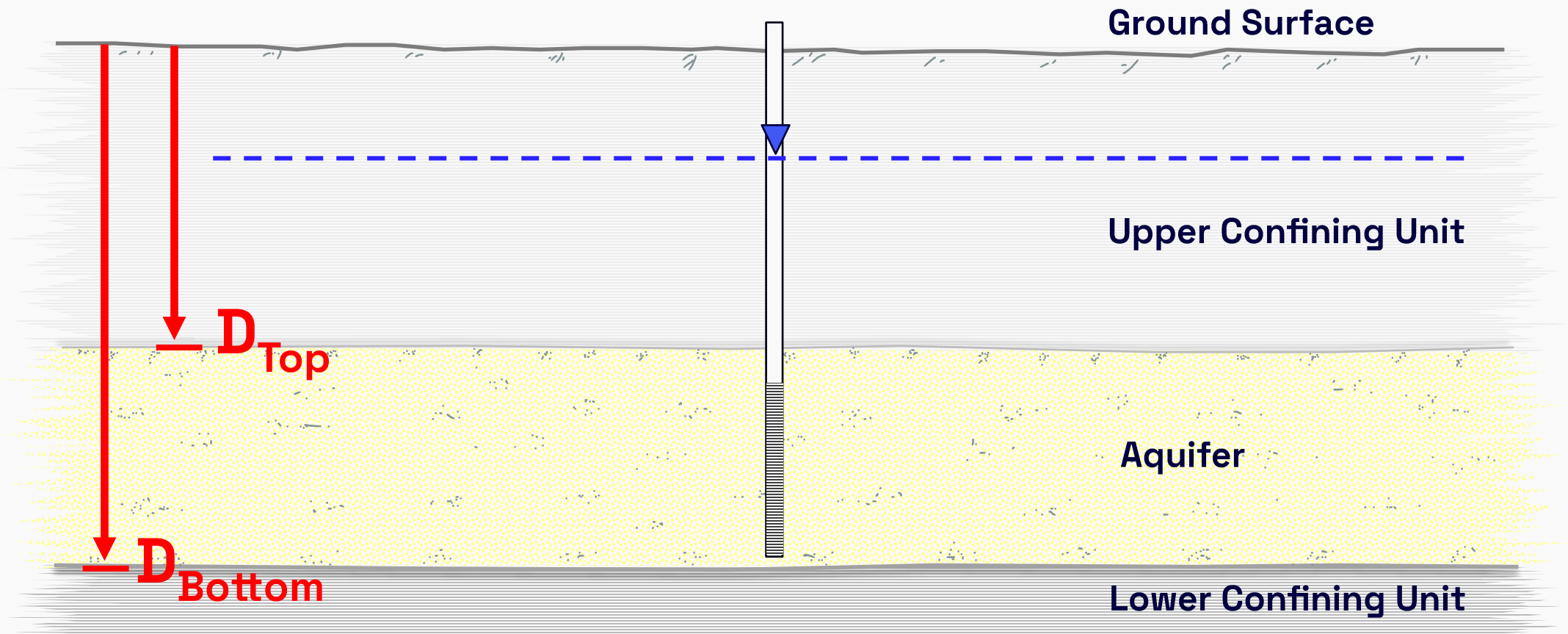
How to Estimate Storage Coefficient from Depth



Van der Gun Equation:

$$S = 1.8 \times 10^{-6}(D_{Bottom} - D_{Top}) + 8.6 \times 10^{-4}(D_{Bottom}^{0.3} - D_{Top}^{0.3})$$

Symbol	Units	Description
S	_	Aquifer storage coefficient
D_{Top}	metres	Depth to the top of the aquifer
D_{Bottom}	metres	Depth to the bottom of the aquifer

When to use this

Use this equation when you need an estimate of aquifer storage coefficient but do not have pumping test results.

You can use this for confined or semi-confined aquifers.

Van der Gun Equation

The Van der Gun equation is an empirical depth-based method for estimating the storage coefficient of sandy aquifers.

This is one of several equations for estimating storage coefficient, and it is notable for using both aquifer depth and thickness.

Key Limitations

This empirical method was developed for confined to semi-confined sandy aquifers.

Use it as an initial estimate and check it against field test data whenever possible.

Inputs & Units

You will require the depth to the top of the aquifer and the depth to the bottom of the aquifer.

Depth must be entered in metres. If needed, convert feet to metres before using the equation.

Case Study

This case study uses pumping-test data from the Oude Korendijk site in The Netherlands, as reported by Kruseman and de Ridder in *Analysis and Evaluation of Pumping Test Data*. The site is described as a confined aquifer system where the first 18 m below ground surface form the confining layer, and the aquifer itself extends from 18 m to 25 m depth. The aquifer consists of coarse sand with some gravel, and for the example the authors assume that all water is derived from this 7 m thick confined aquifer with an impermeable base. The well was pumped at a constant discharge of 9.12 L/s or 788 m³/d for nearly 14 hours.

Estimating storage coefficient with Van der Gunn equation:

$$S = 1.8 \times 10^{-6}(25 - 18) + 8.6 \times 10^{-4}\left(25^{0.3} - 18^{0.3}\right)$$

$$\boldsymbol{S = 2.2 \times 10^{-4}}$$

Field Results

The pumping-test analyses for Oude Korendijk gave storage coefficients ranging from

$\boldsymbol{1.6 \times 10^{-4}}$ **to** $\boldsymbol{4.1 \times 10^{-4}}$.

After reviewing the results, the authors adopted $\boldsymbol{S = 1.7 \times 10^{-4}}$as the final storage coefficient for the site.

For this case study, the Van der Gun equation gave a reasonably good estimate that fell within the range of storage coefficients obtained from the pumping-test analysis.

Further Reading

Boonstra, J., & de Ridder, N. A. (1990). *Numerical modelling of groundwater basins* (2nd ed.). International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands. ISBN 9070260697.

Kasenow, M. (2006). *Aquifer test data: Analysis and evaluation*. Water Resources Publications LLC, Colorado, USA. ISBN 1-887201-41-6.

Van der Gun, J. A. M. (1979). *Schatting van de elastische bergingscoëfficiënt van zandige watervoerende pakketten*. *TNO Jaarverslag 1979*, Delft, pp. 51–61.

Kruseman, G. P., & de Ridder, N. A. (2000). *Analysis and evaluation of pumping test data* (2nd ed., completely revised). ILRI Publication 47, International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands. ISBN 90 70754 207.