

Nominated Area Water Balance & Storage Calculations - Wick Trench Design (EPA compliant)

Site Address: **Beech Forest** Secondary Effluent - Wick Trench 5 or more bedrooms

INPUT DATA				DO NOT MODIFY CELLS IN BLUE			
Design Wastewater Flow	Q	1,080	L/day	Estimated daily load from 5 bedroom residential property, with standard water fixtures and town water			
Daily DLR		12.0	mm/day	Enter DLR from table at right based on Appendix A Table 9 EPA Code of Practice (2013) for limiting soil horizon			
Nominated Land Application Area	L	154.0	m sq	Used for iterative purposes to determine storage requirements based on nominated trench/bed bottom area			
Crop Factor	C	0.5-0.7	unitless	Estimates evapotranspiration as a fraction of ET_0 ; varies with season and crop type (from EPA 168)			
Retained Rainfall	RR	0.85	unitless	Proportion of rainfall that remains onsite and infiltrates; function of slope/cover, allowing for any runoff			
Void Space Ratio	V	0.45	unitless	Proportion of trench that is available for storage (assumes arch drain)			
Rainfall Data	Beech Forest			BoM 70th percentile monthly			
Evaporation Data	Beech Forest			SILO Data Drill Average monthly			

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 Enter DLR from table at right based on Appendix A Table 9 EPA Code of Practice (2013) for limiting soil horizon
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 Proportion of trench that is available for storage (assumes arch drain)
 BoM 70th percentile monthly
 SILO Data Drill Average monthly

Bed Water available (days) = **90**

Soil Category (AS1547:2012)	DLR
Gravels & Sands (1)	NS
Sandy Loams (2) Loams (3) High/Mod Clay Loams (4a)	NS
Weak Clay Loams (4b)	20
Massive Clay Loams (4)	10
Strong Light Clays (5a)	12
Moderate Light Clays (5b)	10
Weak Light Clays (5c)	8
Medium to Heavy Clays (6)	5

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Days in month	D	\	days	31	28	31	30	31	30	31	31	30	31	30	31	31	28	31	30	31	30	365
Rainfall	R	\	mm/month	88.1	90.8	114.0	178.8	207.7	242.0	232.7	243.6	213.1	187.2	134.1	113.6	88.1	90.8	114.0	178.8	207.7	242.0	2,045.7
Potential Evapotranspiration	ET_0	\	mm/month	128.0	105.0	87.0	54.0	34.0	22.0	26.0	38.0	55.0	81.0	97.0	118.0	128.0	105.0	87.0	54.0	34.0	22.0	846.0
Crop Factor	C			0.70	0.70	0.70	0.60	0.50	0.45	0.40	0.45	0.55	0.65	0.70	0.70	0.70	0.70	0.70	0.60	0.50	0.45	
OUTPUTS (LOSSES)																						
Evapotranspiration	ET	$ET_0 \times C$	mm/month	89.6	73.5	60.9	32.4	17.0	9.9	10.4	17.1	30.3	52.7	67.9	82.6	89.6	73.5	60.9	32.4	17.0	9.9	544.2
Percolation	B	$(DLR) \times D$	mm/month	372.0	336.0	372.0	360.0	372.0	360.0	372.0	372.0	360.0	372.0	360.0	372.0	372.0	336.0	372.0	360.0	372.0	360.0	4,380.0
Outputs		ET+B	mm/month	461.6	409.5	432.9	392.4	389.0	369.9	382.4	389.1	390.3	424.7	427.9	454.6	461.6	409.5	432.9	392.4	389.0	369.9	4,924.2
INPUTS (GAINS)																						
Retained Rainfall	Re	$R \times RR$	mm/month	74.9	77.2	96.9	152.0	176.5	205.7	197.8	207.1	181.1	159.1	114.0	96.6	74.9	77.2	96.9	152.0	176.5	205.7	1,738.8
Applied Effluent	W	$(Q \times D) / L$	mm/month	217.4	196.4	217.4	210.4	217.4	210.4	217.4	217.4	210.4	217.4	210.4	217.4	217.4	196.4	217.4	210.4	217.4	210.4	2,559.7
Inputs		Re+W	mm/month	292.3	273.5	314.3	362.4	393.9	416.1	415.2	424.5	391.5	376.5	324.4	314.0	292.3	273.5	314.3	362.4	393.9	416.1	4,298.6
STORAGE CALCULATION (Δ)																						
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	11.0	113.6	186.5	265.1	267.9	161.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	
Storage for the month	S	$((Re+W)-(ET+B))/V$	mm/month	-376.2	-302.1	-263.5	-66.7	11.0	102.6	72.9	78.6	2.8	-106.9	-230.1	-312.5	-376.2	-302.1	-263.5	-66.7	11.0	102.6	-1,390.3
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	11.0	113.6	186.5	265.1	267.9	161.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	113.6	
Maximum Storage Depth for Nominated Area	N		mm	267.9																		
Maximum Storage Vol. for Nominated Area	V	$N \times L$	L	41,262																		

BOTTOM AREA REQUIRED FOR ZERO STORAGE m^2 86.6 91.0 99.6 134.8 157.6 197.3 181.4 183.9 154.9 126.1 103.2 93.5 86.6 91.0 99.6 134.8 157.6 197.3

MINIMUM BOTTOM AREA REQUIRED FOR ZERO STORAGE: **198** m^2 Value is based on the worst month of the year, so the balance overestimates the storage requirement for all other months. Assumes zero effluent depth (storage) in trench/bed. Model is run for 18-months to ensure trench/bed empties at least once per cycle.

- Wick trench dimensions (mm) Trench Width = **600** Depth = **450**
Bed Width = **1,000** Depth = **150**
- Recommended wick trench length (m) = **181.9**
- Minimum trench spacing: 1m for Soil Categories 1-3; and 1.5m for Soil Categories 4-6
- No. of trenches @ (max) 20m length = **10**
- Total footprint with 1m spacing (m^2) = **525**
- Total footprint with 1.5m spacing (m^2) = **620**

