A commercial kitchen would be subjected to trade waste fees and charges to manage and treat the wastewater. Sydney Water operate an electronic tracking system to monitor the generation, collection, transportation and disposal of grease trap waste. Sydney Water will specify the frequency of grease trap cleanout using a registered Wastesafe transporter. The transporter will clean the grease trap, transport the grease trap waste to a treatment facility and treat the grease trap waste at the treatment facility. Appendix C contains a summary of the trade waste fees for commercial properties operating a grease trap.

In addition to costs associated with the operation of a grease trap, Sydney water charge per kL for acceptance of non-residential customers. The following table summarises the expected annual costs associated with management of wastewater using a gravity system.

Table 11 Gravity solution operating costs

Item	Charge per annum
Liquid waste trap charge	$117
Waste trap annual permit	$83
Sydney water grease trap annual operating fees	$370
Pump out fees (estimate 4 times per annum)	$2,560
Wastewater service charge	$576
Usage charge at $1.10/kL	$2,697
Annual operating fees (rounded)	**$6,404**

6.1.7 Gravity Solution Net Present Value Costs

The net present cost (or life-cycle cost) is the present value of all the costs of constructing and operating the sewerage system over the project lifetime. The following table summarizes the NPV costs in today's dollars spread over a 20 year period for a range of discount factors to service the site via a gravity sewerage.

Table 12 NPV costs of a gravity system

Discount factor	4%	7%	10%
Total NPV over 20 years	$273k	$253k	$240k

6.2 Pumping Station Servicing Solution

An acceptable solution to the management of wastewater on site is the use of gravity pipe to drain sewage to a wet well and pump to a receiving manhole in Sydney Water's reticulation. The recommended location to install the wet well is in the southern corner of the site. The gravity pipe would ideally run parallel to the south western boundary to avoid disruption to the site assets. The wet well would contain two macerator pumps in a duty standby arrangement. The macerator pumps serve to blend all solids to a size which can safely pass through a small diameter high density polyethylene pipeline laid along the south eastern boundary of all properties before it discharges to a receiving manhole at either the rear of the Nepean Shores development 400m away or into a manhole in Jamison Road 730m away. The selected manhole would depend on the available capacity in the downstream pipeline.

Figure 8 Package pumping station on site discharging to the Nepean Shores development manhole

Figure 9 Package pumping station on site discharging to the closest manhole in Jamison Road

6.2.1 Pumping station infrastructure requirements

A sewage pumping station solution would need to cater for peak wet weather flow to prevent surcharge of the wet well. This would occur on the weekend when both the café and the function centre are operating plus an allowance for rainfall ingress via overflows, pipe joins, air vents, manholes etc

Based on the sewage loadings detailed in section 5, and discharge to either a manhole at the rear of the Nepean Shores development or to one in Jamison Road, the following infrastructure would be required for a pumping solution:

Table 13 Pumping station solution infrastructure

Asset	Dimensions	Quantity
Gravity pipe from the buildings to the pumping station	DN150 uPVC	226m
FRP package wet well	1000mm diameter x 1.35m deep	1
Pumps (short option)	Flygt MP 3069 HT 3 phase grinder pump with a 258mm impeller	2

Asset	Dimensions	Quantity
Pumps (long option)	Flygt MP 3069 HT 3 phase grinder pump with a 160mm impeller	2
Rising main (short option)	DN50 HDPE PE100 PN10	398m (short)
Rising main (long option)	DN50 HDPE PE100 PN6.3	730m (long)
Odour control	Educt vent with a carbon scrubber and whirly bird	1

Figure 10 Package pumping station wet well to be buried on site

To prevent the risk of odour release, it is recommended a carbon scrubber and whirl bird combination be mounted on the ventilation pipe from the wet well (referred to as the educt vent).

Three phase power would need to be run to the rear of the property. A motor control cabinet containing a junction box and pump control equipment would be visible above ground level. All other equipment would be below the natural surface.

Two Flygt (MF 3069 HT 3~ 254) 3 phase 415v, 1.7kW submersible grinder pumps would be arranged on a duty standby arrangement with a two to one flip flop operational control to prevent simultaneous pump failure. The pumps are to be started on a Demand On Load (DOL) due to the small size. Pump selection data sheets can be seen in Appendix D.

6.2.2 Pumping station construction costs

The following table details the approximate contract award and overall project estimate based on supplier quotations and HWC cost estimating guidelines.

Table 14 On site pumping station with short rising main construction costs

Item	Quantity	Unit	Rate	Total
DN150 PVC gravity pipe	226	m	$106	$23,992
1m dia x 1.35m deep wet well incl. odour control	1	item	$66,667	$66,667
1.7kW Flygt MP3069 HT 3-254 macerator pumps incl. fittings and installation	2	item	$4,069	$8,136
Switchboard and electrical supply	1	item	$19,232	$19,233
DN50 HDPE rising main PN10	398	m	$111	$30,248
Preconstruction records, WAE drawings, line sheets, acceptance testing	624	m	various	$7,934
Establishment & disestablishment costs	1	item	$8,608	$8,608
Contract award sum subtotal	**Costs excluding design & construction management**			**$165,000**
Pre-construction design and PM	Costs prior to construction			$36,036
Construction management	Costs to manage the construction			$16,500
Project contingency	Allowance for market fluctuations			$54,450
Project estimate (rounded)				$280,000

Table 15 On site pumping station with long rising main construction costs

Item	Quantity	Unit	Rate	Total
DN150 PVC gravity pipe	226	m	$106	$23,992
1m dia x 1.35m deep wet well incl. odour control	1	item	$66,667	$66,667
1.7kW Flygt MP3069 HT 3-254 macerator pumps incl. fittings and installation	2	item	$4,140	$8,280
Switchboard and electrical supply	1	item	$19,387	$19,233
DN50 HDPE rising main PN6.3	730	m	$109	$55,480
Preconstruction records, WAE drawings, line sheets, acceptance testing	624	m	various	$12,134
Establishment & disestablishment costs	1	item	$8,608	$8,608
Contract award sum subtotal	**Costs excluding design & construction management**			**$194,400**
Pre-construction design and PM	Costs prior to construction			$42,588
Construction management	Costs to manage the construction			$19,500
Project contingency	Allowance for market fluctuations			$64,350
Project estimate (rounded)				$330,000

6.2.3 Pumping station solution operating costs

A pumping station solution would still involve Sydney Water charges associated with the operation of a grease trap and discharge of effluent to Sydney Water's reticulation in addition to running and maintaining the pumping station. The following table summarises the expected annual operating costs associated with management of wastewater using a pumping station solution.

Table 16 Pumping station solution operating costs

Item	Charge per annum
Liquid waste trap charge	$116
Waste trap annual permit	$83
Sydney water grease trap annual operating fees	$370
Grease trap pump out fees (estimate 4 times per annum)	$2,560
Wastewater service charge	$576
Usage charge at $1.10/kL	$2,698
Pumping station annual maintenance	$2,384
Energy costs	$162
Pipeline maintenance	$932
Annual operating fees (rounded)	**$9,900**

6.2.4 Pumping station solution NPV Costs

The net present cost (or life-cycle cost) is the present value of all the costs of installing and operating the sewerage system over the project lifetime. The following table summarizes the NPV costs over a 20 year period in today's dollars.

Table 17 NPV costs of a pumping station solution (short rising main)

Discount factor	4%	7%	10%
Total NPV over 20 years	$421k	$392k	$372k

Table 18 NPV costs of a pumping station solution (long rising main)

Discount factor	4%	7%	10%
Total NPV over 20 years	$471k	$442k	$422k

6.3 Onsite Treatment Servicing Solution

Onsite wastewater treatment is becoming the preferred treatment method over centralized treatment plants for remote subdivisions. Using onsite wastewater treatment provides effective sanitation that can be tailored to the existing needs in a timely and cost-conscious manner with the added advantage of providing recycled water for gardens, lawns and cistern refills.

6.3.1 On site treatment system requirements and limitations

All on site treatment options will produce treated effluent which must be managed. The end use of the treated effluent will dictate the level of treatment required. As a site-based irrigation system for an orange orchard is proposed to manage the treated effluent, removal of solids is required to prevent irrigation failure and retention of low levels phosphorus and nitrogen is desirable for the orange orchard at certain times of the year. An on site treatment system must therefore:

- ➔ Have the ability to adjust the output concentration of phosphorous and nitrogen
- ➔ Remove solids to a level which will not block the selected irrigation system
- ➔ Produce an effluent which is neutral to slightly alkaline to suit an orange orchard
- ➔ Ensure the site has the evapotranspiration and hydraulic soil capacity to absorb the treated water produced over the whole year

6.3.2 On site treatment systems

Irrespective of the treatment option employed the kitchen would require a grease trap as grease balls hinder the treatment process. There are essentially six processes involved in sewage treatment which are usually performed in the following order:

a. Solids screening or settlement
b. Anaerobic digestion (anoxic)
c. Aerobic digestion (oxygenated)
d. Settlement
e. Filtration
f. Disinfection

All treatment systems employ two or more of these processes to achieve the desired effluent quality. The infrastructure used to undergo these processes include but are not limited to the following:

1. Mechanical screens and filter bags
2. Primary settlement tanks/septic tanks
3. Anaerobic baffled reactors
4. Anaerobic filters
5. Aerobic sequential batch reactors
6. Clarifiers

7. Sand filters
8. Disinfection
9. Constructed wetlands

The site lends itself to an underground treatment system which produces an effluent which is slightly alkaline, contains a small concentration of phosphorous and nitrogen which can be varies and is disinfected. This can be achieved though the following processes:

(A) **Aerobic Process:** Settlement of solids -> aerobic digestion -> clarification -> disinfection -> irrigation

(B) **Anaerobic/Aerobic Process:** Settlement of solids -> anaerobic digestion -> settlement -> aerobic digestion -> clarification -> disinfection -> irrigation

Common to all package treatment plant solutions is the requirement for a gravity drainage from the wet areas of the buildings to either a settling/balance tank or a screening unit. The tank would be sized for 2hours retention to prevent septicity and a solids settlement zone. The tank would contain a small submersible macerator style pump mounted at a high level to lift or distribute the sewage to the downstream treatment process cells. The accumulated solids would need to be periodically removed with a vacuum truck. The frequency of removal would depend on the tank size and the behaviour of the users to release solids to the drain. If a screening unit were employed, an operator would be required to periodically dispose of the screenings.

6.3.2.1 Aerobic process

Aerobic digestion is a process which involves intense aeration of the sewage to feed the aerobic bacteria which break down the solids and cause them to separate from the liquid phase. The aeration is sequenced by clarification, settlement and disinfection. It does not produce odours, is robust to shock loading and produces an effluent which is neutral to alkaline. It does however require significant power to operate the aerators approximately 12 hours per day.

The Aussie Kleen® package treatment plant (Figure 11) and the Tricell® package treatment plant (Figure 12) operate on this principle. The Aussie Kleen® units are brought to site ready made on a skid. They are an above ground facility which is suitable for commercial scale systems. The set-up costs are minimal and the unit is operational almost immediately. Such facilities are widely used in the mining industry. The Tricell® is an underground version and therefore requires excavation, placement, underground plumbing, buoyancy control to prevent floatation of the tanks and flood protection.

This style of treatment does not incorporate a septic phase (anaerobic i.e. devoid of oxygen) so no hydrogen sulphide (rotten egg gas) is produced and therefore no odours. The sewage cycles through fine bubble aeration followed by rest. The latter is required for de-nitrification. Waste activated sludge would need to be decanted and removed intermittently. Approximately 15kL of sludge would be produced annually and would need to be vacuumed from the system and disposed of at the Penrith STP.

The treated effluent would be temporarily stored in a treated water tank for surface irrigation system. If surface irrigation were employed disinfection of the treated effluent would be required by either chlorination or medium pressure UV disinfection (i.e. kills a broad range of bacteria by applying a greater range of wavelengths). Disinfection with liquid sodium hypochlorite (chlorine) is not recommended as it is a class 8 chemical requiring trained staff to safely store, handle and bund the liquid. Calcium hypochlorite tablets would be safer to manage. The dose rate should not exceed 2mg/L to inhibit plant health.

(A) Aussie Kleen®

The Aussie Kleen package treatment plant would be virtually maintenance free. The treatment plant would require the following infrastructure:

- a 2kL underground balance settlement tank with two distribution submersible pumps
- two 4kL SK20 SBR units
- medium pressure UV disinfection or calcium chlorite dosing cell
- irrigation pipework

Figure 11 Site equivalent: balance/settlement, two SK20 SBR units, treated effluent tank and pump

The dimensions of such a facility would be 20m x 10m. As the facility would be above ground screening may be desirable.

(B) Tricell®

The Tricell package treatment plant would be virtually maintenance free. The treatment plant would require the following infrastructure:

- one UK50 unit which includes a primary settlement chamber
- medium pressure UV disinfection or calcium chlorite dosing cell
- irrigation pipework

Figure 12 Site equivalent: balance/settlement, two Tricell units, treated effluent tank and pump

The quality of effluent from both these options would be excellent. The extent of maintenance would include removal of screenings/solids and removal of waste activated sludge with a vacuum pump annually.

➔ The total area required for a Tricell® aerobic treatment system would approximately 7m x 2m x 2.3m deep.

Aerobic processes are robust and will withstand shock hydraulic loads. It is advisable that bleaching powders and disinfectants do not enter the sewage as the treatment process would be compromised. The operation and maintenance of such a system is minimal and would include:

(1) Removal of approximately 15m^3 of sludge annually and taken to Penrith STP

(2) Overhaul of blowers on a 5 yearly cycle

(3) Distribution and irrigation pump maintenance on a 5 yearly cycle

The operation of the SBR is automatic so there is little operator interaction. The power demands are significantly higher than an anaerobic system requiring two 0.25kW blowers to operate approximately 12hours per day (at 25c/h). The quality of effluent would be higher than is necessary for irrigation.

6.3.2.2 Anaerobic processes

A septic tank is essentially a primary sedimentation tank with large detention time of 24 to 36hrs against a period of 2hrs for an ordinary sedimentation tank. The size of the septic tank is designed such that the sewage is retained in the tank until biological decomposition by the action of anaerobic bacteria takes place which liquefies and breaks the sewage leaving small quantity of soil which is known as sludge which settles at the bottom of the tank and clear water, known as effluent, flows out of the tank. They cannot withstand any disinfectants or cleaning products as this kills the anaerobic bacteria.

The EPA will not permit the installation of 'old style' septic systems in NSW on a commercial scale which will discharge treated effluent via an irrigation system. A pure septic system will also produce an effluent which is slightly acidic and is not ideal for the irrigation of orange trees. A hybrid septic system sequencing with an aerobic reactor would produce the desired effluent quality and would be acceptable to the EPA. There are many options on the market. Two options have been presented below which are both subsurface, cost effective and have a proven track record. They are the Ecowise® (Figure 13) and the Bioseptic® (Figure 15) who both supply to the Sydney basin and have been in operation for 40 and 30 years respectively. Both are underground facilities and are very discrete.

(A) Ecowise (ecowisewastewater.com.au)

The Ecowise® system is designed to modulate the 5kL five cell tanks. Two tanks would be required to treat the expected loading. A 2kL balance/settlement tank would be required upstream of the treatment cells housing two small macerator submersible pumps to distribute the flow to each of the cells based on demand. The sewage would be pumped into the primary chamber where solids settle and the liquid weirs over to the secondary chamber. These two cells are essentially a septic system where anaerobic digestion occurs.

The partially treated water is then pumped in pulses to the aeration chamber where aerobic bacteria 'sweeten' the effluent by raising the pH, reducing phosphorus (TP) and nitrogen (TN) levels and generating biomass (dead bugs). The levels of TP and TN required in the treated effluent can be adjusted at this stage to suit the needs of the orchard. The aerated (aerobic) chamber has large areas of submerged fixed film growth media to promote stable biomass which acts as a biological filter through which all effluent passes many times before entering the clarifier.

From this the aeration chamber effluent flows into a coned clarifier where any solid particles remaining sink to the bottom of this cone and are pumped to the primary chamber. The remaining liquid then gravity feeds through filters which are located in the clarifier to stop any solid particles from flowing to the irrigation chamber.

From this clarification chamber the treated, cleaned effluent is then gravity fed into the irrigation disinfection chamber where it comes in contact with appropriately sized calcium hypochlorite tablets to provide a 2mg/L dose rate. The disinfected effluent is then pumped to the irrigation area.

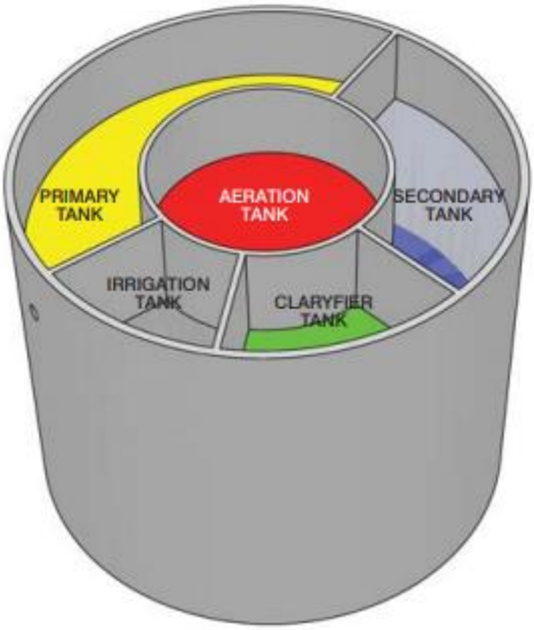


Figure 13 Internals of the Ecowise package treatment system

The system is fully underground and very discrete. Figure 14 show the equivalent system suited to the site. Essentially one tank would be required on the week days and two over the weekend.

Figure 14 Ecowise system discretely installed below ground

The aeration phase has the capability to vary the nitrogen and phosphorous removal rate from the control panel. This is desirable during fruiting season for the orange orchard. Maintenance is included in the first year's operation but can be continued with Ecowise if required.

The site area required for the Ecowise system is approximately 7m x 4m x 2.3m deep

(B) Bioseptic (bioseptic.com.au)

The process of the Bioseptic system is identical to the Ecowise but is arranged into three separate cells. Refer Figure 15. To achieve the required loading at the site one Hi-Flo Bioseptic tank would be required. The first cell houses the septic tank containing a primary and secondary chamber. The second is an equalisation tank housing a submersible pump to feed the treatment tank. The duration in the aerobic zone will dictate the concentration of TP and TN in the final effluent. The solids collected in the final clarifier are returned to the primary tank.

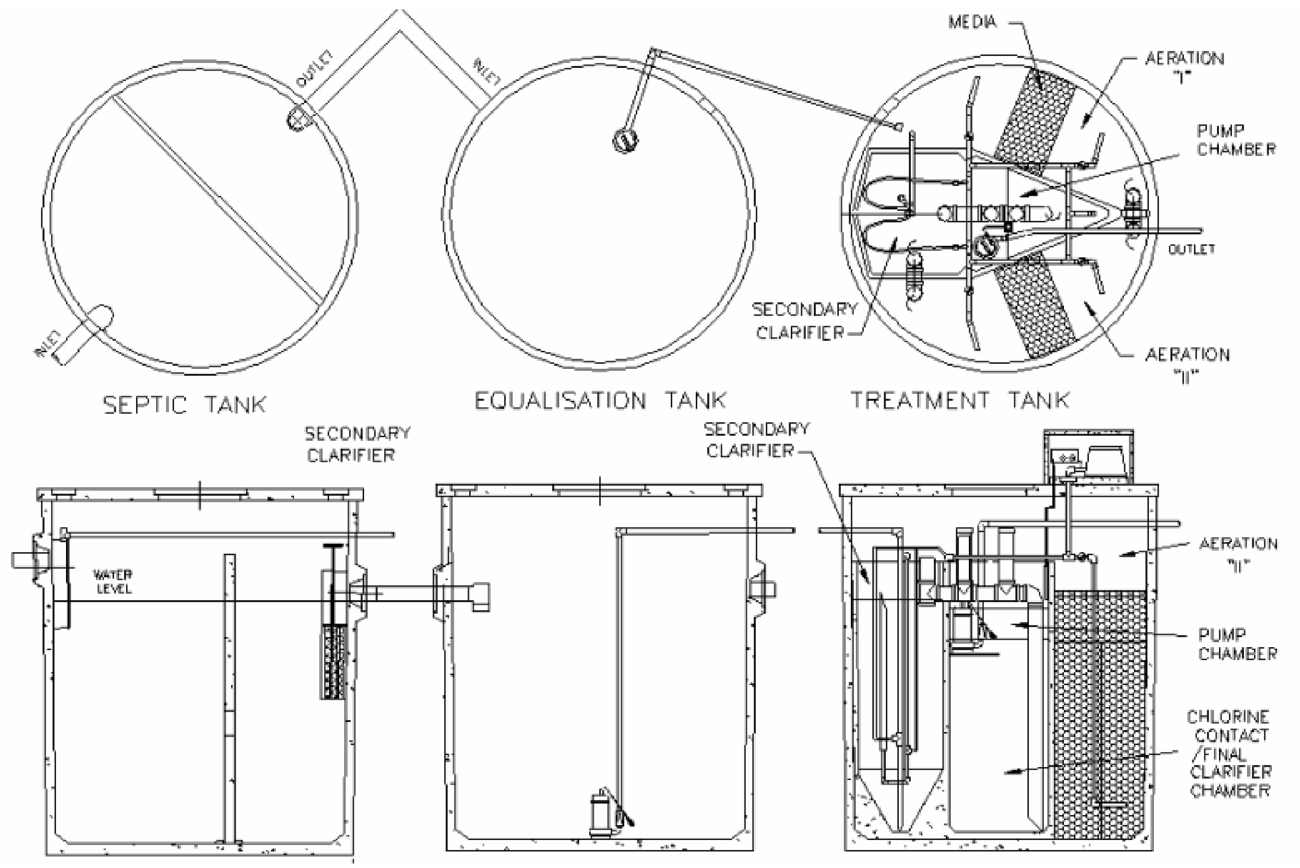


Figure 15 Internals of the Bioseptic system

- ➔ The site area required for an anaerobic/aerobic treatment system would approximately 20m x 3m x 2m deep.

For successful operation of a septic systems, the influent should not contain bleaching powders and disinfectants which kill the bacterial growth required for treatment. The café and restaurant should dispose of harsh cleaning products by other means.

With regards to occupational health and hygiene, the opening of the chambers should be performed by trained personnel with gases testing equipment to avoid being overcome from the noxious and flammable gases.

The operation and maintenance of such a system is minimal and would include:

(1) Removal of approximately 15m^3 of sludge annually and taken to Penrith STP

(2) Maintenance of the distribution pumps 5 yearly

(3) Maintenance of the irrigation pump 5 yearly

(4) Maintenance of the blower 5 yearly

(5) Replacement of the calcium hypochlorite tablets as needed

The operation is automatic apart from the chlorination so there would be little operator interaction.

6.3.3 Management of the treated effluent

Without the capacity to release the treated effluent, a package treatment plant on site would not be viable. The POEO Act (refer section 4) will not permit surface pooling of treated effluent. The soils must therefore have enough permeability to infiltrate the irrigated water and the vegetation cover must also have sufficient evapotranspiration to take up the water in the soil to prevent surface pooling.

If the soils are permanently moist then there will be little void space for treated effluent. The Bureau of Meteorology (BoM) provides data on the average moisture condition of soils throughout NSW. The following graph shows the antecedent moisture condition at the site to vary between 13 and 48% with an average of 29%. This means the soil would have an average of 71% of the water storage available for discharge.

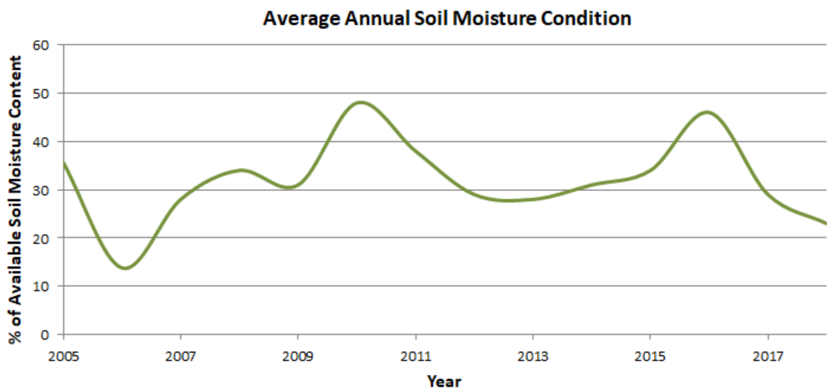


Figure 16 Soil moisture condition

Soil testing over the site indicates the orchard is ideally placed in fertile silty loams with a depth of approximately 500mm overlaying loamy sands with a reported depth of 400mm. The top soil depth was determined through site digging and the subsoil depth sourced from the Office of Environment and Heritage (OEH) online soil data base (ref 2). This material may be sitting over clay or rock. Determining the actual depth of the underlying loamy sands is recommended to confirm the available soil storage capacity.

Appendix E contains a soil profile report for a location just north of the site verifying the site-based diagnosis of soil type. The following table summarises the hydraulic capacity of the site soil and the available water storage based on this information.

Table 19 Site soil hydraulic behaviour

Parameter	Value
Top soil	Silty loam
Top soil depth	500mm
Top soil infiltration	6.8mm/h
Sub soil	Loamy sand
Sub soil depth	400mm
Sub soil infiltration	59.8mm/h
Subgrade material	To be confirmed
Available Water Content (AWC) depth to the limit of soil depth knowledge	65mm
Antecedent moisture condition	28%
Available land area for irrigation	10,700m^2
Available soil storage to the known permeable soil depth within irrigation area	696 kL

6.3.4 Site water balance

As the site has an established plantation of orange trees and it is intended to irrigate the trees with treated effluent then the loss of water through evapotranspiration needs to be greater than the volume of rainfall plus the volume of treated effluent distributed over the site. Established orange trees require between 4.9 and 8.4ML/ha of water per year (ref 1). Assuming an average annual orange orchard uptake of 6.7ML/ha then 7.1ML of treated effluent and rainfall will be required annually to irrigate the orchard. The following table summarises the site water balance based on a monthly water balance increment.

Table 20 Site water balance

Month	Average evapotranspiration from mature orange plantation over irrigation area (mm/day)	Average rainfall over irrigation area (mm/day)	Average treated effluent volume distributed over irrigation area (mm/day)	Rainfall + Effluent - Evapotranspiration (mm/day)	Average surplus kL/month
January	7.9	3.4	0.2	-4.3	0
February	6.8	4.1	0.2	-2.5	0
March	5.8	2.6	0.2	-3.0	0
April	3.9	1.7	0.2	-2.0	0
May	2.4	1.3	0.2	-0.9	0
June	1.6	2.0	0.2	0.7	7.0
July	1.6	1.1	0.2	-0.3	0
August	2.4	1.1	0.2	-1.1	0
September	3.5	1.1	0.2	-2.1	0
October	5.0	1.8	0.2	-3.0	0
November	6.4	2.8	0.2	-3.3	0

Month	Average evapotranspiration from mature orange plantation over irrigation area (mm/day)	Average rainfall over irrigation area (mm/day)	Average treated effluent volume distributed over irrigation area (mm/day)	Rainfall + Effluent - Evapotranspiration (mm/day)	Average surplus kL/month
December	8.1	2.2	0.2	-5.7	0

The analysis shows that water supply only just exceeds demand during the month of June. This analysis does not take into consideration the volume of water storage in the soil. With 700kL of known soil storage beneath the irrigation area the available soil storage would adequately infiltrate this surplus. Pooling would not occur on the surface.

6.3.5 Site Irrigation

The treated effluent would be pumped via a submersible pump through a dendritic network of HDPE irrigation pipework. The pump would start on tank level. Bubbler style irrigation nozzles are recommended which have a discrete umbrella spray pattern with a radius of 0.3 to 0.45m. This would minimise patron contact but are also less likely to block than dripper style outlets.

Figure 17 Package STP infrastructure location and irrigation pipework

6.3.6 Disinfection of irrigation water

As the irrigation water would be surface released under a bubbler style irrigation nozzle the POEO Act will require the treated effluent be disinfected. There are two options available, namely:

(1) Chlorine dosing

(2) Ultraviolet radiation (UV)

Dosing with sodium hypochlorite (liquid), chlorine gas or calcium hydpochlorite (solid tablet) should be applied at the minimum allowable dose rate of 2mg/L. Higher does rates will affect plant health. With a small system dosing with the correct sized tablet into the treated water tank would be the safest and most convenient.

If UV disinfection were preferred a medium pressure UV reactor is recommended over a low-pressure UV to guarantee disinfection of all pathogens. Low pressure UV units are cheaper but only target a single UV frequency and therefore cannot guarantee complete disinfection. UV systems do require a level of experience as the reactors do cloud with fines requiring a tri-weekly clean with citric or acetic acid.

6.3.7 Recommended on site treatment system

An anaerobic/aerobic hydrid system will be more economical to run and will occupy a smaller space. They also provide a greater control in the output quality which is desirable for the irrigation of a nutrient hungry orange orchard.

Of the two hybrid systems presented, the Ecowise® is more compact and provides a greater flexibility in operation having two cells involved in the operation. It also has the capacity to treat up to 10kL per day which would be expected on the weekend. The BioSeptic® would be running beyond its rated capacity on the weekend and below on a weekday.

The Ecowise® system would allow one cell to be shut down in the low periods to reduce operation and maintenance costs. The installation of an Ecowise treatment system will be costed.

6.3.8 On site treatment infrastructure requirements

The sizing of the treatment system is based on an average daily production rate of 7kL

Table 21 Storage and collection infrastructure

Asset	Dimensions	Quantity
Gravity pipe from the buildings to the pumping station	DN150 uPVC	226m
2kL fibre reinforced plastic package wet well containing two macerator style submersible pumps	1340mm diameter x 1.4m deep	1
Submersible grinder pumps	Approx. 250mm dia x 0.6m	2

Asset	Dimensions	Quantity
Ecowise® commercial advanced blower sewage treatment plant	3400mm dia x 2.3m	2
Irrigation pumps	Approx. 250mm dia x 0.6m	2
Irrigation pipework and bubbler nozzles	HDPE DN32 irrigation pipework	1390m

6.3.9 On site treatment construction costs

The following table details the approximate contract award and overall project estimate based on supplier quotations and HWC cost estimating guidelines.

Table 22 On site treatment capital costs

Item	Quantity	Unit	Rate	Total
DN150 PVC gravity pipe	226	m	$106	$23,992
Package PS 1.34m dia with 2 x grinder pumps	1	item	$11,830	$11,830
Ecowise® commercial advanced blower sewage treatment plant, installation	2	item	$47,500	$95,000
Electrical feed and control cabinet	1	item	$8,200	$8,200
Irrigation pumps, irrigation pipework and nozzles	1340	varies		$38,100
WAE testing and commissioning	1	item	$3,024	$3,024
Establishment & disestablishment costs	1	item	$8,608	$8,608
Contract award sum subtotal	**Costs excluding design & construction management**			**$189,000**
Pre-construction design and PM	Costs prior to construction			$41,300
Construction management	Costs to manage the construction			$18,900
Project contingency	Allowance for market fluctuations			$62,370
Project estimate (rounded)				**$320,000**

6.3.10 On site treatment operating costs

A grease trap would still be required, as grease balls can upset the treatment process and block the distribution pumps.

A cost saving has been added associated with the water saving resulting from the use of treated effluent in lieu of main water.

The following table summarises the expected annual running costs associated with operation and management of a package sewage treatment plant.

Table 23 Pumping station solution operating costs

Item	Charge per annum
Grease Trap	
Liquid waste trap charge	$116
Waste trap annual permit	$83

Item	Charge per annum
Sydney water grease trap annual operating fees	$370
Grease trap pump out fees (estimate 4 times per annum)	$2,560
Package STP	
Maintenance	$2,380
Power	$1,509
Sludge pumpout	$2,560
Irrigation	
Maintenance	$2,010
Water savings	-$15,975
Annual operating fees (rounded)	**-$4,387**

6.3.11 On site treatment NPV Costs

The net present cost (or life-cycle cost) is the present value of all the costs of installing and operating the sewerage system over the project lifetime. The following table summarizes the NPV costs over a 20 year period in today's dollars for a storage and collection solution.

Table 24 NPV costs of a pumping station solution

Discount factor	4%	7%	10%
Total NPV over 20 years	$255k	$269	$278

6.3.12 Viability of onsite treatment

Onsite sewage treatment using a hybrid anaerobic and aerobic treatment process with disinfection will produce a treated effluent quality which is suitable for grass and orange orchard irrigation. Management of the treated effluent is only viable if 10,700m^2 or more of the site is used for irrigation. This includes all land west of the proposed car park through to the 'climbing tree' and excluding the access roads. An Ecowise® or equivalent treatment system has EPA approval and would be acceptable.

Waste activated and primary sludge removal would be required annually with an expected volume of 15kL. This sludge could be removed intermittently with the cleaning of the grease trap.

6.4 Storage and Collection Solution

Collection and removal by tanker is often the solution adopted for developments during the short term until regional infrastructure is in place. The solution would involve the installation of gravity pipe to transfer sewage from the wet areas of the buildings to a large underground tank. The tank would contain a partition and weir to form a two stage 'treatment cell' with the primary cell providing anaerobic digestion and the second storage of the supernatant. Partially treating the effluent receives a discounted rate for discharge to Sydney Water's treatment plants.

The primary cell would be vented through either a large scale carbon scrubber or a soil bed filter to mitigate odours. The tank would require emptying biweekly with transport to Penrith Sewage Treatment Plant 7.4 km from the development site via a 26,000L tanker. Companies such as Remondis, JJ Richards, Enviro and Cleanaway offer these services.

Figure 18 Storage and collection option layout

6.4.1 Storage and collection infrastructure requirements

The sizing of the sewage storage tank would be based on a weekly production rate of 47kL (say 50kL). As the sewage could potentially be stored for 7 days septicity would have occurred generating a significant volume of methane, hydrogen sulphide, ammonia, carbon monoxide, sulphur dioxide and nitrogen oxides. These gases are toxic and damaging to infrastructure if not properly protected. Management of the gases by fan extraction and delivery to a soil bed filter is the most economical, virtually maintenance free long term solution. A 316L extraction pipe with a camlock fitting on the surface would be made available for the tanker to draw from.

Table 25 Storage and collection infrastructure

Asset	Dimensions	Quantity
Gravity pipe from the buildings to the pumping station	DN150 uPVC	226m

Asset	Dimensions	Quantity
50kL Concrete storage tank with epoxy lining	4 x 4.5 x 3m	1
Soil bed odour control system	5 x 5m	1

6.4.2 Storage and collection construction costs

The following table details the approximate contract award and overall project estimate based on HWC cost estimating guidelines.

Table 26 Storage and collection construction costs

Item	Quantity	Unit	Rate	Total
DN150 PVC gravity pipe	226	m	$106	$23,992
4 x 4.5 x 3 cast in situ 2 stage concrete tank	1	item	$74,456	$74,456
Soil bed filter and associated air extraction system	1	item	$90,954	$90,954
Establishment & disestablishment costs	1	item	$8,608	$8,608
Contract award sum subtotal	**Costs excluding design & construction management**			**$198,000**
Pre-construction design and PM	Costs prior to construction			$43,462
Construction management	Costs to manage the construction			$19,900
Project contingency	Allowance for market fluctuations			$65,670
Project estimate (rounded)				$330,000

6.4.3 Storage and collection operating costs

A storage and collection solution would involve costs associated with tanker extraction and delivery to Penrith STP. The Contractor would pass on Sydney Water's treatment charges depending on the strength of the sewage.

A grease trap would still be required, as grease balls can block the extraction pipework of the pump out system. The following table summarises the expected annual costs associated with management of a sewage storage and pump out solution.

Table 27 Pumping station solution operating costs

Item	Charge per annum
Grease Trap	
Liquid waste trap charge	$116
Waste trap annual permit	$83
Sydney water grease trap annual operating fees	$370
Grease trap pump out fees (estimate 4 times per annum)	$2,560
Wastewater service charge	$576
Usage charge at $1.10/kL	$2,693
Storage tank	
Waste discharge charge Penrith STP	$5,998
Transport from site to Penrith STP	$61,984
Annual operating fees (rounded)	**$68,000**

6.4.4 Storage and collection NPV Costs

The net present cost (or life-cycle cost) is the present value of all the costs of installing and operating the sewerage system over the project lifetime. The following table summarizes the NPV costs over a 20 year period in today's dollars for a storage and collection solution.

Table 28 NPV costs of a storage and collection solution

Discount factor	4%	7%	10%
Total NPV over 20 years	$1,327k	$1,123k	$980k

6.5 Summary of Options & Recommendations

The following table summarises the options investigated to service the proposed development and the associated up front contract award costs with and without design and management, the annual operating costs and the life cycle cost over 20 years.

Table 29 Summary of options

Option	Description	Contract Award	Total Upfront	Annual Operating	Life Cost 7% NPV	Comments
1	Gravity drainage to a manhole at the rear of the Nepean Shores	$109k	$180k	$6.4k	$253k	Requires topographical survey to verify hydraulic viability and legal endorsement to install pipe across neighbouring properties
2	Gravity drainage to a pumping station with discharge to a manhole at the rear of the Nepean Shores	$165k	$280k	$9.9k	$395k	Verify hydraulic capacity of receiving manhole.
3	Gravity drainage to a pumping station with discharge to a manhole in Jamison Road	$194k	$330k	$9.9k	$392k	Verify hydraulic capacity of receiving manhole
4	Gravity drainage to an Ecowise® package STP (or equivalent), irrigate treated effluent within site	$189k	$320k	-$4.4*	$269k	System is viable if > 1.07Ha is irrigated. Water savings have been included in the calculations
5	Gravity drainage to an anaerobic digestion storage cell and tankering of supernatant to Penrith STP	$198k	$330k	$68k	$1,123k	Requires an expensive odour control system

*Potable water savings have been included in the calculations

The least cost option is a gravity solution, however a topographical survey of the adjoining properties would be required to verify the hydraulic capability to comply with the minimum grade requirements in the code. The spare capacity of the receiving sewerage system would also need to be established. An estimate could be made by verifying the pipe diameter and invert of the receiving manholes at both the rear of the Nepean Shores development and in Jamison Road.

With a greater upfront cost but almost equivalent life cycle cost, the on site treatment system with irrigation is a viable solution. The treatment system must be married with irrigation of the total vegetated area from the car park in the east to the 'climbing tree' in the west. Distribution to the site's toilets should also be considered. The Ecowise® treatment system has been recommended over the others investigated due to its small footprint, low cost, flexibility in operation and control, discreetness, EPA compliance and long standing reputation for reliability.

APPENDIX A

Easements and property acquisition – Sydney Water

SEWER MAIN EASEMENT REQUIREMENT FORM 'S'

EASEMENT REQUIRED FOR: (cross box)

(a) Gravity Sewer Main equal to or larger than DN 600: ☐
or special circumstances (refer Easements Section 3.2)

(b) Sewer Rising Main: ☐
(refer Easements Section 3.3)

PART 1 – PROPOSAL

(TO BE COMPLETED BY DESIGNER)

Project Initiated by: ☐ Developer ☐ Sydney Water

The following particulars are submitted for Sydney Water review:

PROJECT DESCRIPTION

Current Lot/s: DP LGA

Street/s:

Suburb/s:

Developer/Sydney Water Initiator:

Phone: Fax:

Designer:

Phone: Fax:

Sydney Water Project No: File No:

Pipe Diameter/s DN:

Date main laying expected to commence:

DETAILS OF EASEMENT

A copy of the sewer main design plan which includes the following details is attached:

- Proposed easement width m (show width and extent of easement)
- Is easement to be centred over sewer main?

  Yes ☐

  No ☐ (If no, show offset distance on plan)
- Are there structures or fittings on the main or above ground structures or sections of the main (such as aqueducts, ventshafts etc.) that require local widening or extension or variation of the easement?

  Yes ☐ (If yes, show details on plan)

  No ☐

Name (print)
Signed ………………………………………….. Designer

Date:

Sydney WATER

SEWER MAIN EASEMENT REQUIREMENT FORM 'S'

PART 2 – REVIEW

(SYDNEY WATER USE ONLY)

EASEMENT:

The easement proposal detailed in Part 1 of this form has been reviewed and will satisfy Sydney Water's operational requirements.

EASEMENT CONDITIONS REQUIRED:

Are the easement conditions as set out in Easements Section 3.2.2 (gravity sewer mains) or Section 3.3.2 (sewer rising main) to be applied without modification?

Yes ☐

No ☐ (If no, state details below):

Modifications:

Section No:

Section No:

Additional Requirements:

(If space insufficient, attach list)

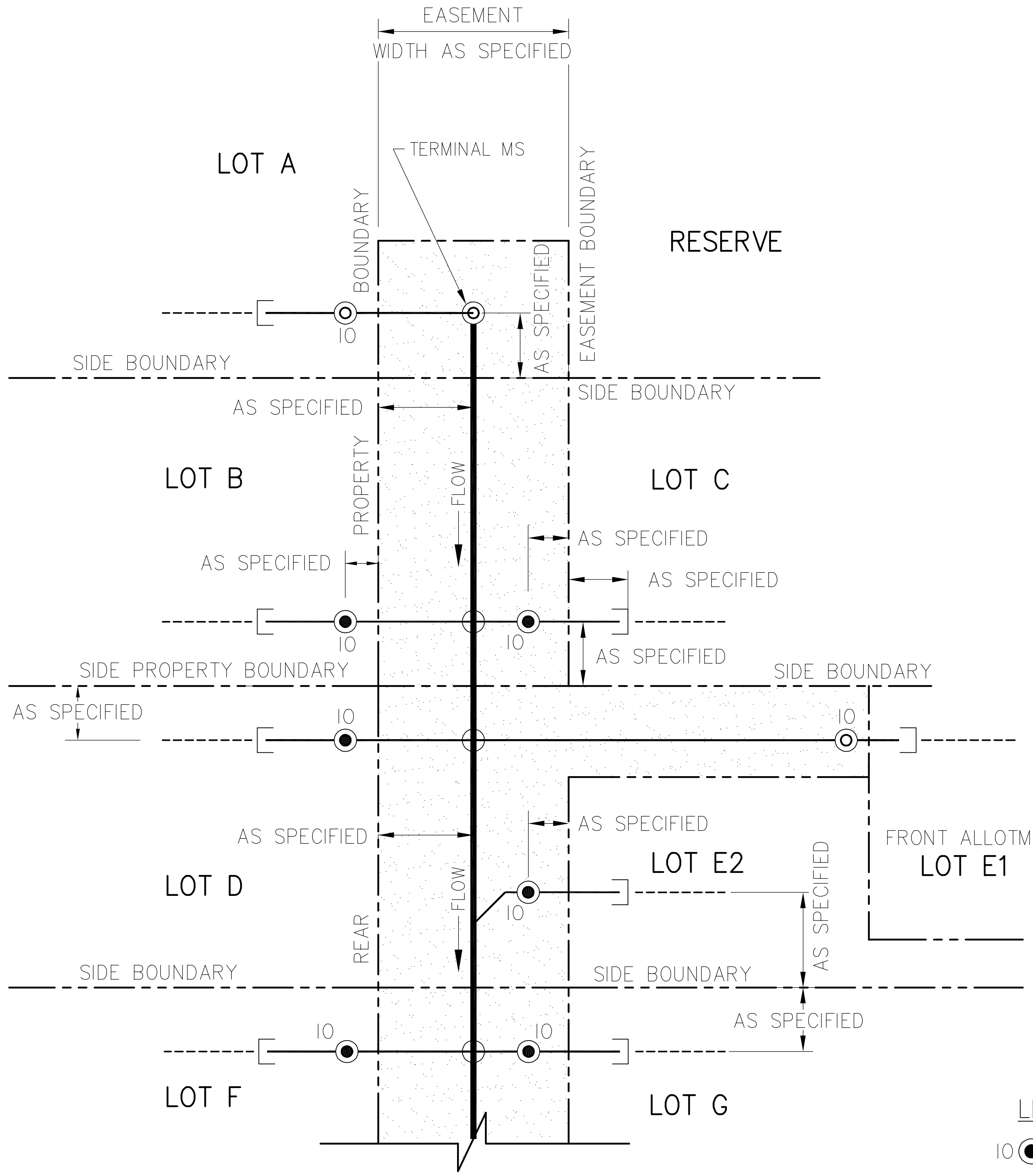
Signed ……………………………………….. Date:

Name (Print) Position: Network Area Manager, Operations Division

Location:

Phone: Fax:

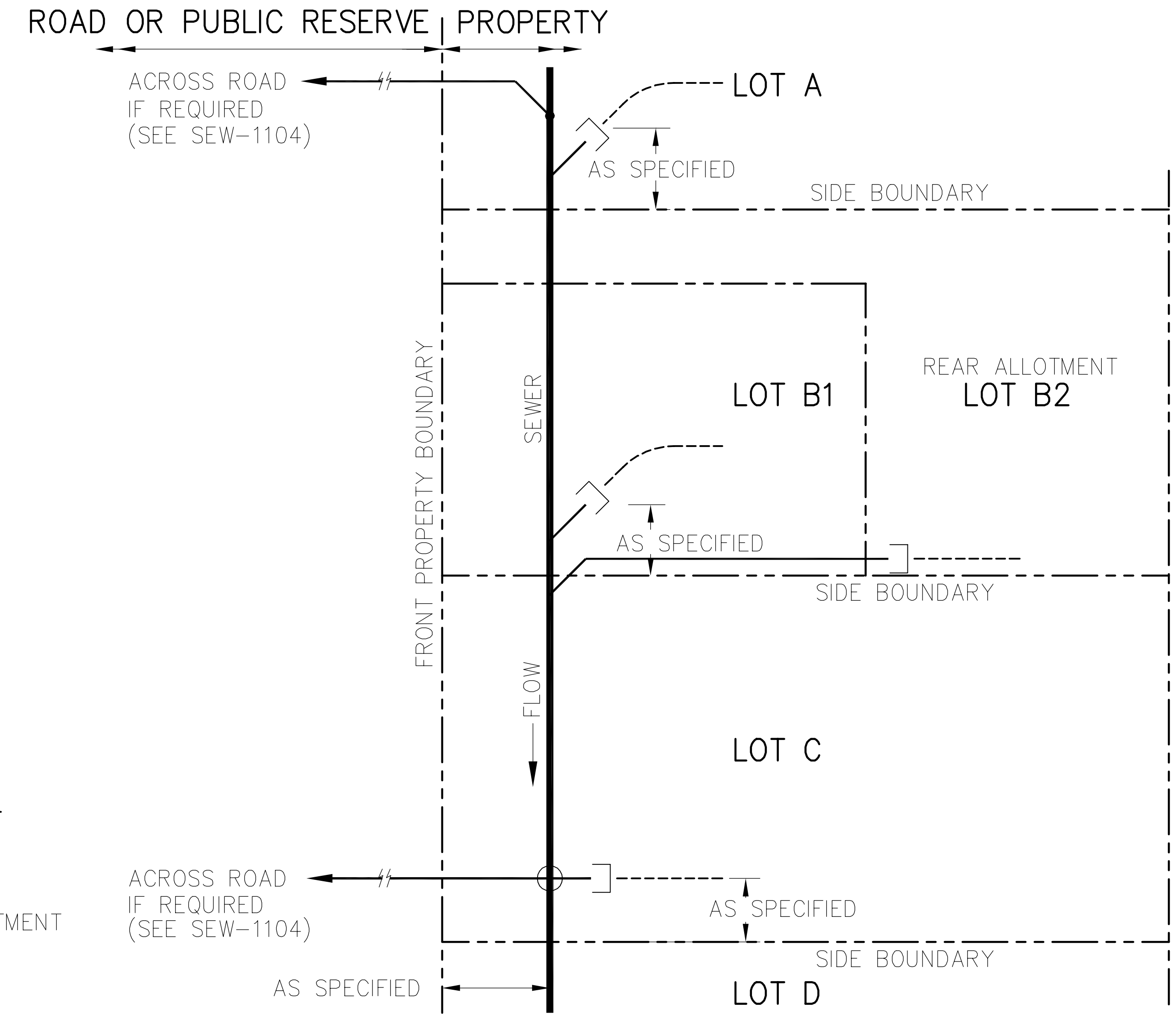
TO:
SYDNEY WATER GROUP PROPERTY (DX 2510W) Project Officer - Manager



TYPICAL CONNECTION METHODS FOR SEWERS
IN EASEMENTS (REAR OR SIDE BOUNDARIES)

INSPECTION OPENING (IO) INTERFACE METHOD

(SEE SEW–1106)



TYPICAL CONNECTION METHODS FOR SEWERS
INSIDE FRONT PROPERTY BOUNDARY

BURIED INTERFACE METHOD

(SEE SEW–1107)

LEGEND:

- IO ● INSPECTION OPENING (RAISED TO SURFACE)
- ○ ACCESS OPENING/RISER/JUMP UP (NOT RAISED TO SURFACE)
- ——] SEALED BURIED CONNECTION JOINT
- - - - - - FUTURE PROPERTY DRAIN
- — - — PROPERTY BOUNDARY

NOTES:

1. LOCATE SEWERS AND IO'S AS SHOWN IN DESIGN DRAWINGS.
2. "AS SPECIFIED" MEANS AS SPECIFIED BY THE WATER AGENCY.
3. REFER TO SEW–1106 TO SEW–1109 FOR PROPERTY CONNECTION DETAILS.
4. RAISE IO TO SURFACE IN ACCORDANCE WITH WATER AGENCY REQUIREMENTS.

WATER SERVICES ASSOCIATION *of Australia*	SEWERAGE CODE OF AUSTRALIA	NOT TO SCALE
	PROPERTY CONNECTION DETAILS SEWER IN EASEMENTS & INSIDE PROPERTY	SEW–1105
		V2.1

ADDITIONAL INFORMATION PROVIDED IN SEW–1100 SERIES COMMENTARY

Document Set ID: 8967006
Version: 1, Version Date: 17/12/2019

Property acquisition

Sydney Water may need to acquire privately owned land or an easement to build or upgrade infrastructure. This fact sheet sets out the process for the acquisition of land or an easement by Sydney Water. It should not be considered legal advice.

Sydney Water sometimes needs to build parts of the water and wastewater networks in privately owned land. When this happens, we call landowners directly affected by the proposed infrastructure.

We don't always need to acquire land or an easement to build within private property – it depends on the type of infrastructure we're building, its location, land zoning and other variables.

Sometimes Sydney Water needs to buy land to build a facility such as a wastewater or water pumping station, a reservoir or other major infrastructure.

In some cases, we take an easement over an underground pipeline. An easement is a legal right of access that ensures Sydney Water can protect and access its pipeline.

Sydney Water communicates with residents while projects are being developed by sending letters or newsletters, and holding information sessions to display the proposed route or other available design options.

Where property owners may be directly affected, Sydney Water contacts them as early as possible to let them know about the potential impacts.

Sydney Water purchases land and/or easements by negotiating with the affected landowner about the purchase price. Compensation is based on the current market value of the property and the terms set out in the *Land Acquisitive (Just Terms Compensation) Act 1991*.

In rare cases we may need to compulsorily acquire land under the *Land Acquisitive (Just Terms Compensation) Act 1991* where the value of the property is determined by the Valuer General's office.

Buying property

Step one: notification

Sydney Water consults with property owners to:

- let them know their property may be directly affected by a project
- outline the project and its potential impacts to the property owner
- confirm preferred options and explain the acquisition process
- formalise our intention to proceed with acquisition.

Step two: offer to purchase

Once Sydney Water knows the portion of land or easement it needs to acquire we engage an independent valuer. The valuer contacts the property owner to carry out a property valuation.

The results of the valuation will be used to inform Sydney Water's formal offer to the property owner.

Property owners also have the option of engaging their own registered valuer to carry out a valuation of the property. Sydney Water will reimburse reasonable valuation fees when the acquisition settles. Sydney Water's Group Property team can tell you more about what we mean by reasonable fees.

Step three: negotiation

Sydney Water, the property owner and the respective valuers will then agree on the market value of the property together.

Once all parties have agreed on the market value, the property owner will receive confirmation in writing from Sydney Water.

Step four: acquisition

After a purchase price is agreed, Sydney Water's solicitors prepare a contract of sale or transfer document and send it to the owner's solicitor. This will start the conveyancing process which is similar to what happens in the open property market. When the signed documents are exchanged, we agree on a settlement date.

Sydney WATER

Sydney Water compensates land owners for reasonable legal fees that are required for the acquisition process when the sale is settled.

What if we can't agree on market value?

If Sydney Water's valuer and the landowner's valuer can't agree on the property value, Sydney Water may start the compulsory land acquisition process.

Sydney Water may continue to negotiate with the property owner during this process. Where land is acquired by compulsory acquisition the amount of compensation is determined by the Valuer General through the Department of Land and Information.

The property owner has the right to appeal the amount of compensation determined by the Valuer General and in the Land and Environment Court.

What if Sydney Water only needs an easement?

In some cases, Sydney Water acquires an easement for infrastructure built above or below the surface of a property or to gain access to its infrastructure through private property.

When would we take an easement?

We decide whether to take an easement on a case by case basis, but there are some circumstances where we generally wouldn't take an easement. In these cases, we rely on our statutory powers under s.44(1) of the *Sydney Water Act 1994*.

Examples of where we wouldn't normally take an easement include:

- for gravity wastewater pipelines with a diameter less than 600mm
- on a standard residential block where the pipe is more than eight metres below the natural surface of the land
- when the infrastructure is to be located on undevelopable land, such as land zoned for drainage or open space.

When do we pay the compensation for easements?

We register and compensate for easements after our infrastructure is built. We do this to ensure the easement reflects the asset as accurately as possible.

The acquisition process for an easement is the same as for purchasing land outright.

How is the value determined?

If Sydney Water only needs part of a property for the project (partial acquisition) or an easement, compensation is assessed using a 'before and after' valuation method.

This involves two separate valuations which are done at the same time by the one valuer:

- the first valuation is of the whole property as unaffected by the work
- the second valuation is of the remaining land, on the basis the infrastructure has been built and is in use.

We then pay the landowner the difference between the two valuations.

When a partial acquisition is necessary, Sydney Water will also, at its cost, adjust services or public utilities, relocate fences and complete other property adjustments if required.

What about above ground infrastructure?

If we need to build infrastructure above the ground on your property you will be compensated as required by s 41(3) of the Sydney Water Act 1994.

Compensation amounts have been determined as follows:

- $400 for access chamber (maintenance holes)
- $250 for air valve chambers
- $850 for ventilation shafts.

Compensation of these amounts is made for each asset on the property and is paid when the above ground infrastructure has been built. For more information about compensation for above ground infrastructure, please read the related fact sheets:

- ventilation shafts
- maintenance holes.

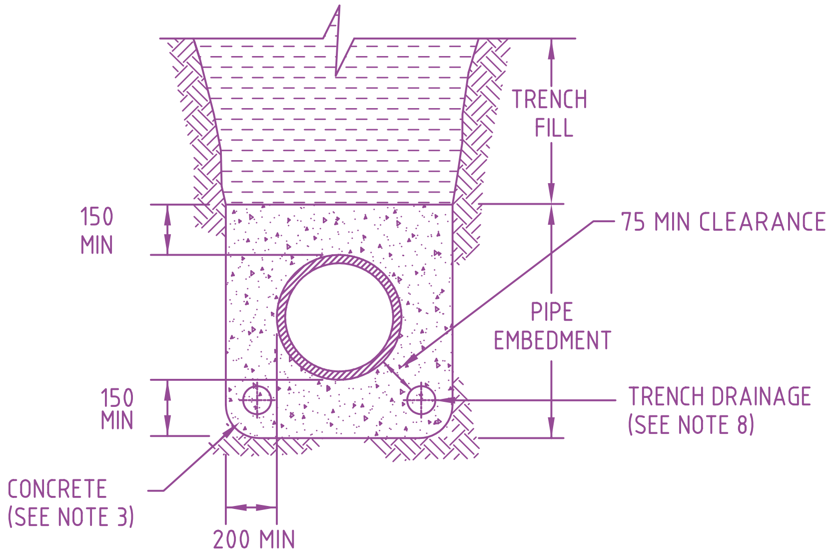
Contact us

To know more:

- visit our website at sydneywater.com.au
- call us on 13 20 92

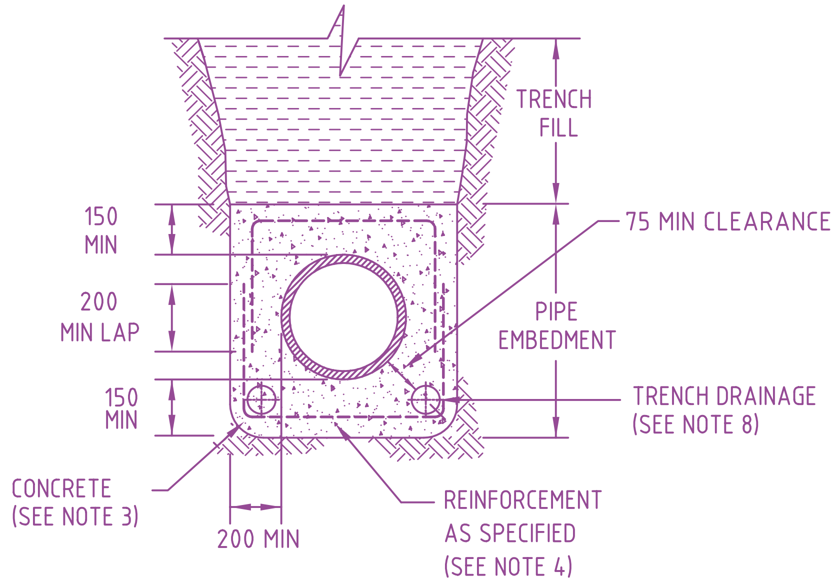
APPENDIX B

Special pipe embedment to reduce cover requirements



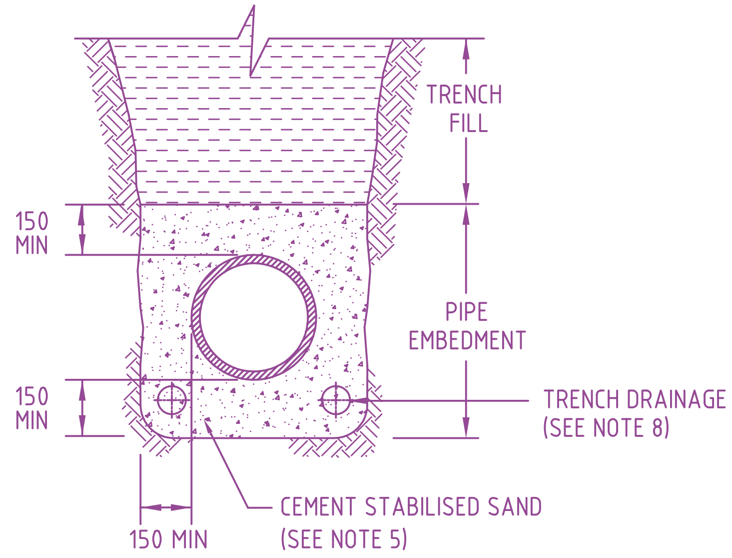
TYPE 12U SUPPORT UTILISING CONCRETE EMBEDMENT

(RIGID & FLEXIBLE PIPES)



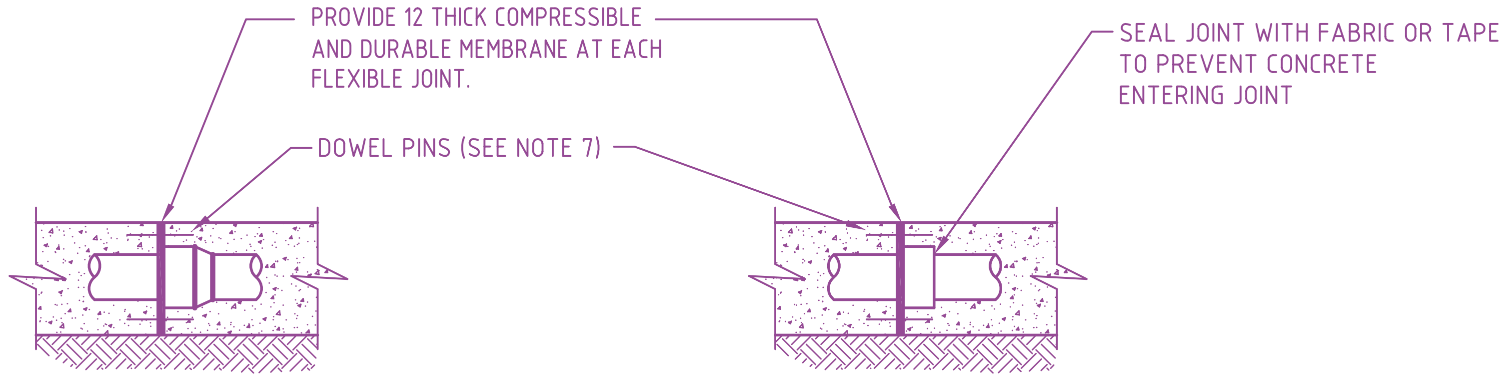
TYPE 12R SUPPORT UTILISING CONCRETE EMBEDMENT

(RIGID & FLEXIBLE PIPES)



TYPE 13 SUPPORT UTILISING CEMENT STABILISED EMBEDMENT

(RIGID & FLEXIBLE PIPES)



SPIGOT/SOCKET JOINT

SLEEVED COUPLING

CONCRETE ENCASEMENT JOINT DETAILS

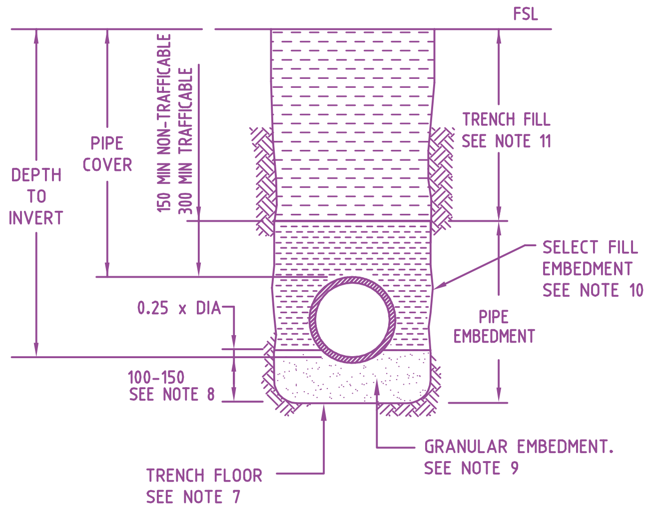
EMBEDMENT TYPES TO BE SPECIFIED IN DESIGN DRAWINGS

NOTES

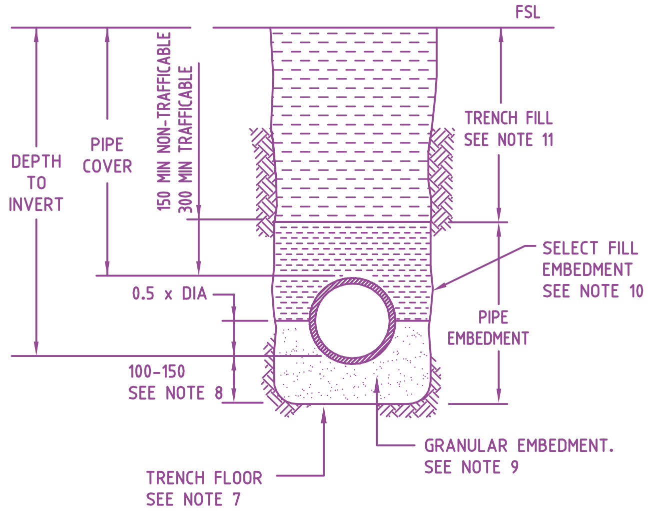
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. USE THESE SUPPORT SYSTEMS WHERE SPECIFIED BY DESIGNER DETAILS TO BE PROVIDED IN DESIGN DRAWINGS.
3. USE UNREINFORCED CONCRETE CLASS N20 MIN, AND REINFORCED CONCRETE N25 MIN. FOR AGGRESSIVE CONDITIONS USE SPECIAL CLASS CONCRETE.
4. MINIMUM STEEL REINFORCEMENT OF 0.4% CONCRETE CROSS SECTION PLACED CENTRALLY AND WITH 65 MINIMUM COVER TO EXTERNAL FACE. DESIGN DRAWINGS SHALL DETAIL REINFORCEMENT FOR THE APPLICABLE LOADING.
5. CEMENT STABILISED SAND OR WELL GRADED CRUSHED ROCK TO BE 25:1 SAND:CEMENT (PLACED DRY).
6. DURING THE ENCASEMENT PROCESS PIPES WILL REQUIRE A RESTRAINT SYSTEM TO PREVENT PIPE MOVEMENT AND/OR FLOTATION.
7. PROVIDE DOWEL PINS, AS DETAILED IN DESIGN DRAWINGS AT EACH CONCRETE ENCASEMENT JOINT TO PREVENT PIPE DAMAGE.
8. SEE SEW-1207 IF CONTINUOUS TRENCH DRAINAGE REQUIRED.

PREPARED BY **ASSET MANAGEMENT** ASSET PLANNING	RECOMMENDED for PROCESS LEADER, WASTEWATER OPERATIONS	Sydney WATER WITH ACKNOWLEDGMENT TO WATER SERVICES ASSOCIATION of Australia	**SEWERAGE CODE WSA-02**	Sydney WATER
			SPECIAL EMBEDMENT CONCRETE & STABILISED SUPPORTS	**SEW-1205-V**
© COPYRIGHT	APPROVED B Nelson 28/03/03 for PROCESS LEADER, ASSET PLANNING			ISSUED 2003 VERSION 1

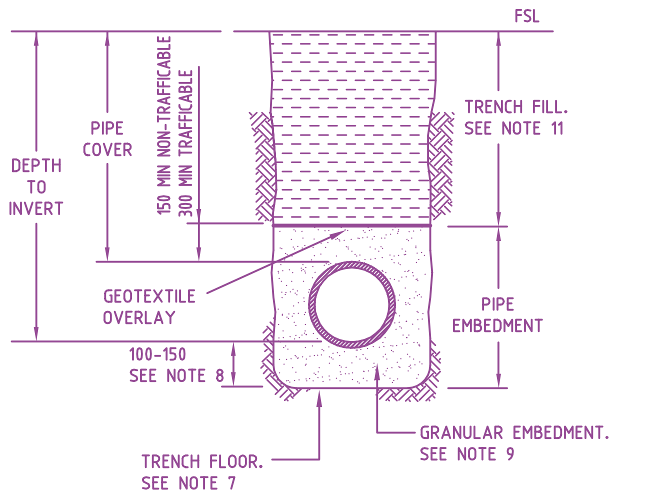
ADDITIONAL INFORMATION PROVIDED IN SEW-1200 SERIES COMMENTARY



TYPE 1 SUPPORT



TYPE 2 SUPPORT



TYPE 3 SUPPORT

TABLE 1. MAXIMUM AND MINIMUM DIMENSIONS FOR VC SEWERS

NOMINAL SIZE (DN)	PIPE CLASS CRUSHING STRENGTH	PIPE SUPPORT TYPE	MINIMUM TRENCH WIDTH	MAXIMUM DEPTH TO INVERT (m)
150	34	1	450	7.1
		2	450	8.9
		3	450	10.0
200	CLASS 160-32kN/m	1	550	5.3
		2	550	6.7
		3	550	7.7
225	CLASS 160-36kN/m	1	600	5.3
		2	600	6.7
		3	600	7.7
250	CLASS 160-40kN/m	1	650	5.3
		2	650	6.7
		3	650	7.7
300	CLASS 160-48kN/m	1	700	5.5
		2	700	6.9
		3	700	8.0
350	CLASS 160-56kN/m	1	850	5.7
		2	850	7.1
		3	850	8.1
400	CLASS 160-64kN/m	1	900	5.8
		2	900	7.2
		3	900	8.3
450	CLASS 160-72kN/m	1	950	5.9
		2	950	7.3
		3	950	8.4
600	CLASS 120-72kN/m	1	1400	4.7
		2	1400	5.8
		3	1400	6.6
700	CLASS 120-84kN/m	1	1400	4.9
		2	1400	6.0
		3	1400	6.8
800	CLASS 120-96kN/m	1	1500	5.2
		2	1500	6.3
		3	1500	7.2
1000	CLASS 95-95kN/m	1	1800	4.5
		2	1800	5.5
		3	1800	6.1

TABLE 2 MAXIMUM AND MINIMUM DIMENSIONS FOR RC SEWERS

NOMINAL SIZE (DN)	PIPE CLASS	PIPE SUPPORT TYPE	MINIMUM TRENCH WIDTH	MAXIMUM DEPTH TO INVERT (m)
600	4 (Z)	1	1300	5.1
		2	1300	6.3
		3	1300	7.2
750	4 (Z)	1	1475	5.3
		2	1475	6.4
		3	1475	7.3
825	4 (Z)	1	1550	5.3
		2	1550	6.5
		3	1550	7.4
900	4 (Z)	1	1650	5.3
		2	1650	6.4
		3	1650	7.3
1050	4 (Z)	1	1900	5.4
		2	1900	6.5
		3	1900	7.4

TABLE 3

MINIMUM PIPE COVER	
LOCATION	MINIMUM COVER
PRIVATE & PUBLIC PROPERTY NON-VEHICULAR LOADING	600
PRIVATE RESIDENTIAL PROPERTY VEHICULAR LOADING	750
FOOTWAY, INDUSTRIAL PROPERTY & LOCAL ROADS	900
ARTERIAL ROADS, STATE ROADS & UNSEALED ROADS	1200

MATERIALS SPECIFICATIONS

PIPES & FITTINGS	SPECIFICATIONS
VITRIFIED CLAY	WSA PS-231
REINFORCED CONCRETE	WSA PS-233
EMBEDMENT	
GRANULAR EMBEDMENT	WSA PS-351
GEOTEXTILE FABRIC	WSA PS-355

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH STANDARD DRAWING SEW-1201.
3. TRENCH WIDTH MEASURED AT SPRING LINE OF THE PIPE. FOR A SUPPORTED TRENCH, TRENCH WIDTH IS DISTANCE BETWEEN INSIDE FACES OF THE SHIELDS.
4. THIS DRAWING APPLIES TO PIPE LAID IN STABLE GROUND WITH EQUIVALENT LOADING OF SATURATED CLAY AND SOIL STIFFNESS OF 2MPa.
5. FOR GREATER DEPTHS TO INVERT AND POOR SOIL CONDITIONS, STRUCTURAL DESIGN IS REQUIRED AND INSTALLATION REQUIREMENTS TO BE SPECIFIED IN DESIGN DRAWINGS.
6. IN ACID SULPHATE SOILS, RC PIPES TO BE COATED WITH AN APPROVED SYSTEM.
7. EXCAVATE OR COMPACT TRENCH FLOOR TO PROVIDE A FLAT FIRM BASE TO SUPPORT BEDDING MATERIAL AND MINIMISE PIPE SETTLEMENT.
8. ENSURE BEDDING IS DEEP ENOUGH THAT PIPE SOCKETS DO NOT TOUCH TRENCH FLOOR.
9. GRANULAR EMBEDMENT AND BEDDING TO BE:
   - FOR DN 150, SINGLE SIZE OR GRADED AGGREGATE 7, 10 OR 14.
   - FOR >DN 150, SINGLE SIZE OR GRADED AGGREGATE 7, 10, 14 OR 20.
10. SELECT FILL EMBEDMENT TO BE EXCAVATED MATERIAL HAVING A MAXIMUM PARTICLE SIZE FOR ROCK OF 20, AND FOR OTHER THAN ROCK, NOT GREATER THAN 75 AND TO BE FREE OF TIMBER, INDUSTRIAL OR DOMESTIC REFUSE AND THE LIKE.
11. TRENCH FILL:
    - OTHER THAN ROADWAYS, EXCAVATED AND IMPORTED FILL TO CONTAIN NOT MORE THAN 20% OF STONES OF SIZE 75-150 AND NONE LARGER THAN 150.
    - FOR ROADWAYS, AS SHOWN ON DESIGN DRAWINGS (AND AUTHORISED BY THE ROAD OWNER) SEE WSAA-02, CLAUSE 21.
12. MAXIMUM DEPTHS DETERMINED USING AS 4060-1992 FOR TABLE 1 AND AS 3725-1989 FOR TABLE 2.

PREPARED BY ASSET MANAGEMENT ASSET PLANNING	RECOMMENDED (signature) for PROCESS LEADER, WASTEWATER OPERATIONS	Sydney WATER	SEWERAGE CODE WSA-02	Sydney WATER SEW-1250-S
© COPYRIGHT	APPROVED B Nelson 23/03/03 for PROCESS LEADER, ASSET PLANNING		STANDARD TRENCH DETAILS RIGID PIPES (VC & RC)	ISSUED 2003 / VERSION 1

ADDITIONAL INFORMATION PROVIDED IN SEW-1200 SERIES COMMENTARY

APPENDIX C

Trade waste fees for grease trap operation

Commercial customers

Trade wastewater fees and charges for 2019-20

IPART has determined that Sydney Water will adjust all trade waste fees and charges from 1 July each year (IPART determination No 5, 2016). The prices listed here apply for one year from 1 July 2019.

This fact sheet lists the commercial processes that require a formal written permit and explains the fees and charging rates for 2019-20.

Charges for commercial customers consist of:

- management charges
- waste quality charges.

Management charges

Permit fees

Permit fees cover our costs to manage permits for discharging trade wastewater to the wastewater system including the cost of:

- planned inspections
- monitoring
- administering permits.

Additional inspection fees

Sydney Water includes planned inspections in the permit fees. An additional inspection fee will apply, if additional inspections are needed to monitor a trade waste discharge to ensure a customer complies with requirements.

Wastesafe

Wastesafe is the electronic tracking system we use to monitor the generation, collection, transport and disposal of grease trap waste.

If you have a grease trap, you must have a Wastesafe transporter clean it out, at the frequency we set.

Your Wastesafe transporter will charge you directly for:

- cleaning your grease trap
- transporting your grease trap waste to a treatment facility
- treating your grease trap waste at the treatment facility.

Sydney Water will charge you:

- a fixed liquid waste trap (grease trap) charge of $29.19 a quarter
- a missed service (pump out charge) of $320.00 for grease traps of 2,000 litres or less
- a missed service (pump out charge) of $640.02 for grease traps over 2,000 litres.

Waste quality charges

Sydney Water assesses concentrations for commercial processes, based on representative sampling. Each process is assigned to a charging band, to determine a volumetric charging rate.

Where the property is separately metered we will, if possible, apply a discharge factor, to determine how much trade wastewater is discharged. Where the property is not separately metered, we assess how much is discharged, based on a representative sample of similar businesses.

Commercial customers pay charges based on the mass of pollutants they discharge to the wastewater system. The quality of trade wastewater for commercial customers is based on historical records for the particular process.

Similar processes are grouped together and have an associated **charging rate**, expressed as $/kL (kilolitre). Where we need the volume of trade waste discharged to the wastewater system to be measured, we may need the customer to install a check meter to accurately measure how much water is supplied to a process that generates trade waste.

Sydney Water may charge more where customers have poorly maintained or inadequate pre-treatment equipment.

See the tables over the page for commercial processes and charging codes

Charges for 2019-20	
Application fee	No fee
Variation fee	No fee
Additional Inspections	$217.60 per inspection
Liquid waste (grease trap) trap charge	$29.19 per quarter
Missed service	$320.00 (2,000 litres or less) $640.02 (more than 2,000 litres)

Quarterly permit fees	
First process	$41.04
Each additional process	$14.09

Sale of trade waste data

Certain sections of commercial permits are subject to public disclosure. Sydney Water will prepare and present trade waste data to meet a customer's needs at a cost of $172.50 an hour (includes GST).

Want to know more?

Visit sydneywater.com.au, email businesscustomers@sydneywater.com.au or speak to a business customer representative by calling **13 20 92**.

Document Set ID: 8967006
Version: 1, Version Date: 17/12/2019

Commercial processes and charging codes

Process group	Charging rate ($/kL)
High-strength BOD food* Fried chicken BOD > 2000 mg/L Asian style BBQ Ice cream parlour Bakery retail - hot breads, cakes	4.029
Low-strength BOD food* Hamburger restaurant (with vertical gravity separator) Cafeteria, canteen and school - hot meals Take-away, including fish and chips, hot chicken Snack bar, coffee lounge, hot foods Restaurant - food court Kitchen - hospital, nursing homes Hamburger restaurant (Non VGS) Pizza restaurant Function centre Fried chicken BOD < 2,000 mg/L Delicatessen with hot food <12 kL/day Wholesale food <12 kL/day, caterer Hotel/ motel kitchen Butcher - retail Fish (fresh outlets), no cooking Chicken (fresh retail), no cooking Smallgoods < 12kL/day maximum Wholesale butcher < 12 kL/day maximum Bakery retail - pies, sausage rolls	2.452
Automotive Service station under canopy forecourt Panel beating and spray painting Car detailer Car wash - hand wash and pressure spray Car wash - mechanical <12 kL/day Mechanical workshop, auto recyclers	0.800

* If the pre-treatment is not maintained, a higher charge of $12.581/kL applies for low strength BOD food and high strength BOD food.

Document Set ID: 8967006
Version: 1, Version Date: 17/12/2019

Process group	Charging rate ($/kL)
Commercial laundry Laundromat Commercial laundry < 2 ML/yr Laundry – hospital, nursing home, hotel < 2 ML/yr Small dyers < 600 L/day	0.500
Equipment hire washing	3.653
Lithographic processing	0.385
Photographic Waterless minilab, with silver recovery unit (SRU) Waterless minilab, used chemistry taken off-site Waterwash minilab, with SRU Waterwash minilab, silver rich wastewater transported off-site Xray, with SRU Xray, silver rich wastewater transported off-site Graphic arts film, with SRU Graphic arts film, silver rich wastewater transported off-site Photo outlab, with SRU Professional lab, with SRU Wholesale lab, with SRU < 2 kL/day Microfilm processing, with SRU Educational institution – black & white photo only Dental hospital, silver rich wastewater transported off-site	Nil
Ship to shore pump out	Nil
Miscellaneous - School laboratory - Municipal pool/aquatic centre	Nil
Other Wastesafe only, includes school domestic science Screen printing Battery room – commercial Ceramic and pottery (hobby club) Stoneworking Glass finishing (commercial) Small laboratory, hospital/university laboratory, pathology laboratory, morgue Mobile bin wash – commercial Portable toilet waste Cooling tower, boiler blowdown – commercial	Nil

Document Set ID: 8967006
Version: 1, Version Date: 17/12/2019

Sydney Water price review – non-residential customers

14 June 2016

WHAT

IPART has published its decisions on Sydney Water's prices for water, wastewater, stormwater and other services.

These prices will apply from 1 July 2016 to 30 June 2020 (the 2016 determination period).

Our prices result in bill decreases for most non-residential customers in 2016-17.

In later years, some customers will see their bills increase above inflation as we make wastewater (sewerage) charges more cost-reflective and consistent across customers.

Large non-residential customers will be able to enter into unregulated pricing agreements with Sydney Water. Details can be found in a separate Fact Sheet.

We have also specified a new late payment fee and dishonoured or declined payment fee. Details can be found in a separate Fact Sheet.

WHY

Our prices reflect, among other amendments, the reduction in Sydney Water's allowance for capital and operating expenditure over the determination period.

We have made changes to Sydney Water's price structures to ensure that water and wastewater charges are more cost reflective so that customers groups imposing similar costs on the system are treated consistently.

Our prices also ensure customers pay no more than is necessary for the services they need.

Most prices will either remain unchanged or decrease in 2016-17. Prices will increase with inflation in subsequent years of the determination period.

HOW

IPART has followed its established price review process, undertaking an extensive investigation and public consultation. In making our decisions, we have considered all submissions received through the review.

We engaged independent consultants to review Sydney Water's capital and operating expenditure proposals (the report can be found here).

We then set prices to allow Sydney Water to raise the revenue it requires to recover the prudent and efficient costs of delivering its services.

WHEN

New prices take effect on 1 July 2016.

LEARN MORE

Our reports, stakeholder submissions, the transcript from the public hearing, and consultants' reports are available on our website (www.ipart.nsw.gov.au).

The Final Report and Determination can be accessed here.

Sydney Water price review – non-residential customers

Bills for most non-residential customers will decrease

The impact on non-residential customers' bills of our price determination depends on their water usage, estimated volume of wastewater discharged to the sewerage system and meter size(s). **In general, non-residential customers will see decreases in their annual water and wastewater bills in 2016-17, with decreases ranging from 4.8% to 31.0%** depending on each customer's characteristics.

In subsequent years, some non-residential customers will see their bills increase above the rate of inflation, as we make wastewater usage and service charges more cost-reflective and consistent across customers.

Small businesses with a discharge factor of 75% will experience similar bill reductions to residential customers. By 2019-20, these customers will save $12 on their bill compared to their bill in 2015-16 (including the effects of inflation).

By 2019-20, bills will increase for small businesses that discharge more wastewater to the sewerage network than residential customers. For example:

- Small businesses with a discharge factor of 78% will pay $13 more in 2019-20 than in 2015-16 (including inflation).
- Small businesses with a discharge factor of 83% will pay $55 more in 2019-20 than in 2015-16 (including inflation).

Table 1 shows the bills under our prices for small businesses (assuming that these customers are on a standalone 20mm meter) using different discharge factors.

Table 1 Small business water and wastewater bills – including inflation

Non-residential stand-alone 20mm meter	**2015-16**[a]	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**Change 2016-20**
200 kL pa water usage						
75% discharge factor	1,167	1,073	1,099	1,127	1,155	-12
Annual change		*-8.1%*	*2.5%*	*2.5%*	*2.5%*	*-1.0%*
78% discharge factor	1,167	1,089	1,117	1,151	1,180	13
Annual change		*-6.7%*	*2.5%*	*3.1%*	*2.5%*	*1.1%*
83% discharge factor	1,167	1,117	1,145	1,192	1,222	55
Annual change		*-4.3%*	*2.5%*	*4.1%*	*2.5%*	*4.7%*
310 kL pa water usage						
83% discharge factor	1,418	1,345	1,435	1,530	1,568	151
Annual change		*-5.1%*	*6.7%*	*6.6%*	*2.5%*	*10.6%*

a 2015-16 prices were not available when Sydney Water finalised its pricing proposal. The bills for 2015-16 have been updated to reflect actual inflation and prices.

Note: Inflation is estimated to be 2.5% per annum over the 2016 period, except for 2016-17 where it is set as 1.3%. Total may not add due to rounding.

We have made changes to Sydney Water's price structures. These ensure that wastewater charges are more cost reflective, so customers groups imposing similar costs on the system are treated consistently.

Our changes to price structures mean cost reflective treatment of Sydney Water's customers

Wastewater service charges

Wastewater service charges predominantly recover fixed costs, reflecting a customer's ability to access the system (ie, that they are connected to the system). Estimating a customer's draw on the wastewater system is problematic because, unlike water, wastewater is not metered. Wastewater charges are, therefore, based on a customer's water meter size multiplied by a discharge factor. The discharge factor is the percentage of metered water consumption that is estimated to be discharged to the wastewater (or sewerage) system.

For the 2016 Determination, we have applied a 75% discharge factor to the wastewater service charge for residential customers (ie, residential customers pay 75% of the base 20mm meter service charge). For non-residential customers, Sydney Water has specific discharge factors that it determines based on the nature of the business and the amount of wastewater that it is likely to discharge.

Discharge factors have previously applied to all non-residential customers, except 20mm standalone customers who were charged the same as residential customers. Where a discharge factor has not been previously assigned to a non-residential customer (ie, 20mm meter standalone customers), Sydney Water states it will apply a default discharge factor of 78%[1].

We consider it important that Sydney Water clearly communicates where the discharge factor is greater than 75% for non-residential customers with a 20mm connection (ie, small businesses).

Wastewater usage charges

Non-residential customers that discharge more than the discharge allowance pay a wastewater usage charge. Currently, the discharge allowance is set at 300 kL per annum.

We consider it appropriate that the discharge allowances for residential and non-residential customers are the same. Going forward, all wastewater service charges will include the cost of a fixed discharge allowance of 150 kL (ie, a deemed wastewater usage component of $165 is included in the wastewater service charge). This reflects a residential customer's average annual wastewater discharge.

We have therefore reduced the non-residential discharge allowance from 300 kL to 150 kL by 2018-19 (ie, by 50 kL increments per year), after which it would remain at this level.

Water and wastewater prices are decreasing

Water usage charges will reduce by $0.31 per kL to $1.97 per kL (excluding inflation). Our decision accords with Sydney Water's proposal, ensures customers have greater control over bills and moves towards our best estimate of the current long-term costs of water supply.

Wastewater usage charges remain unchanged at $1.10 per kL (excluding inflation). Our decision accords with Sydney Water's proposal.

Most water and wastewater service charges will decrease in 2016-17 and then increase by inflation. In 2016-17, the 20mm meter water service charge will be $88.80, a decrease of about $14 or 13.4% (excluding inflation).

1 IPART conducted a review of discharge factors in 2014. In it, we decided to "maintain our current approach of using the discharge factors as set by the water utilities" IPART, Discharge factors for non-residential customers, December 2014, p 3; Sydney Water, Customer Policy - Sewerage usage charging for non-residential customers, Sydney Water website, Last updated 8 March 2013, p 3.

Small businesses (ie, 20mm meter standalone customers) with discharge factors of 75% will face the same wastewater charges and reductions as residential customers. However, those standalone small businesses with discharge factors greater than 75% will face higher wastewater service charges than residential customers.

Small businesses with common 20mm meters will face large reductions in wastewater service charges. This is because they now pay the same metered connection charges (ie, as presented in Table 2) as standalone non-residential customers with 20mm meters.

Our prices are outlined in Table 2 below.

Table 2 Prices for major services from 1 July 2016 ($2015-16) – excluding inflation

	2015-16[a]	2016-17	2017-18	2018-19	2019-20	*% Change*
Water						
Usage charge ($/kL)	2.28	1.97	1.97	1.97	1.97	*-13.5%*
Service charge ($/year)						
– *Residential*	102.53	88.80	88.80	88.80	88.80	*-13.4%*
– *Non-residential service charge 20mm*	129.83[b]	88.80	88.80	88.80	88.80	*-31.6%*
Wastewater						
Usage charge ($/kL)	1.10	1.10	1.10	1.10	1.10	*0.0%*
Service charge ($/year)						
– *Residential*[c]	609.14	576.10	576.10	576.10	576.10	*-5.4%*
– *Non-residential (stand-alone 20mm meter) 75% discharge factor*[d]	609.14	576.10	576.10	576.10	576.10	*-5.4%*
– *Non-residential (stand-alone 20mm meter)* – *81% discharge factor*[d]	609.14	609.14	609.14	609.14	609.14	*0.0%*
– *Non-residential (common 20mm meter) 81% discharge factor*[d]	1,042.67[b]	609.14	609.14	609.14	609.14	*-41.6%*

[a] 2015-16 prices were not available when Sydney Water finalised its pricing proposal. The prices for 2015-16 have been updated to reflect actual inflation and prices.

[b] This service charge applied to non-residential customers on a shared meter or with multiple 20mm meters. Under the 2012 Determination, 20mm standalone non-residential customers paid the residential service charges instead, which was $609.14 in 2015-16. From 2016-17, these customers will be charged the same as other non-residential customers with 20mm meters.

[c] Residential wastewater service charge is the sum of the 20mm equivalent meter charge of $548.13 multiplied by the residential discharge factor of 75%, and the 150 kL of deemed wastewater usage of $165.

[d] The 20mm non-residential wastewater service charges include 150 kL of deemed usage of $165.

Note: Total may not add due to rounding.

Customers will pay more for water in times of drought

If desalinated water is supplied to Sydney Water from the Sydney Desalination Plant (SDP), the water usage charge will increase by $0.12 per kL (excluding inflation) while SDP is operating.

Within water bills, all customers pay, on average, $94 per year (excluding the effects of inflation) to cover the fixed costs of SDP while it is in shutdown mode.

For a typical small business, the costs of SDP operating will add about a further $26 to their annual bill (excluding inflation). Large users of water (ie, large non-residential customers) will pay proportionately more.

Stormwater prices will continue to move to area-based charges

Only some customers fall within Sydney Water's stormwater area and therefore pay stormwater charges to Sydney Water.[2] Local councils, rather than Sydney Water, are the main providers of stormwater services in the Sydney area.

Stormwater service charges will continue to transition to area-based charges. As a result, prices for large non-residential customers will remain constant over the determination period (excluding the effects of inflation).

However, prices for small, multi-premise, medium and low-impact non-residential customers will decrease in 2016-17, and then remain constant for the remaining three years of the determination period (excluding the effects of inflation). Stormwater service charges for small and multi-premise customers will decrease from $31.55 to $23.04 in 2016-17 and for medium and low-impact customers from $86.02 to $73.81.

Table 3 Prices for major services from 1 July 2016 ($2015-16) – excluding inflation

	2015-16[a]	2016-17	2017-18	2018-19	2019-20
Stormwater					
Small and multi premise non-residential ($/year)	31.55	23.04	23.04	23.04	23.04
Annual change		*-27.0%*	*0.0%*	*0.0%*	*0.0%*
Medium and low-impact non-residential ($/year)	86.02	73.81	73.81	73.81	73.81
Annual change		*-14.2%*	*0.0%*	*0.0%*	*0.0%*
Large non-residential ($/year)	430.12	430.12	430.12	430.12	430.12
Annual change		*0.0%*	*0.0%*	*0.0%*	*0.0%*
Very large non-residential ($/year)	1,911.67	1,911.67	1,911.67	1,911.67	1,911.67
Annual change		*0.0%*	*0.0%*	*0.0%*	*0.0%*
Largest non-residential ($/year)	4,779.19	4,779.19	4,779.19	4,779.19	4,779.19
Annual change		*0.0%*	*0.0%*	*0.0%*	*0.0%*

a 2015-16 prices were not available when Sydney Water finalised its pricing proposal. The prices for 2015-16 have been updated to reflect actual inflation and prices.

Rouse Hill charges

We have accepted Sydney Water's proposal to maintain the **Rouse Hill stormwater drainage charge** in real terms at $139.65 per year for residential and non-residential properties less than or equal to 1,000m^2.

[2] According to Sydney Water, this area covers 30 Local Government areas, and generally includes the central business district and inner west of Sydney. It provides stormwater drainage services to around 548,000 residential and non-residential properties (2015-16), which we estimate to represent around 28.6% of the 1.9 million properties that it supplies water services to (2015-16). Sydney water pricing proposal to IPART, June 2015, p 52 and Sydney water pricing proposal to IPART - Appendices, June 2015, p 48.

We have not accepted Sydney Water's proposal for the **Rouse Hill land charge** to remain at $248.85 per year in real terms over the 2016 determination period. To maintain the current charge, Sydney Water argued that the additional land purchase costs in the Rouse Hill stormwater catchment area should be recovered entirely from its broader wastewater customer base (through wastewater charges).

We consider that the cost reflective level of the Rouse Hill land charge is $433.37. This would share the capital costs (both land and civil works) for Rouse Hill equally between residents in Rouse Hill and Sydney Water's broader customer base. This reflects the integrated water management system in Rouse Hill, which performs dual stormwater (specific to Rouse Hill) and wastewater functions (costs to be shared across Sydney).

However, to limit bill impacts, we have decided to transition the Rouse Hill land charge towards cost reflective levels by increasing the current charge by 10% per year over the 2016 determination period, so that it increases from its current level of $248.85 to $364.34 by 2019-20 (as detailed in Table 4).

Table 4 Rouse Hill charges ($ per year, $2015-16)

	2015-16	2016-17	2017-18	2018-19	2019-20
Rouse Hill stormwater drainage chare	139.65	139.65	139.65	139.65	139.65
Rouse Hill land charge	248.85	273.74	301.11	331.22	364.34

Note: The land charge applies for a five year period to properties within the Rouse Hill area that are connected to Sydney Water's water supply system on or after 1 July 2012.

The Rouse Hill land charge will not apply retrospectively but will affect existing Rouse Hill customers who currently pay the Rouse Hill land charge, as well as new Rouse Hill customers. Any Rouse Hill customers currently paying the Rouse Hill land charge will see their fees increase by 10% in 1 July 2016. New Rouse Hill customers who will start paying the land charge in July 2016 will also pay this fee.

Trade waste charges

We have accepted Sydney Water's proposed trade waste prices, except for amending them to allow for recovery of a share of Sydney Water's corporate overheads.

This means trade waste prices will increase by 1.9% in real terms each year over the 2016 determination period (ie, a 7.8% cumulative increase over four years, excluding inflation).

The full list of trade waste prices is outlined in Appendix K of our Final Report.

We are encouraging Sydney Water to be more efficient and responsive to its customers

Our prices for Sydney Water reflect our focus on reducing Sydney Water's overall costs by encouraging efficiency. Efficiency targets have been applied to Sydney Water's proposed:

- operating expenditure, which has been reduced by $54 million to $4,948 million (a 1.1% reduction), and
- capital expenditure, which has been reduced by $300 million to $2,473 million (a 10.8% reduction).

We are satisfied our approach will not adversely affect the ability of Sydney Water to operate, maintain, renew and develop the assets required to deliver its regulated services over the 2016 determination period. Further, we are satisfied our decisions will enable Sydney Water to earn a reasonable rate of return on its assets.

APPENDIX D

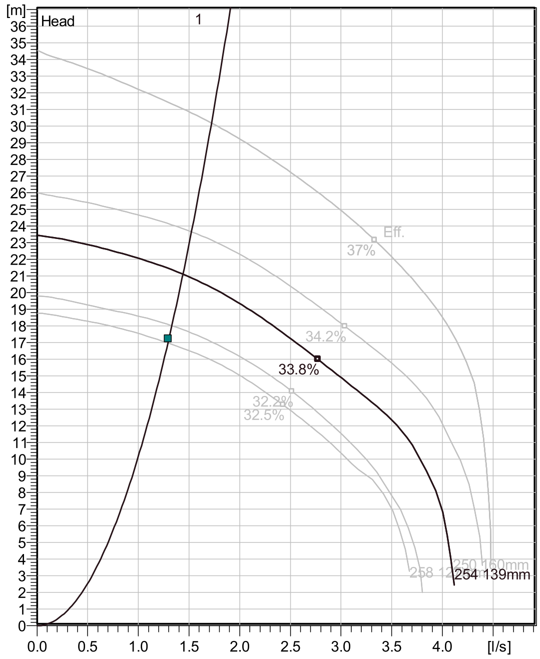
Recommended pump to service the site

MP 3069 HT 3~ 254

Semi-open multi-channel impellers with integral grinder cutter in single volute casing for liquids containing solids and fibres.

Technical specification

Curves according to: Water [100%],277 K,1000 kg/m³,1.569 mm²/s



Curve: ISO 9906

Configuration

Motor number
M3069.170 13-08-2BB-W 1.7KW

Installation type
P - Semi permanent, Wet

Impeller diameter
139 mm

Discharge diameter
40 mm

Pump information

Impeller diameter
139 mm

Discharge diameter
40 mm

Inlet diameter
40 mm

Maximum operating speed
2640 rpm

Number of blades
5

Throughlet diameter
6 mm

Materials

Impeller
Grey cast iron

Stator housing material
Grey cast iron

Project	**Created by**		**Last update**	
Block	**Created on**	11/18/2019		

MP 3069 HT 3~ 254

Technical specification

Motor - General

Motor number	Phases	Rated speed	Rated power
M3069.170 13-08-2BB-W 1.7KW	3~	2640 rpm	1.7 kW
Approval	**Number of poles**	**Rated current**	**Stator variant**
No	2	3.6 A	3
Frequency	**Rated voltage**	**Insulation class**	**Type of Duty**
50 Hz	415 V	F	S1

Motor - Technical

Power factor - 1/1 Load	Motor efficiency - 1/1 Load	Total moment of inertia	Starts per hour max.
0.91	72.4 %	0.0029 kg m²	15
Power factor - 3/4 Load	**Motor efficiency - 3/4 Load**	**Starting current, direct starting**	
0.87	77.8 %	14 A	
Power factor - 1/2 Load	**Motor efficiency - 1/2 Load**	**Starting current, star-delta**	
0.79	80.3 %	4.67 A	

Project	**Created by**		**Last update**
Block	**Created on**	11/18/2019	

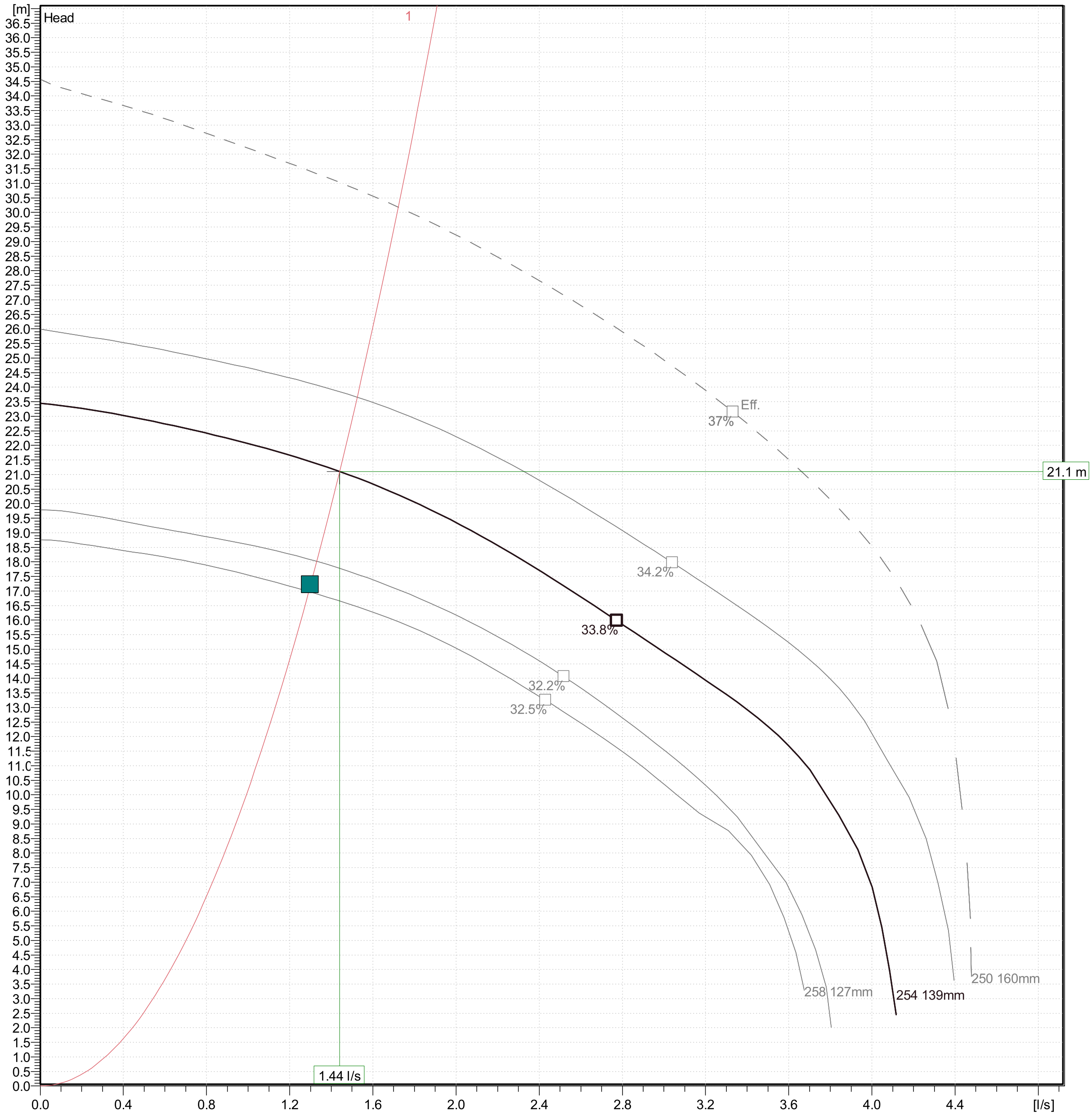
MP 3069 HT 3~ 254

Performance curve

Duty point

Flow	Head
1.44 l/s	21.1 m

Curves according to: Water [100%],277 K,1000 kg/m³,1.569 mm²/s



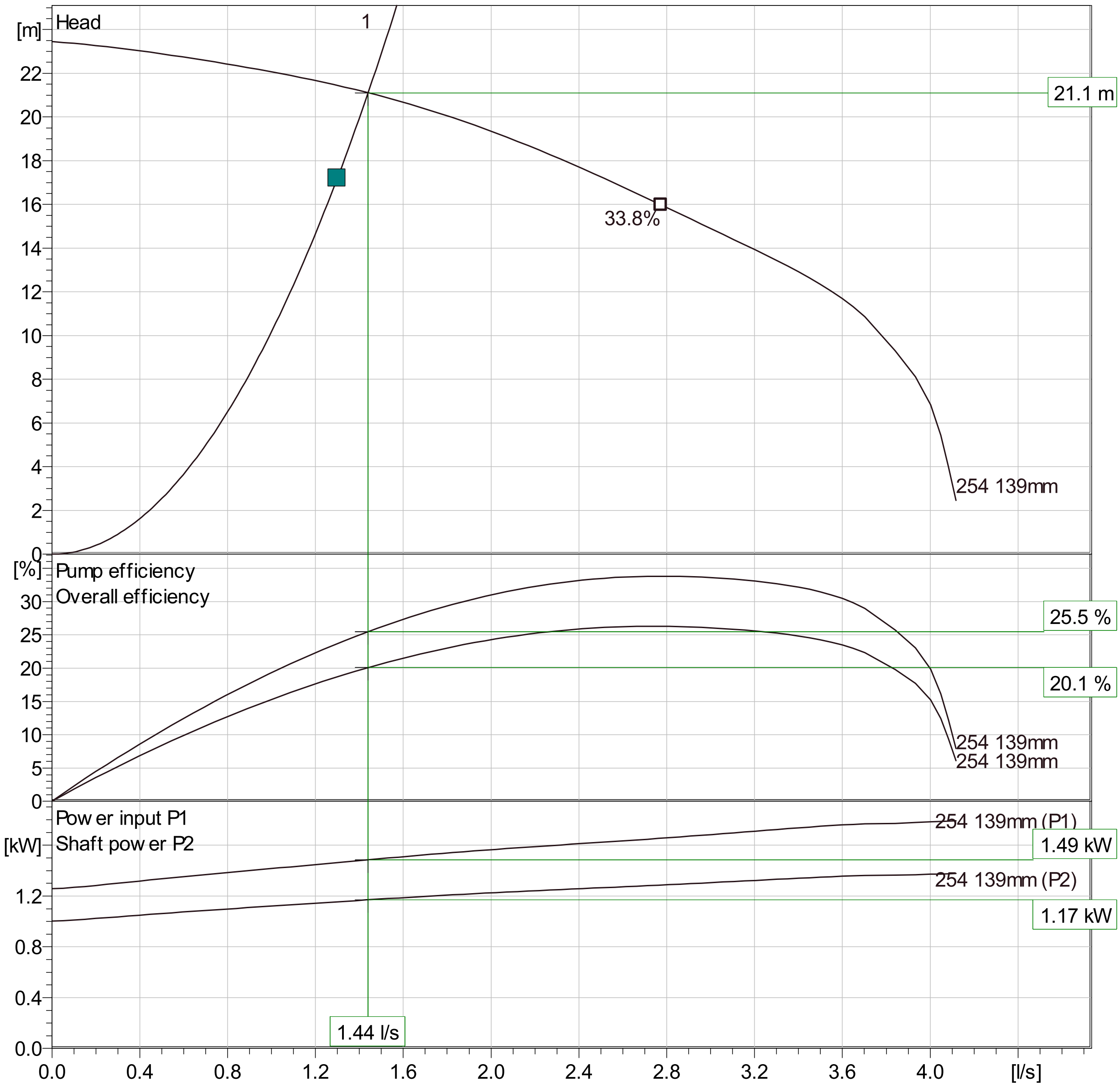
Curve: ISO 9906

Project	**Created by**		**Last update**	
Block	**Created on**	11/18/2019		

MP 3069 HT 3~ 254

Duty Analysis

Curves according to: Water [100%],277 K,1000 kg/m³,1.569 mm²/s



Curve: ISO 9906

Operating characteristics

Pumps/Systems	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHr
1	1.44 l/s	21.1 m	1.17 kW	1.44 l/s	21.1 m	1.17 kW	25.5 %	0.286 kWh/m³	

Project	**Created by**		**Last update**
Block	**Created on**	11/18/2019	

MP 3069 HT 3~ 254

Dimensional drawing

Project	**Created by**		**Last update**	
Block	**Created on**	11/18/2019		

Document Set ID: 8967006
Version: 1, Version Date: 17/12/2019

JAMISONTOWN WWPS

NOTES : Submersible (Duplex) and 50mm Rising Main

PARAMETER	
Loading (EP)	79
Equivalent ET	22
ADWF (L/s)	0.16
Peaking Factor 'r'	4.23
PDWF (L/s)	0.70
Catchment Area (Ha)	1.00
Storm Allowance (L/s) (DATA)	0.58
Pumped Inflow (L/s) (DATA)	0.00
Peak Wet Weather Flow (L/s)	1.28
WET WELL & PUMP	
Max Pump Starts / hour (DATA)	10
Diameter (m) (DATA)	1.00
Control Depth (m) (DATA)	1.00
Control Volume (cu.m)	0.75
Required Volume (cu.m)	0.11
Pump Flow (L/s) (DATA)	1.28
RISING MAIN TO NEW MH	
RM Length (m) (DATA)	398
Internal Dia. (mm) (DATA)	40
Min Velocity required (m/s)	0.8
Flow (L/s) (DATA)	1.28
Detention Time (hr)	1.0
Velocity (m/s)	1.0
Friction Coeff. k (mm)	0.15
k/D	3.8E-03
Reynolds No.	3.6E+04
Friction Factor (f)	0.03117
Fittings sum (k)	2
Minor Losses (m)	0.09
Friction loss (m)	16.3
Static Head to TWL (m) (DATA)	0.27
Max Pump Head (BWL) (m)	17.68
Median Pump Head (MWL) (m)	17.18
Minimum Pump Head (TWL)(m)	16.68

APPENDIX E

Soil profile (OEH) & site soil photos

NSW SOIL AND LAND INFORMATION SYSTEM

Soil Profile Report

SITE DETAILS

Site Location:	Opposite Cable waterski park on Jamieson Rd
Profile Details:	Penrith Soil Landscapes II Survey (1004302), Profile 92, collected from a batter by Mrs Danielle Doughty on 29 October, 2002
Map Reference:	MGA Grid Reference: Zone 56, 284449E, 6262090N. 9030 PENRITH (1:100000) map sheet.
Physiography:	plain under unknown on alluvium lithology and used for urban. Slope 0.0% (estimated), local relief extremely low (< 9m). Surface condition is hard set, profile is mod. well drained, erosion hazard is slight, and no salting evident
Vegetation/Land Use:	highly disturbed at the site, used for urban, with National/State Parks, volun./native pasture and urban in the general area
Surface Condition:	hard set when described, expected to be hard set when dry, ground cover is 50%
Erosion/Land Degradation:	slight, erosion at site is none
Soil Hydrology:	profile is moderately permeable and mod. well drained, no free water, run on is none and runoff is none
Soil Type:	Brown Dermosol (ASC)
Base of observation:	layer continues
Profile Field Notes:	Diagram, Nepean River, RUER, s.c.l. 92 mis site, DEAB. Site is in a drainage plain next to road. Undulating plain Rickabys Ck gravels on surface. DEAB.

SOIL DESCRIPTION

Layer 0

0.00 - 0.00 m

Layer 1	Horizon: A1	
0.00 - 0.60 m	Texture:	silty clay loam
	Colour:	dark brown (10YR 3/3) [moist] with no recorded mottles
	Structure:	massive (fabric is earthy)
	Roots:	many (25-100/10x10cm) (Root size <1 mm), many (25-100/10x10cm) (Root size 1-2 mm),
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	dry, very sticky, disruptive test result was very firm force,
	Erodibility Tests:	Crumb (EAT) test showed no change,

	Field chemical tests:	Field pH is 5.5 (Raupach),
	Sample taken:	none
	Layer Notes:	A1 - dark brown silty clay loam
	Lower Boundary:	wavy gradual (50-100 mm) boundary to ...
Layer 2	Horizon: B2	
0.60 - 0.90 m	Texture:	clay loam
	Colour:	dark brown (10YR 3/3) [moist] with 2% - 10% faint orange mottles
	Structure:	weak pedality (polyhedral, 10 - 20 mm, fabric is rough-faced peds)
	Roots:	many (25-100/10x10cm) (Root size <1 mm), many (25-100/10x10cm) (Root size 1-2 mm),
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	dry, very sticky, disruptive test result was moderately strong force,
	Erodibility Tests:	Crumb (EAT) test showed no change,
	Field chemical tests:	Field pH is 5.5 (Raupach),
	Sample taken:	none
	Layer Notes:	B2 - orange mottles in brown clay loam
	Lower Boundary:	wavy gradual (50-100 mm) boundary to ...

LABORATORY TESTS

None available

For information on laboratory test data and units of measure, please see: Soil survey standard test methods

Report generated on 19/11/2019 at 01:34 PM

APPENDIX F

On site treatment recommendation

Manufacturing Tanks Since 1969

Wastewater & Rainwater Specialists

Commercial Sewage Treatment Solutions

A purpose designed, commercial treatment plant using a monolithic constructed tank that is made out of one piece of concrete with no silicone, mortar or internal joins.

Built to Last!

Taylex Industries Pty Ltd 56 Prairie Rd Ormeau Q 4208 Phone: (07) 3441 5200
Fax: (07) 3287 4199 Email: alistair@taylex.com.au

www.taylex.com.au

About Taylex - The biggest producer of Treatmant Plants in Australia

Taylex's Queensland Head Office

Taylex was founded in 1969 and we were the first company to manufacture domestic Aerobic Wastewater Treatment Systems (AWTS) in Australia. Taylex continues to lead the field in both precast concrete, rotational moulding manufacturing, design & installation of Rainwater Tanks, Home and Commercial Sewage Treatment Plants.

Taylex has a National Distribution Network which is supported by factory trained licensed distributors. Our Distributors can supply, install, service and maintain our range of both concrete and plastic products from Tasmania to Darwin, Perth to Brisbane. We manufacture all our own concrete and plastic products.

Taylex is an ISO 9001 Quality Assured Company. Our range of products carries all relevant State Government Approvals throughout Australia.

Project Management for Your Installation & Commissioning

Your Taylex consultant will project manage your installation with your builder or project manager. They will advise on, and discuss matters with you that may affect the final outcome for you (eg sub-surface irrigation and positioning of tanks; possible excavation problems like rock and high water tables etc.). This ensures a trouble-free install with maximum aesthetic value and minimal environmental impact.

Taylex's Design Philosophy when building a Commercial Sewage Treatment System

It's simple… we used our 40+ years of knowledge and manufactured a range of purpose built tanks for the commercial sewage market.

We designed these systems so that they are:

- Cost effective.
- Simple to maintain
- Able to grow with your future requirements.
- Able to cope with high flows that commercial environments can generate.
- Able to treat effluent over a full 24 hour period, this gives you the best possible output from a commercial system.
- Built with large buffer zones to handle the continued influent flow despite a breakdown; almost a full day's capacity.
- Modular. No matter how it is configured, all our breakdown staff will be able to troubleshoot every system.
- Designed with all parts being 240 volt standard 3 pin plug, including the CABS controller. No electrician required for parts exchange if required.
- Fitted with a self-diagnostic controller which will indicate the nature of the fault that has occured.

The system is that easy!

About the CABS (Commercial Advanced Blower System)

The Taylex CABS System is a purpose built ‘off the shelf’ Commercial Sewage Teatment Plant. It is not a series of Domestic Treatment Plants to make up a commercial system. It is essentially a 5,000 litre per day off-the-shelf modular system that can be used to treat commercial sewage from 5,000, 10,000, 15,000 or 20,000 litres per day. Larger systems such as 50,000 or 60,000 litres per day can also be created.

To our knowledge the 5,000 litres per day “CABS” tank is the only off-the-shelf module aerobic commercial treatment system in Australia. There are tremendous benefits with the CABS design which we will cover later in this brochure.

The system Taylex has created, is called a CABS (Commercial Advanced Blower System)

How did we do it?

Taylex is the largest producer of Domestic Treatment Systems in Australia. We sell over 2,000 systems a year and we have been in the business of sewage treatment for over 40 years. In fact, we now have our 3rd generation of family working in our business. It took us nearly 3 years from design implementation to a completed CABS on the ground.

We have built a dedicated Commercial Tank that rectifies many of these problems that all commercial systems face.

The Taylex Difference

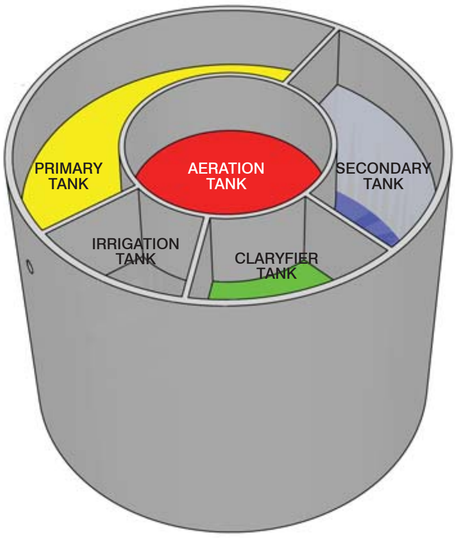
We build our range of commercial systems to last the test of time. They are easy to maintain and operate and they are very price competitive.

Commercial treatment systems are expensive to buy, so don’t just pick one on price alone. The system you are about to buy has to last many years and work constantly, 24 hours a day 7 days a week, year in year out. One of the common reasons for future problems is that the system has not been designed correctly.

A Taylex system is scalable to your future effluent processing needs!
- Because, you can add to it at a later date

Why the Tank is such a good design

To our knowledge, Taylex is the only company in Australia that has specifically built a concrete tank to make a commercial system. It is not a rainwater tank, or a domestic treatment system that has been converted to make a commercial treatment plant.



THE TANK

Pictured to the right is a photo of why the CABS is such a good system. Taylex has specifically designed a commercial tank that has all the boxes ticked.

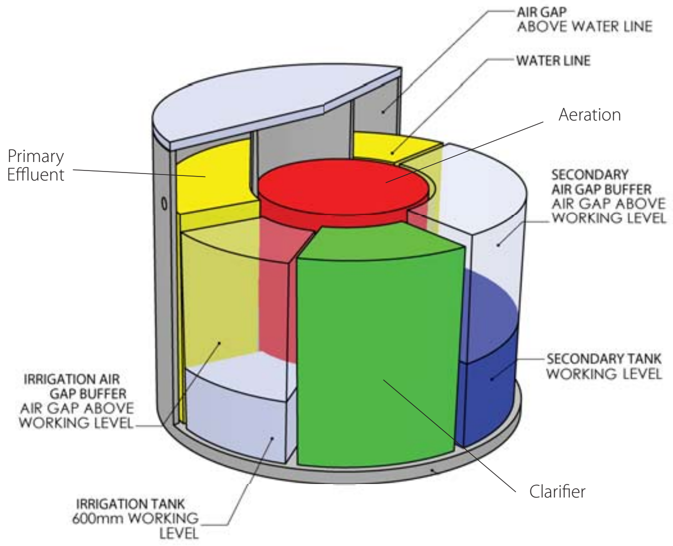
- ☑ A large monolithic, five chambered tank that is made out of one piece of concrete.
- ☑ The chambers go all the way to the roof to stop cross contamination between chambers.
- ☑ The tank is unbelievably strong due to its simple but effective design.
- ☑ There are no silicones, mortar or epoxy used that generally fail after several years of sitting in sewerage.
- ☑ Large buffer zone built into the tank for unforseen breakdowns due to power loss or equipment failure. (Nealy one full day's buffer)
- ☑ And probably the most important part about the tank. Taylex has been making this tank for domestic use for more than 15 years and we have never had a structural tank failure in the field. All we have done is scale it for commercial use.

A CABS tank being de-moulded

OUR TANK DESIGN IS THAT GOOD!

2 x CABS Tanks installed at the Lake Moogerah Ski Club

How Does a 5000 Litres Per Day CABS (Commercial Advanced Blower System) Work?



The CABS is a specifically designed, monolithic, 5 chamber tank that can treat 5,000 litres of effluent per day. The influent is treated over a full 24 hour period using a timed buffering system.

The secret to treating commercial effluent correctly is to treat it slowly.

The CABS system allows us to hold the effluent in the secondary/buffer chamber so that it can be treated over an extended 24 hour period. Every hour we pump a controlled flow through the system. The CABS will treat 208 litres every hour. That's 5,000 litres over a 24 hour period!

Buffer Zones

Another great feature of the CABS System is the extremely large buffer zones.

The Buffer Volumes are as follows:
Primary = 1604 litres
Secondary = 1020 litres
Aeration = 1153 litres
Clarifier = 633 litres
Irrigation = 392 litres
Total buffer in case of emergencies (excluding the pump station) is 4802 litres. Or nearly one day's buffer. So, if something goes wrong, we have a day before it becomes a problem.

Proven Track Record:
The CABS System is a giant version of our domestic treatment plant which we designed in the early 1990's. We have a proven track record with literally 10's of thousands of these systems being installed all over Australia.

Irrigation Areas:
Each CABS will come with its own irrigation pump so we can irrigate to different irrigation areas if required.

Flow Meters:
All CABS tanks are fitted with a flow meter in the irrigation chamber that records the hydraulic volume used by each system. This meter over time, gives us accurate records of the volume of effluent that your CABS system produces both in quiet and busy periods.

Description of a CABS Process Train

The 5,000 litre per day CABS system is a 5 chambered monolithic tank that uses an extended aeration process that can be turned on and off to adjust nitrogen levels.

The effluent enters the primary chamber and then flows into the secondary/buffer chamber which then pumps the desired amount of conditioned effluent to the aeration chamber via the CABS controller unit.

This effluent is pumped from the secondary buffer tank to the aeration chamber once per hour and the amount of effluent pumped across can be varied depending on the amount of effluent that enters the system on a daily basis i.e 100 litres per hour 150, 208 litres per hour.

The aerated (aerobic) chamber has large areas of submerged fixed film growth media to promote stable biomass which acts as a biological filter through which all effluent passes many times before entering the clarifier.

From this the aeration chamber effluent flows into a coned clarifier where any solid particles remaining sink to the bottom of this cone and are pumped via a Davey D25 Vortex pump that operates 4 times a day for 10 seconds to the primary chamber.

The remaining liquid then gravity feeds through 2 Taylex TFG filters which are located in the clarifier to stop any solid particles from flowing to the irrigation chamber.

From this clarification chamber the treated, cleaned effluent is then gravity fed into the irrigation disinfection chamber, the disinfected, cleaned effluent is then pumped to the irrigation management area.

Features	Benefits
A Purpose Built Commercial System	Not a Converted Domestic Treatment System
Large Purpose Built Tank	Designed to handle Commercial Effluent
Walls that go all the way to the roof	Minimising Cross Contamination Issues
Tank & Chambers poured all at the same time	No Leaking Internal Walls - Extremely Strong Tank
Purpose Built Simple Diagnostic Controller.	The System tells you exactly what's wrong with it. Simple to read and understand.
Timed Dose Pump in Secondary Chamber	The Effluent is treated evenly over a full 24 hour period
Every electrical item is fitted with its own Earth Leakage Safety Switch	If there is a fault with any electrical component the system will shut off that electrical component and not the entire treatment plant. The alarm will then sound so the fault can be fixed.
Timed Controlled Aeration	The Aeration motor can be turned off and on to suit the system's needs where possible, saving power.
Systems can be added to at a later stage	A very cost effective way to add to the systems as your needs grow
All eletrical components are 3 pin, plug-in, plug-out	No electrician required to change components

Taylex Manufacture The Most Reliable Vessel for a Commercial Sewage Treatment Plant in Australia

Design Parameters for Effluent

The Taylex CABS Commercial System will acheive the below effluent discharge provided the incoming influent is not greater than the table below, and/or the system is not overloaded by adverse chemicals.

Parameter	Unit	Influent (In)	Effluent (Out)
Biological Oxygen Demand (BOD_5)	mg/L	400	<10
Total Suspended Solids (TSS)	mg/L	350	<10
Oil & Grease	mg/L	75	<5
pH		6.5 - 8.2	
Faecal Coliforms, FC	cfu/100mL		<10/100

Phosphorus Removal:
Sometime in 2013, most of the major manufacturers of detergents in Australia will cease using phosphates in their manufacturing processes as they did in America some years ago. This being the case, phosphate should not be an issue in treatment plants but if for some reason you have a treatment plant that needs phosphate reduction, Taylex has a phosphorus reduction system that can be fitted.

Nitrogen Reduction:
This is a very complex issue in treatment plants and there is no easy fix to nitrogen reduction. There are many ways to reduce nitrogen in treatment systems and we have found that each site is unique and comes with its own set of challenges depending on the grade of influent that each commercial site produces. Nitrogen reduction has to be treated on a site by site basis and we will not know the actual levels that can be acheived until the treatment plant is fully functional.

The Working Parts to a CABS (Commercial Advanced Blower System)

CABS Control Panel

Each CABS tank has only five working parts which are off the shelf and very reasonably priced.

Davey D25
Submersible pump to transfer effluent from the Secondary Chamber

Nitto Air Blower

Davey D25
Submersible pump to transfer effluent from the Clarifyer to the Primary Chamber

Submersible pump from the Irrigation Chamber.
The size of this pump may vary depending on the irrigation requirements

Toro Irrigation Flow Meter

Taylex TFS (Taylex Filter Septic)

Taylex has a range of filters that we build. In the CABS System we use two TFS filters which reduce solid carry over from the clarification chamber to the irrigation chamber. These filters greatly reduce solid matter from entering the irrigation field and assist greatly with the final effluent results. The Taylex TFS filters are extremely robust and are cleaned during regular routine maintenance programs.

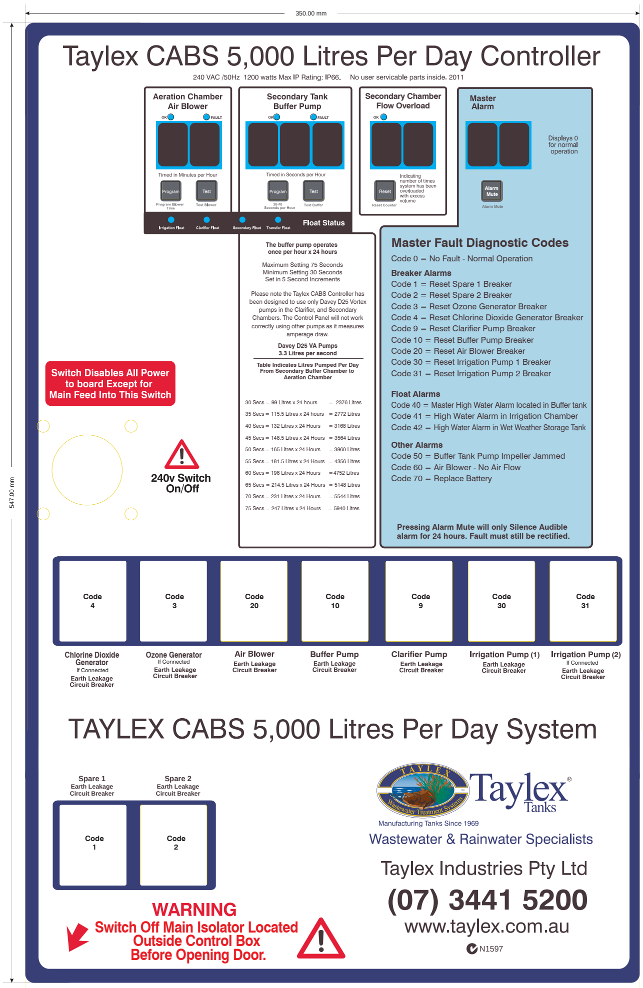
Picture of CABS Dual Fliter setup

Taylex TFG Filter

Filter Cannister Filter

Self Diagnostic Commercial Controller

The CABS Controller tells us exactly what the system is doing and indicates if there is a fault.



Example Only

The Taylex CABS controller has a built in visual flashing light and an audible alarm if a fault occurs. The controller has a mute button that will silence the alarm when pressed. The alarm will automatically re-activate after 24 hours if the fault is not rectified. The controller is also fitted with a battery backup. In case of power failure the alarm will activate.

Master Fault Diagnostic Codes

Code 0 = No Fault - Normal Operation

Breaker Alarms
Code 1 = Reset Master Breaker /Power Failure
Code 2 = Reset Secondary pump Breaker
Code 3 = Reset Clarifier Breaker
Code 4 = Reset Blower Breaker
Code 5 = Reset Irrigation Breaker

Float Alarms
Code 6 = Master High Level Secondary tank
Code 7 = Irrigation Chamber High water alarm

Other Alarms
Code 8 = Secondary Tank Pump Impeller Jammed
Code 9 = Blower- No Air Flow
Low Battery = Flashing 0 Replace Backup Battery

Pushing Mute Alarm will Silence the Alarm for 24 Hours Only. The fault still needs to be rectified.

Having a large modular system like the CABS has some great advantages...

The CABS is a very simple system to maintain and operate due to its simple design. Each CABS comes with a simple self diagnostic controller that will give you a fault code which will indicate the nature of a fault.

Breakdowns: Due to our large buffer system, if a CABS breakdown occurs due to power loss etc, and it can't be fixed immediately, you can by-pass the affected CABS unit and allow the other units to take the extra load for a short period of time. Each CABS system has nearly one day's buffer of extra capacity before the sewerage causes a problem.

Electrical Components: All electrical components are 240 volt standard 3 pin plug, including the CABS controller so no electrician is required for failed parts exchange! Every electrical part in the system is protected by an individual circuit breaker allowing the continued operation of the system in the event of a single component failure. Fault-finding is then a quick and easy process.

For remote sites: Because of the CABS' simple nature, Taylex will supply our customers, if required, with the four replaceable spare parts in a CABS system that your staff can fit when required.

The system is that easy!

Design Parameters of the CABS Tank

Water Volume

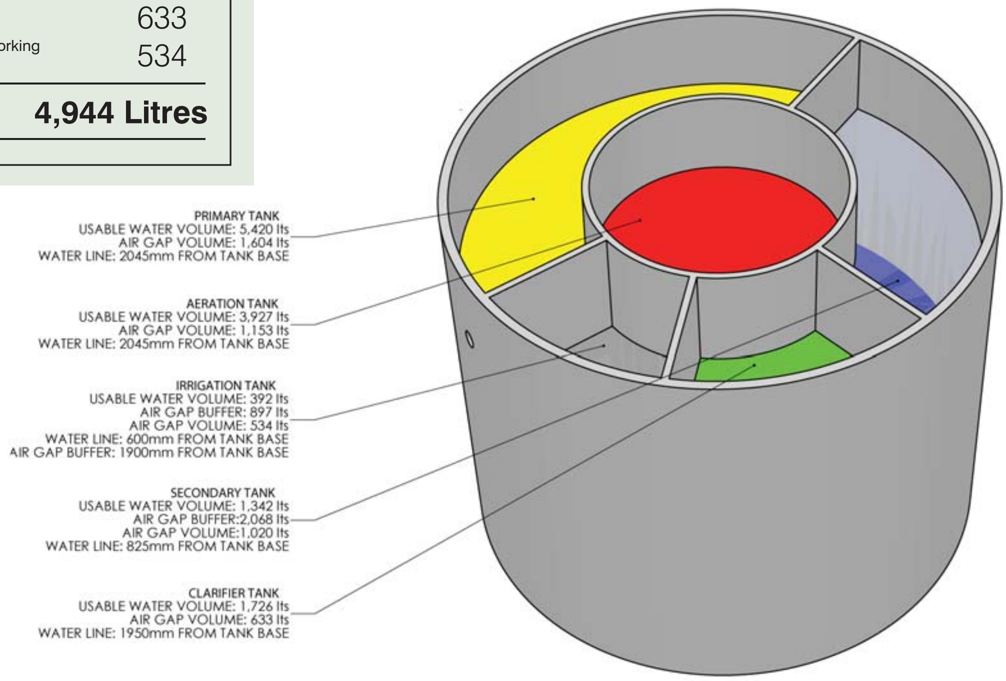
Primary	5,420
Secondary	1,342
Secondary Air Gap Buffer	2,068
Aeration	3,927
Clarifier	1,726
Total Working Capacity	**14,483 Litres**
Plus Irrigation	392
Plus Irrigation Air Gap Buffer	897
Total Working Capacity	**1,289**

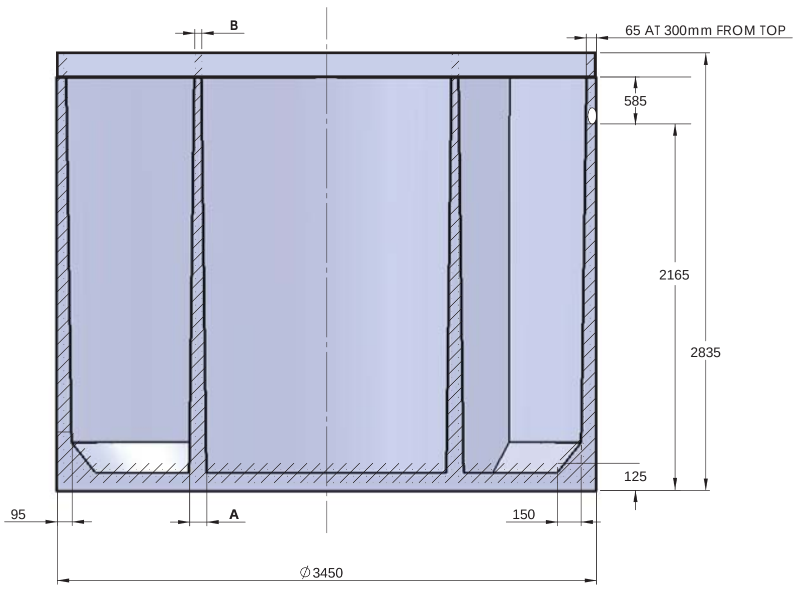
Air Volume

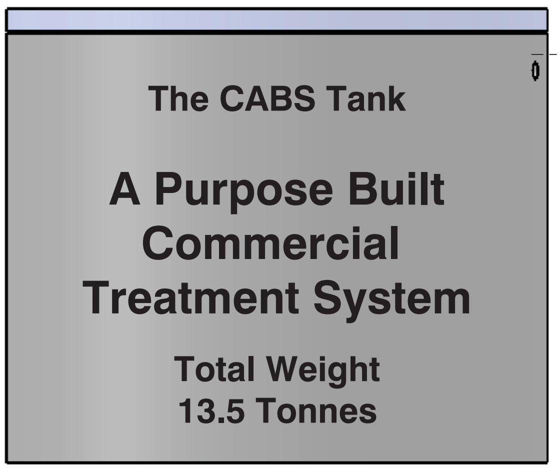
Primary		1,604
Secondary Air Gap	from Working Volume	1,020
Aeration		1,153
Clarifier		633
Irrigation Air Gap	from Working Volume	534
Total Air Volume		**4,944 Litres**

Tank Construction – All Concrete

Height	2835mm
Inlet Invert (from Base)	2165mm
Tank Diameter	3450mm
Tank Dry Weight	11.5 tonnes
Lid Dry Weight	2 tonnes
Total Tank Weight	13.5 tonnes
Maximum Hydraulic Loading	5,000 Litres/day
Operating Capacity	14,483 Litres
Total Tank Capacity	20,716 Litres







The Design Flow Process

The 5 Stage Process

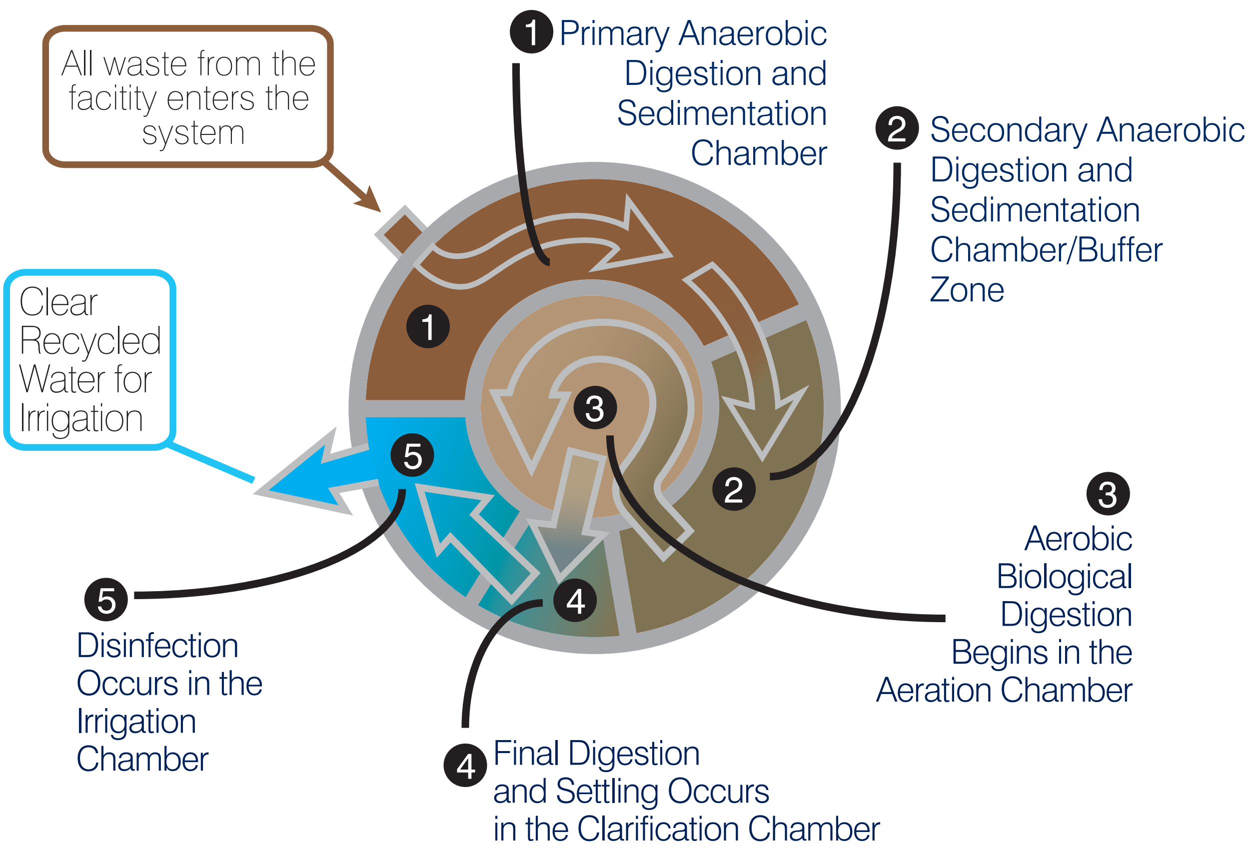
Step 1 & 2: All waste from the facility enters the primary pre-treatment chamber of the Taylex System with liquid then flowing into the secondary/buffer chamber. The time that waste spends in both these anaerobic chambers allows bacterial action to condition it before it is then control pumped evenly over a 24 hour period into the aeration chamber.

Step 3: The CABS system uses an air blower to introduce oxygen into the aeration chamber. The aerobic bacteria multiplies rapidly in this oxygen enriched environment and are thoroughly mixed with the pre-treated liquid to ensure complete digestion of organic material. The blower is set to turn on and off as needed to accommodate the flow of each individual treatment system.

Step 4: The liquid then flows into the clarification chamber for settlement where the remaining organics are then pumped back to the Primary Chamber. The remaining liquid then flows through to the Irrigation Chamber.

Step 5: Pre-treated, aerated and settled, the liquid then passes through Taylex outlet filters prior to disinfection. The filtered liquid passes through a chlorinator, ozone unit, chlorine dioxide unit or U.V. light which ensures the disinfection of the reclaimed effluent. Then your reclaimed effluent is returned to the environment via spray or underground irrigation by a silent pump.

The Five Stages to a Taylex Commercial Treatment System



Increasing the System's Capacity at a Later Stage

The CABS system was designed so that at a later stage, you can cost effectively add another CABS System as your needs grow.

In most cases to add one CABS tank is a one day job.

Steps to putting an extra CABS tank in:

1) Dig the new CABS tank into the ground.
2) Run power to the new CABS.
3) Run a line to the irrigation field.
4) Run an extra 32mm line from the pump station to the new CABS tank.

It's that easy!

We can make a CABS Bigger

This is a simple process.

PUMP STATIONS

- One pump station can supply to 2 to 4 CABS Tanks.

10,000 LITRE PER DAY SYSTEM

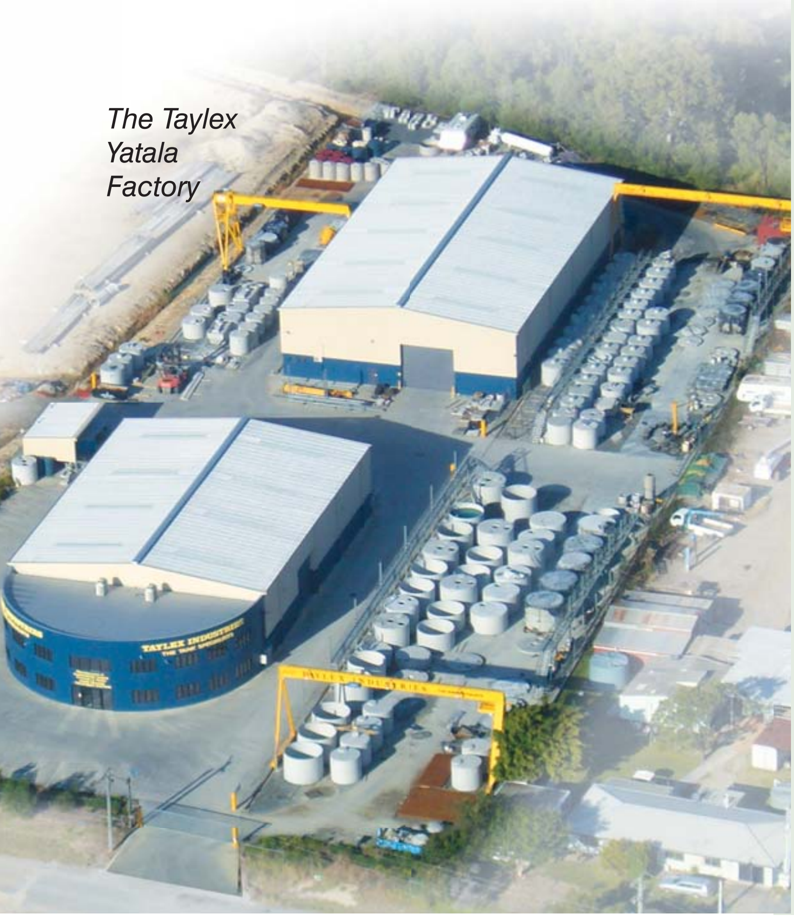
2 x CABS plus 1 x 10,000Lt Up-Front Pump Station

15,000 LITRE PER DAY SYSTEM

3 x CABS plus 1 x 10,000Lt Up-Front Pump Station

20,000 LITRE PER DAY SYSTEM

4 x CABS plus 1 x 22,000Lt Up-Front Pump Station



TAYLEX WARRANTY

CABS (Commercial Advanced Blower System)

15 year manufacturer's warranty.

There is a 15 year warranty on the precast concrete tank including baffles and a 12 month warranty on all electrical and mechanical components, including the irrigation pumps and blower, control panel and a 12 month extended warranty is available.

Please refer to your Taylex distributor for more information.

1300 660 225 Australia Wide

Taylex® Tanks

Manufacturing Tanks Since 1969

Wastewater & Rainwater Specialists

Taylex Industries Pty Ltd 56 Prairie Rd Ormeau Q 4208 Phone: (07) 3441 5200
Fax: (07) 3287 4199 Email: alistair@taylex.com.au

www.taylex.com.au

14-11-2012

Ask us about the Taylex Difference

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

TOWNSVILLE SOUTH
12 Cannan Street
Townsville South QLD 4810
Australia
T: +61 7 4772 6500

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 404 939 922

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

www.slrconsulting.com