NSW Onsite Wastewater Management Guidelines, 2025

Training for Regulators and Designers

Buffer assessment

and

Risk mitigation

Buffers (or setbacks)

- Provide mitigation against unidentified or unintended hazards
- Reduce potential pathways for human and environmental exposure
- Valuable and cost-effective risk management strategy for OWM

Risk-based Buffers

- Risk-based buffers to sensitive receptors as described in Section 4.3.2:
  - Assess local constraints (site, soil and system) to ensure protection of public health, the environment and amenity
  - Allow a reduction in buffer distance related to the mitigation of identified risks

Risk-based Buffers

- Buffers must be set in consultation with:
  - Water authorities for drinking water extraction areas (surface or groundwater)
  - NSW Food Authority in Priority Oyster Aquaculture Areas (POAA)
- Table 4-4 sets out 'ranges' for individual constraint items associated with relevant site or system features

Buffers – Table 4-4

Buffer distance range	Relevant site and system constraints	Constraint scale	
		Low	High
Property Boundaries			
1.5m – 15.0m	Effluent quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement).	Primary treated effluent
	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Method of application	Subsurface or subsoil application	Surface/ above ground application
Buildings			
2.0m – 6.0m	Effluent quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement).	Primary treated effluent
	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Method of application	Subsurface or subsoil application	Surface/ above ground application
Retaining Wall/ Embankment/ Cutting			
Greatest of 3.0m or 45° angle from toe of wall	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Flood potential	Above 1 in 20-year flood contour	Below 1 in 20-year flood contour
	Geology/ Soil	Category 3 and 4 soils, low porosity regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, high porosity regolith
Path/ Walkway			
1.5m – 6.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement).	Primary treated effluent
	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
	Method of Application	Subsurface or subsoil application	Surface/ above ground application

- A4 copy of table follows PowerPoint slides

Buffers – vertical separation

- Vertical separation is from the point of effluent application to the limiting layer
  - Groundwater
  - Bedrock or hardpan
- <0.6m of vertical separation = Raise the point of application
  - Alter the application method (SSI)
  - Import soil or sand (raised bed or mound)

Buffers – new additions

- **Treatment system location** – no set buffer distance, but must consider:
  - Structural integrity of buildings and structures (maintain >45° from the base of the excavation to buildings or site boundaries)
  - Noise and odour impacts
  - Access for maintenance
- **Market gardens** are now included in buffers with swimming pools and recreation areas

Drinking water sources

- A supplier of drinking water (private or public – surface, groundwater, tank storage) must include any OWMS in their Quality Assurance Program as a potential contamination source (Public Health Act 2010 and Regulation 2022)
- Installing a new OWMS can have an impact on existing drinking water suppliers
- New groundwater bore application impacted if an OWMS is present within 250m (WaterNSW)

Risk-based buffer example

Site Features	Range (m)	Constraint	Low Risk	High Risk
Permanent Surface Water	50-100	Effluent Quality	Minimum secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
		Surface Water Pollution Hazard	Category 1 to 3 soils; no surface water downgradient within 100m; low rainfall area	Category 4 to 6 soils; permanent surface water <50m down gradient; high rainfall; high resource/ environmental value
		Slope	0-6% (surface application) 0-10% (subsurface application)	>10% (surface application) >30% (subsurface application)
		Direction of Fall	EAA downgradient of surface water body, property boundary, or recreational area	EAA upgradient of surface water body, property boundary, or recreational area
		Drainage	No visible signs of seepage or saturation	Low lying area. Visible surface saturation. Moisture tolerant vegetation
		Flood Potential	Above 1 in 20-year flood contour	Below 1 in 20-year flood contour
		Application Method	Subsurface or subsoil application	Surface spray application

Risk-based buffer example

Site Features	Range (m)	Constraint	Low Risk	Moderate Risk	High Risk
Permanent Surface Water	50-100	Effluent Quality	Minimum secondary treated effluent (with disinfection and contractual service agreement)	Secondary treated effluent. No disinfection and/or irregular servicing	Primary treated effluent
		Surface Water Pollution Hazard	Category 1 to 3 soils; no surface water downgradient within 100m; low rainfall area	Category 1 to 6 no surface water downgradient within 50m; moderate rainfall area	Category 4 to 6 soils; permanent surface water <50m down gradient; high rainfall; high resource/ environmental value
		Slope	0-6% (surface application) 0-10% (subsurface application)	7-10% (surface application) 10-30% (subsurface application)	>10% (surface application) >30% (subsurface application)
		Direction of Fall	EAA downgradient of surface water body, property boundary, or recreational area	--	EAA upgradient of surface water body, property boundary, or recreational area
		Drainage	No visible signs of seepage or saturation	Mottling noted in subsoil with no signs of surface saturation	Low lying area. Visible surface saturation. Moisture tolerant vegetation
		Flood Potential	Above 1 in 20-year flood contour	--	Below 1 in 20-year flood contour
		Application Method	Subsurface or subsoil application	Subsoil application (minor storage)	Surface spray application
			50m	75m	100m

Risk-based buffer example

Site Features	Range (m)	Constraint	Low Risk	Moderate Risk	High Risk
Permanent Surface Water	50-100	Effluent Quality	Minimum secondary treated effluent (with disinfection and contractual service agreement)	Secondary treated effluent. No disinfection and/or irregular servicing	Primary treated effluent
		Surface Water Pollution Hazard	Category 1 to 3 soils; no surface water downgradient within 100m; low rainfall area	Category 1 to 6; no surface water downgradient within 50m; moderate rainfall area	Category 4 to 6 soils; permanent surface water <50m down gradient; high rainfall; high resource/ environmental value
		Slope	0-6% (surface application) 0-10% (subsurface application)	7-10% (surface application) 10-30% (subsurface application)	>10% (surface application) >30% (subsurface application)
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Buffer assessment - scenario

- Go through the buffer assessment scenario example

Viral die-off modelling

- Viral die-off modelling uses calculations to model the transport of viruses present in effluent away from the EAA and through saturated subsoils
- The model considers the level of treatment, groundwater temperature and subsoil characteristics as factors controlling the movement of viruses

Viral die-off modelling for mitigation

- Where the average groundwater temperature is below 8.5°C, the viral die-off model is not suitable. Alternative mitigation measures will be required
- Viral die-off modelling can be used as one of the mitigation measures for reduced buffers to drinking water, groundwater bores or shallow groundwater

Viral die-off model parameters

- Groundwater temperature (daily mean temperature statistics from BoM can be used in lieu of groundwater monitoring data)
- Orders of magnitude reduction (relates to treatment level – see Table B in example)
- These impact the days required for viral reduction (taken from Figure 1 of Cromer et al. (2001) – see next slide)

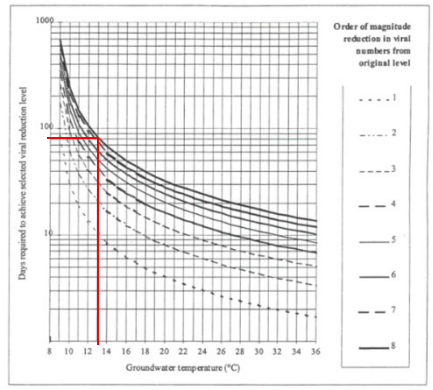


Figure 1. Relationship between Groundwater Temperature and Viral Die-Off Time for Various Order-of-Magnitude Reductions in Viral Numbers

Cromer et al. 2001

- 13ºC
- Primary = 7 orders = 80 days
- Secondary = 2-3 orders = 20-32 days

Viral die-off model parameters

- Effective porosity of soil (calculated from bulk density and specific gravity)
- Saturated hydraulic conductivity (K_{sat}) from Table 4-7 and 6-4 of the Guidelines
- Groundwater gradient (based on surface gradient)
- Vertical drainage before entering groundwater (base of EAA to greatest depth of soil testing or groundwater depth, whichever is less)

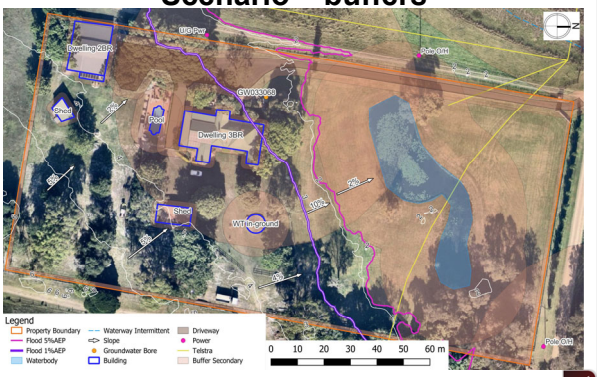
Viral die-off model parameters

- If the parameters aren't conservative, the model may underestimate the distance travelled by viruses in groundwater
- This model isn't indicative of viral die-off if wastewater or effluent enters a waterway through surface flows
- Disinfection – to be conservative, use the non-disinfected figure to cover if failure of disinfection occurs (i.e. chlorine tablets run out)

Groundwater bore buffers

- As a result of completing viral die-off modelling for different soils and scenarios, the Guidelines buffer for groundwater bores was increased to 100m
- Generally, this is conservative, except in sand soils, where viruses travel larger distances in saturated soils, such as in coastal villages on sandy soils with shallow seasonal groundwater

Scenario – buffers



Mitigating risk

- For all moderate or major constraints identified in the site and soil evaluation, some form of mitigation measure is required, including:
  - Installation location
  - Treatment levels
  - EAA sizing modelling
  - Effluent application techniques (subsurface application, narrow trenches, raised application)
  - Modifying the environment or soil amelioration

Constraints and system selection

- See Table 7-1 for constraints and mitigation measures suitable to address those constraints
- E.g. Slope – flat or convergent
  - Poor drainage
  - Run-on from surface and subsurface
- Mitigation measures can include:
  - Divert all run-on (e.g. cut-off drain)
  - Modify the ground surface
  - Raised EAA options (e.g. raised beds or mound)

Constraints and system selection

- Small lot size or limited available EAA
  - Limited area for hydraulic and nutrient uptake
  - Limited available buffers
  - Multiple uses of EAA due to limited space
- Mitigation measures can include:
  - Minimise wastewater generation
  - Source separation approaches (WCT and GTS)
  - Improve effluent quality and reduce nutrients
  - Minimal footprint for treatment system and EAA
  - Nominate optimal exposure EAA location if possible

Mitigating risk

- Some other mitigation measures are:
  - Reducing DLR/ DIR
  - Pressure dosing for even distribution
  - Narrow trenches on steep slopes
  - Changing the location of the system
  - Tank anchoring due to groundwater
  - Subsurface or subsoil application as a barrier
  - Soil amelioration (e.g. dispersive or acidic soils)