

STORM DRAINAGE ANALYSIS - 100 YEAR EVENT

Stagecoach Subdivision

Detention Area #1

Weber County, Utah

11 October 2021

1. Drainage Areas:

Drainage Area #1 -	1.5000 acres	Paving & Impervious Areas
Drainage Area #2 -	0.0000 acres	Building - Roof Areas
Drainage Area #3 -	10.5700 acres	Landscaping Areas
Total Area =	12.070 acres	Drainage Area - Site Detention Area

Drainage Area Slope = 0.5 % (Per the Developer's Contour Map)

Study Area Overview:

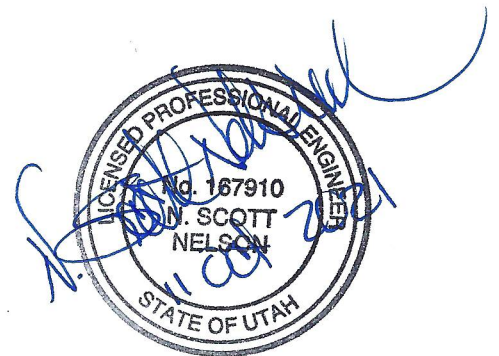
The Study Area is to be developed as a Residential Subdivision

2. Coefficient of Run-off:

The composite coefficient of runoff "C" was developed using design by "Seelye 18-01" and Mark J. Hammer "Water and Waste Water Technology" is as follows:

Drainage Area #1 - Paving & Impervious Areas	C = 0.90
Drainage Area #2 - Building - Roof Areas	C = 0.95
Drainage Area #3 - Landscaping Areas	C = 0.15

Composite "C" = C = 0.24



3. Time of Concentration:

Using Storm Water Run-Off - "Overland Flow Time", design by "Seelye 18-01"

Tc from Area (total) = 45.00 minutes (from attached "Seelye" chart)

4. Rainfall Intensities:

Rainfall Intensities are calculated using the rainfall frequency duration curves for Davis County, Utah. Using the National Weather Bureau "technical paper No. 28" for a 2, 10 and 100 year "Return Period".

Time of Concentration (minutes) Tc	Rainfall Intensity* (in/hour) I
5	6.50
10	4.95
15	4.10
30	2.60
45	1.95
60	1.65
90	1.35
120	0.93

*Rainfall intensity for a 100 year return period

Tc=time of concentration

I=rainfall intensity

Drainage Area (total) 12.070 acres Paving, Impervious and Landscaping Area
Tc = 45.00 minutes
Rainfall Intensity 1.95 (I in/hr) **(Technical Paper)**

Calculation Parameters:

Maximum flow paths used for routing and calculating time of concentration.

Maximum Intensity on technical paper chart used for time of concentration under 5 minutes.

5. Peak Run-off:

Using the "Rational Formula" to calculate the Peak run-off (Q=CIA) - maximum pipe flow

- Q= Quantity of run-off, in cubic feet per second (cfs)
- C= Coefficient of run-off (based upon surface materials)
- I= Intensity of the average storm, in inches per hour (in/hr)
- A= Area of drainage area, in acres

Total Drainage Area		Coeff. of Run-off "C"	Time of Concentration "Tc"	Rainfall Intensity "I"	Rate of Run-off "Q" (cfs)
Total Drainage Area	12.070 acres				
			Paving, Impervious & Landscaping Area		
		0.24	45.00	1.95	5.72
Total Flow					5.72
All Areas		Q = 5.72		cfs	

Pipe sizing - Use 15" diameter at a Slope of 0.5% which will handle the 100-year storm volume.

6. Allowable Discharge:

Allowable discharge of storm water volume (pre-development) is 0.2 cfs per acre.

Allowable discharge = 0.20 cfs/acre 12.070 acres = 2.41 cfs

Allowable discharge = 2.41 cfs

This flow rate is to be used as the allowable discharge from the detention basins.

7. Volume of Run-off: 100 year storm period

Time	Intensity	Allowable Discharge	Volume Generated	Detention Volume Required
Tc minutes	I in/hour	Undeveloped not detained c.f.	Inflow c.f.	Detention c.f.
5	6.50	724.20	5,724.23	5,000.03
10	4.95	1,448.40	8,718.44	7,270.04
15	4.10	2,172.60	10,832.00	8,659.40
30	2.60	4,345.20	13,738.14	9,392.94
45	1.95	6,517.80	15,455.41	8,937.61
60	1.65	8,690.40	17,436.87	8,746.47
90	1.35	13,035.60	21,399.80	8,364.20
120	0.93	17,380.80	19,656.11	2,275.31

Total Detention Required: 9,392.94 Cubic feet of Detention / or 0.22 Acre feet of Detention

8. Orifice Sizing: **100 year storm period**

Given:

Q= 2.41 cubic feet/second
 $2g= 64.4 \text{ ft/sec}^2$ (acceleration due to gravity)
H= (4.0 feet in basin from overflow to flowline outlet pipe)
Cd= 0.62 for square-edged openings
Ao= Area of orifice opening

Formula:

$$Q = C_d \times A_o (2gH)^{1/2} \quad \text{Solving for } A_o$$

$$A_o = Q / C_d \times (2gH)^{1/2}$$

$$A_o = 0.24 \quad \text{square feet (orifice size)}$$

$$A_o = 34.93 \quad \text{square inches (orifice size)}$$

$$A_o = 6.67 \quad \text{inches in diameter (orifice size)}$$

Summary:

100 year storm period
Use a 6.67" diameter orifice and the outlet control rate is = **2.41 cubic feet per second**

APPENDIX DOCUMENTS