

10 May 2024

Our ref: AS/C15204

Client: DuctRite Industries Pty Ltd

Via email: troy@ductrite.com.au

Attention: Troy Reid

PROPOSED RESIDENCE – LOT 15 WOODBURY RIDGE, SUTTON, NSW

On-Site Effluent Management Report

1 INTRODUCTION

At the request of the client, Fortify Geotech Pty. Ltd carried out an effluent disposal assessment to AS1547 “On-Site domestic wastewater management”, for proposed new dwelling at lot 15, Woodbury ridge, Sutton, NSW.

The empty rural block is 5010m² in area and has a falling slope of about 3° to 5° towards the north-west from RL630 to RL627. At the time of site investigation, the block has low to medium grass and sparse trees. There were no trees in the proposed effluent application area.

This Site and Soil Evaluation was conducted on 23 February 2024 in general accordance with AS 1547:2012 - “On-site domestic wastewater management”, and “The Environment & Protection Guidelines 1998 – On-Site Sewage Management for Single Households” (Silver Book).

The recommendations outlined on Land Capability Assessment report prepared for the sub-division by Franklin Consulting Australia Pty Ltd (dated 11 December 2020) has been considered while preparing the report.

2 SITE INFORMATION

Address of site	Lot 15, Woodbury Ridge, Sutton NSW
Local government	Yass Valley Council
Investigation	<p>A site and soil assessment were undertaken using the Australian Standard 1547, <i>On-site domestic wastewater management</i>, and the Environment and Health Protection Guidelines, <i>On-site sewage management for single households</i> (1998), Department of Urban Affairs and Planning, as guidelines. Suitable wastewater application systems, sizing and location for the site are recommended.</p> <p>The evaluation is based on a dwelling with five (5) potential bedrooms in primary residence</p>
Size	Approximately 5010m ²
Location, shape, layout	A plan of the relevant areas of the site and proposed effluent application areas is described in Figures 1 and 2.
Photograph(s) attached	Yes (Figure 3 and 4)
Intended water supply	Rainwater for portable use (tank water supply) or/and bore water supply
Development	Proposed new primary residence
Expected wastewater flow:	<p>Number of bedrooms in a primary residence – 5</p> <p>Design Flowrate for proposed primary residence = 900L/day (as per “Designing and Installing On-site Wastewater Systems – WaterNSW”).</p>
Setting	This lot is in a rural setting where the average dwelling density is less than 1 dwelling per 0.5ha and therefore less than the 1 per 0.4 hectares required for groundwater protection (Geary & Gardner 1996, Land Management for Urban Development, Australian Society of Soil Sciences, Qld).
Current land-use	Vacant
Climate	<p>Summers are warm to hot, and winters are cold with little effective evaporation.</p> <p>Rainfall is distributed evenly throughout the year with an average annual rainfall of 516mm and pan evaporation of 1,726mm (Bureau of Meteorology Canberra Airport, ACT).</p>

3 SITE ASSESSMENT

Site feature	Assessment	Limitation
Vegetation	Native grasses and weeds.	Minor
Flood potential:		
1 in 20 year	Nil	Minor
1 in 100 year	Nil	
Exposure	High	
Site aspect	West	Minor
Shelter belts	Nil	
Topographical feature or structure	Nil	
Slope	3° to 5°	Minor
Landform	Mid-slope	Minor
Run-on and seepage:		
Comment	Run-on and sub-surface seepage is expected to be low.	Minor
Erosion potential:		
Erodibility and Erosion hazard	The topsoil and subsoil have a low erodibility. Erosion hazard is low and is reduced with ground cover.	Minor
Site drainage	No visible signs of surface dampness	Minor
Fill	Nil	Minor
Groundwater:		
Level of protection	High	Minor
Bores and wells in the area and their purpose		

Site feature	Assessment	Limitation
	<p>No groundwater bore is located within 500m of the application area.</p> <p>No impact on groundwater is expected from the application of effluent on the site.</p>	
<p>Surface water:</p> <p>Permanent waters, streams, lakes <i>(Recommended buffer distance 100m)</i></p> <p>Other waters, intermittent waterways, dams <i>(Recommended buffer distance 40m)</i></p>	<p>No permanent waters, streams, or lakes within 250m of the proposed application areas.</p> <p>No drainage lines or dams within 40m of the proposed application areas.</p>	Minor
<p>Buffer distances from recommended application area to:</p> <p>Premises boundaries, paths and walkways, recreation areas <i>(Recommended buffer distance 3-4m)</i></p> <p>Swimming pools <i>(Recommended buffer distance 6m)</i></p> <p>Buildings <i>(Recommended buffer distance 3-15m)</i></p>	<p>>3m</p> <p>>4m</p> <p>>3m</p>	Minor
<p>Area required for application system(s):</p> <p>Area available (including buffers):</p>	<p>300m² minimum area required for irrigation system and additional 55m² for nutrient uptake area.</p> <p>A potential application area greater than 700m² is available in the nominated effluent disposal areas.</p>	Minor
Surface rocks, rock outcrops	No within potential application area	Minor

Site feature	Assessment	Limitation
Geology/ regolith	The MinView Seamless Geology map indicated the area underlain by Ordovician age Adabinaby Group, comprising spotted hornfels and metasedimentary rocks (contact metamorphic aureole).	Minor
Environmental concerns:		
Native plants intolerant of phosphorous	Nil	Minor
High water table	Nil	
Water way/wetland	None nearby	
Community water storage	None nearby	
Site stability:		
Is expert assessment necessary	No, not expected to affect system performance	Minor

4 SOIL ASSESSMENT

Soil was assessed on site on 23 February 2024 . To establish the subsurface condition and soil properties, two boreholes were drilled on the site to refusal at the depths ranging from 1.1m to 1.2m using a 50mm pushtube. Borehole 1 (BH1) was drilled within the proposed application area and soil samples were collected from BH1. BH2 was drilled on the proposed reserve area.

The soil profile was described, and representative samples collected for the determination of physical and chemical properties. Soil physical property measurements undertaken included: dispersion description, texture, colour, pH, and salinity. The laboratory tests for physical properties were undertaken at our office and the results are presented in the following table.

Depth (mm)	Description	Sampled (X)	Texture group	Moisture	Emerson aggregate test*	pH (1:5 water)	ECe dS/m
BH1 (primary residence)							
0 - 200	Dark brown loam	150	L	M	5	6.4	0.78
200 - 1200	Brown light clay with gravel	700	LC	M	3	6.2	0.84

M=Moist, D=Dry *1= highly dispersive (slakes, complete dispersion), 2= moderately dispersive (slakes, some dispersion), 3= slightly dispersive (slakes, some dispersion after remoulding), 4= non-dispersive (slakes, carbonate or gypsum present), 5= non-dispersive (slakes, dispersion in shaken suspension) 6= non-dispersive (slakes, flocculates in shaken suspension), 7= non-dispersive (no slaking, swells in water), 8= non-dispersive (no slaking, does not swell in water).

Site feature	Assessment	Limitation
Depth to bedrock	1.1m – 1.2m in recommended application areas <i>(0.6m below application base recommended)</i>	Minor
Depth to high water table	Greater than 1.2m in recommended application areas <i>(0.6m below application base recommended)</i>	Minor
Coarse fragments	Gravel ~ 5%	Minor
Bulk density	Good (estimated)	Minor
pH	Satisfactory <i>(4.5-8.5 optimum range)</i>	Minor
Salinity	Non-saline <i>(<4.0 dS/m desirable threshold)</i>	Minor
Phosphorus sorption index	6500 kg/ha (estimated)	Minor
Nutrient balance	Water is not expected to move off site, nutrients will be utilised by the vegetation and stored in the soil. The subsoil is well-drained sandy clay loam with gravel that will immobilise largely quantities of nitrogen (in ammonium and organic forms) as derived from primary treatment systems.	Minor
Cation exchange capacity	Moderate (estimated). Will provide adequate retention of nutrients for plant growth.	Minor
Dispersiveness (Emerson aggregate test)	Non-dispersive loam topsoil over a slightly dispersive sandy clay loam subsoil. Regular application of gypsum recommended at the rate of 1kg per square meter of application area.	Minor
Soil structure	Moderately structured	Minor

5 EFFLUENT DISPOSAL SYSTEM SELECTION

Based on the site and soil assessment, an effluent system comprising of a sub-surface drip irrigation system and an advanced secondary treatment system (AWTS) is suitable for the site, which is consistent with the recommendations on Land Capability Assessment prepared for the sub-division.

6 EFFLUENT DISPOSAL SYSTEM DESIGN

The calculations in determining the size for the application area are outlined below. Using Table H1 in AS1547:2012 – “Disposal Systems for Effluent from Domestic Premises”, the daily flow was calculated using the assumptions outlined in Table 1.

Water Balance: $A = Q \text{ (L/day)}/\text{DIR (mm/day)}$
Where $Q = 900 \text{ L/day}$
 $\text{DIR} = 3 \text{ mm/day (for light clay)}$
 $A = 900/3 = \mathbf{300m^2}$

Nitrogen Balance: $A = Q(\text{L/day}) \times \text{TN (mg/L)}/\text{Ln (critical loading of TN, mg/m}^2\text{/day)}$
Where $Q = 900\text{L/day}$
 $\text{TN} = 30\text{mg/L}$

Assume 20% loss by denitrification; $30\text{mg/L} - (30 \times 0.8) = 24\text{mg/L}$
 $\text{Ln} = 24,000\text{mg/m}^2\text{/year (240kg/ha/year, for managed land)}$
 $A = 900 \times 24 \times 365/24,000 = \mathbf{328.5m^2}$

Phosphorous Balance: $A = \text{P gen}/(\text{P uptake} + \text{P sorb})$
P sorption capacity

$\text{P sorb} = 0.65\text{kg/m}^2 \times 1/3 = 0.22\text{kg/m}^2$

P uptake for design period of 50 years
 $\text{P uptake} = 8.2\text{mg/m}^2\text{/day} \times 365 \times 50 = 0.15\text{kg/m}^2$

P generated over 50 year design period
 $\text{P gen} = 8\text{mg/l} \times 900 \times 365 \times 50 = 131.4\text{kg}$

$A = \text{P gen}/(\text{P uptake} + \text{P sorb}) = 131.4 / (0.15 + 0.22) = \mathbf{355m^2}$

Nutrient and water balance results used to determine the size of the nutrient uptake area (m^2).

Based on the difference between the phosphorous balance area (355m^2) and the hydraulic (irrigation) area (300m^2) a dedicated nutrient uptake area (NUA) of 55 m^2 downslope or around the irrigation area required to safely dispose of the effluent.

7 TREATMENT SYSTEM

For sub-surface drip irrigation, the effluent must be secondary treated effluent, which can be treated in an NSW Health accredited AWTS system and should be installed as per the Plumber’s installation manual. The list of NSW Health accredited secondary treatment system can be found on <https://www.health.nsw.gov.au/environment/domesticwastewater/Pages/awts.aspx>.

The system shall have adequate capacity to treat the design flow rate (900L/day) for the proposed dwelling. The septic treatment system (AS1547) with a minimum capacity of 4,000 litres. The septic tank should be fitted with an outlet filter.

The tank should be installed to comply with the local council requirements and the standard AS3500.2:2003 – “Plumbing and Drainage Part 2 Sanitary Plumbing and Drainage”, and the manufacturer’s recommendations.

The tanks should be installed so that the lid of the tank is exposed at least 100mm off the ground surface level to ensure that it is properly sealed, and no stormwater enters the tank.

8 DESIGNATED AREA

The sub-surface (drip) irrigation system with a minimum application area of **300m²** and additional a dedicated nutrient uptake area (NUA) of 55 m² downslope or around the irrigation area is required for the proposed residence. Both the irrigation area and NUA herein are referred to as the effluent management area (EMA). No structures should be built within the EMA and is best to remain landscaped as a lawn or planted with trees and shrubs suited to receive treated wastewater.

Irrigation system should be installed in accordance with the requirements of AS1547: 2012.

The area will need to be covered with at least 200mm of fertile topsoil to act as an immediate storage media for effluent applied to it, and to support the rapid growth of suitable vegetation to maximize evapo-transpiration. A list of suitable plants is provided in “The Easy Septic Guide” produced by the NSW Department of Local Government.

A fence should be placed around the effluent disposal area if there is a risk of children, animals or vehicles coming into the area. Signage, complying with AS1319 shall be placed in at least two places at the boundary of the application area, clearly visible to property uses, with wording such as “Recycled Water – Avoid Contact – DO NOT DRINK”.

The treated effluent is not suitable for vegetable gardens or areas where people can come in contact with the effluent.

The area should not be used for any purposes that compromise the effectiveness of the system or access for future maintenance purposes.

9 CLOSURE

Should you require any further information regarding this report, please do not hesitate to contact our office.

Yours faithfully,

Fortify Geotech Pty Ltd

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FIGURE 1: SITE LOCALITY

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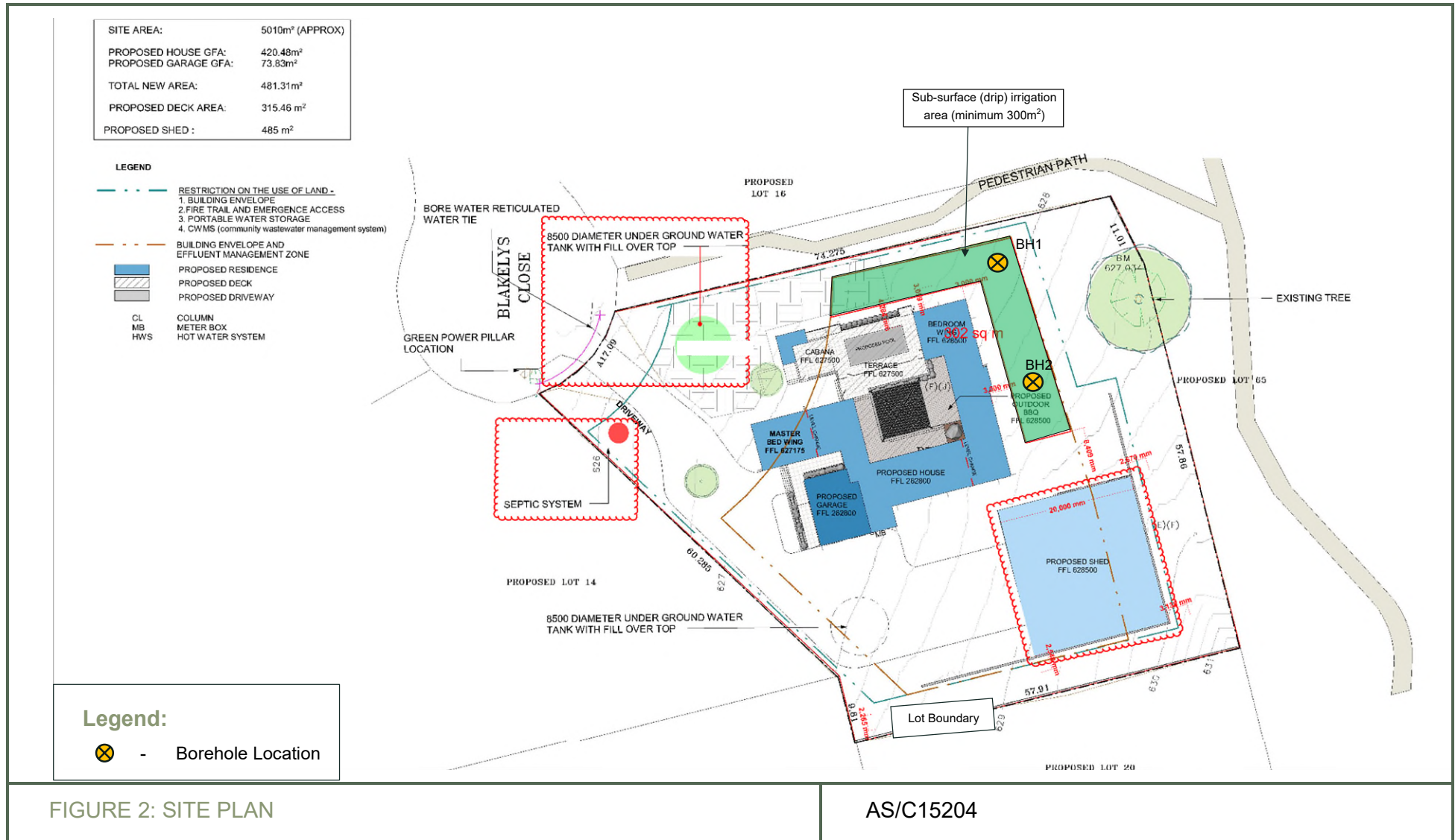




FIGURE 3: SITE PHOTOGRAPH OF THE PROPOSED APPLICATION AREA

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FIGURE 4: SOIL PROFILE AT BH1

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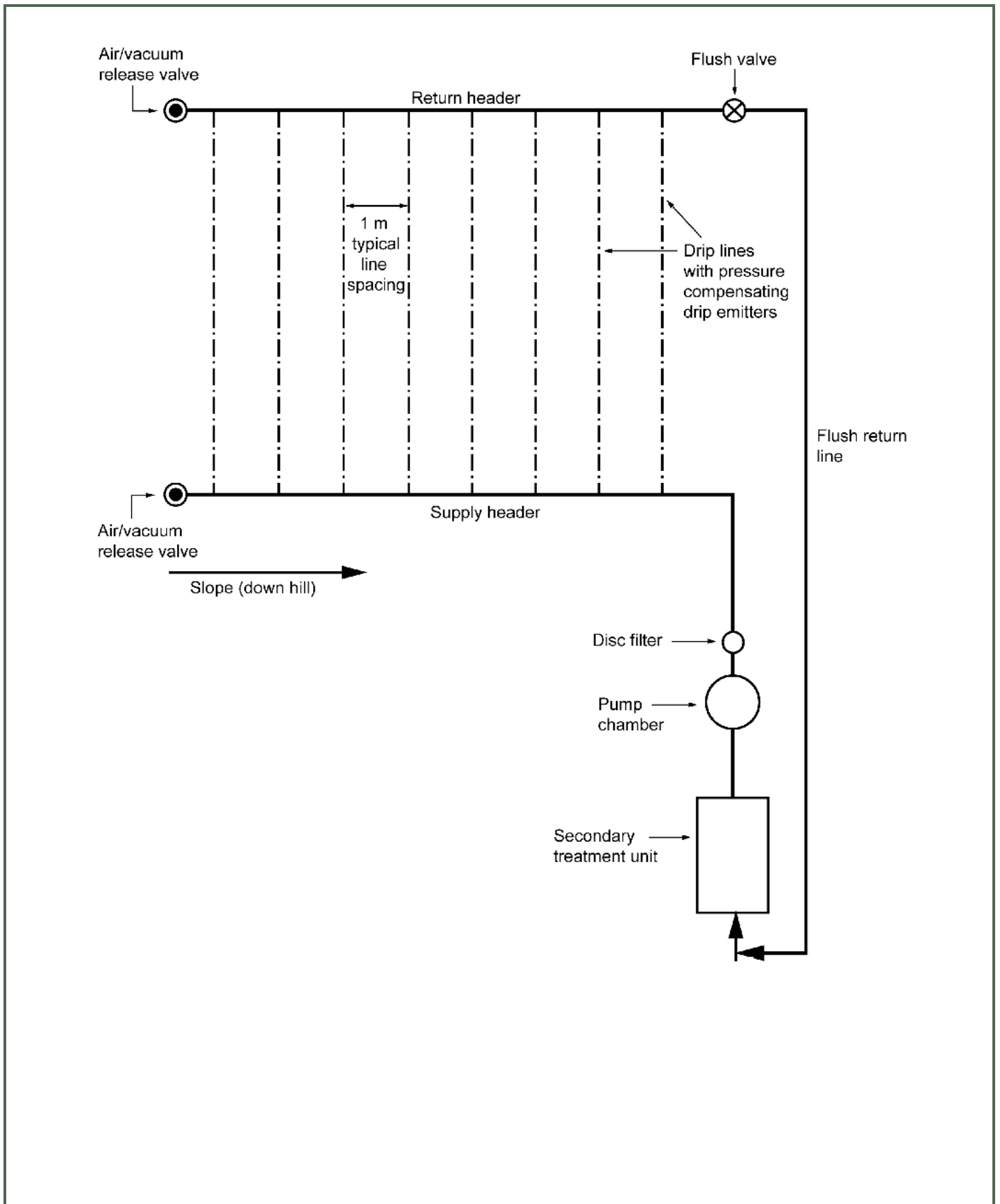


FIGURE 5: EXAMPLES OF DRIP IRRIGATION SYSTEM

AS/C15204

Checklist for effective management of wastewater systems

Domestic wastewater system

DO

- Check household products for suitability of use with a septic tank.
- Conserve water, prolonged period of high-water use can lead to application area failure. For optimum operation, avoid daily and weekly surges in water flows. Spas are not recommended.
- Scrape cooking dishes and plates prior to washing to reduce solid load.
- Maintain the system with regular servicing as per the manufacturer's instructions.

DON'T

- Dispose of excessive solid material, fats, lint or large water volumes into drains.

Land application area

- Construct and maintain diversion drains around the top side of the application area to divert surface water.
- The application area should be a grassed area, which is maintained at 10-30cm height.
- The area around the perimeter can be planted with small shrubs to aid transpiration of the wastewater.
- Ensure run-off from the roof or driveway is directed away from the application area.
- Periodic application of gypsum may be necessary to maintain the absorptive capacity of the soil.
- **Don't** erect any structures or paths on the land application area.
- **Don't** graze animals on the land application area.
- **Don't** drive over the land application area.
- **Don't** plant large trees that shade the land application area thereby reducing transpiration of water.
- **Don't** let children or pets play on the land application area.
- **Don't** extract untreated groundwater for potable use.

