


NSW Onsite Wastewater Management Guidelines, 2025


Training for Regulators and Designers

System Sizing

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Wastewater generation

- Daily Hydraulic Load (L/day) = Design Occupancy (EP) x Design Flow Allowance (L/person/day)
- Always check the requirements of the local water authority when designing in a drinking water catchment
- Design occupancy in domestic settings can be defined as the maximum potential future occupancy of a household based on the number of bedrooms

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Design occupancy

- Dwellings start at 3EP in the first bedroom, with 1EP per bedroom after (number of bedrooms + 2)
- Buildings with own toilet and laundry are classed as a separate household, starting at 3EP again
- Bedrooms are defined as any room that possesses the potential to be used as a bedroom in the future. This is up to the discretion of the council
- Commercial settings includes staff, visitors, guests
- Short term accommodation is based on available beds, not bedrooms

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Design flow allowance

- Design flow allowances can be defined as the daily water use of a development per EP (L/person/day) that will be converted to wastewater
- Table 6-2 flows are based on basic water reduction fixtures (3-star WELS)
- Non-standard water fixtures (spa bath, kitchen food-waste grinders, etc.) are not recommended. If used, flows are to be adjusted to suit increases
- Short-term accommodation should use reticulated water supply flow allowance

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Wastewater generation - scenario

- Daily Hydraulic Load (L/day) = Design Occupancy (EP) x Design Flow Allowance (L/person/day)
- 3-bedroom (5EP) + 2-bedroom house (4EP) = 9EP
- Rainwater tank supply = 120L/person/day
- Daily hydraulic load = 1,080L
- If they used bore water inside, it would be 150L/p/d
- Daily hydraulic load = 1,350L
- If the houses were used for short term accommodation, what would change?

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Septic tank capacity

- Septic Tank Capacity (L) =
Daily Flow (L/day) + Accumulated Sludge (L)
- Daily Flow (L/day) = Maximum Users (EP) x Peak Flow (L/day)
- Accumulated Sludge (L) = Users (EP) x 80L/person/year x 5 Year Pump Out Cycle
- This allows the use of smaller septic tanks, where NSW Health accredited and economically viable

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Sizing for other systems

- Collection wells – minimum of 7-days daily flow + 2-days emergency storage
- Aerobic sand and media filter systems – sized based on the most limiting of hydraulic and BOD loading rates and the media type and whether it is recirculating or not
- Constructed wetlands – volume of the wetland is based on a minimum 5-days of hydraulic retention time and related to the porosity of the gravel used in the wetland

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Design loading and irrigation rates

- DLR and DIR are determined on the basis of the textural class and structure of the limiting layer
- DLR and DIR are based on the long-term application of effluent and its impact on the permeability of the soil, not just the indicative permeability of the soil
- Table 6-4 of the Guidelines compiles the DLR and DIR from Tables L1, M1 and N1 of AS/NZS1547:2012

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Effluent application area sizing

- The simplest method is the areal calculation, based on hydraulics but not climate
- Only suitable for sites with no climatic constraints
- $\text{Area} = Q \text{ (daily hydraulic load)} \div (\text{DLR or DIR})$
- Scenario site has sand soils (Category 1), $Q = 1,080\text{L}$, secondary treated effluent
- $\text{DLR (beds)} = 50\text{mm/day}$ and $\text{DIR (SSI)} = 5\text{mm/day}$
- $\text{Beds area} = 21.6\text{m}^2$ or $\text{SSI area} = 216\text{m}^2$

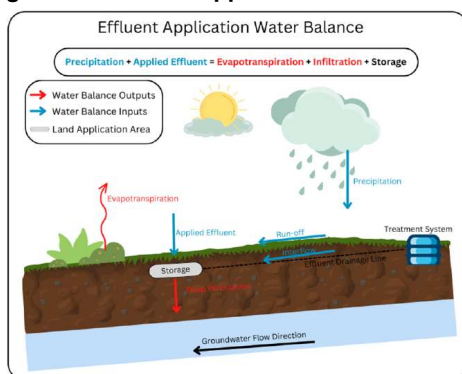
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Water balance

- Water balance modelling is to approximate natural water cycle processes using local climate data and applied effluent to determine the minimum EAA
- Water balances can be based on monthly or daily climate data
- Monthly balances are simpler and more conservative than daily balances
- Include rainfall, evaporation, crop factors, void space ratio, retained rainfall coefficient, DLR/DIR

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Figure 6-1 Effluent application water balance



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Water balance and in soil storage

- In soil storage in a water balance is only suitable for Category 3-6 soils and for absorption or ETA trenches and beds
- In soil storage for irrigation systems and highly permeable soils (Category 1 and 2) should be zero
- Wet weather storage in a tank is not suitable for a domestic OWMS

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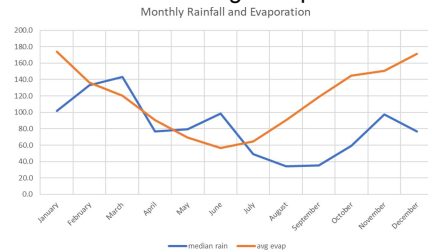
Scenario – water and nutrient balances

- Work through scenario water and nutrient balances for absorption beds and irrigation

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Climate data - Scenario

- Downloaded SILO data drill for 30 years
- Median rainfall and average evaporation



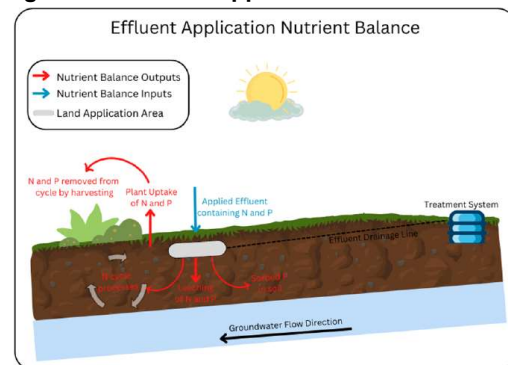
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Nutrient balance and nutrient uptake

- Nutrient balance modelling is to approximate natural nitrogen and phosphorus cycle processes using local data to determine the minimum EAA
- Nutrient Uptake Area (NUA) is the area set aside surrounding and downslope of an EAA that allows for further nutrient reduction to background levels before reaching any sensitive receptors
- The NUA should be vegetated and protected from development and not extend into buffers

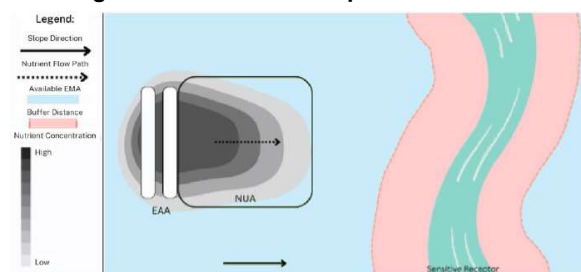
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Figure 6-2 Effluent application nutrient balance



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Figure 6-3 Nutrient transport under EAA



Nutrient Uptake Area (NUA)
= Nutrient Balance Area - Hydraulic Area

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Linear loading rate

- DLR assumes that there is no hydraulically limiting layer beneath the base of the EAA
- The linear loading rate should be used where there is a limiting layer, to ensure that the effluent cannot return to the surface as it travels downslope
- LLR takes into account slope, depth to limiting layer, soil texture and structure
- Table 6-5 of the Guidelines sets out LLR (L/m/day)

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Table 6-5 Linear loading rates

Soil characteristics			Linear loading rates (litres/metre/day) ¹								
			Slope								
			Depth of natural, unsaturated soil (cm)								
Soil category	Soil texture	Structure	20_30	31_60	>61	20_30	31_60	>61	20_30	31_60	>61
1	Gravels and medium-coarse sands	Structureless	50	62	75	62	75	87	75	87	99
	Fine sand and loamy sand	Structureless	43	56	68	50	62	75	62	75	87
2	Sandy loams	Weakly structured	43	56	68	50	62	75	62	75	87
		Massive	37	43	50	45	51	57	62	75	87
3	Loams	High/moderate structured	41	47	53	45	51	57	48	55	61
		Weakly structured or Massive	25	29	32	30	34	37	34	40	46
4	Clay loams	High/moderate structured	30	36	42	34	37	41	37	43	50
		Weakly structured	25	31	37	27	34	40	30	36	42
5	Light clays	Massive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Strongly structured	25	31	37	27	34	40	30	36	42
6	Medium to heavy clays	Moderately structured	25	31	37	27	34	40	30	36	42
		Weakly structured or Massive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NOTES:

1. Adapted from Designing and Installing On-site Wastewater Management Systems from WaterNSW (2023a) and based on Hydraulic Wastewater Loading Rates to Soil Tyler (2001)

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NOTES:
1. Adapted from *Designing and Installing On-site Wastewater Management Systems from WaterNSW (2023a)* and based on Hydraulic Wastewater Loading Rates to Soil Tyler (2001).

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Linear loading rate calculations

- Single bed or end to end bed designs:

$$LLR = \text{Design hydraulic load} \div \text{maximum EAA length along slope}$$
- For beds placed in parallel (stacked) designs:

$$LLR = (\text{Design hydraulic load} \div \text{total field area}) \times \text{total downslope bed width}$$
- Where:
 - Total field area = (total downslope bed width + interbed spacing) x bed length
 - Total downslope bed width = the number of stacked beds x individual bed width

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Linear loading rate - scenario

- Scenario absorption bed is 22m² area, Category 1 soil (fine), 2-5% slope, with a limiting layer within 1m of the point of application
- LLR must be <68L/m
- Option 1: Bed is 7m long and 3.2m wide
 - $LLR = 1,080 \div 7 = 154.3\text{L/m} > 68\text{L/m}$
- Option 2: Bed is 19m long and 1.2m wide
 - $LLR = 1,080 \div 19 = 56.9\text{L/m} < 68\text{L/m}$

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Linear loading rate - scenario

- If the beds in Option 1 were split into 3 beds of 7m long and 1.1m wide, installed in parallel 1m apart:
- $LLR = (Q \div \text{total field area}) \times \text{total downslope bed width}$
- Total downslope bed width = $3 \times 1.1\text{m} = 3.3\text{m}$
- Total field area = $(3.3\text{m} + 2\text{m}) \times 7\text{m} = 37.1\text{m}^2$
- $LLR = (1,080 \div 37.1) \times 3.3 = 96.1\text{L/m}, > 68\text{L/m}$
- The beds would need to be 2.5m apart before $LLR < 68\text{L/m}$

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Linear loading rate - scenario

- Option 3, if there wasn't sufficient area available to have a bed of 19m long (Option 2), another option would be:
- 2 beds of 11m long, 1m wide, 1m apart:
- $LLR = (1,080 \div 33) \times 2 = 65.5\text{L/m}$, which is <68L/m
- It doesn't take a significant increase in length to reduce the LLR

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Scenario – water and nutrient balances



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