

Modified Rational Method assessment for Total Phosphorus	
Project	Bishopstone, Wiltshire

Urban Catchment Wetness Index			
Formula			
$U = -129.5 + (0.424 \times R) - (2.28 \times 10^{-4} \times R^2) - (4.56 \times 10^{-8} \times R^3)$			
U	Urban Catchment Wetness Index value (if rainfall is >760 mm, use 41)		
R	Rainfall		
Parameters			
Parameter	Value	Unit	Source
R	929.82	mm/yr	HADUK-Grid 1991-2020 average rainfall
Results			
U	41.00		

Percentage Runoff (Runoff Coefficient)			
Formula			
$Pr = 0.829 \times PIMP + 0.078 \times U - 20.7$			
<i>Pr</i>	Percentage runoff		
<i>PIMP</i>	Impervious area (%)		
<i>U</i>	Urban Catchment Wetness Index value (if rainfall is >760 mm, use 41)		
Parameters			
Parameter	Value	Unit	Source
U	41.00		UCWI calculation above
PIMP	57.78	%	Measured from site plan
Results			
Pr	30.40	%	

Volume Runoff			
Formula			
$Vr = (Pr / 100) \times R \times 10,000$			
Vr	Volume runoff		
Pr	Percentage runoff		
R	Standard Annual Average Rainfall		
(1 mm ≡ 1 mm/yr ≡ 1 mm/m²/yr ≡ 1 l/m²/yr ≡ 10,000 l/ha/yr)			
Parameters			
Parameter	Value	Unit	Source
Pr	30.40	%	Pr calculation above
R	929.82	mm/yr	HADUK-Grid 1991-2020 average rainfall
Results			
Vr	2,826,431.50	l/ha/yr	

Total Phosphorus Loading			
Formula			
$TP\ load = ((Vr \times TP\ EMC) / 1,000,000) \times Area$			
TP load	Total Phosphorus loading		
Vr	Volume runoff		
TP EMC	Total Phosphorus concentration		
Area	Development area		
Parameters			
Parameter	Value	Unit	Source
Vr	2,826,432	l/ha/yr	Vr calculation above
Land use	Residential		Site plan
TP EMC	0.41	mg/l	NECR459
Area	0.63	ha	Measured from site plan
Results			
TP load	0.73	kg TP/yr	