

Drainage Calculations for Peak Runoff Flow (25yr event)

Calculate peak flow runoff using the rational method for a 25 year storm event
 $Q=CIA$

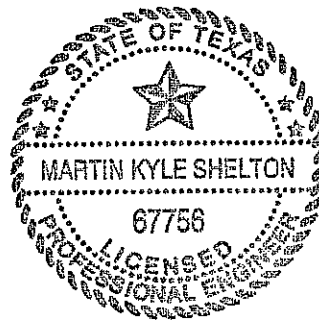
where:
 Q = discharge in cubic feet per second (cfs)
 C = runoff coefficient (from TxDOT Hydraulic Design Manual based on the type of drainage area)
 i = average rainfall intensity in inches per hour (in/hr) based on below equation
 A = drainage area in acres (determined from City of Bryan GIS contours)

$i = b / (t_c + d)^e$

where:
 t_c = time of concentration in minutes (min), TxDOT Hydraulic Design Manual recommends 10 min as the min value for small areas
 b, d, e = coefficients for specific frequencies listed by county in the Rainfall Intensity Duration Frequency Coefficients from the National Weather Service Technical Paper 40 (TP40)
 For a 25 year storm event in Brazos County:

$b = 89$
 $d = 8.5$
 $e = 0.754$

$i = 9.9 \text{ in/hr}$



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 12/29/09

Hydrologic Data				
Drainage Area	C	I	A	Q
Unimproved Area	0.39	9.9	10.96	42.14
Gravel Areas	0.4	9.9	1.50	5.92
Fermenter Building Roof	0.95	9.9	0.23	2.17
Collected Water	NA	9.9	0.42	0
Unloading Area Roof	0.95	9.9	0.12	1.17
			13.23	51.41

Assumes rural watershed: normal relief, normal soil infiltration, low vegetal cover, and high surface characteristics. Includes "offsite" upland area drainage that runs onto project site and lowland area between the project site and the roadside open channel.

Assumed flat using railroad yard "C" value as a gravel lot value

Assumes water entering the biofilter, cooling pond, and overflow basins are lost to the system (i.e. no run-off generated)

Assumes new contained structure will have the same footprint as the existing unloading area

Versus predevelopment peak runoff of:

Hydrologic Data				
Drainage Area	C	I	A	Q
Unimproved Area	0.39	9.9	13.23	50.89
				50.89

Assumes rural watershed: normal relief, normal soil infiltration, low vegetal cover, and high surface characteristics.

Site Drainage

Approximate Channel Volume Receiving Runoff from the Project Site:

Depth of channel varies 2-5'

Assumed width 3'

Length of Roadside Channel Directly Receiving Runoff from the Project Site 428'

Segment L (ft)	Start Depth (ft)	Finish Depth (ft)	Width (ft)	Volume (ft ³)
170	2.5	3	3	1,408
180	3	5	3	2,160
5	5	5	3	75
73	5	2	3	767

TOTAL 4,404 cf

Channel Volume Capacity

Channel drains to a 5' diameter metal culvert

Site Run-on Controls

Estimated Length of Curb Receiving Upland Area Runoff

155

Assuming all of the site minus the unimproved lowland area south of the flexible base paving (conservative estimate since there is no as-built survey for the current Semi-Works plant grading)

Estimated Area Impacting the Curb

peak runoff (CF)

50.24 for entire site minus the unloading area

Minus Area Downgradient of Curbed Area

16.67 See below

	C	I	A	Q
Unimproved Lowland Area	0.39	9.9	4.33	16.67

Assumes rural watershed: normal relief, normal soil infiltration, low vegetal cover, and high

Flow potentially impacting the curbed area = 33.57 cfs

Minimum Height of Curb Required to Divert Run-on

0.22 ft

2.60 inches

6 inches

Assuming new unloading area will have the same footprint as the existing unloading area and runoff comes from the northeast impacting primarily the northeast and eastern curbs on its way to the southern drainage ditch and culvert.

Curb Design Height =

Curb provides adequate protection to divert storm water run-on from a 25-year storm event.