

# 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		10.0	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	216.0	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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 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	<b>365</b>
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	<b>2,045.7</b>
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	<b>846.0</b>
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	
<b>OUTPUTS (LOSSES)</b>																						
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	<b>544.2</b>
Percolation	B	$(DLR) \times D$	mm/month	310.0	280.0	310.0	300.0	310.0	300.0	310.0	310.0	300.0	310.0	300.0	310.0	310.0	280.0	310.0	300.0	310.0	300.0	<b>3,650.0</b>
Outputs		ET+B	mm/month	399.6	353.5	370.9	332.4	327.0	309.9	320.4	327.1	330.3	362.7	367.9	392.6	399.6	353.5	370.9	332.4	327.0	309.9	<b>4,194.2</b>
<b>INPUTS (GAINS)</b>																						
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	<b>1,738.8</b>
Applied Effluent	W	$(Q \times D) / L$	mm/month	155.0	140.0	155.0	150.0	155.0	150.0	155.0	155.0	150.0	155.0	150.0	155.0	155.0	140.0	155.0	150.0	155.0	150.0	<b>1,825.0</b>
Inputs		Re+W	mm/month	229.9	217.2	251.9	302.0	331.5	355.7	352.8	362.1	331.1	314.1	264.0	251.6	229.9	217.2	251.9	302.0	331.5	355.7	<b>3,563.8</b>
<b>STORAGE CALCULATION (<math>\Delta</math>)</b>																						
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	10.1	111.9	183.9	261.6	263.5	155.7	0.0	0.0	0.0	0.0	0.0	0.0	10.1	
Storage for the month	S	$((Re+W)-(ET+B))/V$	mm/month	-377.1	-302.9	-264.4	-67.6	10.1	101.8	72.0	77.7	2.0	-107.8	-230.9	-313.4	-377.1	-302.9	-264.4	-67.6	10.1	101.8	<b>-1,400.8</b>
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	10.1	111.9	183.9	261.6	263.5	155.7	0.0	0.0	0.0	0.0	0.0	0.0	10.1	111.9	
Maximum Storage Depth for Nominated Area	N		mm	<b>263.5</b>																		
Maximum Storage Vol. for Nominated Area	V	$N \times L$	L	<b>56,921</b>																		

<b>BOTTOM AREA REQUIRED FOR ZERO STORAGE</b>			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
			103.1	109.4	122.2	179.6	222.5	310.9	273.1	278.9	217.3	164.5	127.6	113.1	103.1	109.4	122.2	179.6	222.5	310.9
<b>MINIMUM BOTTOM AREA REQUIRED FOR ZERO STORAGE:</b>			<b>311</b> m <sup>2</sup>																	

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 =	<b>600</b>	Depth =	<b>450</b>
	Bed Width =	<b>1,000</b>	Depth =	<b>150</b>
Recommended wick trench length (m) =	<b>255.1</b>			
Minimum trench spacing: 1m for Soil Categories 1-3; and 1.5m for Soil Categories 4-6				
No. of trenches @ (max) 20m length =	<b>13</b>			
Total footprint with 1m spacing (m <sup>2</sup> ) =	<b>689</b>			
Total footprint with 1.5m spacing (m <sup>2</sup> ) =	<b>815</b>			

