

NSW Onsite Wastewater Management Guidelines, 2025

Training for Regulators and Designers

Site and soil evaluation

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Site and soil evaluation – Section 4

- “Site and soil evaluation should follow a systematic approach to the collection, recording and interpretation of information on a suitable scale and depth for the purposes of the investigation.”
- “SSE is required for all unsewered developments where effluent is to be wholly or partially managed onsite.”

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Purpose of SSE

- The SSE is intended to:
 - Identify site and soil characteristics significant to the OWMS selection, location and size
 - Assess capability to sustainably manage all wastewater within allotment boundaries
 - Quantify risk and gathers relevant information to inform the design process and formulate a sustainable design
 - Enable the regulator to make an informed decision on the viability of an unsewered development proposal

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Who should complete a SSE?

- Suitably qualified and experienced professionals, with appropriate training, technical expertise and experience in site and soil evaluation and onsite wastewater design, to meet the requirements of council
- Councils may require written verification of qualifications, experience, professional affiliations and professional indemnity insurance
- Application assessors should have suitable qualifications and experience too, but it is rare

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Steps in a SSE and OWM design

- Site details
- Desktop study
- Field evaluation to fill data gaps
- Constraint (risk) analysis
- Risk mitigation
- OWMS (treatment system and EAA) design
- Detailed site plans
- Management and maintenance

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Desktop study

- Collate previously mapped information to develop a preliminary overview of the site (constraints map)
- Identify data gaps for further investigation
- Identify unsuitable site or soil conditions for OWM
- Target locations for soil boreholes or test pits
- Desktop studies are a suitable first step for all levels of investigation for development (rezoning, subdivision, or individual lot design)

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A critical issue

- One of the critical issues when collating data from different sources to include in a GIS project is that the coordinate reference systems are correct for each layer in the project
- Data must be georeferenced correctly so that all imported layers are aligned in the project

Desktop data to collect

- Cadastre and planning mapping (lot boundaries, roads, land zoning and planning specifications)
- Topographic mapping (contours, landscape position, landform and surface hydrology)
- Imagery (aerial photos – current and historic)
- Geological and soil mapping (soil landscapes, soil test data)
- Groundwater resources (domestic and public supply bores and wells)

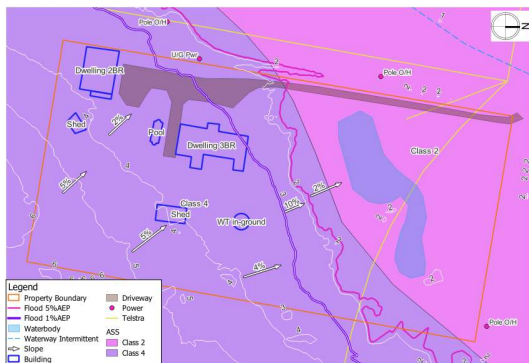
Scenario 1



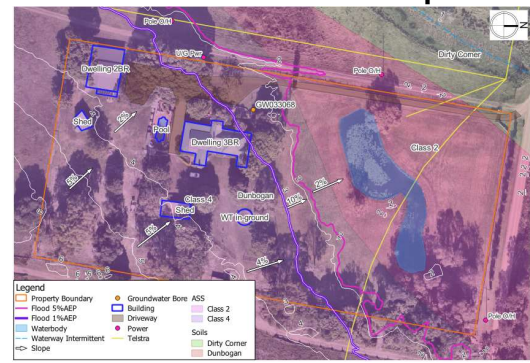
Desktop data to collect

- Land use mapping (adjacent and regional context e.g. agriculture)
- Environmental overlays (flooding, bushfire, ecology and drinking water catchments)
- Location of services (water, electricity, gas etc.)
- Plans or strategies relating to OWM (development strategies, lot size requirements, backlog sewer)
- Site development (existing, approved or proposed)

Scenario 1



Scenario 1 – Constraints plan



Additional desktop data

- Climate data (rainfall and evaporation) – 30+ years
- Local knowledge OWMS limitations (poor soils, shallow rock, groundwater, seasonal inundation)
- Owner discussion
 - Resourcing / capacity and understanding
 - Existing OWMS on the site
 - Existing unmapped services or usage patterns (electricity, water, tracks)

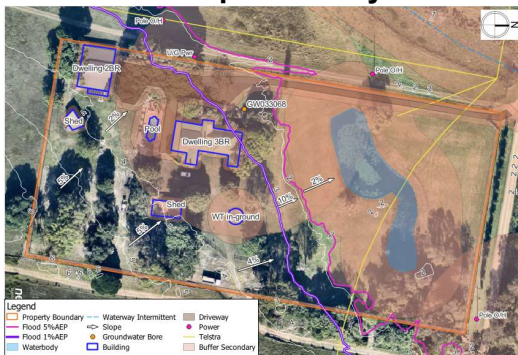
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Desktop preliminary buffers

- Buffer off mapped constraints to provide a preliminary available EAA to field investigate
- This preliminary desktop assessment and buffering may indicate that some OWMS options aren't viable on some sites
- These will focus fieldwork investigations and soil testing locations

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Scenario 1 – preliminary buffers



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Site features

- Once the fieldwork has been completed, the full SSE can be completed
- Table 4-1 considers site features and their risk rating for OWMS (treatment, EAA or both)
- This table can be used in the SSE and by application assessors to determine if all limiting features on the site have been considered and appropriately mitigated, where needed

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Table 4-1 Site features – risk ratings for OWMS

Site Feature	Relevant System(s)	Risk Rating			Restrictive Feature
		Minor Limitation	Moderate Limitation	Major Limitation	
Geology/ regolith	All EAA systems	N/A	N/A	Major geological discontinuities, fractured or highly porous bedrock or regolith	Groundwater pollution hazard
Shallow bedrock	In ground treatment systems and all EAA systems	N/A	N/A	Bedrock at shallower depth than tanks or effluent application systems	Difficult excavation Low saturated hydraulic conductivity Shallow limiting layer (see Table 4.5)
Rocks and rock outcrops (% of land surface containing rocks (boulders) >0.2m diameter)	All EAA systems	<10%	10-20%	>20%	Limits EAA system performance Provides preferential flow paths Difficult excavation
Fill	All OWMS	No fill	Fill present	N/A	Variable permeability Groundwater pollution hazard Resurfacing hazard
Landform	All OWMS	Hill crests, divergent slopes and plains	Convergent slopes and foot slopes	Drainage plains and incised channels	Difficult installation LLR Run-off Erosion
Slope %	Subsurface irrigation	0 - 20	20 - 30	>30	Difficult installation LLR Run-off Erosion
	Surface irrigation	0 - 5	5 - 10	>10	Difficult installation LLR Run-off Erosion
	Evapotranspiration Absorption (ETA)	0 - 10	10 - 20	>20	Difficult installation LLR Run-off Erosion
	ETA Absorption system: trench	0 - 5	5 - 10	>10	Difficult installation LLR Run-off Erosion
	ETA Absorption system: bed	0 - 5	5 - 10	>10	Difficult installation LLR Run-off Erosion

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Table 4-1 Site features – risk ratings for OWMS cont.

Site Feature	Relevant System(s)	Risk Rating			Restrictive Feature
		Minor Limitation	Moderate Limitation	Major Limitation	
	Mound	0 - 10	10 - 15	>15	Difficult installation Large volume of sand required Risk of toe seepage
Erosion potential	All EAA systems	No signs of erosion potential present Well vegetated	Absence of vegetation	Signs of erosion present, e.g. rills, mass movement and slope failure	Soil degradation Transport System failure
Run-on and upslope seepage	All EAA systems	None	Some - diversion possible	High - diversion not practical	System inundation Transport of effluent off-site
Flood potential	All treatment systems	Vents, openings, and electrical components above 1 in 100-year flood contour	N/A	Vents, openings, and electrical components below 1 in 100-year flood contour	Transport of effluent off-site System failure and electrocution hazard
	All EAA systems	Rare, above 1 in 20-year flood contour	N/A	Frequent, below 1 in 20-year flood contour	System inundation Transport of effluent off-site
Site drainage	All effluent application systems	No visible signs of surface dampness	N/A	Visible signs of surface dampness, e.g. moisture-tolerant vegetation (sedges and ferns), seeps, springs	Groundwater pollution hazard Resurfacing hazard
Exposure	All effluent application systems	High sun and wind exposure	N/A	Low sun and wind exposure	Poor evapotranspiration
Land area	All systems	Area is available	N/A	Area is not available	Health risk Pollution risk
Buffer distance	All effluent application systems	(see Section 4.3.2 and Table 4.2)	N/A	N/A	Health risk Pollution risk

NOTES

Sites with major limitations are generally not suitable for land application of effluent. Risk reduction measures must be applied to reduce to minor limitation.

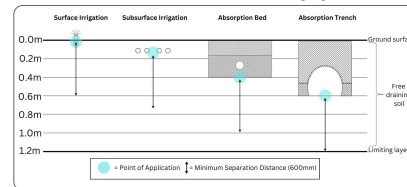
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Site features – scenario

- Go through the site features scenario example using the desktop assessment slides
- Consider what impact the site features could have on the OWM design and possible mitigation measures that could be used

Soil features - terminology

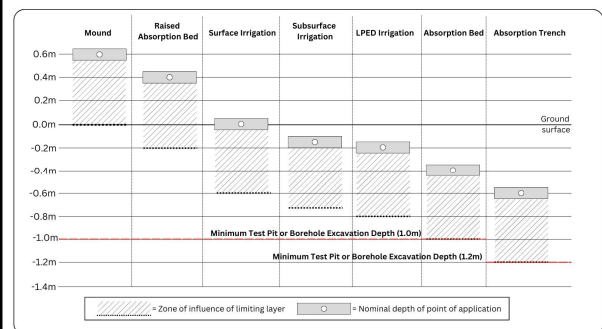
- Standardised terminology across the Guidelines
- Point of application – effluent, e.g. emitters, base of bed or trench
- Separation distance – minimum 0.6m



Soil features - terminology

- Limiting layer - the layer of soil with the lowest saturated hydraulic conductivity or any other limiting layer, such as a hard pan, bedrock, water table, or seasonal high water table (soil mottling), within 0.6m beneath the point of application. The design loading rate is based on the saturated hydraulic conductivity of the limiting layer
- Free-draining soil – soil, beneath the point of application and above any limiting layer, through which effluent can pass freely under gravity

Soil features - terminology



Soil investigations

- Soil investigations should adequately characterise the soil in the proposed EAA
- Minimum – 1 test pit and 2 boreholes in available EAA
- Significant soil variation = additional pits/ holes
- Minimum depth = 0.6m below proposed point of application, or 1.0m, whichever is deeper (i.e. 1.2m for trenches)
- Record – location, depths, layer details, photos

Table 4-5 Soil features – risk ratings for OWMS

Soil Feature	Relevant System	Minor Limitation	Moderate Limitation	Major Limitation	Restrictive Feature
Depth to bedrock or hardpan (m)	Subsurface irrigation	>1.0	0.75 - 1.0	<0.75	Possible waterlogging Increased risk of runoff May limit plant growth (trees)
	Surface irrigation	>1.0	0.6 - 1.0	<0.6	Possible waterlogging Increased risk of runoff May limit plant growth (trees)
	Absorption system	>1.5	1.2 - 1.5	<1.2	May restrict seepage Resurfacing hazard Groundwater pollution hazard
Depth to high episodic/seasonal water table (as evidenced by mottling) (m)	Subsurface irrigation	>1.0	0.75 - 1.0	<0.75	Resurfacing hazard Groundwater pollution hazard
	Surface irrigation	>1.0	0.6 - 1.0	<0.6	Resurfacing hazard Groundwater pollution hazard
	Absorption system	>1.5	1.2 - 1.5 ¹	<1.2	May restrict seepage Groundwater pollution hazard
Soil Category ¹	Subsurface Irrigation	2b, 3 and 4	1, 2a, 5 and 6		Excessive run-off, waterlogging Percolation
	Surface Irrigation	2, 3 and 4	5	1 and 6	
	Evapotranspiration	4 and 5	6 ¹	1, 2 and 3	
	Absorption system	3 and 4		1, 2, 5, and 6	
Coarse fragments (%)	All EAA systems	<20	20 - 40	>40	Preferential flow pathways through soil May restrict plant growth May impede installation

Table 4-5 Soil features – risk ratings for OWMS cont.

Soil Feature	Relevant System	Risk Rating		Restrictive Feature	
		Minor Limitation	Moderate Limitation ³		
Bulk density (g/cm ³)	AI EEA systems Sandy loam Clay loam Clay	<1.8 <1.6 <1.4	>1.8 >1.6 >1.4	Indicator of permeability May restrict plant growth	
pH ¹	AI EEA systems	>8.0	4.5 - 6.0	<4.5 May inhibit plant growth	
Electrical conductivity (EC) (dS/m)	AI EEA systems	<4	4-8	>8 Excessive salt may restrict plant growth	
Sodicity (exchangeable sodium percentage) (ESP)	Subsurface irrigation [0-0.4 m] Absorption system (0-1.2m)	<5 -	5-10 -	>10 Potential for structural degradation	
Carbon exchange capacity (CEC) [local] (kg (0-40cm) ⁻¹)	Subsurface irrigation Surface irrigation	>15	5-15	<5 Indicator of soil fertility Unable to hold plant nutrients	
Phosphorus sorption (log ₁₀)	AI EEA systems (0-100cm for irrigation) (100cm below intended base of trench)	>4,000 (approximately 375 mg/kg)	2,000-6,000	<2,000 (approximately 125 mg/kg)	Unable to immobilise any excess P
Modified Emerson Aggregate Test (biopasson class) ²	AI EEA systems	Class 3, 7, 8	Class 2	Class 1	Potential for structural degradation


1. Sites

- NOTES:
1. Sites with major limitations are generally **not** suitable for land application of effluent. Risk reduction measures must be applied to reduce to minor limitation.
 2. Presence of soil water might indicate soil conditions that facilitate movement of nutrients and other contaminants into the groundwater.
 3. See Table 4-7 for soil category information.
 4. ETA systems are only suitable for use with a minimum of secondary treated effluent in category 6 soils.
 5. May require soil amelioration where a moderate or major limitation is identified (see Figure 6-4).
 6. Soil is likely to become more sodic with effluent application.

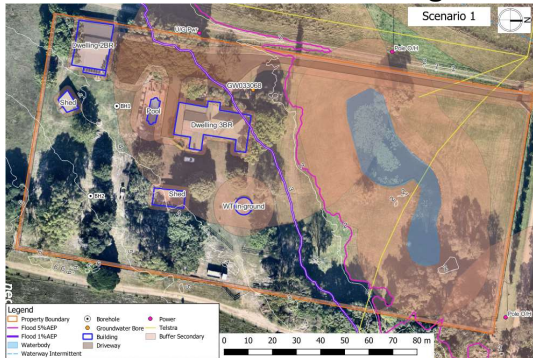
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Soil features – scenario

- Go through the soil features scenario example using the scenario soil data
- Consider what impact the soil features could have on the OWM design and possible mitigation measures that could be used

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Scenario 1 – soil testing



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SSE for tiny houses

- Exemption from full SSE requirements for specific tiny house situation:
 - 1 bedroom, 3 occupants, stand alone OWMS, waterless composting toilet, no flushing toilet, dishwasher or bath
- 1 borehole in EAA, limiting layer texture test and modified Emerson Aggregate Test
- Recommended absorption bed lengths based on soil category only
- Very conservative design

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