RATIONAL METHOD

Description of Catchment			Makhalempongo Chicken Poultry				
River Detail							
Calculated by		N. Mkhwanazi			**Date**	31/07/2022	
Physical characteristic							
Size of catchment (A)			0.11305	km²	Rainfall region		Summer
Longest watercourse (L)			0.4	km	**Area distribution factors**		
Average slope (S_{av})			1.528	m/m	Rural	Urban	Lakes
Dolomite area (D%)			0	%	100	0	0
Mean annual percipitation (MAP)			966	mm			
Rural (1)						**Urban (2)**	
Surface slopes	**%**	**Factor**	**Cs**	**Description**	**%**	**Factor**	**C2**
Vleis and pans	0	0.05	0	**Lawns**			
Flat area	45	0.11	4.95	Sandy, flat (<2%)	0	0.08	0
Hilly	45	0.2	9	Sandy, steep (>7%)	0	0.18	0
Steep area	10	0.3	3	Heavy soil, flat (<2%)	0	0.15	0
Total	**100**	-	0.1695	Heavy, soil, steep (>7%)	10	0.3	3
Permeability	**%**	**Factor**	**Cp**	**Residential areas**			
Very permeable	0	0.05	0	Houses	0	0.5	0
Permeable	60	0.1	6	Flat	0	0.6	0
Semi-permeable	20	0.2	4	**Industry**			
Impermeable	20	0.3	6	Light industry	0	0.65	0
Total	**100**	-	0.16	Heavy industry	0	0.7	0
Vegetation	**%**	**Factor**	**Cv**	**Business**			
Thich bush and plantation	70	0.05	3.5	City centre	0	0.6	0
Light bush and farm-lands	15	0.15	2.25	Subruban	0	0.85	0
Grasslands	15	0.25	3.75	Streets	90	0.95	85.5
No vegetation	0	0.3	0	Maximum flood	0	1	0
Total	**100**	-	0.095	Total (C_2)	100	-	0.885

Time of concentration (Tc)				**Notes:**
Overland (3)		Defined watercourse		Manuals : SANRAL Drainage Manual and Geometric Design
$T_c = 0{,}604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0{,}467}$		$T_c = \left(\frac{0{,}87L^2}{1000S_{av}}\right)^{0{,}385}$		Notes
	hours	0.232	hours	

Run-off coefficient - Predevelopment							
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Run-off coefficient, C_1 (C_1 = Cs + Cp + Cv)	0.4245	0.4245	0.4245	0.4245	0.4245	0.4245	
Adjusted for dolomite areas, C_{1D} = (C_1(1-D%)+(C_1D%(SUM(Dfactor X Cs%)) (4)							
Adjustment factor for initial saturation, Ft (5)	1	1	1	1	1	1	
Adjustment run-off coefficient, C_T	0.4245	0.4245	0.4245	0.4245	0.4245	0.4245	
Rainfall							
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Point precipitation (mm) Pt	12	18	20	25	32	40	
Point intensity (mm/hr), Pi = Pt/Tc	51.72414	77.5862069	86.2068966	107.7586207	137.931	172.41379	
Area reduction factor ARF_T (7)	0.75	0.8	0.85	0.9	0.95	1	
Average intensity (mm/hr), I_T = Pi x ARF_T	38.7931	62.06896552	73.2758621	96.98275862	131.0345	172.41379	
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3{,}6}$	**0.517131**	**0.827409052**	**0.97680235**	**1.292826643**	**1.746752**	**2.2983585**	

Run-off coefficient - Post development							
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Run-off coefficient, C_1 (C_1 = Cs + Cp + Cv)	0.885	0.885	0.885	0.885	0.885	0.885	
Adjusted for dolomite areas, C_{1D} = (C_1(1-D%)+(C_1D%(SUM(Dfactor X Cs%)) (4)							
Adjustment factor for initial saturation, Ft (5)	1	1	1	1	1	1	
Adjustment run-off coefficient, C_T	0.885	0.885	0.885	0.885	0.885	0.885	
Rainfall							
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Point precipitation (mm) Pt	12	18	20	25	32	40	
Point intensity (mm/hr), Pi = Pt/Tc	51.72414	77.5862069	86.2068966	107.7586207	137.931	172.41379	
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Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3{,}6}$	**1.078117**	**1.724987069**	**2.03644307**	**2.695292295**	**3.641639**	**4.7916307**	