

PROJECT:	RAIN FOREST CARWASH		
STORMWATER RUN-OFF CALCULATIONS			
Formulas used:			
[1] RATIONAL METHOD: Q=Aci			
where:	Q=	Peak discharge of watershed in cubic feet per second (cfs) due to maximum storm assumed.	
	A=	Area of watershed in acres.	
	c=	Coefficient of run-off [2].	
	i=	Intensity of rainfall in inches per hour based on concentration time. [3]	
[4] TC= $\frac{(L^{0.8}(\frac{1000}{c} - 9)^{0.7})}{(1140(s^{0.5}))}$			
where:	TC=	Time of concentration= time required for rain falling at most remote point to reach discharge point.	
	c=	Site run-off coefficient based on conditions shown.	
	s=	Percent slope of overland flow.	
AREA OF WORK – PRIOR DEVELOPMENT 25 Year Frequency			
Q₁ = Aci			
Watertight Surfaces		0	sqft = 0.000 Acres
c(1) =	0.9		
Gravel Surface		0	sqft = 0.000 Acres
c(2) =	0.25		
Green Space		37154	sqft = 0.853 Acres
c(3) =	0.1		
Summary		37154	sqft = 0.853 Acres
c =	0.10		
Duration (D) = Time of concentration (TC)			
where	L = 263	run-off length ft	Elev diff = 1.9
	c = 0.10	run-off coef	
	S = 0.7224	percent slope	
therefore	TC = D = 40.57	minutes	
Expected Rainfall Intensity	i = 3.50	in/hr	
Q₁ =	0.299 cfs		10% retention= 0.030 cfs
AREA OF WORK - POST DEVELOPMENT 25 Year Frequency			
Q₂ = Aci			
Watertight Surfaces		26549	sqft = 0.609 Acres
c(1) =	0.9		
Gravel Surface		0	sqft = 0.000 Acres
c(2) =	0.25		
Green Space		10605	sqft = 0.243
c(3) =	0.1		
Summary		37154	sqft = 0.853 Acres
c =	0.67		
D = Time of concentration (TC)			
where	L = 200	Runoff length ft	Elev diff = 5
	c = 0.67	Runoff coef	
	S = 2.5000	Percent Slope	
therefore	TC = D = 15.92	minutes	
Expected Rainfall Intensity	I = 3.50	in/hr	
Q₂ =	2.005 cfs		Total Retention Required Q₂-Q₁+10%= 1.736 cfs
RESULTS			
DETENTION REQUIRED		1.736 cfs	
ONE HOUR DETENTION		6251.0 cuft	
DETENTION DIMENSIONS	WIDTH	100 feet	
	LENGTH	163 feet	
	DEPTH	0.38 feet	
DISCHARGE END AREA REQUIREMENTS 25 Year Frequency Area requirements for pipe servicing On-Site Retention Pond			
[5] A= $\frac{Q}{(c\sqrt{(2gh)})}$			
where:	A=	Discharge Area required	
	g=	Acceleration of gravity	
	c=	Discharge coefficient	
	h=	Hydraulic head	
	Q=	Flow volume from run-off	
Pipe Servicing Offsite Drainage	Q =	1.736 cfs	H = 1.00 feet
	c =	0.62 coefficient	A = 0.35 sqft
	g =	32.16 ft/ft/sec	
REQUIRED CONDUIT =	8.00 inch diameter		Use 6" Orifice
References:			
1. Chen, W.F. <i>The Civil Engineering Handbook</i> . 1995. Eq.# 31.1, pg. 1036			
2. Seelye, Elwyn E. <i>Data Book for Civil Engineers</i> . Vol.1 1960. Tbl. B, pg. 18-02			
3. Seelye, Elwyn E. <i>Data Book for Civil Engineers</i> . Vol.1 1960. Fig.B, pg. 18-01			
4. Chen, W.F. <i>The Civil Engineering Handbook</i> . 1995. Tbl. 31.2 Regan Equation (n=0.013)			
5. Chen, W.F. <i>The Civil Engineering Handbook</i> . 1995. Eq.# 28.32, pg. 969			