

FARM-STAY ACCOMMODATION & RURAL INDUSTRY DEVELOPMENT

LOT 7 DP228075

440 MULHOLLANDS ROAD

THIRLMERE. NSW. 2572

WASTEWATER MANAGEMENT REPORT



Prepared by SOWDES
3 July 2019

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INTRODUCTION & DISCLAIMER

SOWDES has been commissioned to undertake a site and soil assessment of the property identified as the Lot 7 DP228075 - 440 Mulhollands Road at Thirlmere. NSW. 2572 for the purpose of determining an appropriate disposal method for on-site generated domestic wastewater and to prepare these recommendations in a report format to complement the proponent's development application to Council. The development application is for the retrospective approval of several tourist accommodation cabins and improvements to the existing intensive horticultural operations.

The recommendations within this report are based on the details contained in the attached site information sheets and photographs and are referenced by AS/NZS 1547:2012 "On-site Domestic Wastewater Management", "On-site Sewage Management for Single Households (1998)", Local Council regulations, and "Designing and Installing On-Site Wastewater Systems (A Sydney Catchment Authority Current Recommended Best Practice - 2012)".

Within the attached documentation amongst other site specific information is a site plan that includes the major landform features and approximate locations of proprietary infrastructure items. These are placed within the site plan for indication purposes and will need to be amended on site to accommodate the final design concepts, suffice to say that the final design concepts do not reduce the need to include such facilities. The following information, details and recommendations are based on site specific parameters obtained from the initial requesting brief and instructions provided by the clients (or their representatives) and the site-specific conditions that were applicable at the time of the site inspection. Any subsequent alterations to the nominated location of the proposed infrastructure items or referenced guidelines after the date of this report may therefore render this report and its recommendations invalid.

This site soil classification has been undertaken on the assumption that the soil sample site mentioned above provides an indicative representation of the geological and substrate materials that underlie the nominated effluent disposal area. Variability within soil classes and profile can be experienced with very distinct boundary changes occurring within relatively small areas hence the determination of this report is construed in good faith whilst also acknowledging that what lies beneath the surface is always difficult to precisely quantify. It is for this reason the soil type and site conditions should be constantly monitored during the excavation/installation process to identify any significant variability from the soil class determination of this report. If any such variability within the soil profile is encountered, it should be referred back to the author of this report for reclassification and/or a redesign of the wastewater management system. **This report does not assess or certify any existing sewage drainage or pipe network system against relevant standards, guidelines or best practice principles.**

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3 July 2019

| 1. EXISTING LAND USE, SITE CONDITIONS & DEVELOPMENT DETAILS | | |
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| # | DESCRIPTION | DETAIL |
| 1.1 | Property details | The subject development property is a single portion of land identified as Lot 7 DP228075 |
| 1.2 | Formal address | 440 Mulhollands Road, Thirlmere. NSW. 2572. |
| 1.3 | Land Zoning | RU1 Primary Production |
| 1.4 | Area | The development property covers an area of approximately 10.12 hectares and is essentially rectangular in shape. |
| 1.5 | Access | Access to the development property is from the Mulhollands Road traffic corridor with the front entrance located approximately 110 metre to the east from the intersection with Oaks Road. |
| 1.6 | Slope / topography | <p>The terrain throughout the development property is essentially divided into two regimes – separated by the passage of a defined drainage depression running west → east through the centre of the property.</p> <p>The southern half of the block which houses the majority of the development activities and horticultural enterprises falls from the south toward the north at an average grade of 7%, whilst the northern half which is set to several grazing paddocks falls from the north-northwest toward the south at slightly lower grades approximating 5%.</p> |
| 1.7 | Site stormwater drainage | <p>The development property is not serviced by an inter-allotment stormwater drainage system and is thereby required to manage all stormwater runoff on the site.</p> <p>Several of the sheds and roofed areas are connected to a number of rainwater tanks scattered across the site that are primarily used for animal drinking water, external cleaning – particularly around the main machinery shed area, and small amounts of localised irrigation by hand-watering.</p> <p>Surface water runoff from the southern half of the property is essentially directed to the defined drainage depression located in the centre of the site, however there is a shared dam with the neighbouring property to the west located approximately midway long the length of the western boundary in that half of the block with the main source of water from the development property entering the dam derived from the overflow pipe off a concrete water tank located at the rear of the machinery shed, and a small amount of surface water runoff from the machinery shed area and an adjoining orchard in the southeast quarter of the block.</p> |

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| | | <p>Surface water runoff from the southern half of the site that flows toward the central drainage depression is largely attenuated and filtered through the horticultural plots which have been formed to run parallel to the contours thereby intercepting and detaining the smaller rain events and the initial first flushes for the larger rain events.</p> <p>The surface water runoff from the northern half of the property also flows toward the central drainage depression with a moderate sized dam in the southern half intercepting a portion of the runoff and being used by grazing stock for drinking water.</p> <p>The drainage depression that flows through the centre of the site forms part of the tributary network that discharges into the Stonequarry Creek located further to the east, which in turn drains into the Nepean River system.</p> <p>Stormwater that flows through the central drainage corridor is collected in a long in-line dam that is formed with a broad wall toward the eastern boundary that is keyed into the banks on either side and houses a narrow-unsealed carriageway for vehicle, animal and machinery movements.</p> |
| 1.8 | Vegetation | <p>The vegetation formations throughout the southern half of the property are dominated by managed lands around the main dwelling and curtilage, with a blend of ornamental plants, market and vegetable gardens, fruit orchard, and lavender plots in the outer paddock areas.</p> <p>The northern half of the property is set to open paddocks of native grasses for grazing by a small number of animals, whilst the central drainage corridor and sections of the front and side boundaries are lined with a scattering of eucalyptus trees and established rows of conifers.</p> |
| 1.9 | Development details | <p>The property owner has undertaken a program of horticultural developments and building improvements on the property to establish a viable primary production enterprise as the principle use of the land, and a tourism facility as an ancillary land use.</p> <p>The primary focus of the operations is the large-scale propagation of lavender for the extraction of the essential oils that complements other business interest in the cosmetic and aromatherapy industries in which the property owner operates.</p> |

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| | <p>Lavender (<i>Lavandula angustifolia</i>) is harvested manually from the plot of approximately 5,000 plants and then steam distilled in rooms on the northern end of the machinery shed to extract the oil component, with the current plant numbers anticipated to yield approximately 4 to 5 litres of oil per harvest.</p> <p>The harvested oil is then used in the production and value-adding of cosmetic and aroma-therapy products, with some of the product on display in the entertainment and dining building and available for purchase by visitors to the site.</p> <p>The additional cropping of ornamental plants and vegetables has a two-fold function; one being the provision of all produce to meet the needs of the farm and for purchase by any visitors, but secondly as a beneficial and symbiotic operation that promotes bees and pollination of the lavender plants.</p> <p>The outlying areas of the site are set to a range of animal and bird holdings that provide additional attractions and inter-actions for visitors, with the tourism concept essentially being targeted to visitors from China that don't necessarily get to experience the hands-on activities of a working property in their normal day-to-day lives.</p> <p>The tourism aspect of the development is supported by an established entertainment and dining building located to the east of the main dwelling, and five separate cabins (four 1-bedroom units and a single 2-bedroom unit) located to the northeast of the dwelling that can be hired for short-term accommodation, each being self-contained with bathrooms and kitchenettes.</p> <p>It is understood that the entertainment and dining building has been approved by Council, however the short-term accommodation buildings, and certain parts of the machinery shed that have sinks and cleaning facilities associated with the harvesting and lavender oil extraction operations have not been formally approved.</p> <p>It is assumed that the sewage drainage from the entertainment and dining building, and from the accommodation cabins is connected to the inlet side of the existing wastewater treatment system, however this has not been confirmed.</p> |
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| | <p>Wastewater associated with the sinks in the machinery shed complex are presently allowed to discharge onto the ground just outside the northern aspect of the building – approximately 40 metres from the dam along the western boundary which does not meet current standards and best practice guidelines.</p> <p>Similarly, a small and separate laundry structure to the immediate north of the accommodation cabins is also allowed to discharge onto the ground close to the vegetable garden area, again not meeting current standards and best practice guidelines.</p> <p>A pair of single cubicle toilets are located just to the south of the machinery shed, however the nature of the drainage from these toilets was not able to be established during the site survey, and it is not known if the toilets have been approved for use by Council.</p> <p>The site is presently serviced by a single wastewater management system that was originally installed to service the main dwelling, which is comprised of four bedrooms and a separate office/study, deemed to be the equivalent of five bedrooms.</p> <p>The wastewater management system is comprised of a small primary treatment septic tank of nominal 2,500 litre capacity located approximately 30 metres to the north of the dwelling that trickles into a secondary treatment 'Econocycle ENC 10-01' Aerated Wastewater Treatment System unit (AWTS) adjacent to the septic tank which is rated at a treatment capacity of 2,000 litres per day and is serviced quarterly by an authorised agent.</p> <p>Treated effluent from the AWTS unit is pumped to an above-ground irrigation disposal area located in a managed lawn area on the eastern aspect of the entertainment and dining building and is comprised of three turf valve outlets whose location is identified by a star-picket post in the ground and a series of 3 capitol style sprinklers spaced along a single 9-metre length of lilac coloured low-density poly pipe.</p> <p>The distribution of the treated effluent over the land application area is reliant upon someone physically pivoting the sprinkler set around the turf valve outlet, and moving the sprinkler set between turf valve outlets on a regular basis to prevent over-irrigation of the same area.</p> |
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| 1.10 | Summary of the wastewater management proposal | <p>To improve the management of wastewater across the site it is proposed that the following measures will be undertaken:</p> <ul style="list-style-type: none"> • The existing wastewater management system will be dedicated to servicing the daily inflows from the existing dwelling, the two separate toilets to the south of the machinery shed, and the sinks in the machinery shed • The sewage drainage from the entertainment and dining building, the accommodation cabins, and the small laundry unit which all have a lower daily flow and intermittent usage will be directed into a new secondary treatment AWTS unit to be located to the north of the accommodation cabins. • The existing irrigation disposal system will be re-configured to comprise four separate outlet zones along the eastern aspect of the entertainment and dining building with each zone to comprise two sets of sprinkler hoses (further details in Section 5 of this report) • A separate irrigation disposal system will be installed for the new AWTS unit and it will also comprise four separate outlet zones along the eastern aspect of the entertainment and dining building with each zone to comprise two sets of sprinkler hoses • The sinks within the machinery shed will be plumbed into a small-scale low-pressure sewer pump station equal to the '<i>Aquatec Sewertec 1 – Tank Model A – 620 Litres</i>' to be located on the northern aspect of the building that will discharge the contents under pump level controls to the existing wastewater treatment system via a 32Ø PN12.5 polyethylene pipe with lilac stripes • The nature and location of the drainage associated with the two toilets to the south of the machinery shed will be checked and if not already, will be connected to the inlet side if the existing wastewater management system. <p>The required land area for effluent irrigation associated with each wastewater treatment system has been determined using a hydraulic water balance calculation with the existing wastewater treatment system treating up to 1,200 litres per day requiring a minimum area of 560m², and the new wastewater treatment system treating a potential daily loading of 1,800 litres requiring a minimum area of 850m², details of the individual calculations are contained on pages 32 and 33 of this report.</p> |
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| | | <p>A suitable land area within lawns to the east of the entertainment and dining building has been identified for the application of the secondary treated effluent from each wastewater treatment system which also allows for the necessary buffer separation distances from features such as boundary fences and buildings.</p> <p>The application of secondary treated effluent to a designated surface irrigation disposal system will allow for the influences of evaporation, evapotranspiration and moderate percolation into the soil profile as measures in combination to the assimilate the end waste product.</p> <p>The following sections within this 'Wastewater Management Report', the 'Design and Installation Requirements' and the 'Technical Specifications' provide a detailed summary of the site conditions and wastewater management system recommendations.</p> |
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| 2. SOILS | | | |
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| # | DESCRIPTION | DETAIL | |
| | Sample number | 1 | 2 |
| 2.1 | Location | -34.17651 150.55017 | -34.17703 150.55005 |
| 2.2 | Method of sampling | Hand augur - 75Ø | Hand augur - 75Ø |
| 2.3 | Soil depths | 1000mm | 1000mm |
| 2.4 | Topsoil depth | 0 - 200mm | 0 – 200mm |
| 2.5 | Reason for termination | Adequate depth | Adequate depth |
| 2.6 | Soil characteristics | Dry, and slightly non-adherent silty topsoil to 300mm. Soils have an abrupt transition into a light-brown to mid-brown coloured sandy clay loam layer before then transitioning into a slightly darker brown clay loam texture approximately 700mm below the surface. Very few stones or pebbles in the deeper extractions, and the clay content is approximately 30% of sample. | Dry, compact and slightly non-adherent silty topsoil to 300mm. Soils have an abrupt transition into a light-brown to mid-brown coloured sandy clay loam layer before then transitioning into a red-brown clay loam texture approximately 700mm below the surface. Very few stones or pebbles in the deeper extractions, and the clay content is approximately 30% of sample. |
| 2.7 | Coarse fractions | Generally, less than 20mm throughout the soil column, with occasional small rocks scattered across the surface | Generally, less than 20mm throughout the soil column, with occasional small rocks scattered across the surface |
| 2.8 | Clay content | ~30% | ~30% |
| 2.9 | Depth of plant roots | 0 - 400mm | 0 - 500mm |
| 2.10 | Electrical conductivity readings (mS/cm ⁻¹) | 0.00 – 0.03 | 0.02 – 0.04 |
| 2.11 | pH readings | 5.0 – 5.4 | 5.3 – 5.5 |
| 2.12 | Soil classification | weakly structured light clay at depth | |
| 2.13 | Type of wastewater treatment system | Secondary treatment – AWTS unit | |
| 2.14 | Design load rating | 3.0mm/day for surface irrigation application | |
| 2.15 | Additional soils information | Further details of the soil characteristics are included amongst the supporting documents that follow this section of the report. | |

| 3. SITE & DESIGN CONSTRAINTS | | |
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| # | DESCRIPTION | DETAIL |
| 3.1 | Drainage and buffer distance requirements | <p>The southern half of the development property is burdened by a defined drainage corridor the traverses through the centre of the property in a west → east alignment, and there is a shared dam located along the western boundary – approximately 40 metres north of the machinery shed.</p> <p>The site has multiple buildings and structures including the main residential dwelling and several habitable cabins for short-stay accommodation purposes.</p> <p>There is also a large area of the development precinct that is set to horticultural enterprises including consumable crops such as vegetables a fruit orchard.</p> <p>The above listed features all require a minimum prescribed separation distance from the land application area associated with a wastewater management system as detailed in the table on page 34 of this report.</p> <p>The use of an Aerated Wastewater Treatment System (AWTS) unit allows the identified sources of wastewater to be collected and treated to a higher (secondary) level of effluent which can then be discharged under pump pressure to surface disposal areas upslope and away from the identified drainage depressions and other significant site features, and therefore 'drainage' and 'buffer distance requirements' as a potential constraint can be adequately addressed.</p> |
| 3.2 | Groundwater Sources | <p>For developments that fall within the Sydney Groundwater Basins as defined in the <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011</i> administered under 'Section 50 of the Water Management Act (2000)', an assessment is required to be undertaken to determine the likely impact of any 'contamination source' on groundwater sources.</p> <p>Schedule 1 (a) of the <i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011</i> defines an onsite sewage disposal system or septic tank as a contamination source which particularly relates to the proximity of an effluent management and disposal area to any registered groundwater bore, irrespective of the use, with a minimum separation distance under current guidelines of at least 250 metres from the plume associated with a contamination source.</p> |

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| | <p>Where the proposed location of an effluent disposal area may be less than 250 metres of an identified groundwater bore then a 'draw down analysis' similar to that prescribed by Cromer, Gardner and Beavers 'An Improved Viral Die-off Method to Estimate Setback Distances' (2001) may be undertaken to demonstrate that the proposed lesser separation distance will be suitable.</p> <p>In relation to this particular development which falls within the 'Sydney Basin Nepean – Management Zone 2' region of the plan a search of the NSW Office of Water 'Groundwater Data Base' for any registered bores within 500 metres of the proposed effluent management system has been undertaken which has resulted in a three findings, however only one of these bores is located within 250 metres of the nominated effluent disposal area.</p> <p>The groundwater bore identified as GW105679 is located in the second allotment to the east of the development property (Lot 101 DP594132), with positioning details indicating that the bore is approximately 180 metres from the nearest margins of the proposed effluent disposal area.</p> <p>Details of the groundwater bore indicate that it was drilled in 2003 to a depth of 90 metres with the best water bearing zone sitting between 64 and 86 metres below the surface, and the bore has been cased with 150Ø Class 9 PVC pipe and cemented around the outer drilling to a depth of 12 metres.</p> <p>A calculation using the Cromer, Gardner and Beavers 'An Improved Viral Die-off Method to Estimate Setback Distances' with input parameters specific to the site indicates that a minimum setback distance required from the 'radius of influence' of the bore is 42 metres, which is readily achieved by the existing physical separation distances.</p> <p>Finally, it is noted that there is a developed property between the subject site and the registered groundwater bore that has an existing dwelling and onsite effluent management system which is more likely to have a direct impact on groundwater quality in this instance, and it is therefore considered that the proposed wastewater management system will not have an adverse impact on local groundwater sources.</p> |
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| 4. DAILY LOADING AND DISPOSAL AREA CALCULATIONS | | |
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| # | DESCRIPTION | DETAIL |
| 4.1 | Design Load Rating (DLR) summary | <p>The volumes of potential daily effluent loading for both the existing and proposed wastewater management systems has been undertaken in the following manner:</p> <p>1/. Existing wastewater management system</p> <p>Daily effluent volumes for the main dwelling have been calculated in accordance with the figures in AS/NZS 1547:2012 <i>On-site Domestic Wastewater Management</i>, (page 121) Table H1 "Typical Domestic Wastewater Design Flow Allowances - Australia" which recommends 150 litres per person per day for developments that have access to a utility maintained reticulated water supply.</p> <p>In this matter it is noted that there is water meter located inside the front southern boundary approximately 15 metres west of the entrance driveway.</p> <p>The property is operated with approximately 4 persons on site, all of whom reside in the main dwelling.</p> <p>Use of the two separate toilets to the south of the machinery shed and the sinks within the machinery shed are considered alternatives to using the amenities inside the dwelling when working outdoors and therefore do not impose any additional loading.</p> <p>The existing dwelling has 4 bedrooms and a separate office which is deemed the equivalent of 5 bedrooms that can support up to 8 persons (Table J1, AS/NZS 1547:2012 <i>On-site Domestic Wastewater Management</i>, (page 127) which in turn creates a potential effluent loading of 1,200 litres per day.</p> <p>2/. The proposed new wastewater management system.</p> <p>The effluent loading associated with the accommodation cabins is also calculated using the same values described above (150 litres per person per day), and the total number of persons within the cabins is assessed as 6 persons based on the number of beds (4 single bed units and 1 double bed unit) which generates a potential effluent loading of 900 litres per day.</p> |

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| | | <p>There are no specific guideline values in the relevant standard AS/NZS 1547:2012 <i>On-site Domestic Wastewater Management</i>, or local Council guidelines for the daily effluent volumes associated with the use of the entertainment and dining building facilities which is probably more closely aligned to the function of a restaurant.</p> <p>Advise from the proponent is that the potential number of visitors to the site is in the order of 4 persons on any given weekday as passing traffic, and on occasional weekends during the milder periods of the year a bus with 30 visitors may attend – with notice.</p> <p>In the absence of any formal loading guideline values for restaurants the potential daily loading allowance has adopted the figures from NSW Health Department "Septic Tank and Collection Well Accreditation Guideline", December 2001 and used the categories of 'Restaurant' (page 20) which for each person is equivalent to an effluent loading of 28 litres per day (WC, urinal, basin and kitchen).</p> <p>For a total of 30 visitors the potential effluent volume would be 840 litres per day which has been rounded up to 900 litres per day for design and calculation purposes.</p> <p>The maximum effluent volume to be treated in the proposed new wastewater management system is therefore 1,800 litres per day.</p> |
| 4.2 | Disposal area calculations | <p>The disposal land area calculations for a secondary treated effluent from an AWTs system can be undertaken in a number of ways, with the 'nitrogen loading', 'soil phosphorus sorption capacity', and 'water balance using a nominated irrigation area' being the principle considerations.</p> <p>The nitrogen loading, and phosphorus sorption calculation methods tend to result in very large land area requirements due to the immobile nature of the contaminants and the subsequent need to provide large tracts of vegetated land to promote transpiration as the predominant mechanism of removal.</p> <p>This land area requirement is often too large to be supported by an irrigation system solely supplied from an AWTs system, and therefore they become ineffective due to 'die - back' of the vegetation resulting from a lack of underlying soil moisture within the profile.</p> |

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| | | <p>The preferred method of determining the disposal land area requirement is to use the 'water balance with nominated irrigation area' method which essentially calculates all the water inputs such as effluent loads and precipitation for the geographical region, and then deducting the evaporation, a plant usage factor (cropping factor), and a nominal irrigation area until such time as there is an output deficit in the figures where there is no requirement for onsite storage of effluent.</p> <p>The climatological data is proportioned into monthly figures based on historical data such that the wetter and cooler months that have less evaporation and evapotranspiration influences require a larger irrigation area than the drier and warmer months, and the size of the irrigation area must be large enough to ensure that every month has a deficit requirement for inputs (zero onsite storage requirement) to satisfy the monthly water balance method of determination.</p> <p>In this particular development, the soil has been assessed to have a design irrigation rating (DIR) of 3.0mm per day (21.0mm per week) for secondary treated effluent as described in the earlier section under 'Soils', and the development property is in the Picton climatological region.</p> <p>Based on the 'water balance with nominated irrigation area' method, the total land area required for irrigation disposal of the 1,200 litres from the existing wastewater management system is 560m², and the total land area required for irrigation disposal of the 1,800 litres from the proposed wastewater management system is 850m², (refer to the accompanying individual worksheets entitled "Monthly Water Balance used to Determine Wet Weather Storage for Picton Region with Nominated Irrigation Area" for calculation details).</p> <p>Precipitation values used in the 'Monthly Water Balance' calculations are derived from historical rainfall figures from the nearest long-term operating recording station (Bureau of Meteorology Weather Station Site Number - 068052 Picton Council Depot), and monthly evaporation figures are obtained from the '<i>Monthly Potential Evapotranspiration Data For The Sydney Basin Bioregion</i>' (1982 – 2012) – Australian Government Department of the Environment and Energy, the Bureau of Meteorology, CSIRO and Geoscience Australia - Bioregional Assessment.</p> |
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| 5. PROPOSED WASTEWATER MANAGEMENT SYSTEM | | |
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| # | DESCRIPTION | DETAIL |
| 5.1 | Description | With consideration of the site conditions, effluent loading details and identified constraints it is determined that the proposed development will be serviced by the following measures: |
| 5.2 | | The existing wastewater management system comprised of a septic tank and Aerated Wastewater Treatment System (AWTS) will be retained 'as is' to treat the effluent loadings associated with the day-to-day sources from the main dwelling, the cleaning facilities within the machinery shed operations, and the two separate toilets to the south of the machinery shed |
| 5.3 | | The irrigation disposal system associated with the existing wastewater management system will be relocated in the lawn area to the east of the entertainment and dining building and will be re-configured to cover an effective area of at least 560m ² which will be achieved by creating four irrigation separate zones, with each zone comprising two irrigation hose sets |
| 5.4 | | The accommodation cabins, the entertainment and dining building, and the small laundry structure to the north of the accommodation cabins representing the intermittent sources of effluent will be plumbed into a new NSW Health Department approved Aerated Wastewater Treatment System (AWTS) unit to be located approximately 6 metres to the immediate north of the accommodation cabins adjacent to the vegetable gardens. |
| 5.5 | | Treated effluent from the new wastewater treatment system will be directed to the lawn area to the east of the entertainment and dining building and will be configured to cover an effective area of at least 850m ² which will be achieved by creating four irrigation separate zones, with each zone comprising two irrigation hose sets |
| 5.6 | | It is noted that for ease of installation and consistency in design and application, each irrigation system will have an effective distribution area of approximately 850m ² . |
| 5.7 | | The secondary treated effluent from each AWTS unit is to be directed to a 4-port outlet 'K Rain' Sequencing Valve via 32Ø distribution line with each sequencing valve to be installed such that the body of the valve is slightly higher than the highest irrigation outlet point to prevent possible back pressure on the automatic cam operation inside the valve. |
| 5.8 | | A total of 4 distribution laterals will be installed from each indexing valve – one from each port, with each lateral to have two outlet points in the form of quick coupling turf valves with lilac coloured lids that finish at surface level (8 in total per irrigation system). |

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| 5.9 | | Each of the quick coupling turf valves will be fitted with a 'hose set' comprised of a compatible bayonet style turf valve key, a 90° elbow, a 4 metre length of 20Ø lilac coloured distribution hose, and a 20Ø BSP lilac coloured 'capitol' sprinkler. (refer to the accompanying plan titled 'Wastewater Management Disposal Conceptual Design Details - Aerated Wastewater Treatment System to Fixed Irrigation Disposal', Ref: -0070519-01EFFIRR for the conceptual design details of the irrigation disposal system). |
| 5.10 | | Each cycle of the irrigation pump will activate the cam within the sequencing valve to the next port in the sequence to create an automatic rotation of the irrigation system, and each sprinkler hose should be rotated manually by pivoting the turf valve key around the outlet and shifting the sprinkler hose set to a new location at least weekly during the warmer months and every two to three days during the cooler months. |
| 5.11 | | The irrigation disposal areas will be situated such that the irrigation spray does not fall within the drip zone of any fruit-bearing trees or planted edible produce, and the application area should be mown regularly to reduce the overall height of the vegetation and promote new growth. |
| 5.12 | | Appropriate signage will need to be erected around the nominated irrigation areas noting the fact that effluent water is used for irrigation with wording to the effect of "RECYCLED WATER – AVOID CONTACT – DO NOT DRINK" |
| 5.13 | | A maintenance contract with the manufacturer or authorised agent to undertake quarterly service inspections of the AWTS unit as per the accreditation and licencing requirements of the system and Council's conditions of development consent will need to be maintained for the existing system and established for the new system. |
| 5.14 | | A separate low-pressure sewer pump system equal to the 'Aquatec Sewertec 1 – Tank Model A – 620 Litres' will transfer sewage from the sinks and cleaning facilities within the machinery shed to the inlet side of the septic tank component of the existing wastewater management system via a 32Ø PN12.5 polyethylene pipe with lilac stripes |
| 5.15 | | The drainage associated with the two toilets to the south of the machinery shed will need to be determined, and if not already it will need to be re-directed to the inlet side of the septic tank component of the existing wastewater management system |
| 5.16 | | All existing drainage lines and systems that do not form part of the above listed requirements will need to fully decommissioned and made redundant to prevent possible future use and/or cross-connection. |

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| 5.17 | | The location of all drainage lines, electrical services and transfer pipes that lie between the various buildings, the wastewater management systems, and the effluent disposal area should be identified by placing marker posts in the ground and will need to be installed deep enough below finished ground level to avoid possible compaction and physical damage by vehicles and animals. |
| 5.18 | | Refer to the accompanying Wastewater Management Site Plan Ref: 0070519-01C for details of the proposed locations of major infrastructure items |



Example of warning sign to be posted around the outside of the effluent disposal area

6. CONSTRUCTION & MAINTENANCE

| # | DESCRIPTION | DETAIL |
|-----|-----------------------------|--|
| 6.1 | Description | <p>The size and configuration of each irrigation areas has been calculated assuming an average of 200 litres of secondary treated effluent being discharged during each pump cycle of the AWTS unit.</p> <p>Assuming a full wastewater loading of 1,200 litres per day for the existing wastewater management system then each zone within the irrigation area will receive on average 10 applications per week, whilst a full wastewater loading for the proposed new wastewater management system of 1,800 litres per day would result in each zone of the irrigation area receiving on average 16 activations per week.</p> <p>All below ground pipes should be labelled with a lilac coloured stripe or appropriate warning tape to reduce the chances of cross-connection with potable water supplies, and to highlight the location of services in the ground for future reference.</p> <p>All quick coupling turf valves are to have a lilac coloured lid that finishes at ground level, and all turf valve keys must be a compatible fit with the turf valve – ideally spring controlled.</p> <p>For the effluent irrigation disposal system to be effective and prevent possible land degradation and localised saturation, each sprinkler should be rotated at least once per week during the warmer months, and at least every 2 to 3 days during the cooler months.</p> <p>To avoid over-application of effluent irrigation in one location the position of the sprinklers in each distribution zone shall be such that there is no overlap of sprays with an adjoining sprinkler within the same cycle.</p> |
| 6.2 | Vegetation and ground cover | <p>The secondary treated effluent should not be applied to any consumable plant species such as fruits or vegetables as the quality of effluent water can alter with time, maintenance of the unit, usage, and inputs, and the ability for plants to screen out viruses and harmful pathogens is not a matter of certainty.</p> <p>This practice is also prohibited under NSW State Health Department guidelines.</p> |

| | | |
|-----|--|--|
| | | <p>As a general rule, the irrigation area should ideally have a grass covering, lawn or improved pastures that can regularly be mown or occasionally grazed by small animals under supervision to prevent possible damage to the distribution infrastructure.</p> |
| 6.3 | Maintenance and protection of the effluent management system | <p>It is recommended that as the grass or vegetation cover increases across the irrigation disposal area that the area be mowed or slashed regularly to manage the heights such that they don't interfere with the normal distribution pattern of the sprinklers.</p> <p>Prior to any mowing or slashing of the irrigation disposal area all hose sets (turf valve key, distribution hose and capitol sprinkler) will need to be completely removed from their respective quick coupling valves and the lids closed to prevent damage to the units, and all hose sets then returned immediately to the turf valve after the mowing is completed and prior to the next irrigation application.</p> <p>Finally, the AWTS unit will need to be serviced on a regular basis in line with the system manufacturer's accreditation guidelines and Council requirements, and a copy of all service records should be forwarded to Council after each service event for their records to ensure compliance with this requirement.</p> <p>For the effluent disposal system to operate properly, large wastewater generators such as laundering and large-scale cleaning should be spread over the course of the week rather than in a single day or consecutive days where possible which will allow the effluent applied across the irrigation disposal system to evaporate and drain away between loadings.</p> |

| 7. SUMMARY & CONCLUSION | | |
|------------------------------------|----------------------|--|
| # | DESCRIPTION | DETAIL |
| 7.1 | Summary requirements | <p>The existing wastewater management system comprised of a septic tank and Econocycle AWTS unit installed approximately 30 metres downslope and to the north of the dwelling will be retained to service the main dwelling, the cleaning and wash facilities for the machinery shed, and the two toilets to the south of the machinery shed.</p> <p>A separate wastewater management system to service the accommodation cabins, the entertainment and dining building, and small laundry will be installed approximately 6 metres downslope and to the north of the accommodation cabins.</p> <p>All redundant drainage lines affected by the changes will need to be fully decommissioned to prevent possible re-connection or cross-connection in the future.</p> <p>Effluent from the individual AWTS units will be directed to separate but adjoining surface irrigation disposal areas located to the east of the entertainment and dining building, no closer than 6 metres to the eastern boundary or 6 metres to the footprint of the building.</p> <p>All drainage, pipework and electrical services that pass between the individual buildings and the wastewater treatment systems and the effluent disposal areas will need to be installed deep enough below finished surface level and any internal driveways to protect them from mechanical and/or compaction damage, and the location of all pipes and services should be documented for future reference.</p> <p>Both AWTS units and the low-pressure sewer pump system will need to be maintained on a regular basis in accordance with the accreditation, licencing and Council requirements.</p> <p>To ensure that the effluent disposal systems can operate effectively all reasonable measures should be undertaken to spread heavy laundering and cleaning loads over the course of several days as opposed to bulk loading to allow the effluent to gradually evaporate and percolate into the soil profile and thereby avoid unnecessary hydraulic inundation.</p> |

| | | |
|-----|--------------------------------------|--|
| 7.2 | Checklists and material requirements | <p>Within the next section titled "Design and Installation Requirements" is a summary of the main components associated with the installation and upgrades of the wastewater system which is accompanied by a detailed site plan in A1 format.</p> <p>At the conclusion of that section are two separate checklists and an installation declaration to be completed by the installers of the wastewater management system which are to be presented to the Council and the property owners after practical completion of the installation.</p> <p>One checklist covers the installation of the Aerated Wastewater Treatment System whilst the second checklist covers the installation of the irrigation disposal system – one checklist should be completed for each wastewater management and irrigation disposal system.</p> <p>Both checklist plus the Installer's Declaration are to be completed with as much detail as applicable to the particular development and then submitted as part of the overall certification process to ensure compliance with the recommendations of this report.</p> |
|-----|--------------------------------------|--|

ON-SITE SEWAGE (WASTEWATER) MANAGEMENT

GENERAL NOTES TO BE APPLIED AS APPROPRIATE FOR THE DEVELOPMENT

1. All proposed wastewater management collection, treatment and discharge measures are to be installed and commissioned in accordance with the recommendations of the Wastewater Management Assessment that accompanies this development, all relevant NSW Health Department guidelines, Council's engineering standards, and any conditions of development consent.
2. If the site soil conditions encountered within the area nominated for effluent disposal during the construction process vary from those described in the Wastewater Management Assessment seek additional information and design options from the designer of the system before progressing to completion.
3. All wastewater management collection, treatment and discharge components such as tanks, transfer pipework, disposal areas, and any associated infrastructure used in the construction of the wastewater management system are to be protected from potential physical damage by the installation of appropriate mechanisms such as bollards, fencing or barricades to the satisfaction of the consent authority and/or certifying engineer.
4. All plants, grasses and ground covers sown as part of wastewater treatment measures are to be maintained and/or replaced until a satisfactory strike rate of at least 90%, or until such time as plants have established rigour and survivability. Particular attention is required for sowing plants during the hotter summer months, and when there will be no monitoring of the survivability of the plant material for extended periods of time due to the likes of holidays or contractors moving on due to project completion.
5. Ensure that all civil works such as stormwater diversion berms, mounds and/or trenches are installed prior to completion of the job, and that all excess spoil is removed from around the effluent management area
6. All construction checklists are to be completed with as much detail as appropriate for the development with a copy of the checklist to be presented to the property owner, Council (certifier), and a copy retained by the installer.
7. At the completion of the project complete the 'Certification Statement', add additional information to the statement as necessary, and then present a copy of the Certification Statement to the property owner, Council (certifier), and retain a copy for future reference
8. Where possible and appropriate, take photos of the earthworks and installation process at various milestone points and present a copy of the images to the property owner and Council (certifier) to help with identification of the installed products and materials, and for future reference as to the location and physical characteristics of the system.

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Goulburn. NSW. 2580
ABN: 63 326 094 249



DESIGN PRODUCER STATEMENT

On-site Wastewater Management and/or Effluent Disposal System Design

Issued By: SOWDES

To: Wollondilly Shire Council

SOWDES Reference No: 0070519

Issued To:

In Respect Of: On-site wastewater management system

For Development At: Lot 7 DP228075
440 Mulhollands Road, Thirlmere. NSW. 2572

SOWDES has been engaged by the proponents to provide the technical design details for an on-site wastewater management system.

The design has been carried out in accordance with the following Standards and Best Practice Guidelines:

- 'Environment and Health Protection Guidelines On-site Sewage Management for Single Households'. Department of Local Government. (1998)
- AS/NZS 1547:2012 'On-site domestic wastewater management'

For details of the site assessment and design particulars, refer to the **Wastewater Management Report prepared by SOWDES** dated 3 July 2019.

DECLARATION:

I believe on reasonable grounds that this design has been carried out in accordance with agency and council requirements, and best practice in on-site wastewater design principles and procedures.

NOTE: This statement does not approve the installed system.

This is an independent design, covered by a current policy of Professional Indemnity Insurance.

Under certain conditions, **SOWDES** is available to certify the installed system. These conditions include:

- the technology supplier(s) take(s) full responsibility for the stated quality and performance of technologies and other equipment supplied
- the installer(s) take full responsibility for installing the system as specified by **SOWDES** design reports and the appropriate Conditions of Consent unless departure from the stated specification(s) is subsequently agreed between the installer, **SOWDES** and the relevant consent authority
- prior to the installation of the wastewater management system as specified in the wastewater management report dated 3 July 2019 **SOWDES is to be engaged under separate contract** to supervise the installation of all the specified system components.

DISCLAIMER:

The Client is to make full disclosure of relevant information on existing and/or proposed activities on the site that will influence the estimation of the likely daily wastewater quantity (potential number of bedrooms and other wastewater producing activities) and quality (in particular any chemicals in the water supply and/or wastewater stream potentially toxic to biological wastewater processes).

This design is based on the site assessment carried out by **SOWDES** and the conditions applicable at the time of the site assessment. Subsequent changes to the site that might affect the topography and soil profiles are to be notified by the client. Failure, by the Client, to provide this information will invalidate this 'Design Producer Statement'.


Approval is to be sought from **SOWDES** should variations to the specification and layout in this report/drawing be considered necessary by the installer prior to or at the time of installation. Failure to do so will invalidate the 'Design Producer Statement' and **SOWDES** will no longer take responsibility for the design.

For and on behalf of **SOWDES**

Paul Johnson

Paul Johnson (JP)
Bachelor Science Agriculture/Irrigation (CSU)
Graduate Diploma Bushfire Protection (UWS)
Graduate Certificate Engineering – Water (UTS)
3 July 2019

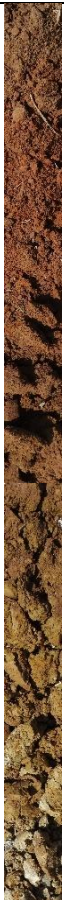
SOIL SAMPLE 1

| | | | | | | | | | | | |
|---|----------|----------------------|-----------------|---|----------------------|-----------|-------------|--|---|------------|----------|
| Site Details: Lot 7 DP228075 440 Mulhollands Road, Thirlmere. NSW. 2572 | | | | | | | | Date of Inspection: 31st May 2019 | | | |
| Landform: Simple slope to open depression | | | | Topography: Slopes south to north | | | | Reference No: 0070519 Sample 1 EMA Area | | | |
| Vegetation: Managed Lands | | | | Land Use: Rural residential & horticulture | | | | GPS Coordinates Latitude: -34.17651 Longitude: 150.55017 | | | |
| Elevation: 311m | | Aspect: Northerly | | | Slope: <5° | | | Microrelief: Elongated depression | | | |
| The soil is assessed to have a design irrigation rate (DIR) for irrigation purposes of 3.0mm per day (21.0mm/week), set at a conservative rate for secondary treated effluent discharging within a weakly structured light clay soil environment (AS/NZS 1547:2012 <i>On-site Domestic Wastewater Management</i> , (page 160) Table M1 "Recommended Design Irrigation Rates for Irrigation Systems"). | | | | | | | | | | | |
| | Depth mm | Texture | Coarse Fraction | Condition of Surface Soil | Pedality / Structure | Fabric | Consistence | EC / pH | Water Regime | Boundaries | Horizons |
|  | 0-100 | silty loam | <20mm | firm | polyhedral, weak | earthy | dry weak | | moderately permeable, imperfectly drained | | A1 |
| | 100-200 | silty loam | <20mm | | polyhedral, weak | earthy | dry weak | | | | |
| | 200-300 | silty loam | <10mm | | polyhedral, weak | earthy | dry weak | 0.00 / 5.4 | | gradual | A2 |
| | 300-400 | sandy clay loam | <10mm | | polyhedral, weak | rough ped | dry firm | | | abrupt | B1 |
| | 400-500 | sandy clay loam | <10mm | | polyhedral, weak | rough ped | dry firm | | | | |
| | 500-600 | clay loam | <10mm | | polyhedral, weak | rough ped | dry firm | 0.01 / 5.2 | | gradual | B2 |
| | 600-700 | clay loam | <10mm | | polyhedral, moderate | rough ped | dry firm | | | | |
| | 700-800 | light clay | <10mm | | polyhedral, moderate | rough ped | dry firm | | | gradual | B2a |
| | 800-900 | light clay | <10mm | | polyhedral, moderate | rough ped | dry firm | 0.03 / 5.2 | | | |
| | 900-1000 | light clay | <10mm | | polyhedral, moderate | rough ped | dry firm | | | | |

SOIL SAMPLE 2

| | | | | | |
|--|-----------------------------|--|--|---|--|
| Site Details: Lot 7 DP228075 440 Mulhollands Road, Thirlmere. NSW. 2572 | | | | Date of Inspection: 31st May 2019 | |
| Landform: Simple slope to open depression | | Topography: Slopes south to north | | Reference No: 0070519 Sample 1 EMA Area | |
| Vegetation: Managed Lands | | Land Use: Rural residential & horticulture | | GPS Coordinates Latitude: -34.17703 Longitude: 150.55005 | |
| Elevation: 311m | Aspect: Northerly | Slope: <5° | | Microrelief: Elongated depression | |

The soil is assessed to have a design irrigation rate (DIR) for irrigation purposes of 3.0mm per day (21.0mm/week), set at a conservative rate for secondary treated effluent discharging within a weakly structured light clay soil environment (AS/NZS 1547:2012 *On-site Domestic Wastewater Management*, (page 160) Table M1 "Recommended Design Irrigation Rates for Irrigation Systems").

| | Depth mm | Texture | Coarse Fraction | Condition of Surface Soil | Pedality / Structure | Fabric | Consistence | EC / pH | Water Regime | Boundaries | Horizons |
|---|----------|-----------------|-----------------|---------------------------|----------------------|-----------|-------------|------------|---|------------|----------|
|  | 0-100 | silty loam | <20mm | firm | polyhedral, weak | earthy | dry weak | | moderately permeable, imperfectly drained | | A1 |
| | 100-200 | silty loam | <20mm | | polyhedral, weak | earthy | dry weak | | | gradual | A2 |
| | 200-300 | silty loam | <10mm | | polyhedral, weak | earthy | dry weak | 0.02 / 5.5 | | | |
| | 300-400 | silty loam | <10mm | | polyhedral, weak | earthy | dry weak | | | abrupt | B1 |
| | 400-500 | sandy clay loam | <10mm | | polyhedral, weak | rough ped | dry firm | | | | |
| | 500-600 | clay loam | <10mm | | polyhedral, weak | rough ped | dry firm | 0.04 / 5.3 | | gradual | B2 |
| | 600-700 | clay loam | <10mm | | polyhedral, moderate | rough ped | dry firm | | | | |
| | 700-800 | light clay | <10mm | | polyhedral, moderate | rough ped | dry firm | | | gradual | B2a |
| | 800-900 | light clay | <10mm | | polyhedral, moderate | rough ped | dry firm | 0.03 / 5.3 | | | |
| | 900-1000 | light clay | <10mm | | polyhedral, moderate | rough ped | dry firm | | | | |

WASTEWATER MANAGEMENT SYSTEM RECOMMENDATION

EXISTING WASTEWATER MANAGEMENT SYSTEM

Collection and Treatment:

| | |
|--|--|
| System Type - Existing | Septic tank (2,500 litres) and Aerated Wastewater Treatment System (AWTS) |
| Treatment Level | Secondary |
| Brand | Econocycle |
| Model | ENC 10-01 |
| Tank Capacity | Nominally 2,000 litres– 10 persons per day |
| Location | Approximately 30 metres downslope and to the north of the dwelling |
| New Low-Pressure Sewer Pump System – Machinery Shed | Aquatec 'Sewertec 1 Single Sewerage Pump System' (Tank Model A – 620 Litres) to be installed on the northern aspect of the machinery shed to collect all existing sinks and waste streams |

Disposal Method:

| | |
|---|--|
| Method | Surface irrigation |
| Dimensions / Area | Minimum area of 560m² (for ease of installation and uniform irrigation applications with the proposed new wastewater management system this has been designed with an area of 850m²) |
| Description / Location (approximate) | The irrigation disposal area will be located approximately 6 metres to the east of the entertainment and dining building (refer to the Wastewater Management Site Plan). |
| Proprietary Products | As per the manufacturer's / supplier's standard inclusions for the pre-packaged products of the AWTS unit and the Low-Pressure Sewer Pump System, quick coupling turf valves with lilac coloured lids, lilac coloured capitol style sprinklers, turf valve keys, lilac coloured hoses for on ground distribution, K-Rain 4000 series sequencing valve with 4-port outlet inside a weather-proof cover, 32Ø uPVC pressure pipe and PN12.5 polyethylene pipes, 'Reclaimed Effluent' warning sign. |

WASTEWATER MANAGEMENT SYSTEM RECOMMENDATION

PROPOSED NEW WASTEWATER MANAGEMENT SYSTEM

Collection and Treatment:

| | |
|------------------------|--|
| System Type | Aerated Wastewater Treatment System (AWTS) |
| Treatment Level | Secondary |
| Brand | Econocycle |
| Model | ENC 10-01 (or equivalent) |
| Tank Capacity | Nominally 2,000 litres– 10 persons per day |
| Location | Approximately 6 metres downslope and to the north of the accommodation cabins |

Disposal Method:

| | |
|---|--|
| Method | Surface irrigation |
| Dimensions / Area | Minimum area of 850m² |
| Description / Location (approximate) | The irrigation disposal area will be located to the east of the entertainment and dining building – no closer than 6 metres to the eastern boundary (refer to the Wastewater Management Site Plan). |
| Proprietary Products | As per the manufacturer's / supplier's standard inclusions for the pre-packaged products of the AWTS unit and the Low-Pressure Sewer Pump System, quick coupling turf valves with lilac coloured lids, lilac coloured capitol style sprinklers, turf valve keys, lilac coloured hoses for on ground distribution, K-Rain 4000 series sequencing valve with 4-port outlet inside a weather-proof cover, 32Ø uPVC pressure pipe and PN12.5 polyethylene pipes, 'Reclaimed Effluent' warning sign. |

Recommended Design Irrigation Rates (DIR) For Irrigation Systems

| Soil Category (See Note 1) | Soil Texture | Structure | Indicative Permeability (K_{sat}) (m/d) | Design Irrigation Rate (DIR) (mm/day) | | |
|-------------------------------|-----------------------|------------------------------|---|---------------------------------------|------------------|---------------------|
| | | | | Drip Irrigation | Spray Irrigation | LPED Irrigation |
| 1 | Gravels & sands | Structureless (massive) | >3.0 | 5 (see Note 2) | 5 | (see Note 3) |
| 2 | Sandy loams | Weakly structured | >3.0 | | | 4 |
| | | Massive | 1.4 - 3.0 | | | |
| 3 | Loams | High / moderate structure | 1.5 - 3.0 | 4 (see Note 1) | 4 | 3.5 |
| | | Weakly structured or massive | 0.5 - 1.5 | | | |
| 4 | Clay loams | High / moderate structure | 0.5 - 1.5 | 3.5 (see Note 1) | 3.5 | 3 |
| | | Weakly structured | 0.12 - 0.5 | | | |
| | | Massive | 0.06 - 0.12 | | | |
| 5 | Light clays | Strongly structured | 0.12 - 0.5 | 3 (see Note 1) | 3 | 2.5 (see Note 4) |
| | | Moderately structured | 0.06 - 0.12 | | | |
| | | Weakly structured or massive | <0.06 | | | |
| 6 | Medium to heavy clays | Strongly structured | 0.06 - 0.5 | 2 (see Note 2) | 2 | (see Note 3) |
| | | Moderately structured | <0.06 | | | |
| | | Weakly structured or massive | <0.06 | | | |

NOTES:

- For Category 3 to 5 soils (loam to light clays) the drip irrigation system needs to be installed in an adequate depth of topsoil (in the order of 150 to 200mm of in situ or imported good quality topsoil) to slow the soakage and assist with nutrient reduction.
- For Category 1, 2 and 6 soils the drip irrigation system has as depth of 100 to 150mm in good quality topsoil (see CM1 and M3.1)
- LPED Irrigation is not advised for Category 1 or Category 6 soils - drip irrigation of secondary effluent is the preferred irrigation method.
- LPED irrigation for Category 5 soils needs a minimum depth of 250mm of good quality topsoil (see M5 and CM7.1).

Monthly Water Balance used to Determine Wet Weather Storage for Picton Region with Nominated Irrigation Area - Existing Dwelling & Services

| | | | |
|-----------------------------|---|----------------|------|
| No. of Persons @ 150L/p/day | 8 | | |
| Design Wastewater Flow | Q | 1/day | 1200 |
| Design Percolation Rate | R | mm/week | 21 |
| Land Area | L | m ² | 560 |

| Parameter | Symbol | Formula | Units | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---------------|--------|---------|----------|------|------|------|------|-----|------|-----|------|------|-----|------|------|-------|
| Days in month | D | - | days | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | 365 |
| Precipitation | P | - | mm/month | 86.5 | 89.3 | 89.2 | 68.6 | 55 | 67.2 | 49 | 44.5 | 43.6 | 63 | 71.9 | 69.9 | 797.7 |
| Evaporation | E | - | mm/month | 200 | 170 | 140 | 100 | 70 | 60 | 60 | 100 | 120 | 170 | 200 | 220 | 1610 |
| Crop factor | C | - | - | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | - |

Outputs

| | | | | | | | | | | | | | | | | |
|--------------------|----|--------------------|----------|-------|-------|------|------|------|------|------|------|------|-------|-------|-------|--------|
| Evapotranspiration | ET | $E \times C$ | mm/month | 140.0 | 119.0 | 98.0 | 70.0 | 49.0 | 42.0 | 42.0 | 70.0 | 84.0 | 119.0 | 140.0 | 154.0 | 1127.0 |
| Percolation | B | $(R / 7) \times D$ | mm/month | 93 | 84 | 93 | 90 | 93 | 90 | 93 | 93 | 90 | 93 | 90 | 93 | 1095 |
| Outputs | | $(ET + B)$ | mm/month | 233 | 203 | 191 | 160 | 142 | 132 | 135 | 163 | 174 | 212 | 230 | 247 | 2222 |

Inputs

| | | | | | | | | | | | | | | | | |
|---------------------|---|--------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Precipitation | P | | mm/month | 86.5 | 89.3 | 89.2 | 68.6 | 55 | 67.2 | 49 | 44.5 | 43.6 | 63 | 71.9 | 69.9 | 797.7 |
| Effluent irrigation | W | $(Q \times D) / L$ | mm/month | 66.4 | 60.0 | 66.4 | 64.3 | 66.4 | 64.3 | 66.4 | 66.4 | 64.3 | 66.4 | 64.3 | 66.4 | 782.1 |
| Inputs | | $(P + W)$ | mm/month | 152.9 | 149.3 | 155.6 | 132.9 | 121.4 | 131.5 | 115.4 | 110.9 | 107.9 | 129.4 | 136.2 | 136.3 | 1579.8 |

| | | | | | | | | | | | | | | | | |
|--------------------|---|----------------------|----------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|--------|---|
| Storage | S | $(P + W) - (ET + B)$ | mm/month | -80.1 | -53.7 | -35.4 | -27.1 | -20.6 | -0.5 | -19.6 | -52.1 | -66.1 | -82.6 | -93.8 | -110.7 | - |
| Cumulative storage | M | - | mm | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - |

| | | | | |
|---------|---|-----------------------|----------------|-----|
| Storage | V | Largest M | mm | 0.0 |
| | | $(V \times L) / 1000$ | m ³ | 0.0 |

Precipitation values used in the 'Monthly Water Balance' calculations are derived from historical rainfall figures from the nearest long-term operating recording station (Bureau of Meteorology Weather Station Site Number - 068052 Picton Council Depot), and monthly evaporation figures are obtained from the 'Monthly Potential Evapotranspiration Data For The Sydney Basin Bioregion' (1982 – 2012) – Australian Government Department of the Environment and Energy, the Bureau of Meteorology, CSIRO and Geoscience Australia - Bioregional Assessment.

Monthly Water Balance used to Determine Wet Weather Storage for Picton Region with Nominated Irrigation Area - Entertainment & Dining Building

| | | | |
|-----------------------------|---|--------------------------------|------|
| No. of Persons @ 150L/p/day | 6 | Number of persons at 28L/p/day | 30 |
| Design Wastewater Flow | Q | 1/day | 1800 |
| Design Percolation Rate | R | mm/week | 21 |
| Land Area | L | m ² | 850 |

(FIGURE ROUNDED UP FROM 1740 LITRES PER DAY)

| Parameter | Symbol | Formula | Units | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---------------|--------|---------|----------|------|------|------|------|-----|------|-----|------|------|-----|------|------|-------|
| Days in month | D | - | days | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 | 365 |
| Precipitation | P | - | mm/month | 86.5 | 89.3 | 89.2 | 68.6 | 55 | 67.2 | 49 | 44.5 | 43.6 | 63 | 71.9 | 69.9 | 797.7 |
| Evaporation | E | - | mm/month | 200 | 170 | 140 | 100 | 70 | 60 | 60 | 100 | 120 | 170 | 200 | 220 | 1610 |
| Crop factor | C | - | - | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | - |

Outputs

| | | | | | | | | | | | | | | | | |
|--------------------|----|--------------------|----------|-------|-------|------|------|------|------|------|------|------|-------|-------|-------|--------|
| Evapotranspiration | ET | $E \times C$ | mm/month | 140.0 | 119.0 | 98.0 | 70.0 | 49.0 | 42.0 | 42.0 | 70.0 | 84.0 | 119.0 | 140.0 | 154.0 | 1127.0 |
| Percolation | B | $(R / 7) \times D$ | mm/month | 93 | 84 | 93 | 90 | 93 | 90 | 93 | 93 | 90 | 93 | 90 | 93 | 1095 |
| Outputs | | $(ET + B)$ | mm/month | 233 | 203 | 191 | 160 | 142 | 132 | 135 | 163 | 174 | 212 | 230 | 247 | 2222 |

Inputs

| | | | | | | | | | | | | | | | | |
|---------------------|---|--------------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| Precipitation | P | | mm/month | 86.5 | 89.3 | 89.2 | 68.6 | 55 | 67.2 | 49 | 44.5 | 43.6 | 63 | 71.9 | 69.9 | 797.7 |
| Effluent irrigation | W | $(Q \times D) / L$ | mm/month | 65.6 | 59.3 | 65.6 | 63.5 | 65.6 | 63.5 | 65.6 | 65.6 | 63.5 | 65.6 | 63.5 | 65.6 | 772.9 |
| Inputs | | $(P + W)$ | mm/month | 152.1 | 148.6 | 154.8 | 132.1 | 120.6 | 130.7 | 114.6 | 110.1 | 107.1 | 128.6 | 135.4 | 135.5 | 1570.6 |

| | | | | | | | | | | | | | | | | |
|--------------------|---|----------------------|----------|-------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|--------|---|
| Storage | S | $(P + W) - (ET + B)$ | mm/month | -80.9 | -54.4 | -36.2 | -27.9 | -21.4 | -1.3 | -20.4 | -52.9 | -66.9 | -83.4 | -94.6 | -111.5 | - |
| Cumulative storage | M | - | mm | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | - |

| | | | | |
|---------|---|-----------------------|----------------|-----|
| Storage | V | Largest M | mm | 0.0 |
| | | $(V \times L) / 1000$ | m ³ | 0.0 |

Precipitation values used in the 'Monthly Water Balance' calculations are derived from historical rainfall figures from the nearest long-term operating recording station (Bureau of Meteorology Weather Station Site Number - 068052 Picton Council Depot), and monthly evaporation figures are obtained from the 'Monthly Potential Evapotranspiration Data For The Sydney Basin Bioregion' (1982 – 2012) – Australian Government Department of the Environment and Energy, the Bureau of Meteorology, CSIRO and Geoscience Australia - Bioregional Assessment.

Recommended Buffer Distance for On-site Wastewater Management Systems

| System | Recommended Buffer Distance |
|-------------------------------------|---|
| All land application systems | <ul style="list-style-type: none"> ○ 100 metres to permanent surface waters (e.g. rivers, streams, lakes, etc) ○ 250 metres to domestic groundwater well ○ 40 metres to other waters (e.g. farm dams, intermittent waterways and drainage channels, etc) |
| Surface spray irrigation | <ul style="list-style-type: none"> ○ 6 metres if area up-gradient and 3 metres if area down-gradient of driveways and property boundaries ○ 15 metres to dwellings ○ 3 metres to paths and walkways ○ 6 metres to swimming pools |
| Surface drip and trickle irrigation | <ul style="list-style-type: none"> ○ 6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, property boundaries, driveways and buildings |
| Subsurface irrigation | <ul style="list-style-type: none"> ○ 6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, property boundaries, driveways and buildings |
| Absorption system | <ul style="list-style-type: none"> ○ 12 metres if area up-gradient and 6 metres if area down-gradient of property boundary ○ 6 metres if area up-gradient and 3 metres if area down-gradient of swimming pools, driveways and buildings |

'On-site Sewage Management for Single Households', Table 5 (page 66)

Design and Installation Requirements

Table of Contents

- Wastewater Management System Treatment and Disposal Recommendations
- Materials and Installation Requirements Summary
- Wastewater Management Site Plan (separate A1 attachment)
- Conceptual Design Details for Surface Irrigation Disposal Systems
- Installation Checklist for Aerated Wastewater Treatment Systems
- Installation Checklist for Surface Irrigation Systems
- Installer's Declaration

WASTEWATER MANAGEMENT SYSTEM RECOMMENDATION

EXISTING WASTEWATER MANAGEMENT SYSTEM

Collection and Treatment:

| | |
|--|--|
| System Type - Existing | Septic tank (2,500 litres) and Aerated Wastewater Treatment System (AWTS) |
| Treatment Level | Secondary |
| Brand | Econocycle |
| Model | ENC 10-01 |
| Tank Capacity | Nominally 2,000 litres– 10 persons per day |
| Location | Approximately 30 metres downslope and to the north of the dwelling |
| New Low-Pressure Sewer Pump System – Machinery Shed | Aquatec 'Sewertec 1 Single Sewerage Pump System' (Tank Model A – 620 Litres) to be installed on the northern aspect of the machinery shed to collect all existing sinks and waste streams |

Disposal Method:

| | |
|---|--|
| Method | Surface irrigation |
| Dimensions / Area | Minimum area of 560m² however for ease of installation and uniform irrigation applications with the proposed new wastewater management system this has been designed with an area of 850m². |
| Description / Location (approximate) | The irrigation disposal area will be located approximately 6 metres to the east of the entertainment and dining building (refer to the Wastewater Management Site Plan). |
| Proprietary Products | As per the manufacturer's / supplier's standard inclusions for the pre-packaged products of the AWTS unit and the Low-Pressure Sewer Pump System, quick coupling turf valves with lilac coloured lids, lilac coloured capitol style sprinklers, turf valve keys, lilac coloured hoses for on ground distribution, K-Rain 4000 series sequencing valve with 4-port outlet inside a weather-proof cover, 32Ø uPVC pressure pipe and PN12.5 polyethylene pipes, 'Reclaimed Effluent' warning sign. |

WASTEWATER MANAGEMENT SYSTEM RECOMMENDATION

PROPOSED NEW WASTEWATER MANAGEMENT SYSTEM

Collection and Treatment:

| | |
|------------------------|--|
| System Type | Aerated Wastewater Treatment System (AWTS) |
| Treatment Level | Secondary |
| Brand | Econocycle |
| Model | ENC 10-01 (or equivalent) |
| Tank Capacity | Nominally 2,000 litres– 10 persons per day |
| Location | Approximately 6 metres downslope and to the north of the accommodation cabins |

Disposal Method:

| | |
|---|--|
| Method | Surface irrigation |
| Dimensions / Area | Minimum area of 850m² |
| Description / Location (approximate) | The irrigation disposal area will be located to the east of the entertainment and dining building – no closer than 6 metres to the eastern boundary (refer to the Wastewater Management Site Plan). |
| Proprietary Products | As per the manufacturer's / supplier's standard inclusions for the pre-packaged products of the AWTS unit and the Low-Pressure Sewer Pump System, quick coupling turf valves with lilac coloured lids, lilac coloured capitol style sprinklers, turf valve keys, lilac coloured hoses for on ground distribution, K-Rain 4000 series sequencing valve with 4-port outlet inside a weather-proof cover, 32Ø uPVC pressure pipe and PN12.5 polyethylene pipes, 'Reclaimed Effluent' warning sign. |

Materials and Installation Requirement Summary.

The following Tables represent the primary material, location, construction, installation, commissioning and operational components of the wastewater management system and are to be undertaken to ensure compliance with the design concepts. The respective lists may not be in any particular order of undertaking, and some of the lesser requirements may be omitted or not specifically mentioned, however this does not preclude the need to undertake or supply such items.

Construction Materials / Proprietary Products

| Component | Product Description |
|--------------------------------|---|
| AWTS unit | Equal to Everhard ENC 10-01 – check the pump duty |
| Low-pressure pump system | Equal to 'Aquatec Sewertec 1 – Tank Model A – 620 Litres' |
| Automatic sequencing valve | K-Rain 4000 series 4-port outlets |
| Turf valve & key | Professional quality 20Ø turf valve and key with lilac coloured lid |
| Sprinkler outlets | Lilac coloured 'capitol' style sprinkler – 20Ø BSP thread |
| Distribution hose and fittings | 20Ø lilac coloured or striped distribution hose and durable above and below ground fittings |
| Isolating & flush valves | Professional quality irrigation grade fittings |
| Transfer line | 32Ø PN12 SWJ uPVC pipe or PN12.5 PE poly pipe with lilac striping (as specified in the design and construction details) |
| Valve cover | Weatherproof cabinet / cover for the automatic sequencing valve to provide access for maintenance and protect the unit from frost |
| Warning tape | Provide 'Reclaimed Water' warning tape where labelling is not fixed to the pipe system during manufacturing |

Location: (refer to the site plan for the proposed locations of main items)

| Description | Completed | | | |
|--|--------------------------|-----|--------------------------|----|
| Install the new AWTS approximately 6 metres downslope and to the north of the accommodation cabins, and install the low-pressure sewer pump system on the northern aspect of the machinery shed | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Install two irrigation disposal areas that each have an effective irrigation application area of at least 850m ² on the eastern aspect of the entertainment and dining building – no closer than 6 metres to the eastern boundary and 6 metres to the footprint of the building | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Construct earthen mounds on any upslope aspect of the effluent management system to divert surface water run-off away from both the wastewater treatment systems and the surface irrigation areas | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |

Construction / Installation: New AWTS Unit & Low -Pressure Sewer Pump System

| Description | Completed | | | |
|--|--------------------------|-----|--------------------------|----|
| Install both the AWTS unit and the low-pressure sewer pump system as per the manufacturer's specifications including appropriate transfer pump to meet site conditions and performance criteria | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Connect the drainage pipes from all buildings and sources to the inlet side of the individual wastewater treatment systems and connect the 32Ø pump discharge line from the pump well in both AWTS units to the designated irrigation disposal areas | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |

Construction / Installation: Surface Irrigation Disposal (complete 1 checklist for each system).

| Description: | Completed | | | |
|---|--------------------------|-----|--------------------------|----|
| Ensure that the area identified for effluent irrigation disposal in the Wastewater Management Report is still suitable and free of any other services, utilities or trafficable areas that could be affected by exposure to irrigation applications, and that the height of the vegetative cover does not impede the natural distribution pattern of the sprinkler outlets, mow or slash the area if necessary. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Install a 32Ø transfer line from the outlet of the AWTs unit to the inlet side of the K-Rain sequencing valve, ensuring that at least the first and last 2 metres of the pipeline is in PN12 SWJ uPVC pipe material for strength and rigidity. Other sections of the pipe line – particularly for long runs can be in 32Ø PN12.5 PE poly pipe. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| In accordance with the manufacturers recommendations, ensure that the body of the sequencing valve is slightly higher than the highest outlet point in the irrigation disposal system to avoid the potential for back-pressure on the unit that could affect the operation of the internal cams. This does not necessarily mean that the sequencing valve has to be above ground. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Connect 4 distribution pipes to the outlet side of the sequencing valve with each line being a separate distribution zone, ensuring that at least the first 2 metres of each pipe is in PN12 SWJ uPVC pipe material for strength and rigidity. Other sections of the pipe line – particularly for long runs can be in 32Ø PN12.5 PE poly pipe. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Continue each lateral distribution line to the designated irrigation disposal areas as per the Wastewater Management Report and design, and ensure that all pipes have suitable lilac coloured 'Reclaimed Water' identification labelling or warning tapes prior to backfilling | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Install all quick coupling turf valves with lilac coloured lids as per the Wastewater Management Report and design ensuring that the closed lids finish at natural surface level. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Assemble 8 'sprinkler hose sets' each comprised of a bayonet style turf valve key, a 20Ø x 90° elbow, a 4 metre length of 20Ø lilac coloured hose, and a 20Ø BSP lilac coloured 'capitol' style sprinkler, and insert each set into the individual quick coupling turf valves. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Undertake a flow test of the system to check for any leaks, proper rotation of the sequencing valve, and even distribution of effluent from each sprinkler outlet. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Complete backfilling over the pipe trenches and cover the sequencing valve with a suitable weather-proof cabinet or cover, particularly for frost protection. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Where the sequencing valve is required to be installed above ground secure the body of the valve and the pipe network to a post or other form of stabilising system to prevent unnecessary movements and to keep the entire unit upright. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Repeat the above installation process for the construction of the designated 'reserve' irrigation area and provide suitable control valves to enable management of the flow to each of the irrigation disposal areas – provide covers over the control valves to protect them from damage and for ease of identification. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |

| | | | | |
|---|--------------------------|-----|--------------------------|----|
| Create stormwater diversion mounds on any upslope side effluent irrigation disposal areas to divert surface flows away | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Erect exclusion fencing around the effluent disposal system to protect the area from heavy vehicle and large animal traffic movements and place warning signs around the margins of the surface irrigation area with wording to the effect of "RECLAIMED EFFLUENT – AVOID CONTACT – DO NOT DRINK" | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |

Commission / Operation:

| Description | Completed | | | |
|--|--------------------------|-----|--------------------------|----|
| Commission the AWTS unit as per manufacturer's specifications and requirements | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Organise appropriate 'hold' and 'witness' inspections as required in the Council's conditions of consent. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |
| Complete certification and installation declaration requirements and submit to Council and client. Provide the client with all necessary operating instructions, warranty information and emergency contact information. | <input type="checkbox"/> | Yes | <input type="checkbox"/> | No |



Example of warning sign to be posted around the outside of the effluent disposal area

**FOR ELECTRONIC VERSIONS OF THE
REPORT PLEASE REFER TO A1
WASTEWATER MANAGEMENT SITE PLAN
DRAWING**

REFERENCE No. 0070519-01C

**FOR ELECTRONIC VERSIONS OF THE
REPORT PLEASE REFER TO THE A3
'SURFACE IRRIGATION DISPOSAL' DRAWING
REFERENCE No. 0070519-01EFFIRR**



| Checklist. AWTs Tank Installation Inspection for use by Plumbers / Installers and Council Inspectors – Complete 1 for each system | | |
|--|---|--|
| Owners name: | | |
| Address: | | |
| Installation date: | | |
| Tank description: | | |
| Type of AWTs | | |
| Manufacturer: | | Model: |
| Material: | <input type="checkbox"/> Plastic / Poly | <input type="checkbox"/> Concrete <input type="checkbox"/> Fibreglass <input type="checkbox"/> Other |
| Manufacturer's load bearing rating: | | |
| Multiple tanks: | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Specified or calculated tank capacity of each tank | | |
| Tank 1 | Litres | Tank 2 Litres |
| Tank dimensions and capacities (as provided on manufacturer's design specification sheet) | | |
| | Tank 1 | Tank 2 |
| Exterior dimensions (diameter & height) | mm | mm |
| Interior dimensions (base to invert of outlet) | mm | mm |
| Exterior height of inlet invert | mm | mm |
| Exterior height of outlet invert | mm | mm |
| Effective depth | mm | mm |
| Capacities of each tank | | |
| Anaerobic (Septic) | Litres | Aeration Litres |
| Clarifier (sludge settling) | Litres | Pump well (chlorine contact) Litres |
| Other (describe) | | |
| Excavation / settling tank | | |
| Location of tanks (describe): | | |
| Nature of installation | <input type="checkbox"/> Free standing | <input type="checkbox"/> Buried |
| Verify required inlet / outlet elevations | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Ground water present in excavation | <input type="checkbox"/> Yes | <input type="checkbox"/> No |



| Checklist. AWTs Tank Installation Inspection for use by Plumbers / Installers and Council Inspectors – Complete 1 for each system | | | |
|--|------------------------------|-----------------------------|--|
| Bottom of excavation | | | |
| Level | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Free of rock and debris | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Bedding material | | | |
| Description: | Depth | cm | |
| Free of large rocks and debris | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Compacted | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Structural integrity of tank verified | | | |
| Tank installed level | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Tank oriented correctly | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Flotation protection (for buried tanks only) | | | |
| Buoyancy calculation provided on design | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Anchor weight installed | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Other (describe) | | | |
| Backfill | | | |
| Backfill material | | | |
| Free of debris and large rocks | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Compacted | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Piping | | | |
| Piping in appropriate sequence (inlet / outlet) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Inlet mm | Outlet / supply line mm | | |
| Pipe specifications (nominal diameter and material) | | | |
| Return line mm | Electrical conduit mm | | |
| Joints in excavated area | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |
| Pipe sealing | | | |
| Pipes sealed (including electrical conduit) | <input type="checkbox"/> Yes | <input type="checkbox"/> No | |



| Checklist. AWTs Tank Installation Inspection for use by Plumbers / Installers and Council Inspectors – Complete 1 for each system | |
|---|----------------------|
| Type of sealant | Inlet |
| | Outlet / supply line |
| | Return line |
| | Electrical conduit |
| Recirculation device <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Type of device | |
| Tank lids | |
| Venting <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Tank vent (description) | |
| Tank water tightness testing <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Manufacturer testing <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Pumps operational <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Pump timing <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Alarm to indicate no irrigation / high water <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Service contract in place <input type="checkbox"/> Yes <input type="checkbox"/> No | |
| Service provider: | |
| Contract number: | |
| Comments, actions or repairs needed: (Where a response has been selected in the above Checklist requiring additional information please specify the action plan and corrective process undertaken or proposed to be undertaken to remediate the problem, or the alternative that is being offered). | |
| Name / title of inspector: | |
| Signature: | Date: |

| Checklist. Installation of surface irrigation systems for use by Plumbers / Installers and Council Inspectors – Complete 1 for each system | | | |
|---|----------------------------------|---------------------------------|---|
| Is the effluent irrigation area located according to the conditions of consent and the wastewater report or any covenant? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Is the size of the effluent irrigation area consistent with the conditions of consent and the wastewater report? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Is the effluent irrigation area located according to buffer distances relating to: | | | |
| Dwelling and other buildings (15m)? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Swimming pool and other sensitive receptors (6m; irrigation should area not be located upslope of feature)? | <input type="checkbox"/> N/A | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Driveways and property boundaries (3m downslope and where flat, or 6m upslope)? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Drainage features (100m to a permanent or intermittent watercourse or 40m to dams and drainage depressions)? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Fixed sprinkler type: | <input type="checkbox"/> Bayonet | <input type="checkbox"/> Pop-up | <input type="checkbox"/> Other (describe) |
| Sprinkler head type (describe)? | | | |
| What is the sprinkler plume height? | mm | | |
| What is the sprinkler throw (radius)? | m | | |
| Are the sprinklers appropriately placed given their throw and plume height? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Do the sprinklers receive uniform amounts of effluent? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Have manual or automatic sequencing valves been installed? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Has a disc filter been installed upstream of any sequencing valve? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Have air, pressure reducing and/or non-return valves been incorporated into the design (as needed)? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Does the irrigation system have a flushing valve? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Does the flushing line return to the wastewater treatment system (not the primary chamber)? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Is the flushing line directed to a small absorption pit? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Has the pump sufficient capacity to service the demands of the effluent irrigation area and overcome friction and head losses in the system? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Is the effluent distribution line from the tank to the effluent irrigation area buried at an appropriate depth (min. 300mm) and in a manner that provides protection against mechanical damage? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Are the distribution laterals buried at a depth between 100 – 150mm? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |
| Has the irrigation area been protected to prevent damage (eg, fencing)? | <input type="checkbox"/> | Yes | <input type="checkbox"/> No |



**Checklist. Installation of surface irrigation systems for use by Plumbers / Installers
 and Council Inspectors – Complete 1 for each system**

NB. Some of the questions in the above checklist may not be relevant for either the initial installation inspection or ongoing operational inspections. In this case answer N/A.

Service provider:

Contact number:

Comments, actions or repairs needed: (Where a response has been selected in the above Checklist requiring additional information please specify the action plan and corrective process undertaken or proposed to be undertaken to remediate the problem, or the alternative that is being offered).

Name / title of inspector:

Signature:

Date:

COMPLETION OF WORKS INSTALLATION CERTIFICATE
On-site Wastewater Management and/or Effluent Disposal System

Issued By

(Installer's Details):

To: Wollondilly Shire Council

Development

Application No:

Property Owners:

For Development At: Lot 7 DP228075

440 Mulhollands Road, Thirlmere. NSW. 2572

**Description of the
Project:**

- 1/. Install an approved AWTS unit approximately 6 metres downslope and to the north of the accommodation units
- 2/. Establish two irrigation disposal areas of not less than 850m² approximately 6 metres to the east of the entertainment and dining building and no closer than 6 metres to the eastern boundary
- 3/. Install a low-pressure sewer pump system on the northern aspect of the machinery shed
- 4/. Establish / maintain a regular maintenance contract with an approved service provider for both the AWTS unit and the low-pressure sewer pump system

INSTALLED IN ACCORDANCE WITH:

- SOWDES Wastewater Management Report dated 3 July 2019, Reference No: 0070519

DATE OF SITE INSTALLATION INSPECTION: _____

INSTALLATION REPORT SUMMARY (includes any variations to the original design, etc):

- Variations:
- Report:

DECLARATION:

I believe on reasonable grounds that all the wastewater works have been completed in accordance with **SOWDES Wastewater Management Report dated 3 July 2019, Reference No. 0070519** and Council Consent Number _____

For and on behalf of (Installer's Details):

Name:

Signature:

Title:

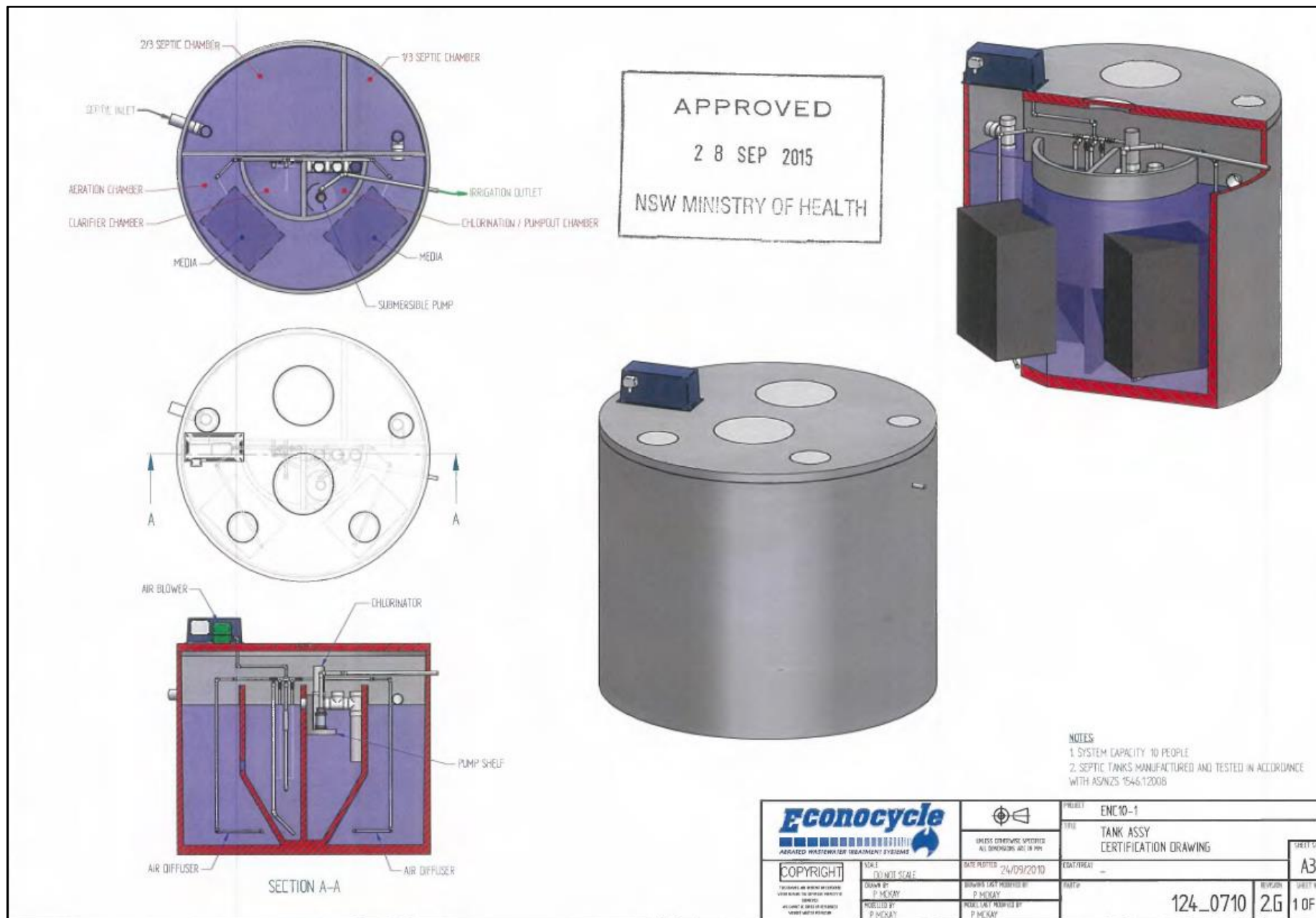
Date:

cc: the property owners

Technical Specifications

Table of Contents

- Econocycle ENC 10-01 Aerated Wastewater Treatment System
- Aquatec Sewertec 1 – *Single Sewer Pumping System*
- K-Rain 4000 Series Sequencing Valve
- Plant Species Suitable for Use in Evapotranspiration & Absorption Beds and Irrigation Disposal Systems
- General Notes and Guidelines Adopted from the Publication Titled "On-site Sewage Management for Single Households (1998)", NSW Department of Local Government, the NSW Environment Protection Authority, the NSW Department of Health, the NSW Department of Land and Water Conservation, and the NSW Department of Urban Affairs and Planning.





Sewertec 1
Single Sewerage
Pumping System



The Aquatec Sewertec 1 pump system manages residential or small-scale commercial sewerage and industrial waste where gravity is not feasible.

A fully submersible, heavy duty Sewertec single pump system is housed within a robust, lightweight polyethylene chamber featuring a unique domed base to eliminate solids build-up. Moulded inlet stubs facilitate sealed and guaranteed pipe connections on-site.

Applications

- Household sewer lift stations
- Restaurants
- Commercial buildings
- Industrial sites
- Marinas
- Factories
- Toilet Blocks

Standard Features

- Sewertec fully submersible sewerage pump
- Level Control
- Polyethylene chamber to AS/NZS 1546.1:2008
- Isolation and non-return valve
- Pipework and connection coupling
- Polyethylene cover

Optional Accessories

- Light duty cast iron cover
- Heavy duty cast iron cover
- Alarm panel
- Control panel
- Safety grate
- BMS volt free contacts
- Larger chambers
- Guide rails

| System Model | Voltage | Max Flow (L/min) | Head (max) | Outlet size (mm) |
|-------------------|-----------|------------------|------------|------------------|
| Sewertec 1 - 300* | 240 / 415 | 380 | 15 | 80 |
| Sewertec 1 - 300* | 240 / 415 | 115 | 20 | 40 |
| Sewertec 1 - 300 | 240 / 415 | 165 | 22 | 40 |
| Sewertec 1 - 400 | 415 | 230 | 33 | 40 |
| Sewertec 1 - 500 | 415 | 280 | 36 | 40 |

* Screened sewerage only
Note: Flows and heads subject to change

| Tank Model | Volume | Diameter | Depth | Invert of Inlet |
|------------|--------|----------|--------|-----------------|
| A | 620L | 1000mm | 1000mm | 900mm |
| B | 1,300L | 1000mm | 1600mm | 1100mm |
| C | 1,500L | 1000mm | 2200mm | 1700mm |
| D | 3,000L | 1800mm | 2200mm | 1700mm |

Note: Additional sizes are available on request

Building Services
Pumping Solutions

Water Innovation Partners

T 1300 088 555
> aquatecenviro.com.au



K-RAIN 4000
DISTRIBUTING VALVES
THE NEXT GENERATION OF
PROFESSIONAL PRODUCTS.

FEATURES/BENEFITS

- **2 Year Trade Warranty**- Factory support up to two years after purchase.
- **ABS Polymer Construction**- High-strength, non-corrosive body for long product life.
- **Available in 4 and 6 Outlet Models**- Can quickly and easily change from two to six watering zones.
- **Simplicity of Design**- Valves are easily maintained and serviced for long product life.
- **Operates at Low 10 GPM at Pressures of 25-75 PSI**- Reliably automates multiple zoned residential and small commercial irrigation or wastewater systems.

K
RAIN
IRRIGATION SOLUTIONS WORLDWIDE™

K-RAIN MODEL 4000: DISTRIBUTING VALVE

The 4000 distributing valve offers a reliable, economical way to automate multiple zoned residential and small commercial irrigation systems. The simplicity of design and a minimum of moving parts ensures ease of maintenance and long service life.

These patented valves allow for the number of watering zones to be changed quickly and easily. They are ideally suited for both city water and pump applications and may also be used for onsite wastewater or effluent water applications.

The 4000 valve is available in 4 or 6 outlet models. A quick change of the cam allows the valve to operate from 2 to 6 zones. The valve will operate with flows as low as 10 GPM and at pressures of 25 to 75 PSI.

The distributing valve shall carry a two-year trade warranty against manufacturing defects.

HOW TO SPECIFY



IRRIGATION SOLUTIONS WORLDWIDE™

K-Rain Manufacturing Corp.
 1640 Australian Avenue
 Riviera Beach, FL 33404 USA
 PH: 1-561-844-1002 FAX: 1-561-842-9493
 1-800-735-7246
 EMAIL: krain@k-rain.com
 WEB: <http://www.k-rain.com>

MODELS

4 Outlet - 1 1/4" x 1 1/4" Models

| | |
|-------------|-----------------------------|
| 4400 | No Cam |
| 4402 | Cammed for 2 Zone Operation |
| 4403 | Cammed for 3 Zone Operation |
| 4404 | Cammed for 4 Zone Operation |

Other Options: Add to Part Number
RCW Reclaimed Water Use

4 Outlet - 1" x 1" Models

| | |
|-------------|-----------------------------|
| 4410 | No Cam |
| 4412 | Cammed for 2 Zone Operation |
| 4413 | Cammed for 3 Zone Operation |
| 4414 | Cammed for 4 Zone Operation |

6 Outlet - 1 1/4" x 1" Models

| | |
|-------------|-----------------------------|
| 4600 | No Cam |
| 4602 | Cammed for 2 Zone Operation |
| 4603 | Cammed for 3 Zone Operation |
| 4604 | Cammed for 4 Zone Operation |
| 4605 | Cammed for 5 Zone Operation |
| 4606 | Cammed for 6 Zone Operation |

Other Options: Add to Part Number
RCW Reclaimed Water Use

6 Outlet - 1" x 1" Models

| | |
|-------------|-----------------------------|
| 4610 | No Cam |
| 4612 | Cammed for 2 Zone Operation |
| 4613 | Cammed for 3 Zone Operation |
| 4614 | Cammed for 4 Zone Operation |
| 4615 | Cammed for 5 Zone Operation |
| 4616 | Cammed for 6 Zone Operation |

SPECIFICATIONS

- Constructed of High Strength, Non-Corrosive ABS Polymer
- Flow Range:
 4 Outlet Valve: 10-40 GPM
 6 Outlet Valve: 10-25 GPM
- Pressure Rating: 25 - 75 PSI
- Pressure Loss:
 4 Outlet Valve

| | | | | |
|------------|-----|-----|-----|-----|
| Flow (GPM) | 10 | 20 | 30 | 40 |
| PSI Loss | 2.0 | 3.0 | 4.5 | 6.4 |

 6 Outlet Valve

| | | | |
|------------|-----|-----|-----|
| Flow (GPM) | 10 | 20 | 30 |
| PSI Loss | 2.5 | 4.5 | 7.5 |
- Inlet: Slip and Glue Connection
 4400 Series: to 1 1/4" PVC Pipe
 4410 Series: to 1" PVC Pipe
 4600 Series: to 1 1/4" PVC Pipe
 4610 Series: to 1" PVC Pipe
- Outlets: Slip and Glue Connections
 4400 Series: to 1 1/4" PVC Pipe
 4410 Series: to 1" PVC Pipe
 4600 Series: to 1" PVC Pipe
 4610 Series: to 1" PVC Pipe
- Dimensions: Height: 5-3/4"
 Width: 5-3/4"

INSTALLATION TIPS

- We Recommend the Installation of an Atmospheric Vacuum Breaker Between the Pump and the Valve.

Plant Species Suitable for Use in Evapotranspiration & Absorption Beds and Irrigation Disposal Systems

| Botanical name | Common name | Form | Height (m) | Description | Planting density (/ m ²) |
|--|-----------------------|------|----------------------|---|--------------------------------------|
| <i>Carex appressa</i> | Tall sedge | M | 0.5 - 1.2 | Dense, robust and tough, hairy and sticky | 4 - 8 |
| <i>Carex fascicularis</i> | Tassel sedge | M | 0.5 - 1.0 | Coarse, tufted plant | 6 - 8 |
| <i>Carex inversa</i> | Knob sedge | M | 0.5 - 1.0 | Small tufted or spreading clump | 10 |
| <i>Ficinia nodosa</i> | Knobby club-rush | M | 0.6 - 1.5 | Tall, coarse, wiry and densely tufted perennial rush with creeping rhizomes | 6 - 8 |
| <i>Juncus amabilis</i> | - | M | 0.2 - 1.2 | Rhizomatous tufted perennial rush | 8 - 10 |
| <i>Juncus flavidus</i> | Yellow rush | M | 0.4 - 1.2 | Rhizomatous tufted perennial rush, yellow-green | 8 - 10 |
| <i>Juncus gregiflorus</i> | - | M | 0.5 - 1.4 | Rhizomatous tufted perennial rush | 8 - 10 |
| <i>Juncus procerus</i> | - | M | 1.0 - 2.0 | Rhizomatous tufted perennial rush | 8 - 10 |
| <i>Lepidosperma gladiatum</i> | Coastal sword sedge | M | 1.0 - 1.5 | Leaves wide and flat with dark green blades | 6 |
| <i>Lepidosperma laterale</i> | Variable sword sedge | M | 0.5 - 1.0 | Leaves wide and flat with dark green blades | 6 |
| <i>Lepidosperma longitudinale</i> | Common sword sedge | M | 0.6 - 1.7 | Sedge with long, flat dark green blades | 6 |
| <i>Lomandra filiformis ssp. filiformis</i> | Wattle mat rush | M | 0.15 - 0.5 | Small tussock with fine blades | 6 - 8 |
| <i>Lomandra longifolia var. exilis</i> | - | M | 0.5 - 1.0 | Large tussock with broad flat leaves | 4 - 6 |
| <i>Lomandra longifolia var. longifolia</i> | Spiny-headed mat rush | M | 0.5 - 1.0 | Large tussock | 4 - 6 |
| <i>Patersonia occidentalis</i> | Long purple flag | M | 0.2 - 0.5 | Compact clumping perennial herb | 6 - 8 |
| <i>Poa labillardieri</i> | Common tussock grass | M | 0.3 - 0.8, stems 1.2 | Large, coarse densely tufted tussock | 6 - 8 |
| <i>Poa morrisii</i> | Velvet tussock grass | M | Prostrate - 0.3 | Soft, dense tussock | 6 - 8 |
| <i>Schoenus melanostachys</i> | - | M | 0.5 - 1.0 | Perennial with short stout rhizome, often forms big weeping tussocks | 6 - 8 |

| | | |
|----------------------------|---|---------------------|
| Key to plant species Form: | M | Emergent macrophyte |
|----------------------------|---|---------------------|

Aerated Wastewater Treatment Systems (AWTS)

In unsewered areas, the proper treatment and utilisation of household wastewater on-site is critical in preserving the health of the public and the environment. AWTS have been developed as a way of achieving this.

What is an AWTS?

An AWTS is a purpose built system used for the treatment of sewage and liquid wastes from a single household or multiple dwellings.

It consists of a series of treatment chambers combined with an irrigation system. An AWTS enables people living in unsewered areas to treat and utilise their wastewater.

How does an AWTS work?

Wastewater from a household is treated in stages in several separate chambers. The first chamber is similar to a conventional septic tank. The wastewater enters the chamber where the solids settle to the bottom and are retained in the tank forming a sludge layer. Scum collects at the top, and the partially clarified wastewater flows into a second chamber. Here the wastewater is mixed with air

to assist bacteria to further treat it. A third chamber allows additional clarification through the settling of solids, which are returned for further treatment to either the septic chamber (as shown) or to the aeration chamber. The clarified effluent is disinfected in another chamber (usually by chlorination) before irrigation can take place.

Bacteria in the first chamber break down the solid matter in the sludge and scum layers. Material that cannot be fully broken down gradually builds up in the chamber and must be pumped out periodically.

Regulations and recommendations

Local councils are primarily responsible for approving the smaller, domestic AWTSs in their area. The Environment Protection Authority (EPA) approves larger units, whilst the NSW Department of Health determines the design and structural requirements for all AWTSs.

At present AWTSs need to be serviced quarterly by an approved contractor at a cost to the owner. Local councils should also maintain a register of the servicing of each system within their area.

AWTSs should be fitted with an alarm having visual and audible components to indicate mechanical and electrical equipment malfunctions. The alarm should provide a signal adjacent to the alarm and at a relevant position inside the house. The alarm should incorporate a warning lamp which may only be reset by the service agent.

Maintaining your AWTS

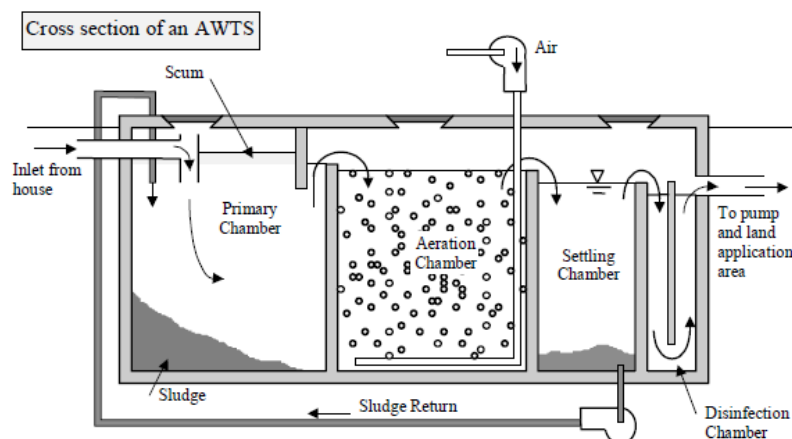
The effectiveness of the system will, in part, depend on how it is used and maintained. The following is a guide on good maintenance procedures that you should follow:

DO

- ✓ Have your AWTS inspected and serviced four times per year by an approved contractor. Assessment should be applicable to the system design.
- ✓ Have your system service include assessment of sludge and scum levels in all tanks, and performance of irrigation areas.
- ✓ Have all your tanks desludged at least every three years.
- ✓ Have your disinfection chamber inspected and tested quarterly to ensure correct disinfectant levels.
- ✓ Have your grease trap (if installed) cleaned out at least every two months.
- ✓ Keep a record of pumping, inspections, and other maintenance.
- ✓ Learn the location and layout of your AWTS and land application area.
- ✓ Use biodegradable liquid detergents such as concentrates with low sodium and phosphorous levels.
- ✓ Conserve water.

DON'T

- ✗ Don't put bleaches, disinfectants, whiteners, nappy soakers and spot removers in large quantities into your AWTS via the sink, washing machine or toilet.
- ✗ Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
- ✗ Don't use more than the recommended amounts of detergents.
- ✗ Don't put fats and oils down the drain and keep food waste out of your system.
- ✗ Don't switch off power to the AWTS, even if you are going on holidays



Reducing water usage

Reducing water usage will lessen the likelihood of problems such as overloading with your AWTs. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system entering a nearby river, creek or dam.

Conservative water use around the house will reduce the amount of wastewater which is produced and needs to be treated.

Your AWTs is also unable to cope with large volumes of water such as several showers or loads of washing over a short period of time. You should try to avoid these 'shock loads' by ensuring water use is spread more evenly throughout the day and week.

Warning signs

You can look out for a few warning signs that signal to you that there are troubles with your AWTs. Ensure that these problems are attended to immediately to protect your health and the environment.

Look out for the following warning signs:

- ⚠ Water that drains too slowly.
- ⚠ Drain pipes that gurgle or make noises when air bubbles are forced back through the system.
- ⚠ Sewage smells, this indicates a serious problem.
- ⚠ Water backing up into your sink which may indicate that your system is already failing.
- ⚠ Wastewater pooling over the land application area.
- ⚠ Black coloured effluent in the aerated tank.
- ⚠ Excess noise from the blower or pumping equipment
- ⚠ Poor vegetation growth in irrigated area.

Odour problems from a vent on the AWTs can be a result of slow or inadequate breakdown of solids. Call a technician to service the system.

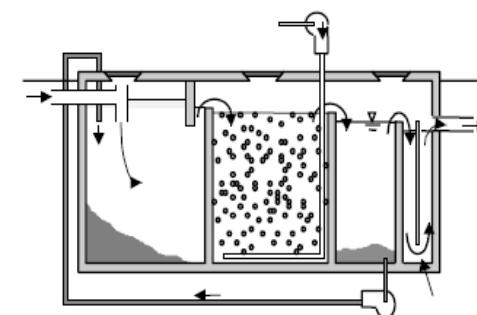
HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained AWTs are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your treatment system you can do your part in helping to protect the environment and the health of you and your family.

If you would like more information please contact:

Your Aerated Wastewater Treatment System



LAND APPLICATION AREAS

The reuse of domestic wastewater on-site can be an economical and environmentally sound use of resources.

What are land application areas?

These are areas that allow treated domestic wastewater to be managed entirely on-site.

The area must be able to utilise the wastewater and treat any organic matter and wastes it may contain. The wastewater is rich in nutrients, and can provide excellent nourishment for flower gardens, lawns, certain shrubs and trees. The vegetation should be suitably tolerant of high water and nutrient loads.

How does a land application area work?

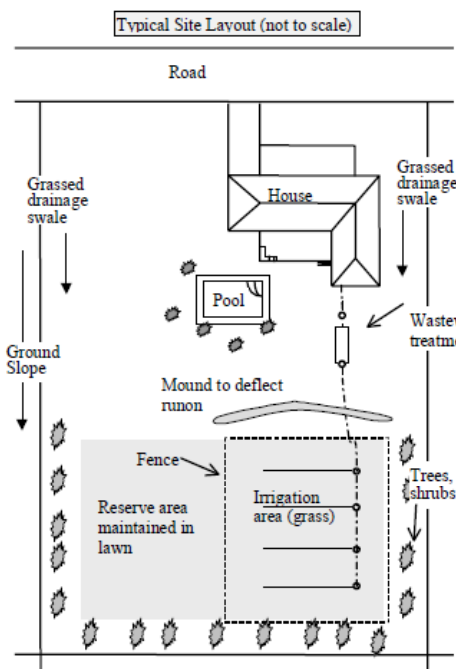
Treated wastewater applied to a land application area may be utilised or simply disposed, depending on the type of application system that is used. The application of the wastewater can be through a soil absorption system (based on disposal) or through an irrigation system (based on utilisation).

Soil absorption systems do not require highly treated effluent, and wastewater treated by a septic tank is reasonable as the solids content in the effluent has been reduced. Absorption systems release the effluent into the soil at a depth that cannot be reached by the roots of most small shrubs and grasses. They rely mainly on the processes of soil treatment and then transmission to the water table, with minimal evaporation and up-take by plants. **These systems are not recommended in sensitive areas as they may lead to contamination of surface water and groundwater.**

Irrigation systems may be classed as either subsurface or surface irrigation. If an irrigation system is to be used, wastewater needs to be pre-treated to at least the quality produced by an aerated wastewater treatment system (AWTS).

Subsurface irrigation requires highly treated effluent that is introduced into the soil close to the surface. The effluent is utilised mainly by plants and evaporation.

Surface irrigation requires highly treated effluent that has undergone aeration and disinfection treatments, so as to reduce the possibility of bacteria and virus contamination.



The effluent is then applied to the land area through a series of drip, trickle, or spray points which are designed to eliminate airborne drift and run-off into neighbouring properties.

There are some public health and environmental concerns about surface irrigation. There is the risk of contact with treated effluent and the potential for surface run-off. Given these problems, subsurface irrigation is arguably the safest, most efficient and effective method of effluent utilisation.

Regulations and recommendations

The design and installation of land application areas should only be carried out by suitably qualified or experienced people, and only after a site and soil evaluation is done by a soil scientist. Care should be

taken to ensure correct buffer distances are left between the application area and bores, waterways, buildings, and neighbouring properties.

Heavy fines may be imposed under the Clean Waters Act if effluent is managed improperly.

At least two warning signs should be installed along the boundary of a land application area. The signs should comprise of 20mm high Series C lettering in black or white on a green background with the words:

**RECLAIMED EFFLUENT
 NOT FOR DRINKING
 AVOID CONTACT**

Depending on the requirements of your local council, wet weather storage and soil moisture sensors may need to be installed to ensure that effluent is only irrigated when the soil is not saturated.

Regular checks should be undertaken of any mechanical equipment to ensure that it is operating correctly. Local councils may require periodic analysis of soil or groundwater characteristics

Humans and animals should be excluded from land application areas during and immediately after the application of treated wastewater. The longer the period of exclusion from an area, the lower the risk to public health.

The householder is required to enter into a service contract with the installation company, its agent or the manufacturer of their sewage management system, this will ensure that the system operates efficiently.

Location of the application area

Treated wastewater has the potential to have negative impacts on public health and the environment. For this reason the application area must be located in accordance with the results of a site evaluation, and approved landscaping must be completed prior to occupation of the building. Sandy soil and clayey soils may present special problems.

The system must allow even distribution of treated wastewater over the land application area.

Maintaining your land application area

The effectiveness of the application area is governed by the activities of the owner.

DO

- ✓ Construct and maintain diversion drains around the top side of the application area to divert surface water.
- ✓ Ensure that your application area is kept level by filling any depressions with good quality top soil (not clay).
- ✓ Keep the grass regularly mowed and plant small trees around the perimeter to aid absorption and transpiration of the effluent.
- ✓ Ensure that any run off from the roof, driveway and other impermeable surfaces is directed away from the application area.
- ✓ Fence irrigation areas.
- ✓ Ensure appropriate warning signs are visible at all times in the vicinity of a spray irrigation area.
- ✓ Have your irrigation system checked by the service agent when they are carrying out service on the treatment system.

DON'T

- ✗ Don't erect any structures, construct paths, graze animals or drive over the land application area.
- ✗ Don't plant large trees that shade the land application area, as the area needs sunlight to aid in the evaporation and transpiration of the effluent.
- ✗ Don't plant trees or shrubs near or on house drains.
- ✗ Don't alter stormwater lines to discharge into or near the land application area.
- ✗ Don't flood the land application area through the use of hoses or sprinklers.
- ✗ Don't let children or pets play on land application areas.
- ✗ Don't water fruit and vegetables with the effluent.
- ✗ Don't extract untreated groundwater for potable use.

Warning signs

Regular visual checking of the system will ensure that problems are located and fixed early.

The visual signs of system failure include:

- ⚠ surface ponding and run-off of treated wastewater
- ⚠ soil quality deterioration
- ⚠ poor vegetation growth
- ⚠ unusual odours

Volume of water

Land application areas and systems for on-site application are designed and constructed in anticipation of the volume of waste to be discharged. Uncontrolled use of water may lead to poorly treated effluent being released from the system.

If the land application area is waterlogged and soggy the following are possible reasons:

- ⚠ Overloading the treatment system with wastewater.
- ⚠ The clogging of the trench with solids not trapped by the septic tank. The tank may require desludging.
- ⚠ The application area has been poorly designed.
- ⚠ Stormwater is running onto the area.

HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT

Poorly maintained land application areas are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your sewage management system you can do your part in helping to protect the environment and the health of you and your family.

For more information please contact:

Your Land Application Area

