Constructed Wetland (Reed Bed) Area by Kickuth

Bed area of a horizontal subsurface-flow constructed wetland to cut BOD from inlet to outlet concentration by the Kickuth equation, with area per person.

Method: Kickuth horizontal-flow constructed wetland sizing equation

Input parameters

Unit system: SI

Parameter	Value	Unit
Daily flow	20.000	m³/d
Inlet BOD	150.00	mg/L
Outlet BOD wanted	20.000	mg/L
Area rate constant	0.10000	m/d
Population served (0 = skip)	150.00	

Calculated results

Parameter	Value	Unit
Bed area	402.98	m²
Area per person	2.6865	m²
Hydraulic loading	49.630	mm/d

Notes for this case

• Kickuth's equation A = Q(ln C_i − ln C_o)/K_BOD treats BOD removal as first order on the bed area, with K_BOD about 0.1 m/day for horizontal subsurface-flow reed beds treating settled domestic sewage. Pre-treat (septic or settling tank) to remove solids that would clog the gravel. Typical results are 2–5 m² per person for secondary treatment; check the cross-section for hydraulic capacity through the gravel too.

Formula and method

$$A = \frac{Q\,(\ln C_i - \ln C_o)}{K_{BOD}}$$

Variables

Q	Daily flow	m³/s
C_i	Inlet BOD	kg/m³
C_o	Outlet BOD wanted	kg/m³
K_{BOD}	Area rate constant	m/s
N	Population served (0 = skip)	-
A	Bed area	m²
A/N	Area per person	m²
q_h	Hydraulic loading	m/s

Method and standards

Constructed wetland.

Assumptions and limits

- Horizontal subsurface flow; first-order BOD removal.

References

Kickuth horizontal-flow constructed wetland sizing equation

Report details

Report reference	FCC-98EP-SH64 (the same inputs always give the same reference)
Generated	23 November 2026, 17:51 UTC
Calculator	Constructed Wetland (Reed Bed) Area by Kickuth
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/environmental/wastewater/constructed-wetland-area

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.