

PROJECT: LIVING THE WORD INTERNATIONAL CHURCH

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.

PRIOR DEVELOPMENT
100 Year Frequency

Q₁ = Aci

Watertight Surfaces		34371	sqft =	0.789	Acres
c(1) =	0.9				
Gravel Surface		99330	sqft =	2.280	Acres
c(2) =	0.25				
Green Space		8304.6	sqft =	0.191	Acres
c(3) =	0.15				
Summary		142005.6	sqft =	3.260	Acres
c =	0.40				

Duration (D) = Time of concentration (TC)

where L = 500 run-off length ft Elev diff = 3.4
 c = 0.40 run-off coef
 S = 0.6800 percent slope
 therefore TC = D = 24.82 minutes
 Expected rainfall intensity i = 4.41 in/hr

Q₁ = 5.772 cfs 25% reduction **1.443 cfs**

POST DEVELOPMENT
100 Year Frequency

Q₂ = Aci

Watertight Surfaces		101851	sqft =	2.338	Acres
c(1) =	0.9				
Gravel Surface		6025	sqft =	0.138	Acres
c(2) =	0.25				
Green Space		34129.6	sqft =	0.784	Acres
c(3) =	0.15				
Summary		142005.6	sqft =	3.260	Acres
c =	0.69				

Duration (D) = Time of concentration (TC)

where L = 750 run-off length ft Elev diff = 3.3
 c = 0.69 run-off coef
 S = 0.4400 percent slope
 therefore TC = D = 18.83 minutes
 Expected rainfall intensity i = 4.41 in/hr

Q₂ = 9.951 cfs

DETENTION REQUIREMENTS

Detention required Q1-Q2+.25Q1 = **5.62 cfs**
20239.5 cuft

ONE HOUR DETENTION

DETENTION DIMENSIONS	WIDTH	60 feet
	LENGTH	240 feet
	DEPTH	1.41 feet

DISCHARGE END AREA REQUIREMENTS
100 Year Frequency

$$[5] A = \frac{Q}{(c\sqrt{(2gh)})}$$

where: A= Discharge Area required
 g= Acceleration of gravity
 c= Discharge coefficient
 h= Hydraulic head
 Q= Flow volume from run-off

Pipe Servicing Site Drainage

Q =	5.622 cfs	h =	3.30 feet
c =	0.62 coefficient	A =	0.622 sqft
g =	32.16 ft/sec^2	D =	0.890 ft

REQUIRED CONDUIT = 10.68 inch inside diameter Use 12" PVC

References:

- Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 31.1, pg. 1036
- Seelye, Elwyn E. Data Book for Civil Engineers, Vol.1 1960. Tbl. B, pg. 18-02
- Seelye, Elwyn E. Data Book for Civil Engineers, Vol.1 1960. Fig.B, pg. 18-01
- Chen, W.F. The Civil Engineering Handbook. 1995. Tbl. 31.2 Regan Equation (n=0.013)
- Chen, W.F. The Civil Engineering Handbook. 1995. Eq.# 28.32, pg. 969