



Water Budget Equation for a Catchment Formulas

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Conversions!

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List of 20 Water Budget Equation for a Catchment Formulas

Water Budget Equation for a Catchment ©

1) Catchment Area given Peak Discharge in Jarvis formula

$$A = \left(rac{Q_p}{C}
ight)^2$$

ex
$$0.000511 \mathrm{m}^2 = \left(\frac{4 \mathrm{m}^3/\mathrm{s}}{177}\right)^2$$

2) Change in Storage of Water in Catchment

fx
$$S = \Delta S + \Delta Sm + \Delta Ss$$

ex
$$18 \text{m}^3 = 7 \text{m}^3 + 6 \text{m}^3 + 5.0 \text{m}^3$$

3) Continuity equation for water balance

fx
$$\Delta \mathrm{s} = \mathrm{Q} - \mathrm{V_o}$$

 $5 {
m m} = 30 {
m m}^3/{
m s} - 25 {
m m}^3$

4) Ground Water Storage given Storage of Water in Catchment

fx
$$\Delta ext{S} = ext{S} - \Delta ext{S} ext{s} - \Delta ext{S} ext{m}$$

ex $7 \text{m}^3 = 18 \text{m}^3 - 5.0 \text{m}^3 - 6 \text{m}^3$

fx
$$V_{
m o}=Q-\Delta s$$

 $25\mathrm{m}^{_3}=30\mathrm{m}^{_3}/\mathrm{s}-5\mathrm{m}^{_3}$

6) Mass Outflow Rate given Change in Mass Storage

fx $Q = \Delta s + V_o$

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 $|\mathbf{ex}| 30 \mathrm{m}^3/\mathrm{s} = 5 \mathrm{m} + 25 \mathrm{m}^3$

7) Mean Annual Flood proposed by Natural Environment Research Council

Open Calculator $m Q_{mean} = C_{NERC} \cdot A_{NERC}^{0.94} \cdot SF^{0.27} \cdot S_{C}^{0.16} \cdot SO^{1.23} \cdot RSMD^{1.03} \cdot (1+a)^{-0.85}$

ex

 $25.045 \text{m}^{\scriptscriptstyle 3}/\text{s} = 0.0315 \cdot (7.6)^{0.94} \cdot (5.5)^{0.27} \cdot (8.7)^{0.16} \cdot (8.9)^{1.23} \cdot (49.2)^{1.03} \cdot (1 + 24 \text{m}^{\scriptscriptstyle 2})^{-0.85}$

8) Precipitation in Rainfall Runoff Relationship

 $\mathbf{f}_{\mathbf{x}} \left[\mathbf{P} = \mathbf{S}_{\mathrm{r}} + \mathbf{L}
ight]$

Open Calculator

 $50 \text{mm} = 0.05 \text{m}^3/\text{s} + 49.95 \text{m}^3$

9) Rainfall Runoff Relationship

 $f_{\mathbf{x}}[S_{\mathbf{r}} = P - L]$ $0.05 \mathrm{m}^3/\mathrm{s} = 50 \mathrm{mm} - 49.95 \mathrm{m}^3$ Open Calculator

10) Runoff Losses in Rainfall Runoff Relationship 🗗

fx $[L = P - S_r]$

Open Calculator

 $49.95 \text{m}^3 = 50 \text{mm} - 0.05 \text{m}^3/\text{s}$

11) Soil Moisture Storage given Storage of Water 🗗

fx $\Delta \mathrm{Sm} = \mathrm{S} - \overline{\Delta \mathrm{Ss} - \Delta \mathrm{S}}$

Open Calculator 2

 $6 \mathrm{m}^{\scriptscriptstyle 3} = 18 \mathrm{m}^{\scriptscriptstyle 3} - 5.0 \mathrm{m}^{\scriptscriptstyle 3} - 7 \mathrm{m}^{\scriptscriptstyle 3}$





12) Surface Water Storage given Storage of Water in Catchment

fx $\Delta \mathrm{Ss} = \mathrm{S} - \Delta \mathrm{Sm} - \Delta \mathrm{S}$

Open Calculator 🚰

 $5 \mathrm{m}^3 = 18 \mathrm{m}^3 - 6 \mathrm{m}^3 - 7 \mathrm{m}^3$

Hydrological Continuity Equation 🗗

13) Daily Groundwater Inflow

 $\overline{V}_{ig} = V_{os} + V_{og} + E_L + \Delta S_L + T_L - P - V_{is}$

Open Calculator

 $5 \text{m}^3/\text{s} = 2 \text{m}^3/\text{s} + 4 \text{m}^3/\text{s} + 1958 \text{mm} + 70 \text{mm} + 22 \text{mm} - 50 \text{mm} - 3 \text{m}^3/\text{s}$

14) Daily Precipitation from Water Budget Continuity Equation

 $P = V_{
m os} + V_{
m og} + E_{
m L} + \Delta S_{
m L} + T_{
m L} - V_{
m is} - V_{
m ig}$

Open Calculator

 $= 2m^3/s + 4m^3/s + 1958mm + 70mm + 22mm - 3m^3/s - 5m^3/s$

15) Daily Seepage Outflow 🔽

 $V_{
m og} = P + V_{
m ig} + V_{
m is} - V_{
m os} - E_{
m L} - \Delta S_{
m L} - T_{
m L}$

Open Calculator

 $\boxed{ \text{ex} \ 4\text{m}^3/\text{s} = 50\text{mm} + 5\text{m}^3/\text{s} + 3\text{m}^3/\text{s} - 2\text{m}^3/\text{s} - 1958\text{mm} - 70\text{mm} - 22\text{mm} }$

16) Daily Surface Inflow into Lake 🖸

 $\overline{V_{
m is} = V_{
m og} + V_{
m os} + E_{
m L} + \Delta S_{
m L} + T_{
m L} - P - V_{
m ig}}$

Open Calculator 🗗

 $= 3 \text{m}^3/\text{s} = 4 \text{m}^3/\text{s} + 2 \text{m}^3/\text{s} + 1958 \text{mm} + 70 \text{mm} + 22 \text{mm} - 50 \text{mm} - 5 \text{m}^3/\text{s}$

17) Daily Surface Outflow from Lake

fx $m V_{os} = P + V_{is} + V_{ig} - V_{og} - E_L - \Delta S_L - T_L$

Open Calculator

 $2 ext{m}^3/ ext{s} = 50 ext{mm} + 3 ext{m}^3/ ext{s} + 5 ext{m}^3/ ext{s} - 4 ext{m}^3/ ext{s} - 1958 ext{mm} - 70 ext{mm} - 22 ext{mm}$





18) Daily Transpiration Loss 🗗

fx $T_{
m L}={
m P}+{
m V}_{
m is}+{
m V}_{
m ig}-{
m V}_{
m os}-{
m V}_{
m og}-{
m E}_{
m L}-\Delta{
m S}_{
m L}$

- Open Calculator
- 19) Equation for Daily Lake Evaporation 🗗
- $ag{E_{
 m L}} = {
 m P} + ({
 m V_{is}} {
 m V_{os}}) + ({
 m V_{ig}} {
 m V_{og}}) {
 m T_L} \Delta {
 m S_L}$
- Open Calculator
- $= 1958 \text{mm} = 50 \text{mm} + (3 \text{m}^3/\text{s} 2 \text{m}^3/\text{s}) + (5 \text{m}^3/\text{s} 4 \text{m}^3/\text{s}) 22 \text{mm} 70 \text{mm}$
- 20) Increase in Lake Storage in day
- $\Delta
 m S_L = P + V_{is} + V_{ig} V_{os} V_{og} E_L T_L$

- Open Calculator
- $70 \text{mm} = 50 \text{mm} + 3 \text{m}^3/\text{s} + 5 \text{m}^3/\text{s} 2 \text{m}^3/\text{s} 4 \text{m}^3/\text{s} 1958 \text{mm} 22 \text{mm}$



Variables Used

- a Area of Lakes or Reservoirs (Square Meter)
- A Catchment Area (Square Meter)
- A_{NERC} Area
- C Coefficient
- C_{NFRC} Constant C
- E_L Daily Lake Evaporation (Millimeter)
- L Runoff Losses (Cubic Meter)
- P Precipitation (Millimeter)
- Q Outflow Rate (Cubic Meter per Second)
- Q_{mean} Mean Annual Flood (Cubic Meter per Second)
- Q_p Peak Discharge (Cubic Meter per Second)
- RSMD RSMD
- S Storage of Water (Cubic Meter)
- Sc Slope of the Catchment
- S_r Surface Runoff (Cubic Meter per Second)
- SF Stream Frequency
- SO Soil Type Index
- T_L Daily Transpiration Loss (Millimeter)
- V_{ig} Daily Groundwater Inflow (Cubic Meter per Second)
- V_{is} Daily Surface Inflow (Cubic Meter per Second)
- Vo Mass Outflow (Cubic Meter)
- V_{og} Daily Seepage Outflow (Cubic Meter per Second)
- ullet V_{os} Daily Surface Outflow (Cubic Meter per Second)
- Δs Change in Mass Storage (Meter)
- **\Delta S** Change in Groundwater Storage (Cubic Meter)
- ΔS_L Increase in Lake Storage in a Day (Millimeter)
- ΔSm Change in Soil Moisture Storage (Cubic Meter)
- ΔSs Change in Surface Water Storage (Cubic Meter)





Constants, Functions, Measurements used

- Measurement: Length in Meter (m), Millimeter (mm)
 Length Unit Conversion
- Measurement: Volume in Cubic Meter (m³)

 Volume Unit Conversion
- Measurement: Area in Square Meter (m²)

 Area Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s)

 Volumetric Flow Rate Unit Conversion





Check other formula lists

- Abstractions from Precipitation
 Formulas
- Area, Velocity and Ultrasonic Method of Streamflow Measurement Formulas
- Discharge Measurements Formulas
- Indirect Methods of Streamflow Measurement Formulas

- Losses from Precipitation Formulas
- Measurement of Evapotranspiration Formulas
- Precipitation Formulas
- Streamflow Measurement Formulas
- Water Budget Equation for a Catchment Formulas

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