Important Erosion and Sediment Deposits Formulas PDF

Formulas
Examples
with Units

List of 16
Important Erosion and Sediment Deposits Formulas

1) Channel Erosion Formulas

1.1) Equation for Suspended Sediment Load Formula

Evaluate Formula

Formula

$$Q_s = K \cdot \left(Q^{n} \right)$$

Example with Units

$$229.5\,\text{t/d} = 0.17 \cdot \left(2.5\,\text{m}^3/\text{s}^{3} \right)$$

1.2) Soil Erodibility Factor given Suspended Sediment Load Formula

Evaluate Formula

Formula

$$K = \frac{Q_s}{Q^{n}}$$

Example with Units

$$0.1704 = \frac{230\,\text{t/d}}{2.5\,\text{m}^3/\text{s}^{3}}$$

1.3) Stream Flow Discharge given Suspended Sediment Load Formula

Evaluate Formula

Formula

$$Q = \left(\frac{Q_s}{K} \right)^{\frac{1}{n}}$$

Example with Units

$$2.5018\,\text{m}^3/\text{s} = \left(\frac{230\,\text{t/d}}{0.17} \right)^{\frac{1}{3}}$$

2) Density of Sediment Deposits Formulas

2.1) Average Unit Weight of Sediment Deposit during Period of T Years Formula

Evaluate Formula

Formula

$$W_{av} = W_{T1} + \left(0.4343 \cdot B_w \right) \cdot \left(\left(\left(\frac{T}{T - 1} \right) \cdot \ln\left(T \right) \right) - 1 \right)$$

Example with Units

$$15.0592\,\text{kN/m}^3 = 15\,\text{kN/m}^3 + \left(0.4343 \cdot 7 \right) \cdot \left(\left(\left(\frac{25\,\text{Year}}{25\,\text{Year} - 1} \right) \cdot \ln\left(25\,\text{Year} \right) \right) - 1 \right)$$

2.2) Equation for Weighted Value of Sand, Silt and Clay Formula

Evaluate Formula

Formula

$$B_w = \frac{W_{av} - W_{T1}}{0.4343 \cdot \left(\left(\left(\frac{T}{T - 1} \right) \cdot \ln\left(T \right) \right) - 1 \right)}$$

Example with Units

$$7.0898 = \frac{15.06\,\text{kN/m}^3 - 15\,\text{kN/m}^3}{0.4343 \cdot \left(\left(\left(\frac{25\,\text{Year}}{25\,\text{Year} - 1} \right) \cdot \ln\left(25\,\text{Year} \right) \right) - 1 \right)}$$

2.3) Initial Unit Weight given Average Unit Weight of Deposit Formula

Evaluate Formula

Formula

$$W_{T1} = W_{av} - \left(0.4343 \cdot B_w \right) \cdot \left(\left(\left(\frac{T}{T - 1} \right) \cdot \ln\left(T \right) \right) - 1 \right)$$

Example with Units

$$15.0008\,\text{kN/m}^3 = 15.06\,\text{kN/m}^3 - \left(0.4343 \cdot 7 \right) \cdot \left(\left(\left(\frac{25\,\text{Year}}{25\,\text{Year} - 1} \right) \cdot \ln\left(25\,\text{Year} \right) \right) - 1 \right)$$

2.4) Percentage of Clay given Unit Weight of Deposit Formula

Evaluate Formula

Formula

$$p_{cl} = \frac{\left(W_{av} \right) - \left(\left(\frac{p_{sa}}{100} \right) \cdot \left(W_1 + B_1 \cdot \log10\left(T \right) \right) \right) - \left(\left(\frac{p_{si}}{100} \right) \cdot \left(W_2 + B_2 \cdot \log10\left(T \right) \right) \right)}{\frac{W_3 + B_3 \cdot \log10\left(T \right)}{100}}$$

Example with Units

$$31.3608 = \frac{\left(15.06\,\text{kN/m}^3 \right) - \left(\left(\frac{20.0}{100} \right) \cdot \left(16.4\,\text{kN/m}^3 + 0.20 \cdot \log10\left(25\,\text{Year} \right) \right) \right) - \left(\left(\frac{35}{100} \right) \cdot \left(19\,\text{kN/m}^3 + 0.10 \cdot \log10\left(25\,\text{Year} \right) \right) \right)}{\frac{16\,\text{kN/m}^3 + 40 \cdot \log10\left(25\,\text{Year} \right)}{100}}$$

2.5) Percentage of Sand given Unit Weight of Deposit Formula

Evaluate Formula

Formula

$$p_{sa} = \frac{\left(W_{av}\right) - \left(\left(\frac{p_{si}}{100}\right) \cdot \left(W_2 + B_2 \cdot \log10\left(T\right)\right)\right) - \left(\left(\frac{p_{cl}}{100}\right) \cdot \left(W_3 + B_3 \cdot \log10\left(T\right)\right)\right)}{\frac{W_1 + B_1 \cdot \log10\left(T\right)}{100}}$$

Example with Units

$$20.0606 = \frac{\left(15.06\,\text{kN/m}^3\right) - \left(\left(\frac{35}{100}\right) \cdot \left(19\,\text{kN/m}^3 + 0.10 \cdot \log10\left(25\,\text{Year}\right)\right)\right) - \left(\left(\frac{31.3}{100}\right) \cdot \left(16\,\text{kN/m}^3 + 40 \cdot \log10\left(25\,\text{Year}\right)\right)\right)}{\frac{16.4\,\text{kN/m}^3 + 0.20 \cdot \log10\left(25\,\text{Year}\right)}{100}}$$

2.6) Percentage of Silt for Unit Weight of Deposits Formula

Evaluate Formula

Formula

$$p_{si} = \frac{\left(W_{av}\right) - \left(\left(\frac{p_{sa}}{100}\right) \cdot \left(W_1 + B_1 \cdot \log10\left(T\right)\right)\right) - \left(\left(\frac{p_{cl}}{100}\right) \cdot \left(W_3 + B_3 \cdot \log10\left(T\right)\right)\right)}{\frac{W_2 + B_2 \cdot \log10\left(T\right)}{100}}$$

Example with Units

$$35.0523 = \frac{\left(15.06\,\text{kN/m}^3\right) - \left(\left(\frac{20.0}{100}\right) \cdot \left(16.4\,\text{kN/m}^3 + 0.20 \cdot \log10\left(25\,\text{Year}\right)\right)\right) - \left(\left(\frac{31.3}{100}\right) \cdot \left(16\,\text{kN/m}^3 + 40 \cdot \log10\left(25\,\text{Year}\right)\right)\right)}{\frac{19\,\text{kN/m}^3 + 0.10 \cdot \log10\left(25\,\text{Year}\right)}{100}}$$

2.7) Rough Estimation for Unit Weight of Deposit by Koelzer and Lara Formula Formula

Evaluate Formula

Formula

$$W_T = \left(\left(\frac{p_{sa}}{100}\right) \cdot \left(W_1 + B_1 \cdot \log10\left(T\right)\right)\right) + \left(\left(\frac{p_{si}}{100}\right) \cdot \left(W_2 + B_2 \cdot \log10\left(T\right)\right)\right) + \left(\left(\frac{p_{cl}}{100}\right) \cdot \left(W_3 + B_3 \cdot \log10\left(T\right)\right)\right)$$

Example with Units

$$15.0501\,\text{kN/m}^3 = \left(\left(\frac{20.0}{100}\right) \cdot \left(16.4\,\text{kN/m}^3 + 0.20 \cdot \log10\left(25\,\text{Year}\right)\right)\right) + \left(\left(\frac{35}{100}\right) \cdot \left(19\,\text{kN/m}^3 + 0.10 \cdot \log10\left(25\,\text{Year}\right)\right)\right) + \left(\left(\frac{31.3}{100}\right) \cdot \left(16\,\text{kN/m}^3 + 40 \cdot \log10\left(25\,\text{Year}\right)\right)\right)$$

2.8) Weighted Value given Average Unit Weight of Deposit Formula

Evaluate Formula

Formula

$$B_w = \frac{\left(p_{sa} \cdot B_1\right) + \left(p_{si} \cdot B_2\right) + \left(p_{cl} \cdot B_3\right)}{100}$$

Example

$$12.595 = \frac{\left(20.0 \cdot 0.20\right) + \left(35 \cdot 0.10\right) + \left(31.3 \cdot 40\right)}{100}$$

3) Movement of Sediments from Watersheds Formulas

3.1) Equation for Sediment Delivery Ratio Formula

Evaluate Formula

Formula

$$SDR = k \cdot \left(A^m\right) \cdot \left(\frac{R}{L}\right)^n$$

Example with Units

$$0.002 = 0.1 \cdot \left(20\,\text{m}^2{}^{0.3}\right) \cdot \left(\frac{10}{50\,\text{m}}\right)^3$$

3.2) Watershed Length when Sediment Delivery Ratio is considered Formula

Evaluate Formula

Formula

$$L = \frac{R}{\left(\frac{SDR}{k \cdot \left(A^m\right)}\right)^{\frac{1}{n}}}$$

Example with Units

$$50.0014\,\text{m} = \frac{10}{\left(\frac{0.001965}{0.1 \cdot \left(20\,\text{m}^2{}^{0.3}\right)}\right)^{\frac{1}{3}}}$$

3.3) Watershed Relief when Sediment Delivery Ratio is considered Formula

Evaluate Formula

Formula

$$R = L \cdot \left(\frac{SDR}{k \cdot \left(A^m\right)}\right)^{\frac{1}{n}}$$

Example with Units

$$9.9997 = 50\,\text{m} \cdot \left(\frac{0.001965}{0.1 \cdot \left(20\,\text{m}^2{}^{0.3}\right)}\right)^{\frac{1}{3}}$$

4) Trap Efficiency Formulas

4.1) Capacity Inflow Ratio Formula

Evaluate Formula

Formula

$$CI = \frac{C}{I}$$

Example with Units

$$0.7143 = \frac{20\,m^3}{28\,m^3/s}$$

4.2) Equation for Trap Efficiency Formula

Evaluate Formula

Formula

$$\eta_t = K_{C/I} \cdot \ln(CI) + M$$

Example

$$99.3171 = 6.064 \cdot \ln(0.7) + 101.48$$

Variables used in list of Erosion and Sediment Deposits Formulas above

- **A** Watershed Area *(Square Meter)*
- B_1 Constant B1
- B_2 Constant B2
- B_3 Constant B3
- B_w Weighted Value of B
- **C** Capacity of Reservoir *(Cubic Meter)*
- **CI** Capacity-Inflow Ratio
- **I** Inflow Rate *(Cubic Meter per Second)*
- **k** Coefficient K
- **K** Soil Erodibility Factor
- $K_{C/I}$ Coefficient K dependent on C/I
- **L** Watershed Length *(Meter)*
- **m** Coefficient m
- **M** Coefficient M dependent on C/I
- **n** Constant n
- p_{cl} Percentage of Clay
- p_{sa} Percentage of Sand
- p_{si} Percentage of Silt
- **Q** Stream Discharge *(Cubic Meter per Second)*
- Q_s Suspended Sediment Load *(Ton (metric) per Day)*
- **R** Watershed Relief
- **SDR** Sediment Delivery Ratio
- **T** Age of Sediment *(Year)*
- W_1 Unit Weight of Sand *(Kilonewton per Cubic Meter)*
- W_2 Unit Weight of Silt *(Kilonewton per Cubic Meter)*
- W_3 Unit Weight of Clay *(Kilonewton per Cubic Meter)*
- W_{av} Average Unit Weight of Deposit *(Kilonewton per Cubic Meter)*
- W_T Unit Weight of Deposit *(Kilonewton per Cubic Meter)*
- W_{T1} Initial Unit Weight *(Kilonewton per Cubic Meter)*
- η_t Trap Efficiency

Constants, Functions, Measurements used in list of Erosion and Sediment Deposits Formulas above

- Functions: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Functions: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Time** in Year (Year)
  Time Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Meter per Second (m^3/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Mass Flow Rate** in Ton (metric) per Day (t/d)
  Mass Flow Rate Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
  Specific Weight Unit Conversion

Download other Important Erosion and Reservoir Sedimentation PDFs

- Important Erosion and Sediment Deposits Formulas
- Important Estimation of Watershed Erosion and Sediment Delivery Ratio Formulas
- Important Prediction of Sediment Distribution Formulas
- Important Soil Loss Equation Formulas

Try our Unique Visual Calculators

- Percentage of number
- LCM calculator
- Simple fraction

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

English Spanish French German Russian Italian Portuguese Polish Dutch

7/9/2024 | 6:52:39 AM UTC