| PROJECT: | EL-BETHEL CHURCH |
|---|---|

STORMWATER RUN-OFF CALCULATIONS (RETENTION POND)

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]** $TC = \frac{\left(L^{0.8}\left(\frac{1000}{c} - 9\right)^{0.7}\right)}{(1140(s^{0.5}))}$

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 SERVICED BY RETENTION POND – POST DEVELOPMENT**

25 Year Frequency

**$Q_1$ = Aci**

| | | | | | |
|---|---|---|---|---|---|
| Watertight Surfaces | | 13419 | sqft = | 0.308 | Acres |
| c(1) = | 0.9 | | | | |
| Gravel Surface | | 7696 | sqft = | 0.177 | Acres |
| c(2) = | 0.25 | | | | |
| Green Space | | 0 | sqft = | 0.000 | Acres |
| c(3) = | 0.1 | | | | |
| Summary | | 21115 | sqft = | 0.485 | Acres |
| c = | 0.66 | | | | |

Duration (D) = Time of concentration (TC)

| | | | | |
|---|---|---|---|---|
| where | L = 185 | run-off length ft | Elev diff = | 0.4 |
| | c = 0.66 | run-off coef | | |
| | S = 0.2162 | percent slope | | |
| therefore | TC = D = 4.44 | minutes | | |
| Expected Rainfall Intensity | i = 3.50 | in/hr | | |

**Q1 = 1.125 cfs**

**RESULTS**

| | | | |
|---|---|---|---|
| DETENTION REQUIRED | 1.125 | cfs | |
| ONE HOUR DETENTION | 4049.9 | cuft | |
| DETENTION DIMENSIONS | WIDTH | 20 | feet |
| | LENGTH | 110 | feet |
| | DEPTH | 1.84 | 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 = | 1.125 | cfs | H = | 2.10 feet |
| c = | 0.62 | coefficient | A = | 0.16 sqft |
| g = | 32.16 | ft/ft/sec | | |

**REQUIRED CONDUIT = 5.35 inch diameter** **Use 6" Orifice**


**References:**

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