

Flood Estimation Report



Project name: Floods estimation example

Project number: 2026-001

Client: City of Tshwane

Designer: Marco van Dijk

Date analysed: 2026-09-16 13:58:59

Project notes: Example flood estimation project for a culvert upgrade

Included sections

1. Rational Method 1
2. Rational Method 2
3. Rational Method 3
4. Standard Design Flood
5. SCS-SA Method
6. Unit Hydrograph Method
7. Empirical Methods

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Rational Method 1



Project name	Floods estimation example	Project no	2026-001
Description of catchment	Moretele Spruit Catchment	River detail	Moretele Spruit
Calculated by	Marco van Dijk	Date	16/09/2026
Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Physical characteristics			
Size of catchment, A (km ²)	26.9	Area distribution factors	
Longest watercourse, L (km)	6.69	Rural, α (%)	30
Height difference along 10-85 slope (m)	109	Urban, β (%)	70
Average slope, S_{av} (m/m)	0.02172	Lakes, γ (%)	0
Rainfall region	Inland	Dolomite area, D (%)	10
Mean annual precipitation, MAP (mm)	746.6		

Rural classification	%	Factor	Contribution	Urban classification	%	Factor	Contribution
Surface slope				Lawns			
Wetlands / vleis and pans	20	0.03	0.0060	Sandy, flat (<2%)	20	0.10	0.0200
Flat areas	70	0.08	0.0560	Sandy, steep (>7%)	10	0.20	0.0200
Hilly	10	0.16	0.0160	Heavy soil, flat (<2%)	0	0.17	0.0000
Steep areas	0	0.26	0.0000	Heavy soil, steep (>7%)	0	0.35	0.0000
Surface slope weighted result (C_s)	100	-	0.0780	Residential areas			
Permeability				Houses	40	0.50	0.2000
Very permeable	0	0.04	0.0000	Flats	5	0.70	0.0350
Permeable	50	0.08	0.0400	Industry			
Semi-permeable	50	0.16	0.0800	Light industry	5	0.80	0.0400
Impermeable	0	0.26	0.0000	Heavy industry	0	0.90	0.0000
Permeability weighted result (C_p)	100	-	0.1200	Business			
Vegetation				City centre	0	0.95	0.0000
Thick bush and plantation	0	0.04	0.0000	Suburban	10	0.70	0.0700
Light bush and farm-lands	45	0.11	0.0495	Streets	10	0.95	0.0950
Grasslands	50	0.21	0.1050	Maximum flood	0	1.00	0.0000
No vegetation	5	0.28	0.0140				
Vegetation weighted result (C_v)	100	-	0.1685				

Rural - C_1	0.3665	Urban - C_2	0.4800	Lakes - C_3	1.0000
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Time of concentration, T_c	Value	Adjustment factor	Selection
Defined watercourse	1.252 h	F_t	Flat and permeable catchments

Runoff coefficient							
Return period, T (years)	2	5	10	20	25	50	100
Run-off coefficient, C_1	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665
Adjusted for dolomitic areas, C_{1D}	0.3370	0.3370	0.3370	0.3370	0.3370	0.3370	0.3370
Adjustment factor for initial saturation, F_t	0.500	0.550	0.600	0.670	0.709	0.830	1.000
Adjusted run-off coefficient, C_{1T}	0.1685	0.1853	0.2022	0.2258	0.2389	0.2797	0.3370
Combined run-off coefficient, C_T	0.387	0.392	0.397	0.404	0.408	0.420	0.437

Rural runoff coefficient C_{1D} includes dolomitic factors where applicable. | The adjustment saturation factor F_t is applied only to the rural runoff coefficient for each return period.

Rainfall							
Return period, T (years)	2	5	10	20	25	50	100
Point rainfall, P_T (mm)	37.2	50.7	64.1	79.2	84.9	102.9	126.6
Point intensity, P_{IT} (mm/h)	29.7	40.5	51.2	63.2	67.8	82.2	101.2
Area reduction factor, ARF_T (%)	97.2	96.2	95.2	94.0	93.6	92.2	90.4
Average intensity, I_T (mm/h)	28.9	38.9	48.7	59.4	63.5	75.8	91.5

The HRU, Report 2/78, Depth-Duration-Frequency diagram was used to determine the point rainfall.

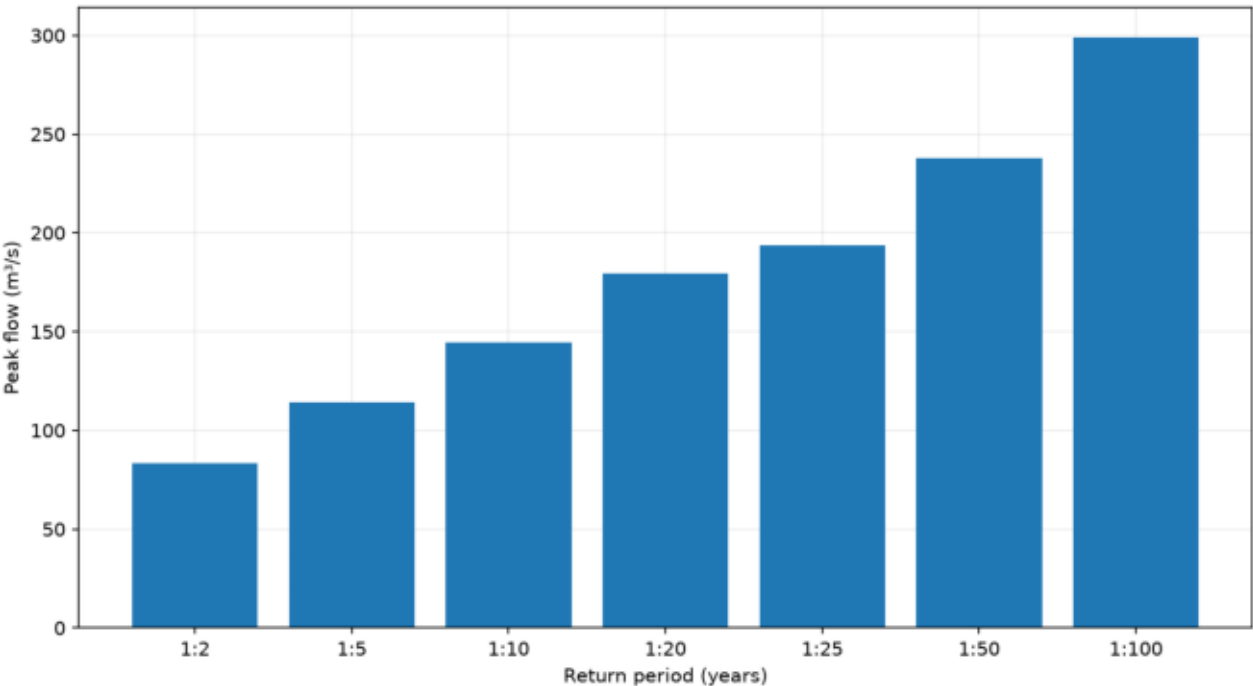
Peak flow results							
Return period, T (years)	2	5	10	20	25	50	100
Peak flow, Q (m ³ /s)	83	114	145	179	194	238	299

Rational Method 1 Graph



Rational Method 1 Floods estimation example

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Rational Method 2



Project name	Floods estimation example	Project no	2026-001
Description of catchment	Moretele Spruit Catchment	River detail	Moretele Spruit
Calculated by	Marco van Dijk	Date	16/09/2026
Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Physical characteristics			
Size of catchment, A (km ²)	26.9	Area distribution factors	
Longest watercourse, L (km)	6.69	Rural, α (%)	30
Height difference along 10–85 slope (m)	109	Urban, β (%)	70
Average slope, S_{av} (m/m)	0.02172	Lakes, γ (%)	0
Mean annual precipitation, MAP (mm)	746.6	Dolomite area, D (%)	10

Rural classification	%	Factor	Contribution	Urban classification	%	Factor	Contribution
Surface slope				Lawns			
Wetlands / vleis and pans	20	0.03	0.0060	Sandy, flat (<2%)	20	0.10	0.0200
Flat areas	70	0.08	0.0560	Sandy, steep (>7%)	10	0.20	0.0200
Hilly	10	0.16	0.0160	Heavy soil, flat (<2%)	0	0.17	0.0000
Steep areas	0	0.26	0.0000	Heavy soil, steep (>7%)	0	0.35	0.0000
Surface slope weighted result (C_s)	100	-	0.0780	Residential areas			
Permeability				Houses	40	0.50	0.2000
Very permeable	0	0.04	0.0000	Flats	5	0.70	0.0350
Permeable	50	0.08	0.0400	Industry			
Semi-permeable	50	0.16	0.0800	Light industry	5	0.80	0.0400
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Permeability weighted result (C_p)	100	-	0.1200	Business			
Vegetation				City centre	0	0.95	0.0000
Thick bush and plantation	0	0.04	0.0000	Suburban	10	0.70	0.0700
Light bush and farm-lands	45	0.11	0.0495	Streets	10	0.95	0.0950
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No vegetation	5	0.28	0.0140				
Vegetation weighted result (C_v)	100	-	0.1685				
Rural - C_1	0.3665	Urban - C_2	0.4800	Lakes - C_3	1.0000		

Time of concentration, T_c	Value	Adjustment factor	Selection
Defined watercourse	1.252 h	F_t	Flat and permeable catchments

Runoff coefficient								
Return period, T (years)	2	5	10	20	25	50	100	200
Run-off coefficient, C_1	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665
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Adjustment factor for initial saturation, F_t	0.500	0.550	0.600	0.670	0.709	0.830	1.000	1.000
Adjusted run-off coefficient, C_{1T}	0.1685	0.1853	0.2022	0.2258	0.2389	0.2797	0.3370	0.3370
Combined run-off coefficient, C_T	0.387	0.392	0.397	0.404	0.408	0.420	0.437	0.437

Rural runoff coefficient C_{1D} includes dolomitic factors where applicable. | The adjustment saturation factor F_t is applied only to the rural runoff coefficient for each return period.

TR102 Rainfall station & n-day rainfall data (mm)										
Station nr	0513437	Duration / Return period	1:2	1:5	1:10	1:20	1:25*	1:50	1:100	1:200
Station location	PRETORIA (WATERKL00F)	1 day	69	98	121	146	155.0	183	215	250
		2 days	86	121	149	178	188.7	222	259	301
Station MAP	761 mm	3 days	96	137	169	204	216.4	255	299	347
Days thunder heard	61 days/year	7 days	120	170	208	247	261.1	305	353	405

*The 1:25-year rainfall values are interpolated values. | The modified recalibrated Hershfield relationship was used to determine the point rainfall.

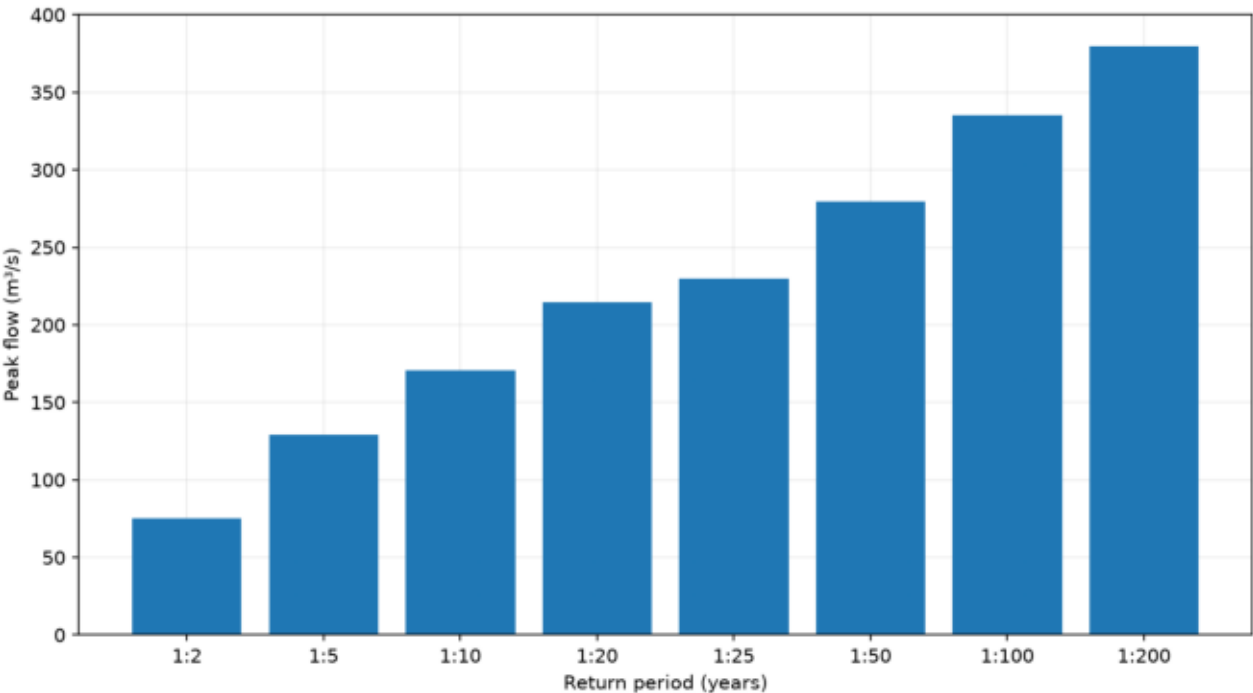
Rainfall								
Return period, T (years)	2	5	10	20	25	50	100	200
Point rainfall, P_T (mm)	34.0	57.4	75.0	92.7	98.4	116.1	133.7	151.4
Area reduction factor, ARF_T (%)	96.0	96.0	96.0	96.0	96.0	96.0	96.0	96.0
Average intensity, I_T (mm/h)	26.1	44.0	57.5	71.1	75.5	89.0	102.6	116.1

Peak flow results								
Return period, T (years)	2	5	10	20	25	50	100	200
Peak flow, Q (m ³ /s)	75	129	171	215	230	280	335	380

Rational Method 2

Floods estimation example

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Rational Method 3



Project name	Floods estimation example	Project no	2026-001
Description of catchment	Moretele Spruit Catchment	River detail	Moretele Spruit
Calculated by	Marco van Dijk	Date	16/09/2026
Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Physical characteristics			
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Mean annual precipitation, MAP (mm)	746.6	Dolomite area, D (%)	10

Rural classification	%	Factor	Contribution	Urban classification	%	Factor	Contribution
Surface slope				Lawns			
Wetlands / vleis and pans	20	0.03	0.0060	Sandy, flat (<2%)	20	0.10	0.0200
Flat areas	70	0.08	0.0560	Sandy, steep (>7%)	10	0.20	0.0200
Hilly	10	0.16	0.0160	Heavy soil, flat (<2%)	0	0.17	0.0000
Steep areas	0	0.26	0.0000	Heavy soil, steep (>7%)	0	0.35	0.0000
Surface slope weighted result (C_s)	100	-	0.0780	Residential areas			
Permeability				Houses	40	0.50	0.2000
Very permeable	0	0.04	0.0000	Flats	5	0.70	0.0350
Permeable	50	0.08	0.0400	Industry			
Semi-permeable	50	0.16	0.0800	Light industry	5	0.80	0.0400
Impermeable	0	0.26	0.0000	Heavy industry	0	0.90	0.0000
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Vegetation				City centre	0	0.95	0.0000
Thick bush and plantation	0	0.04	0.0000	Suburban	10	0.70	0.0700
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Time of concentration, T_c	Value	Adjustment factor	Selection
Defined watercourse	1.252 h	F_t	Flat and permeable catchments

Runoff coefficient								
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Run-off coefficient, C_1	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665	0.3665
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Adjusted run-off coefficient, C_{1T}	0.1685	0.1853	0.2022	0.2258	0.2389	0.2797	0.3370	0.3370
Combined run-off coefficient, C_T	0.219	0.240	0.262	0.293	0.310	0.363	0.437	0.437

Rural runoff coefficient C_{1D} includes dolomitic factors where applicable. | The adjustment saturation factor F_t is applied only to the rural runoff coefficient for each return period.

Rainfall information	
Extraction method	3. Area-weighted grid rainfall
Location method	Latitude / longitude
Catchment file	Catchment.gpkg
Rainfall data used	Estimate
Average MAP / contributing grid cells	724.7 mm 18 grid cells

Rational Method 3



Design rainfall								
Duration	1:2	1:5	1:10	1:20	1:25*	1:50	1:100	1:200
5 min	9.5	13.2	15.9	18.8	19.9	23.1	26.7	30.6
10 min	13.9	19.2	23.2	27.5	29.0	33.7	38.9	44.7
15 min	17.4	24.0	29.0	34.3	36.2	42.1	48.6	55.8
30 min	22.2	30.6	37.0	43.8	46.2	53.7	62.0	71.2
45 min	25.6	35.3	42.7	50.5	53.3	61.9	71.5	82.1
1 hour	28.3	39.1	47.2	55.9	59.0	68.5	79.2	90.8
1.5 hour	32.6	45.1	54.5	64.5	68.0	79.1	91.3	104.8
2 hour	36.1	49.9	60.3	71.4	75.3	87.5	101.0	115.9
4 hour	43.3	59.7	72.2	85.5	90.2	104.8	121.0	138.9
6 hour	48.1	66.4	80.3	95.0	100.3	116.5	134.5	154.4
8 hour	51.8	71.6	86.5	102.4	108.1	125.6	145.0	166.4
10 hour	55.0	75.9	91.7	108.6	114.5	133.1	153.7	176.4
12 hour	57.6	79.6	96.2	113.9	120.1	139.6	161.2	185.0
16 hour	62.1	85.8	103.7	122.7	129.5	150.5	173.8	199.4
20 hour	65.8	90.9	109.9	130.1	137.3	159.5	184.2	211.4
24 hour	69.1	95.3	115.3	136.4	143.9	167.3	193.2	221.7
1 day	58.7	81.0	97.9	115.9	122.3	142.1	164.1	188.3
2 day	72.3	99.9	120.7	142.9	150.8	175.2	202.3	232.2
3 day	81.8	112.9	136.5	161.5	170.4	198.1	228.7	262.5
4 day	89.3	123.3	149.1	176.4	186.2	216.3	249.8	286.7
5 day	95.6	132.0	159.6	188.9	199.3	231.7	267.5	307.0
6 day	101.1	139.6	168.8	199.8	210.8	245.0	282.9	324.7
7 day	106.0	146.4	177.0	209.5	221.0	256.9	296.7	340.4

The storm duration used in the analysis was 1.252 hours.

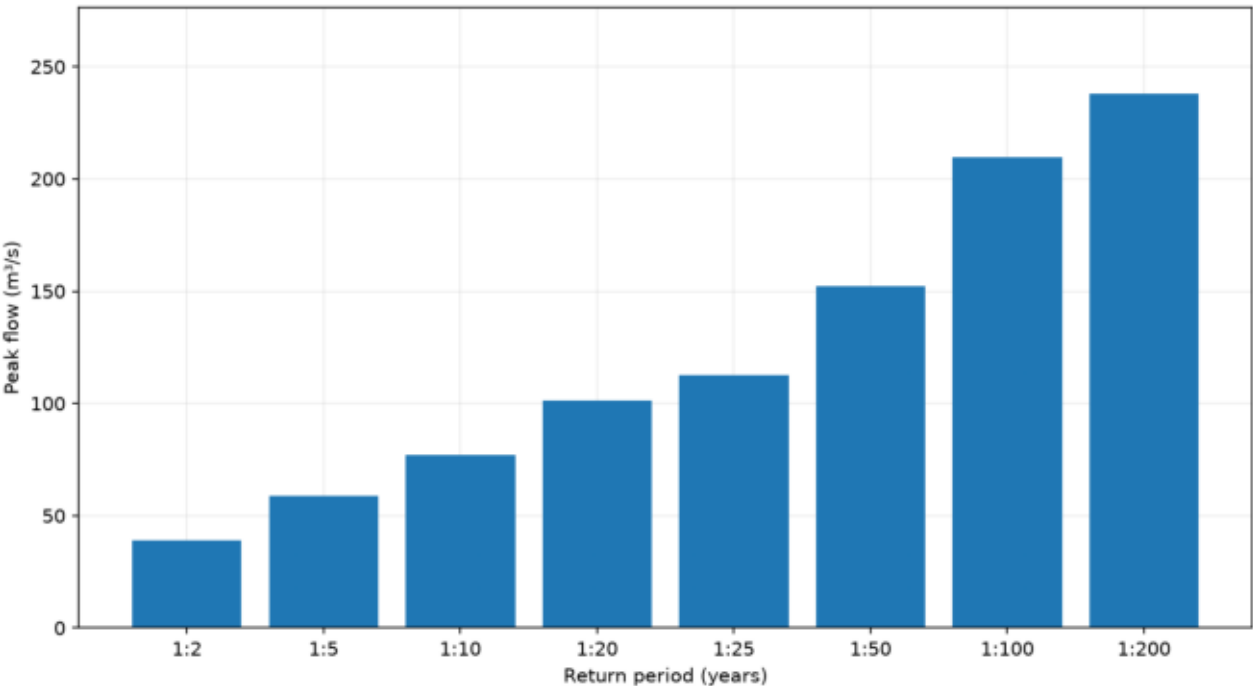
Rainfall								
Return period, T (years)	2	5	10	20	25	50	100	200
Point rainfall, P_T (mm)	30.7	42.4	51.2	60.7	64.0	74.4	85.9	98.6
Point intensity, Pi_T (mm/h)	24.5	33.9	40.9	48.4	51.1	59.4	68.6	78.7
Area reduction factor, ARF_T (%)	97.7	96.8	96.1	95.4	95.2	94.4	93.5	92.5
Average intensity, I_T (mm/h)	24.0	32.8	39.3	46.2	48.6	56.1	64.1	72.9

Peak flow results								
Return period, T (years)	2	5	10	20	25	50	100	200
Peak flow, Q (m ³ /s)	39.1	59	77	101	113	152	210	238

Rational Method 3

Floods estimation example

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Standard Design Flood



Project name	Floods estimation example	Project no	2026-001
Description of catchment	Moretele Spruit Catchment	River detail	Moretele Spruit
Calculated by	Marco van Dijk	Date	16/09/2026
Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Physical characteristics			
Size of catchment, A (km ²)	26.9	Height difference along 10–85 slope (m)	109.0
Longest watercourse, L (km)	6.69	Average slope, S_{av} (m/m)	0.02172

Drainage basin characteristics			
Drainage basin number	1	Basin mean annual precipitation, MAP (mm)	550
Mean annual daily maximum rain, M (mm)	56	Basin mean annual evaporation, MAE (mm)	1800
Days on which thunder was heard, R (days/year)	30	Basin evaporation index MAE/MAP	3.27
Runoff coefficient C_2 (%)	10	Runoff coefficient C_{100} (%)	40
Time of concentration, T_C (h)	1.252		

Rainfall data	
Weather services station (from TR102)	546204 – STRUAN
Point mean annual precipitation (mm)	550
Coordinates of this rainfall station (Latitude and longitude)	25°24' & 26°07'

The rainfall data in the table below are derived from two sources. The daily rainfall is from the Department of Water Affairs' publication TR102 for the representative site. The Hershfield equation is used for durations up to four hours. Linear interpolation is used for values between 4 hours and one day.

Design rainfall (mm)								
Duration	1:2	1:5	1:10	1:20	1:25*	1:50	1:100	1:200
0.25 h	15.0	25.3	33.2	41.0	43.5	51.3	59.1	66.9
0.5 h	19.6	33.0	43.1	53.3	56.6	66.7	76.9	87.1
1 h	24.1	40.6	53.1	65.7	69.7	82.2	94.7	107.2
2 h	28.6	48.3	63.1	78.0	82.8	97.6	112.5	127.4
4 h	33.1	55.9	73.1	90.3	95.9	113.1	130.3	147.5
1 day	56.0	80.0	99.0	119.0	126.5	150.0	177.0	206.0
2 day	71.0	105.0	132.0	161.0	171.7	205.0	243.0	286.0
3 day	80.0	117.0	146.0	177.0	188.4	224.0	263.0	308.0
7 day	102.0	154.0	196.0	242.0	258.6	310.0	369.0	435.0

*The 1:25-year rainfall values are interpolated values.

Rainfall								
Return period, T (years)	2	5	10	20	25	50	100	200
Point rainfall, P_T (mm)	25.5	43.1	56.4	69.7	73.9	87.2	100.5	113.8
Point intensity, P_{IT} (mm/h)	20.4	34.4	45.0	55.6	59.1	69.7	80.3	90.9
Area reduction factor, ARF_T (%)	96.0	96.0	96.0	96.0	96.0	96.0	96.0	96.0
Average intensity, I_T (mm/h)	19.6	33.1	43.2	53.4	56.7	66.9	77.1	87.2

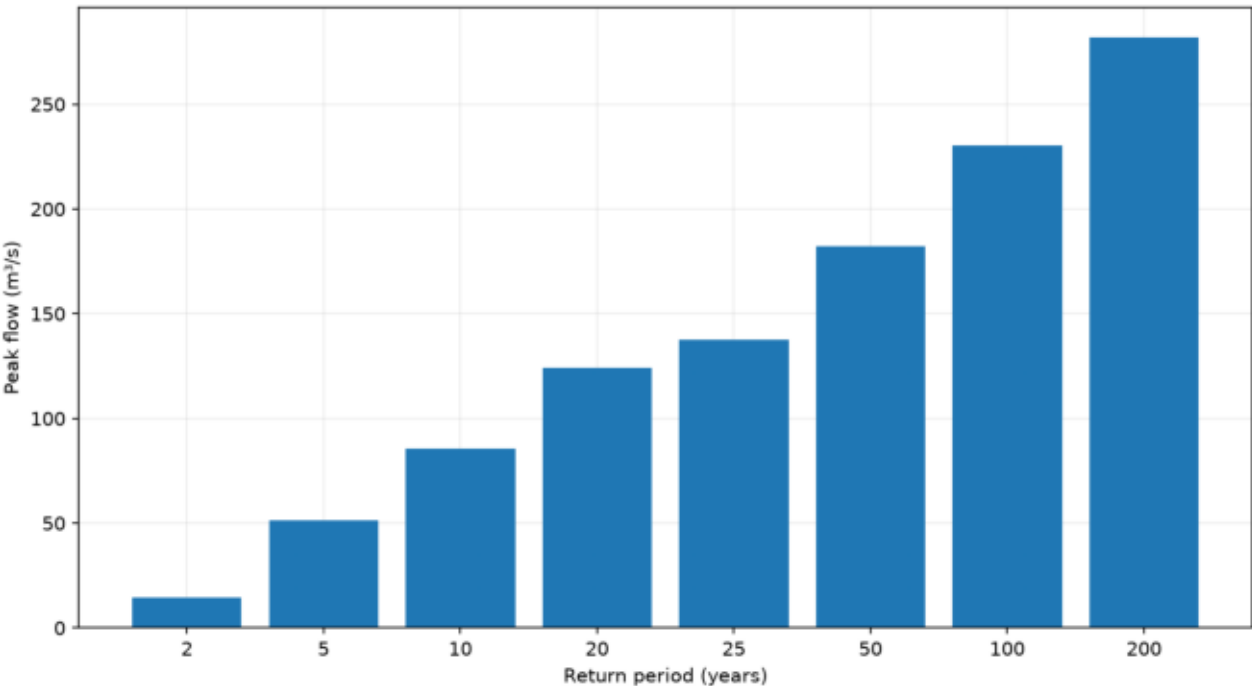
Runoff coefficients								
Return period, T (years)	2	5	10	20	25	50	100	200
Runoff coefficient, (%)	10.0	20.8	26.5	31.1	32.4	36.4	40.0	43.2

Peak flow results								
Return period, T (years)	2	5	10	20	25	50	100	200
Peak flow, Q (m ³ /s)	14.7	51	86	124	137	182	231	282

Standard Design Flood

Floods estimation example

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SCS-SA Method



Project name	Floods estimation example	Project no	2026-001
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Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Catchment characteristics			
Size of catchment, A (km ²)	26.9	Height difference along 10-85 slope (m)	109.0
Longest watercourse, L (km)	6.69	Mean annual precipitation, MAP (mm)	746.6

Catchment response			
Average slope, S_{av} (m/m)	0.02172	Lag estimation method	Time of Concentration
Time of concentration, T_C (h)	1.252	Catchment lag (hours)	0.751
Initial abstraction ratio, λ	0.10	Area Reduction Factor method	Alexander Area Reduction Factor

HRU parameters								
HRU	Area (%)	Soil	Land cover	Treatment	Stormflow	CN	S (mm)	Ia (mm)
1	30.0	B/C	Urban/Suburban Land Uses	7 = Residential: lot size 1350 m ² - 30% impervious	Not applicable	77.0	75.9	7.6
2	30.0	B/C	Urban/Suburban Land Uses	8 = Residential: lot size 2000 m ² - 25% impervious	Not applicable	76.0	80.2	8.0
3	20.0	A	Veld (range) and Pasture	2 = Veld/pasture in fair condition	Moderate	49.0	264.4	26.4
4	20.0	B/C	Veld (range) and Pasture	2 = Veld/pasture in fair condition	Moderate	75.0	84.7	8.5

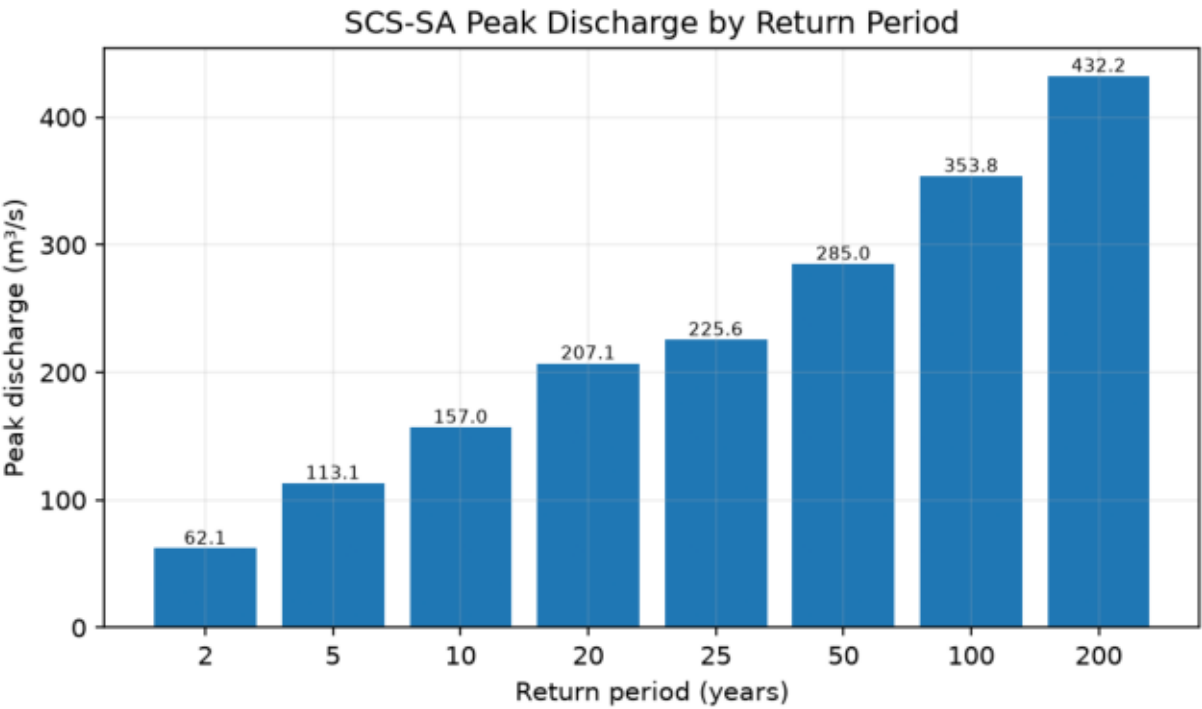
Rainfall information	
Extraction method	3. Area-weighted grid rainfall
Location method	Latitude / longitude
Catchment file	Catchment.gpkg
Rainfall data used	Estimate
Average MAP / contributing grid cells	724.7 mm 18 grid cells

Rainfall								
Return period, T (years)	2	5	10	20	25	50	100	200
Point one-day rainfall, P_D (mm)	58.7	81.0	97.9	115.9	122.3	142.1	164.1	188.3
Area reduction factor, ARF_T (%)	96.0	96.0	96.0	96.0	96.0	96.0	96.0	96.0
Catchment one-day rainfall, P (mm)	56.3	77.8	94.0	111.3	117.4	136.4	157.6	180.8
Catchment stormflow depth, Q (mm)	15.2	27.7	38.5	50.8	55.3	69.9	86.8	106.0
Stormflow volume, V (Million m ³)	0.410	0.746	1.036	1.366	1.488	1.881	2.335	2.852

Peak flow results								
Return period, T (years)	2	5	10	20	25	50	100	200
Peak flow, Q (m ³ /s)	62	113	157	207	226	285	354	432

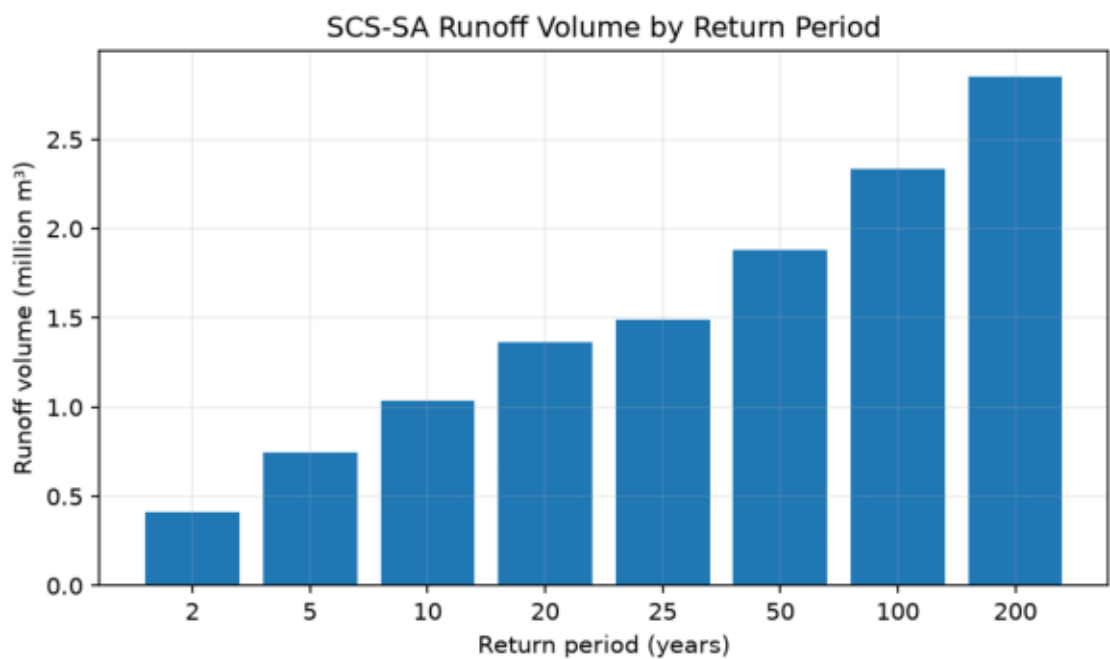
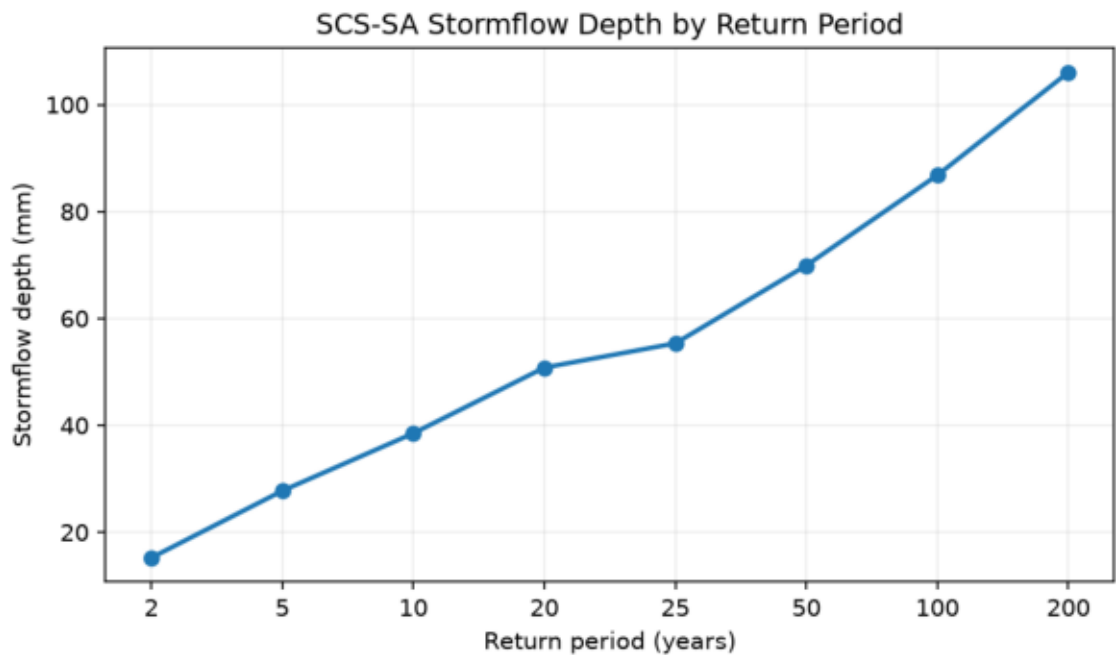
SCS-SA Method

Floods estimation example



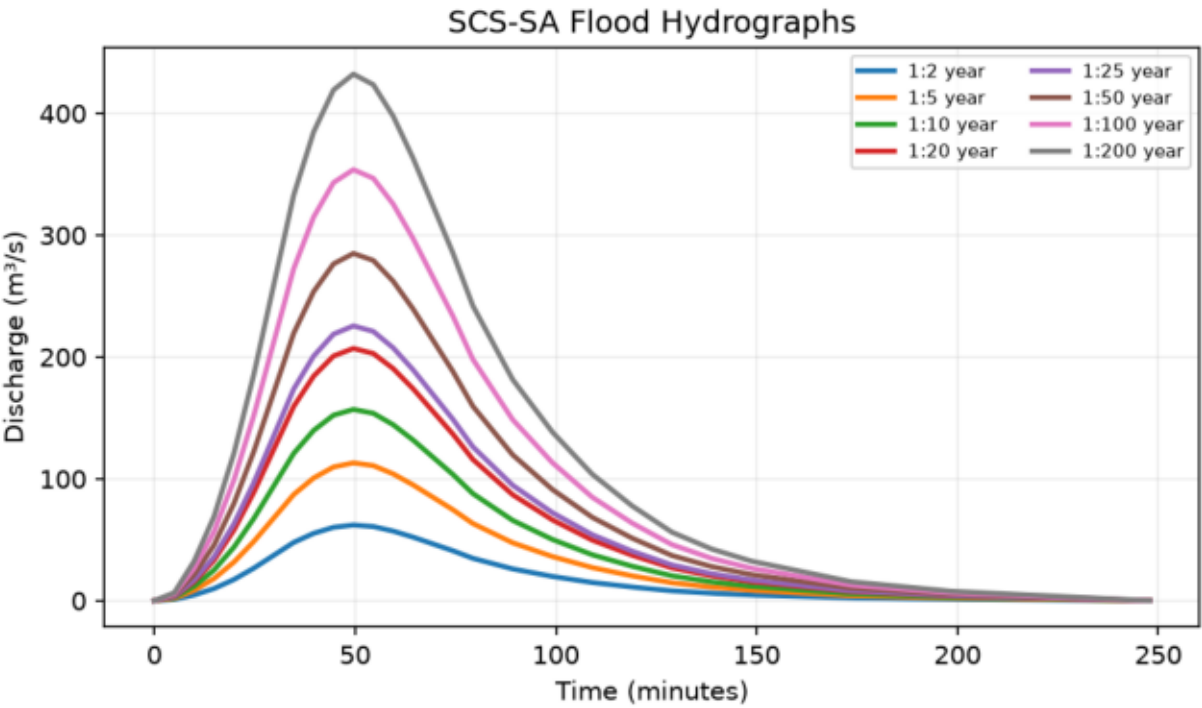
SCS-SA Method

Floods estimation example



SCS-SA Method

Floods estimation example



Unit Hydrograph Method



Project name	Floods estimation example	Project no	2026-001
Description of catchment	Moretele Spruit Catchment	River detail	Moretele Spruit
Calculated by	Marco van Dijk	Date	16/09/2026
Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Catchment characteristics			
Catchment area, A (km ²)	26.9	Mean annual precipitation, MAP (mm)	746.6
Length of longest watercourse, L (km)	6.69	Distance to catchment centroid, L _C (km)	3.350
Height difference along 10-85 slope, ΔH ₁₀₋₈₅ (m)	109.0	Veld-type zone	8 - Bushveld

Unit hydrograph parameters			
Average stream slope, S _{av} (m/m)	0.021724	Catchment index, I _C	152.055
Lag coefficient, C _t	0.432	Basin lag, T _L (h)	1.163
Coefficient, Ku	0.367	One-millimetre one-hour UH peak, Q _p (m ³ /s/mm)	8.487

Rainfall information	
Extraction method	3. Area-weighted grid rainfall
Location method	Latitude / longitude
Catchment file	Catchment.gpkg
Rainfall data used	Estimate
Average MAP / contributing grid cells	724.7 mm 18 grid cells

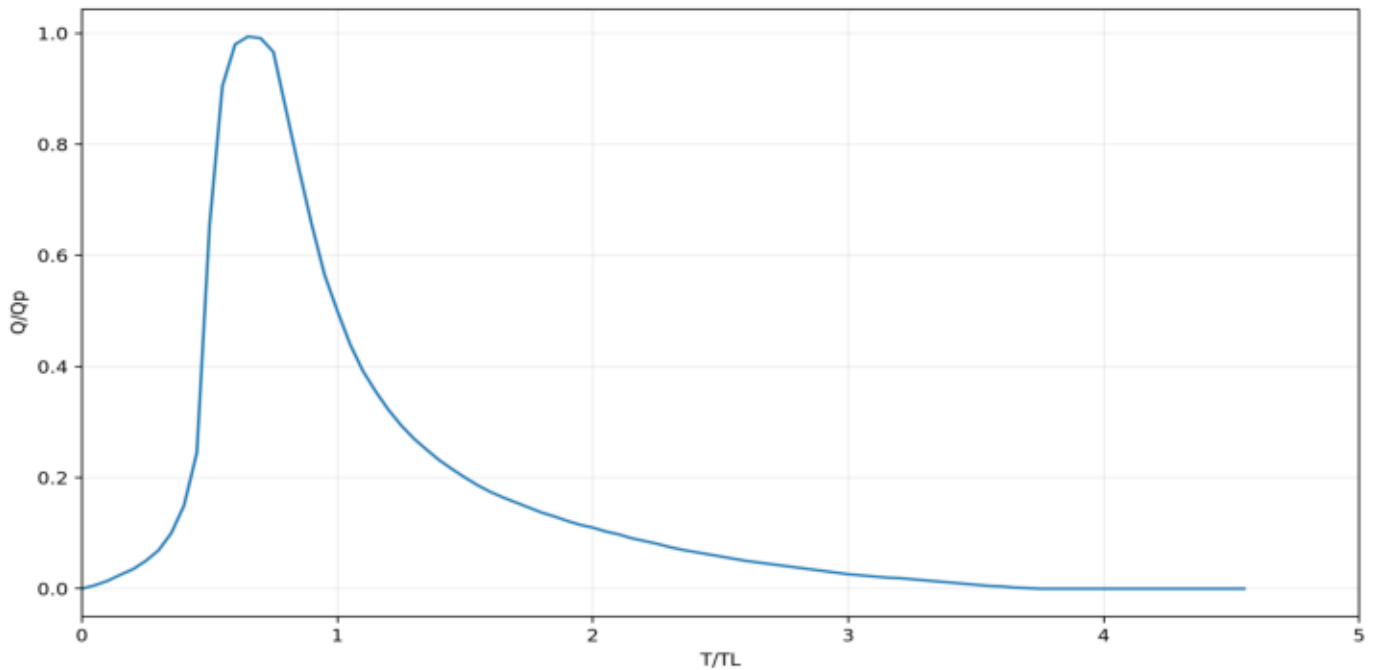
Rainfall								
Return period, T (years)	2	5	10	20	25	50	100	200
Critical duration, T _{SD} (min)	15	15	15	15	15	15	20	20
Point rainfall, P _T (mm)	17.4	24.0	29.0	34.3	36.2	42.1	54.2	62.2
Rainfall intensity, P _{iT} (mm/h)	69.5	95.9	116.0	137.3	144.8	168.3	162.5	186.5
ARF (%)	93.4	90.9	89.0	87.0	86.3	84.1	84.6	82.3
Average rainfall, P _{AvgiT} (mm)	16.2	21.8	25.8	29.9	31.2	35.4	45.8	51.2
Runoff factor, f _{iT} (%)	7.3	8.9	10.0	10.9	11.2	12.1	14.2	15.2
Effective rainfall, H _{eIT} (mm)	1.2	1.9	2.6	3.3	3.5	4.3	6.5	7.8
UH peak, Q _{pIT} (m ³ /s/mm)	28.23	28.23	28.23	28.23	28.23	28.23	22.52	22.52

Peak flow results								
Return period, T (years)	2	5	10	20	25	50	100	200
Peak flow, Q _{iT} (m ³ /s)	33.4	55	73	92	99	121	146	175
Adjusted peak flow, Q _T (m ³ /s)	33.4	55	73	92	99	121	146	175

Dimensionless 1-hour Unit hydrograph - Veld type zone 8

Floods estimation example

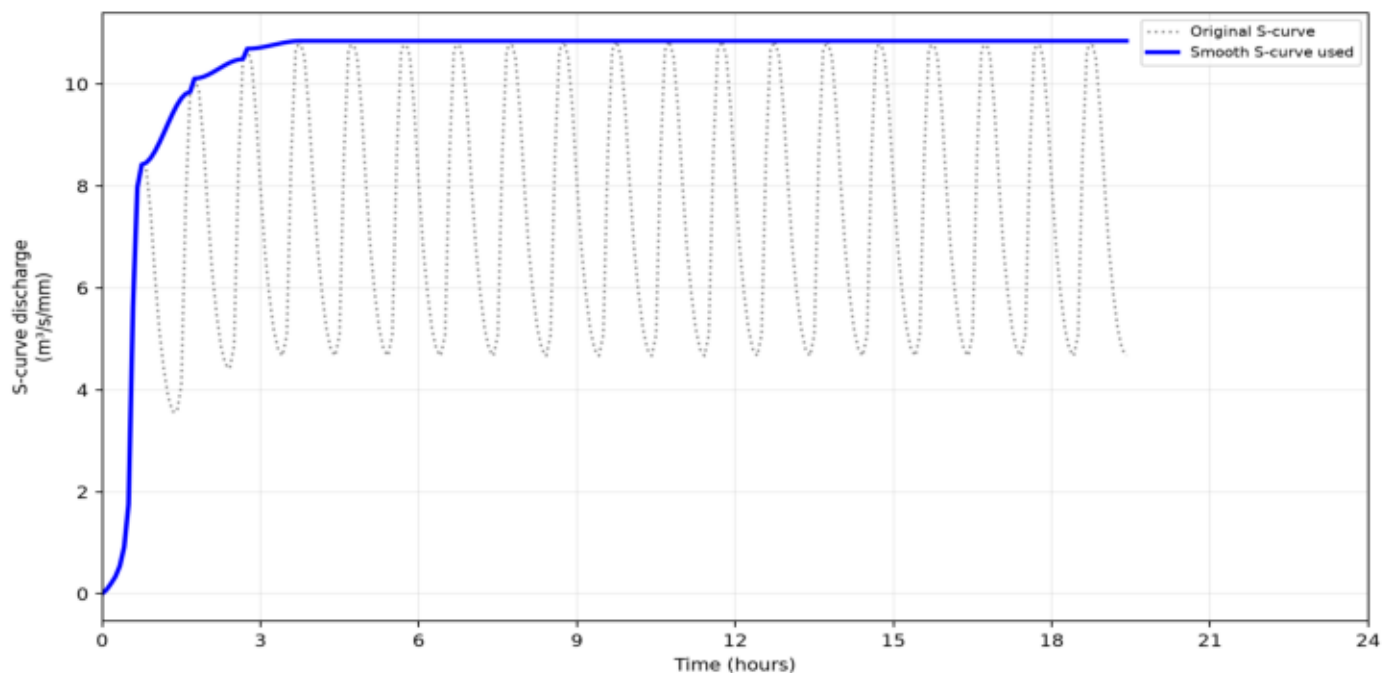
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Compiled S-curve

Floods estimation example

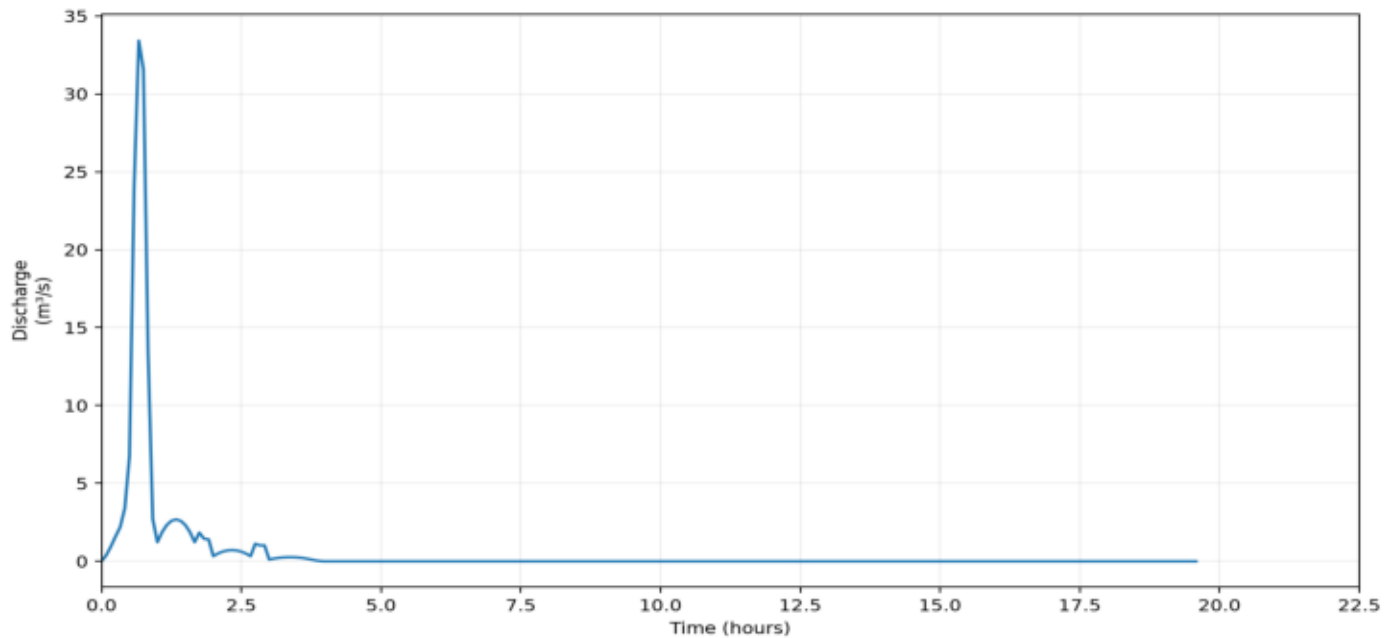
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Flood hydrograph - 15 min - 1:2

Floods estimation example

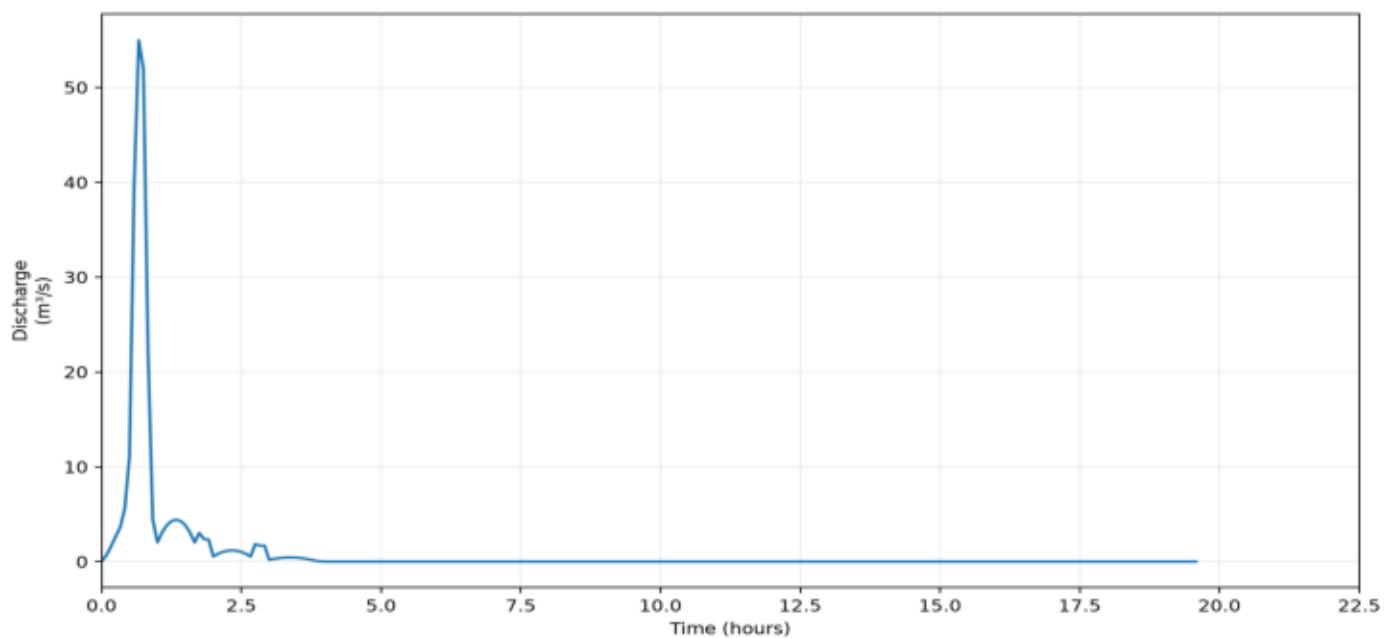
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Flood hydrograph - 15 min - 1:5

Floods estimation example

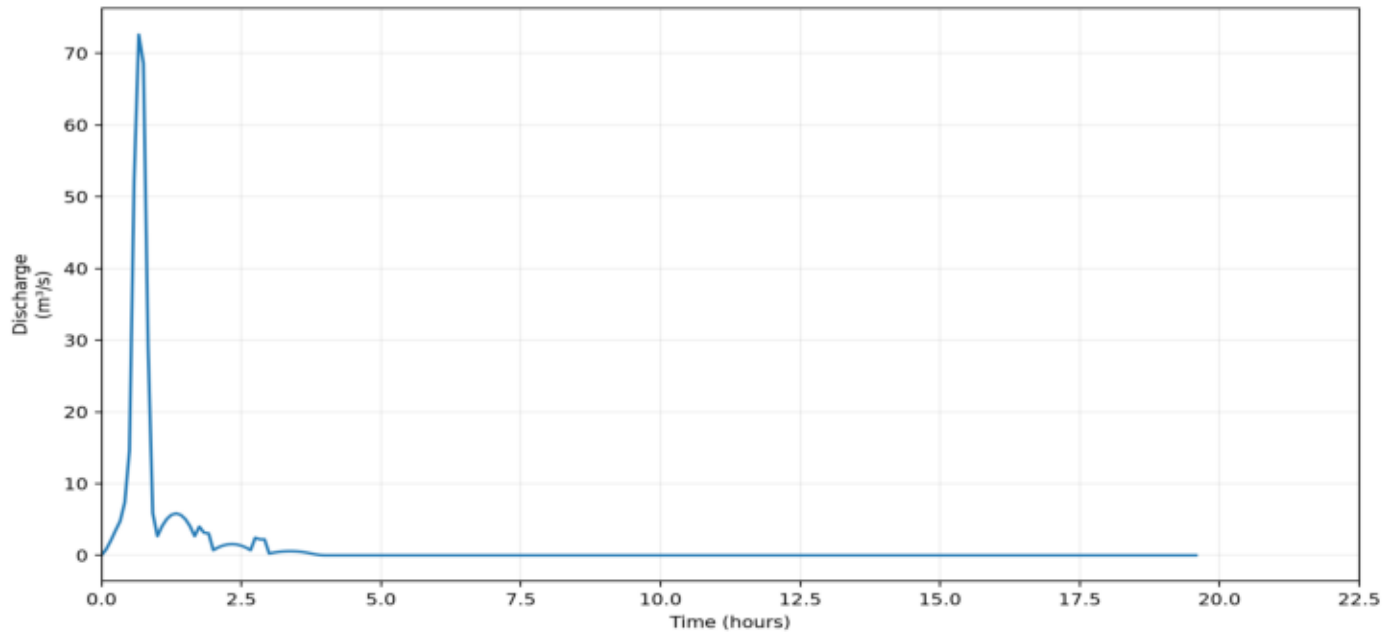
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Flood hydrograph - 15 min - 1:10

Floods estimation example

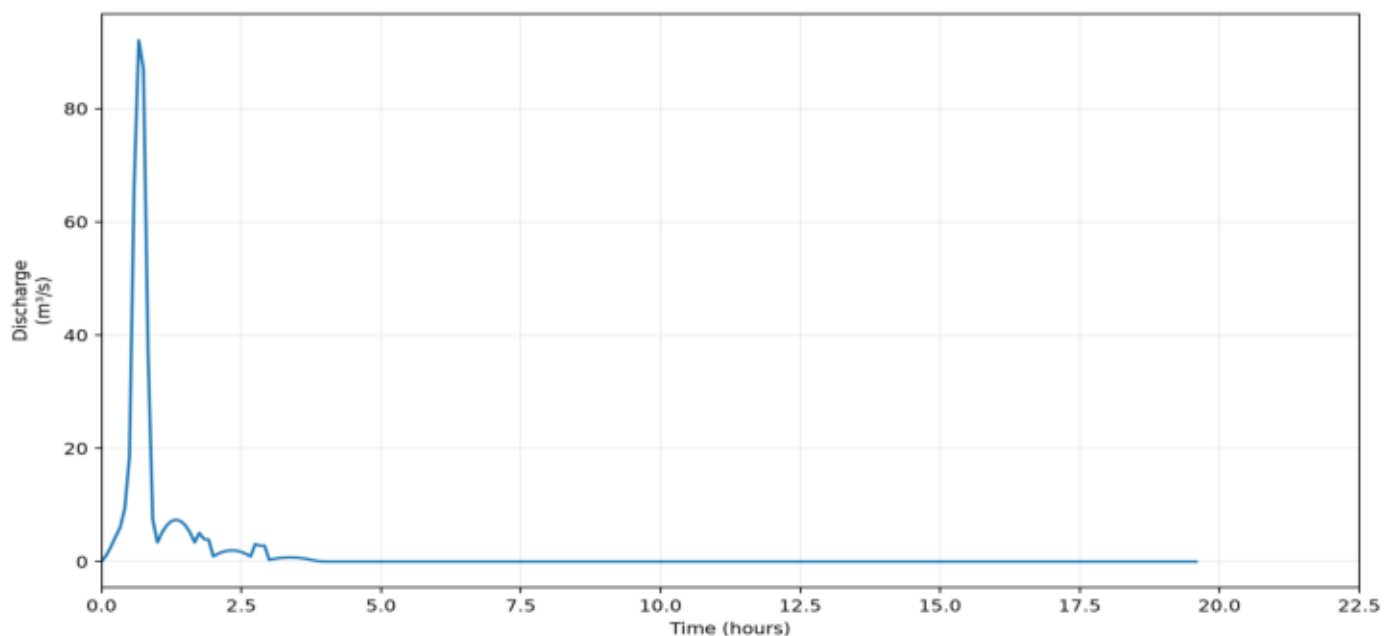
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Flood hydrograph - 15 min - 1:20

Floods estimation example

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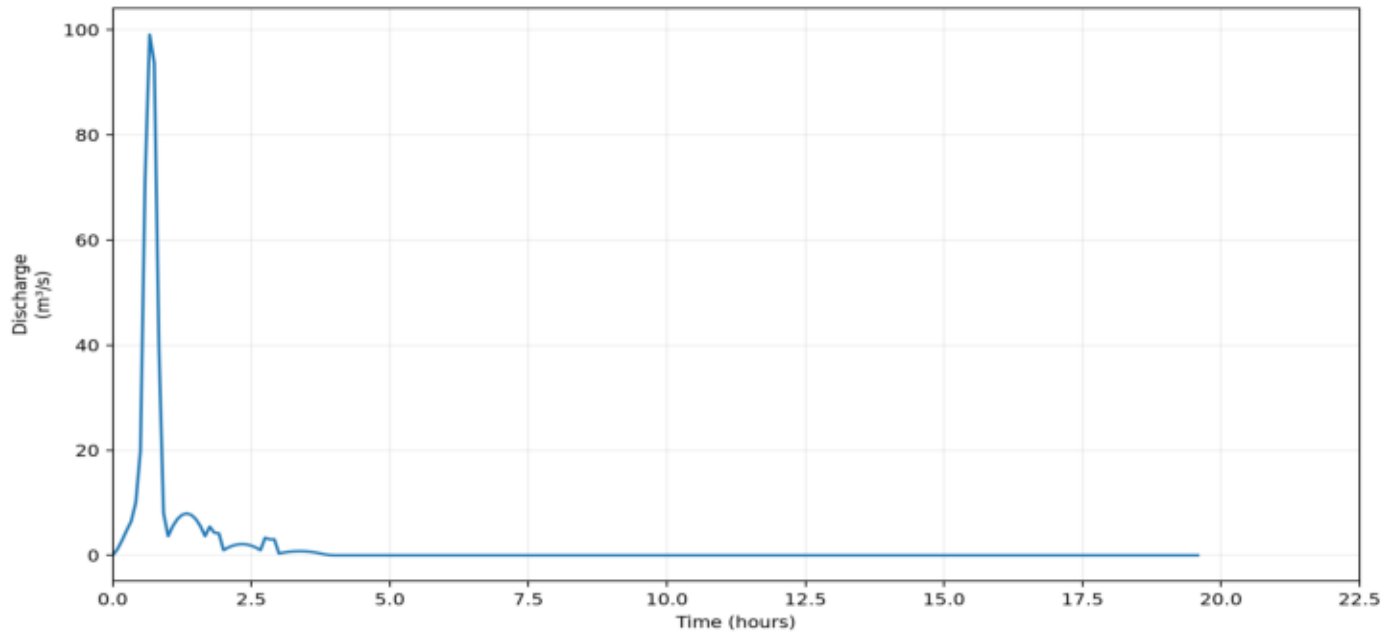


Unit Hydrograph Method Graphs

Flood hydrograph - 15 min - 1:25

Floods estimation example

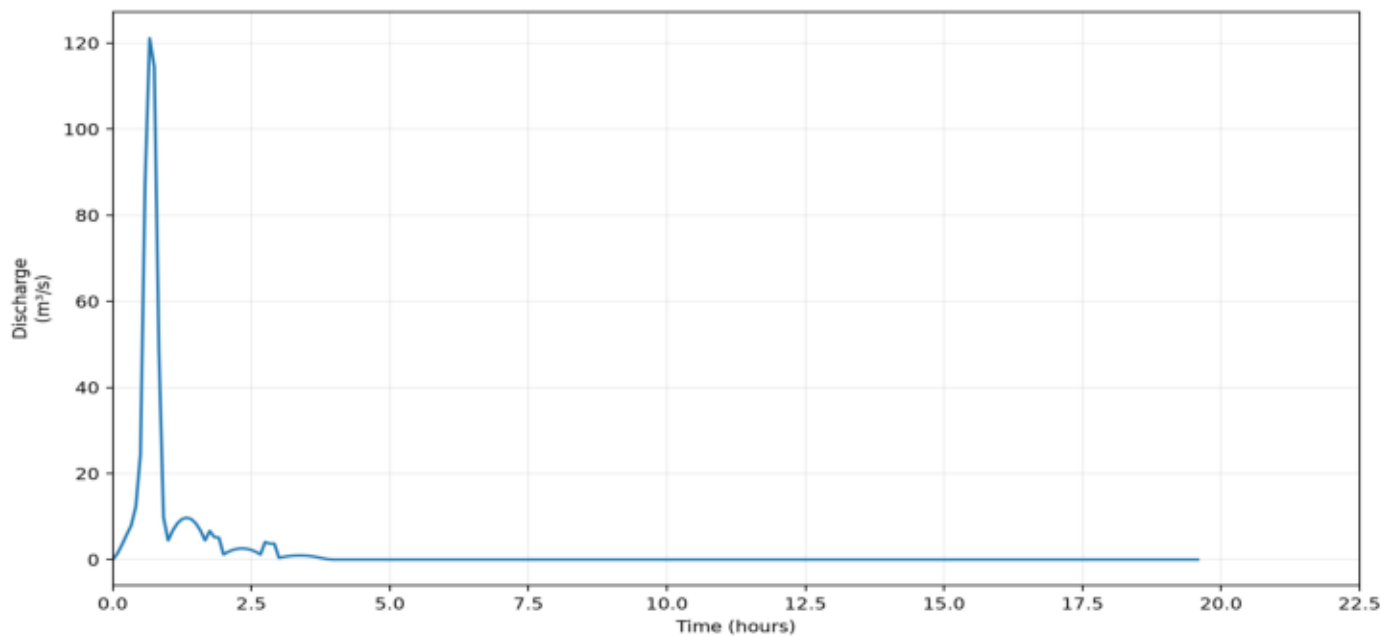
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Flood hydrograph - 15 min - 1:50

Floods estimation example

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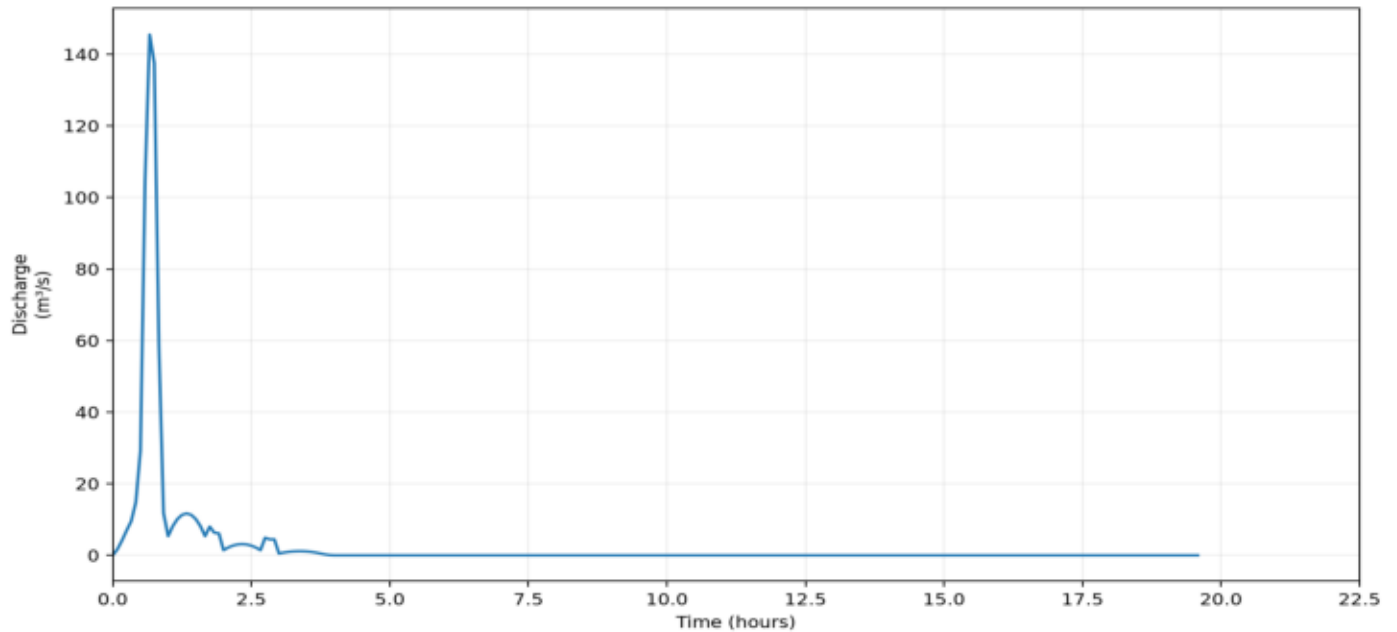


Flood hydrograph - 15 min - 1:100

Floods estimation example

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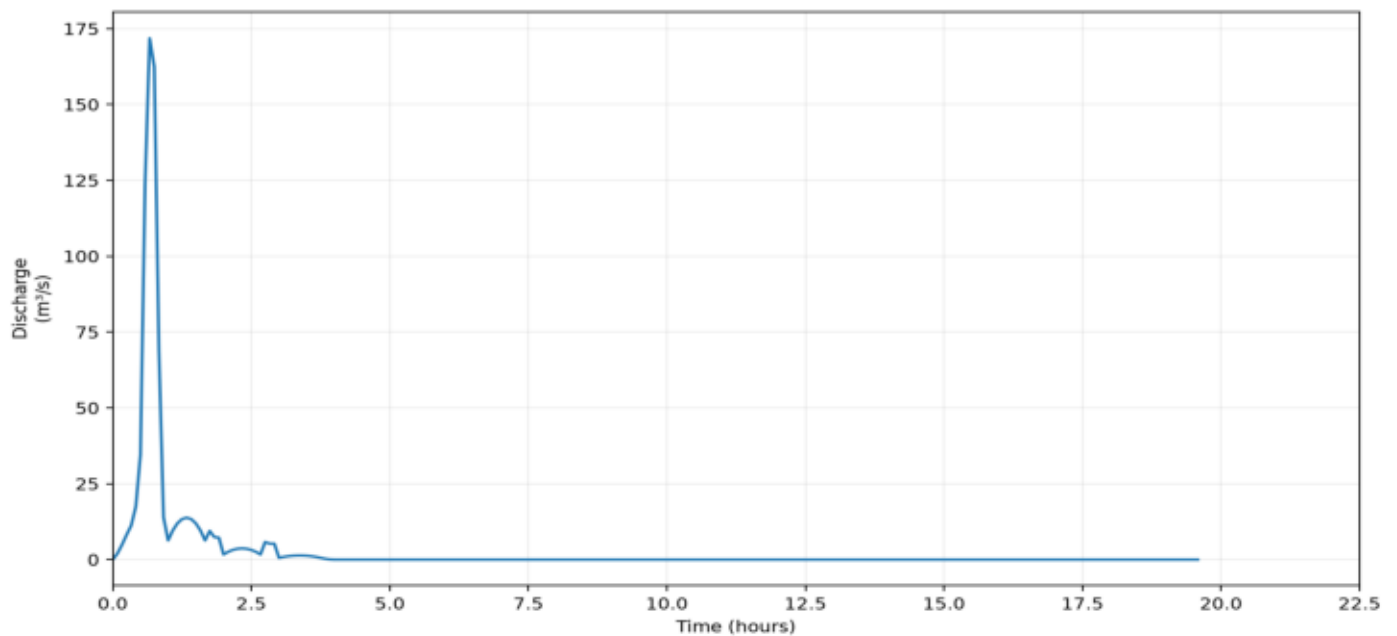


Flood hydrograph - 15 min - 1:200

Floods estimation example

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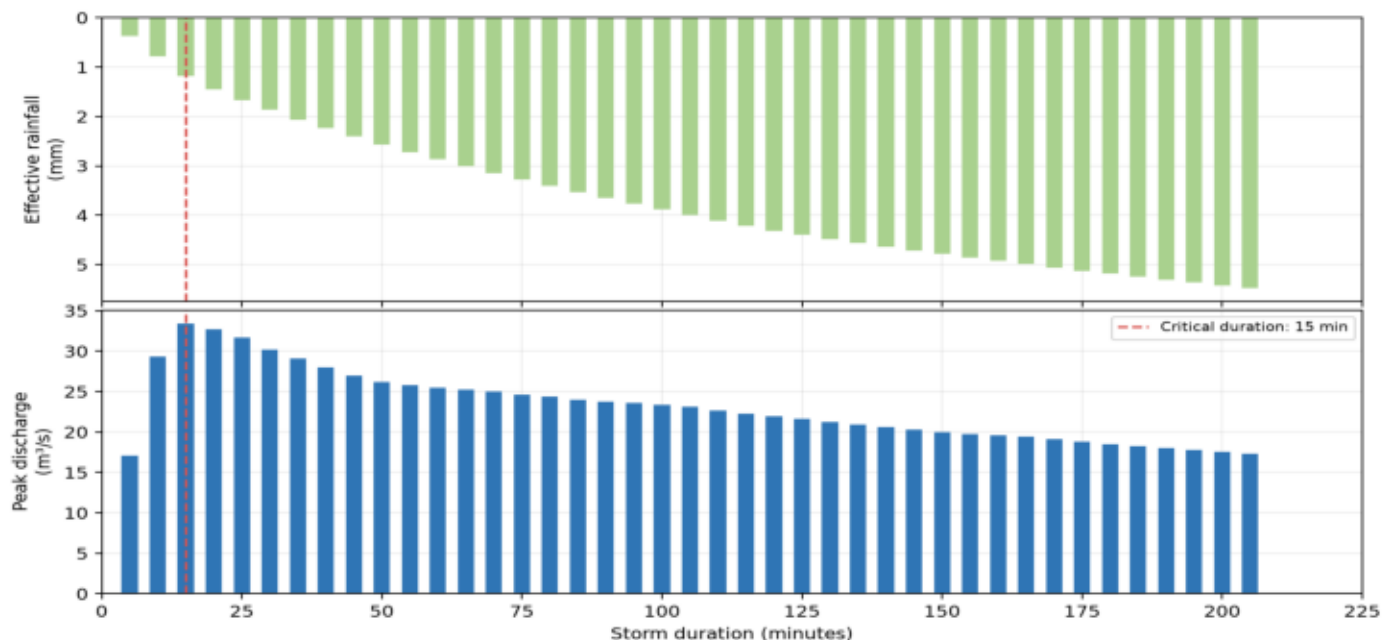
Unit Hydrograph Method Graphs

Peak discharge and effective rainfall - 1:2

Floods estimation example

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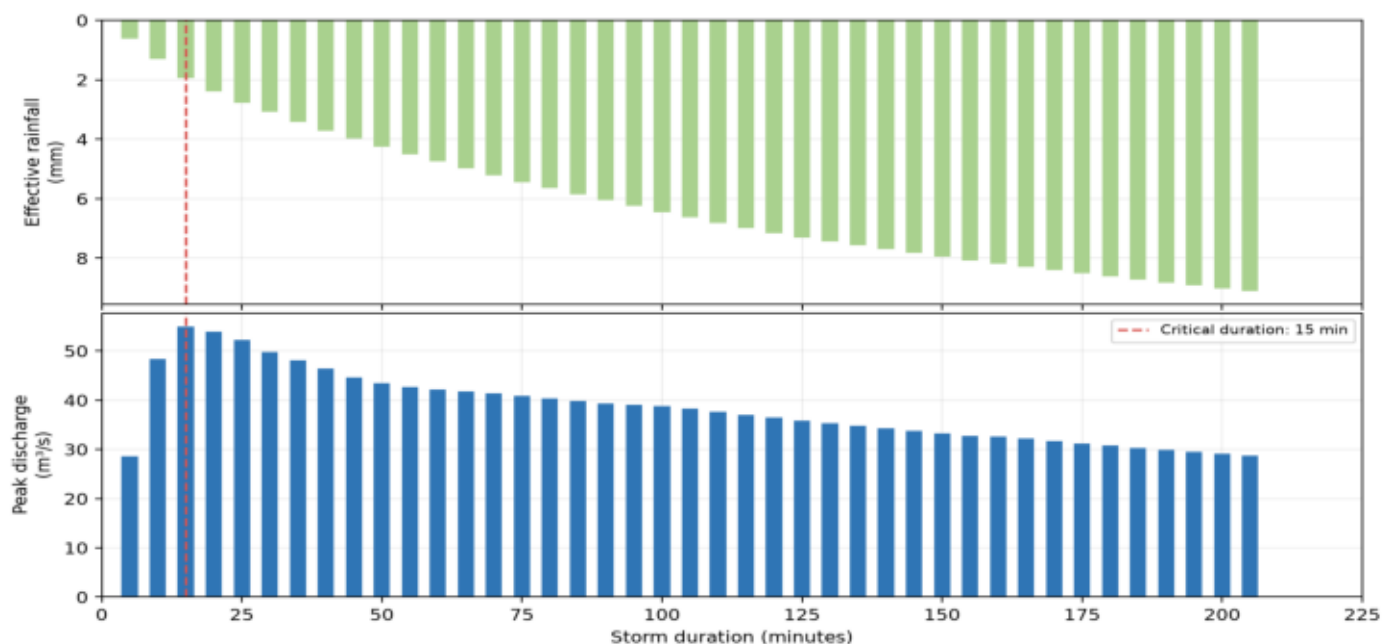


Peak discharge and effective rainfall - 1:5

Floods estimation example

GHI HydroSuite V 1.1

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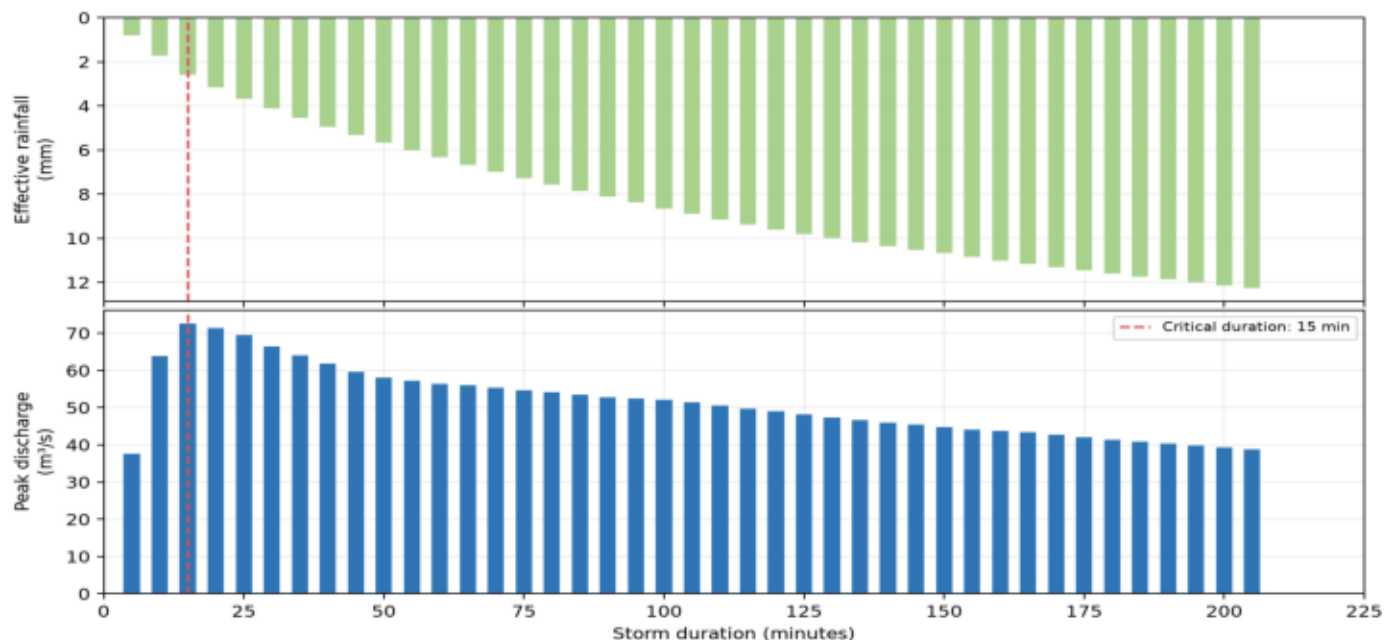
Unit Hydrograph Method Graphs

Peak discharge and effective rainfall - 1:10

Floods estimation example

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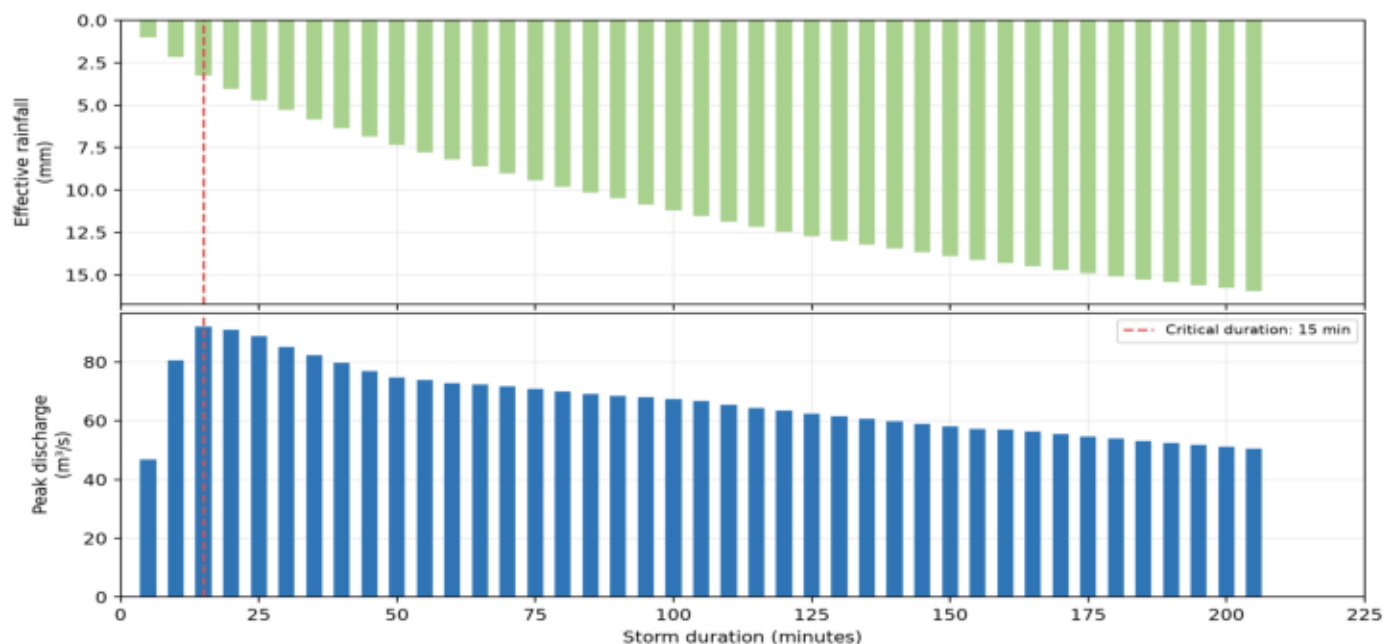


Peak discharge and effective rainfall - 1:20

Floods estimation example

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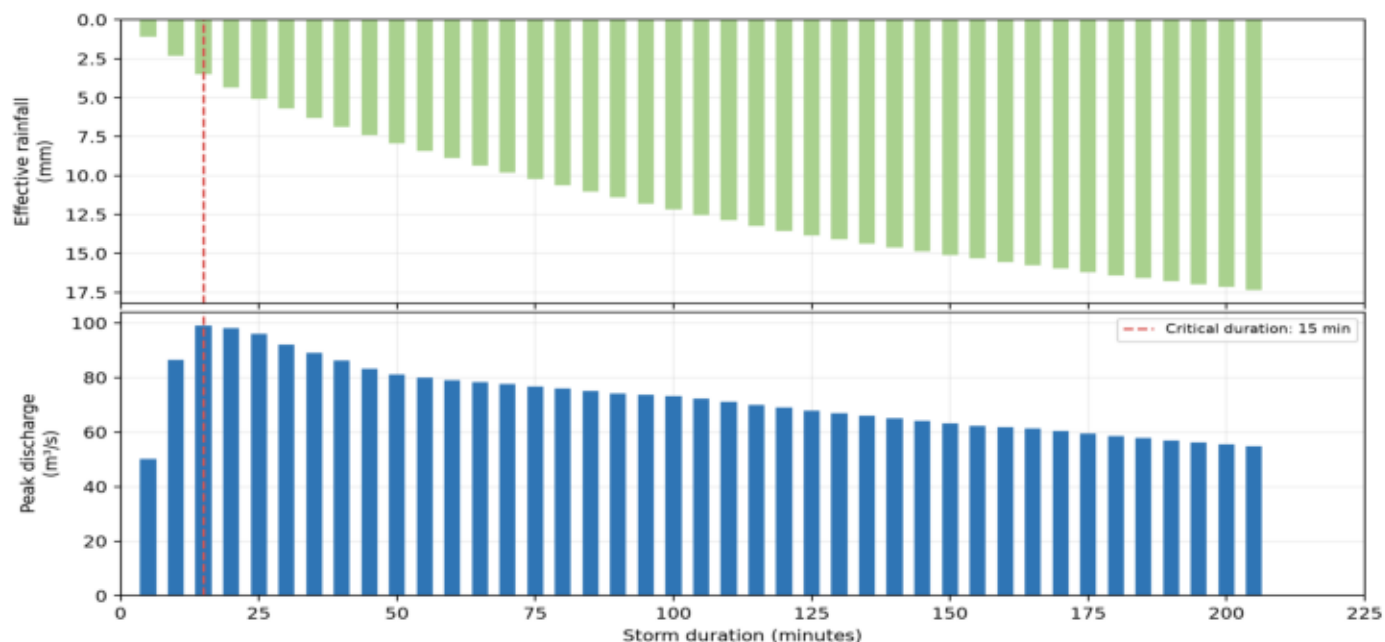
Unit Hydrograph Method Graphs

Peak discharge and effective rainfall - 1:25

Floods estimation example

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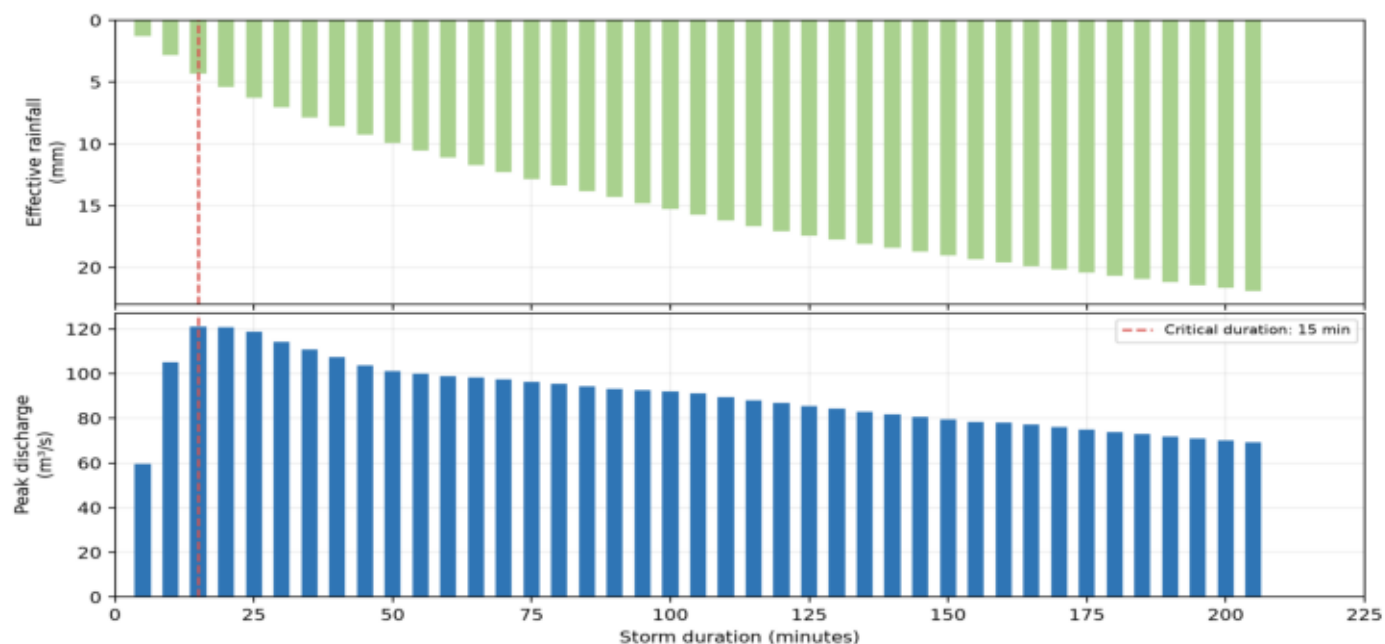


Peak discharge and effective rainfall - 1:50

Floods estimation example

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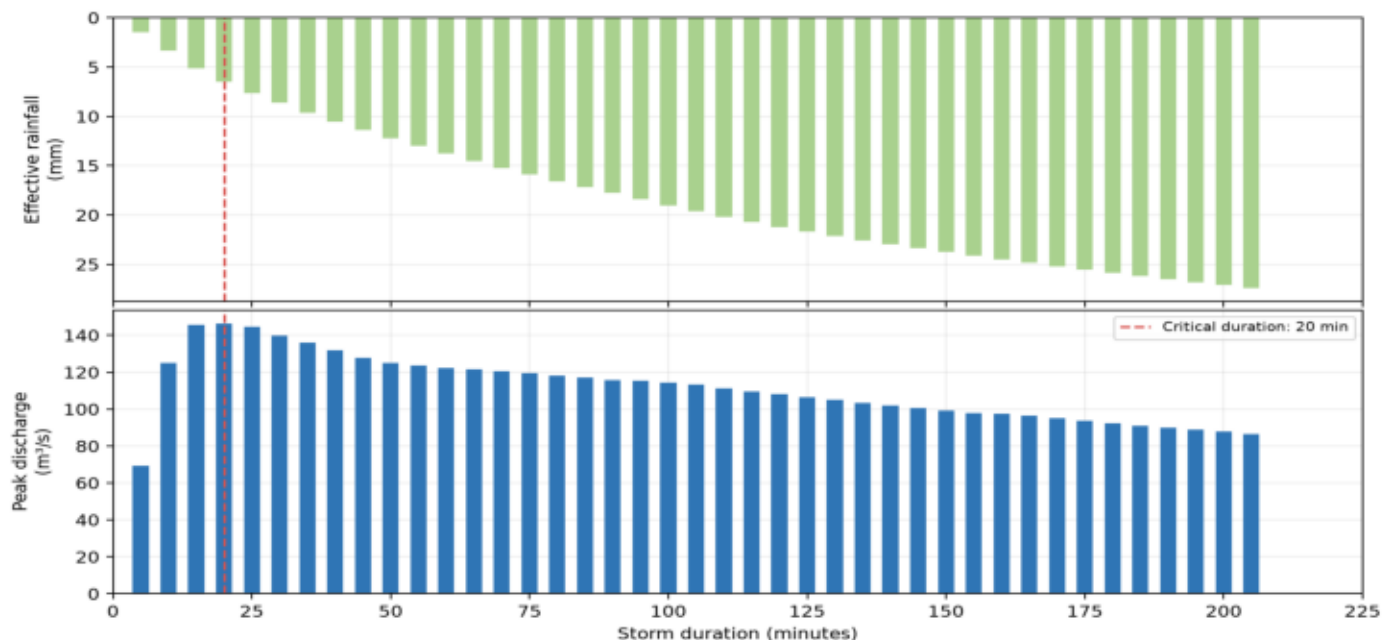
Unit Hydrograph Method Graphs

Peak discharge and effective rainfall - 1:100

Floods estimation example

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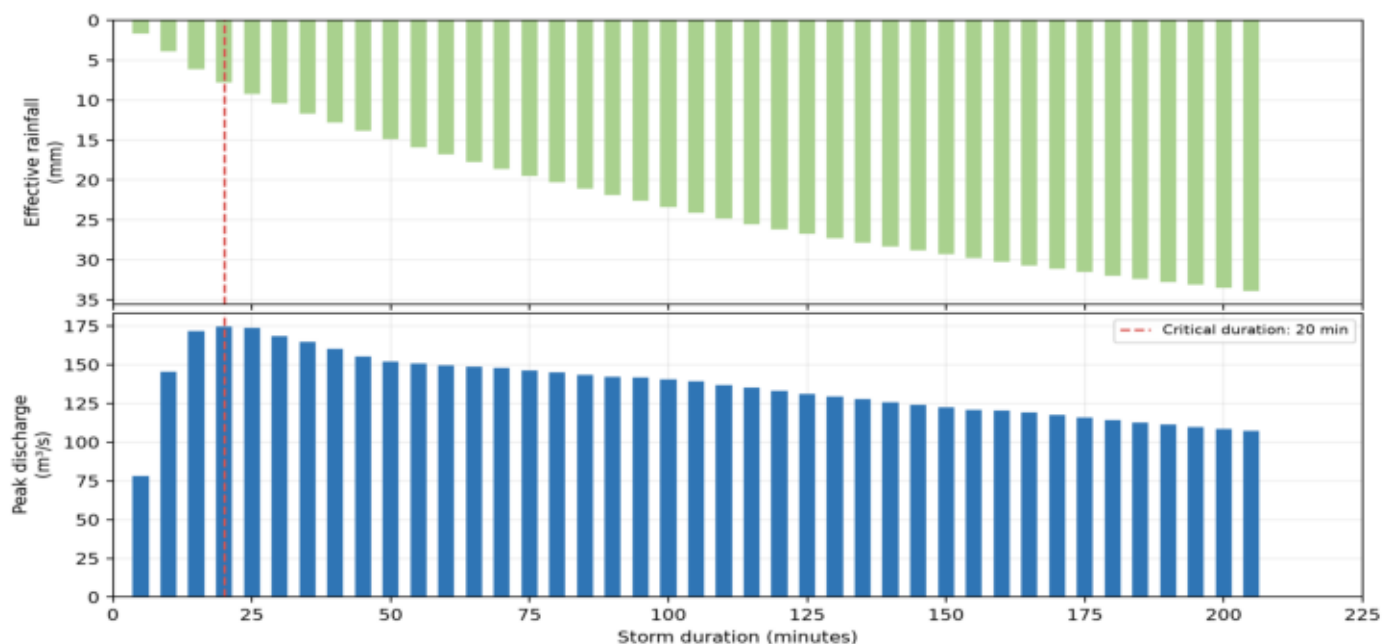


Peak discharge and effective rainfall - 1:200

Floods estimation example

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Empirical Methods



Project name	Floods estimation example	Project no	2026-001
Description of catchment	Moretele Spruit Catchment	River detail	Moretele Spruit
Calculated by	Marco van Dijk	Date	16/09/2026
Client	City of Tshwane	Latitude & Longitude	-25.80 / 28.30

Catchment characteristics			
Catchment area, A (km ²)	26.900	Mean annual precipitation, MAP (mm)	746.6
Length of longest watercourse, L (km)	6.690	Distance outlet to centroid, Lc (km)	3.350
Height difference along 10-85 slope, ΔH_{10-85} (m)	109.000	Mean catchment surface slope, SA (m/m)	0.020000

Midgley-Pitman method	
Generalised veld-type zone	Zone 8 — Bushveld
Midgley-Pitman parameter, C	0.17691

Peak flow results Midgley-Pitman				
Return period, T (years)	10	20	50	100
K_T	0.42	0.57	0.79	1.00
Peak flow, Q (m ³ /s)	60	82	113	143

Catchment parameter method (CAPA)	
Lumped catchment parameter, M	929.668
Regression constant, a	0.100803
Mean Annual Flood, Q50%	9.4 m ³ /s

Peak flow results CAPA							
Return period, T (years)	2	5	10	20	50	100	200
K_P	1.000	1.976	2.859	3.953	5.737	7.118	8.428
Peak flow, Q (m ³ /s)	9.4	18.6	26.9	37.1	54	67	79

Regional Maximum Flood (RMF)			
Selection method	Kovács region	Kovács region	K5
K-factor	5.00	Zone applied	Transition Zone

Peak flow results RMF			
Regional Maximum Flood	519 m ³ /s		
Return period, T (years)	50	100	200
Q_T/Q_{RMF} ratio	0.421	0.525	0.640
Peak flow, Q (m ³ /s)	218	273	332

Country / ratio dataset used: South Africa, Lesotho and Eswatini