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Pipe Sizing Calculations
25-Year Frequency

61 Waverly Street
The Residences at Ashland

By: KIC
Checked By: WWP
Date: 01/22/2026

Manning's Equation

$$S \times 2/3 \times R \times A \times n \times 1.49$$

$$R = A/P$$

Rational Method Equation

$$Q = c \times I \times A$$

Manning's Notes		
n	0.013	RCP
n	0.011	HDPE smooth & CIP
c	0.9	Impervious
c	0.35	Open Space

Calculation Notes

Grey Boxes represent data obtained through HydroCAD
Yellow Boxes represent input data
IDF Curve based off of the 100yr storm
Length of pipe was round to the nearest whole number

*Cornell: 24 hours 25-year storm

Line From	Line To	Length (ft)	Imperv. Area (acres)	Perv. Area (acres)	c*A (acres)	SUM (c*A) (acres)	Time of Conc. (BASIN) (min.)	Rainfall* I (in./hr.)	Req. Cap. Qd (cfs)	Pipe (in)	Slope (ft/ft)	Flow Full Qf (cfs)	Flow Full Vf (fps)	Design Vel. Vd (fps)	Qd/Qf	Time in Pipe (min)
CB 3-5	DMH 3-3	134	0.15	0.11	0.17	0.17	6.00	6.40	1.11	12	0.005	2.98	2.34	1.84	0.37	1.21
CB 3-4	DMH 3-3	11	0.16	0.06	0.17	0.17	6.00	6.40	1.06	12	0.040	8.42	6.61	3.79	0.13	0.05
RD 3-1	DMH 3-3	50	0.49	0.00	0.44	0.44	6.00	6.40	2.82	12	0.010	4.21	3.31	3.08	0.67	0.27
DMH 3-3	DMH 3-2	109	0.00	0.00	0.00	0.78	6.00	6.40	4.99	18	0.005	8.79	3.07	2.73	0.57	0.67
Courtyard	DMH 3-2	100	0.21	0.18	0.25	0.25	6.00	6.40	1.61	12	0.005	2.98	2.34	2.05	0.54	0.81
CB 3-3	DMH 3-2	8	0.18	0.09	0.19	0.19	6.00	6.40	1.24	12	0.040	8.42	6.61	3.97	0.15	0.03
DMH 3-2	DMH 3-1	124	0.00	0.00	0.00	1.23	6.00	6.40	7.84	18	0.005	8.79	3.07	3.11	0.89	0.67
CB 3-2	DMH 3-1	15	0.15	0.07	0.16	0.16	6.00	6.40	1.02	12	0.040	8.42	6.61	3.75	0.12	0.07
DMH 3-1	WQU 3-1	104	0.00	0.00	0.00	1.38	6.00	6.40	8.86	18	0.008	11.11	3.88	3.80	0.80	0.46
CB 3-1	WQU 3-1	15	0.18	0.08	0.19	0.19	6.00	6.40	1.22	12	0.025	6.66	5.23	3.34	0.18	0.07
			1.52	*0.59*												
WQU 3-1	INLET 3-1	67	0.00	0.00	0.00	1.57	6.00	6.40	10.08	18	0.011	13.03	4.55	4.42	0.77	0.25
CB 2-14	DMH 2-8	22	0.03	0.01	0.03	0.03	6.00	6.40	0.20	12	0.005	2.98	2.34	1.11	0.07	0.33
CB 2-13	DMH 2-8	8	0.12	0.07	0.13	0.13	6.00	6.40	0.85	12	0.005	2.98	2.34	1.70	0.28	0.08
DMH 2-8	WQU 2-2	34	0.00	0.00	0.00	0.16	6.00	6.40	1.04	12	0.005	2.98	2.34	1.81	0.35	0.31
CB 2-12	WQU 2-2	10	0.13	0.02	0.12	0.12	6.00	6.40	0.79	12	0.025	6.66	5.23	2.95	0.12	0.06
WQU 2-2	INLET 1-2	30	0.00	0.00	0.00	0.29	6.00	6.40	1.84	12	0.005	2.98	2.34	2.13	0.62	0.23
CB 2-11	DMH 2-7	80	0.23	0.01	0.21	0.21	6.00	6.40	1.35	12	0.005	2.98	2.34	1.94	0.45	0.69
CB 2-10	DMH 2-7	81	0.08	0.01	0.08	0.08	6.00	6.40	0.48	12	0.005	2.98	2.34	1.44	0.16	0.93
CB 2-9	DMH 2-7	8	0.17	0.07	0.18	0.18	6.00	6.40	1.14	12	0.005	2.98	2.34	1.85	0.38	0.07
DMH 2-7	DMH 2-5	112	0.00	0.00	0.00	0.46	6.00	6.40	2.97	18	0.005	8.79	3.07	2.34	0.34	0.80
CB 2-8	DMH 2-5	26	0.06	0.01	0.06	0.06	6.00	6.40	0.37	12	0.005	2.98	2.34	1.33	0.12	0.32
DMH 2-5	DMH 2-3	46	0.00	0.00	0.00	0.52	6.00	6.40	3.33	18	0.005	8.79	3.07	2.42	0.38	0.32
CB 2-7	DMH 2-6	18	0.02	0.01	0.02	0.02	6.00	6.40	0.14	12	0.005	2.98	2.34	1.00	0.05	0.30
CB 2-6	DMH 2-6	18	0.04	0.12	0.08	0.08	6.00	6.40	0.50	12	0.005	2.98	2.34	1.46	0.17	0.21
DMH 2-6	DMH 2-4	128	0.00	0.00	0.00	0.10	6.00	6.40	0.64	12	0.005	2.98	2.34	1.56	0.21	1.36

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Manning's Equation

$$Q = \frac{1.49}{n} \times A \times R^{2/3} \times S$$

$$R = A/P$$

Rational Method Equation

$$Q = c \times I \times A$$

Manning's Notes		
n	0.013	RCP
n	0.011	HDPE smooth & CIP
c	0.9	Impervious
c	0.35	Open Space

Calculation Notes

Grey Boxes represent data obtained through HydroCAD
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IDF Curve based off of the 100yr storm
Length of pipe was round to the nearest whole number

*Cornell: 24 hours 25-year storm

Line From	Line To	Length (ft)	Imperv. Area (acres)	Perv. Area (acres)	c*A (acres)	SUM (c*A) (acres)	Time of Conc. (BASIN) (min.)	Rainfall* I (in./hr.)	Req. Cap. Qd (cfs)	Pipe (in)	Slope (ft/ft)	Flow Full Qf (cfs)	Flow Full Vf (fps)	Design Vel. Vd (fps)	Qd/Qf	Time in Pipe (min)
CB 2-5	DMH 2-4	8	0.18	0.06	0.18	0.18	6.00	6.40	1.17	12	0.040	8.42	6.61	3.91	0.14	0.03
DMH 2-4	DMH 2-3	83	0.00	0.00	0.00	0.28	6.00	6.40	1.81	12	0.005	2.98	2.34	2.12	0.61	0.65
CB 2-4	DMH 2-3	26	0.22	0.09	0.23	0.23	6.00	6.40	1.47	12	0.015	5.16	4.05	2.95	0.28	0.15
DMH 2-3	DMH 2-2	236	0.00	0.00	0.00	1.03	6.00	6.40	6.61	18	0.005	8.79	3.07	2.96	0.75	1.33
CB 2-3	DMH 2-2	67	0.18	0.27	0.26	0.26	6.00	6.40	1.64	12	0.015	5.16	4.05	3.04	0.32	0.37
CB 2-2	DMH 2-2	8	0.12	0.03	0.12	0.12	6.00	6.40	0.76	12	0.040	8.42	6.61	3.44	0.09	0.04
DMH 2-2	WQU 2-1	84	0.00	0.00	0.00	1.41	6.00	6.40	9.01	18	0.010	12.43	4.34	4.14	0.73	0.34
CB 2-1	WQU 2-1	80	0.28	0.06	0.27	0.27	6.00	6.40	1.75	12	0.005	2.98	2.34	2.10	0.59	0.64
RD 2-1	WQU 2-1	38	0.56	0.00	0.50	0.50	6.00	6.40	3.23	12	0.025	6.66	5.23	4.44	0.48	0.14
WQU 2-1	INLET 1-1	10	0.00	0.00	0.00	2.19	6.00	6.40	13.98	18	0.020	17.57	6.13	6.01	0.80	0.03
			2.42	*0.74*												
CB 1-7	DMH 1-4	95	0.48	0.11	0.47	0.47	6.00	6.40	3.01	12	0.010	4.21	3.31	3.14	0.72	0.50
RD 1-1	DMH 1-4	50	0.23	0.00	0.21	0.21	6.00	6.40	1.32	12	0.025	6.66	5.23	3.43	0.20	0.24
DMH 1-4	DMH 1-3	46	0.00	0.00	0.00	0.68	6.00	6.40	4.34	18	0.010	12.43	4.34	3.35	0.35	0.23
CB 1-6	DMH 1-3	15	0.16	0.10	0.18	0.18	6.00	6.40	1.15	12	0.040	8.42	6.61	3.88	0.14	0.06
DMH 1-3	WQU 1-2	146	0.00	0.00	0.00	0.86	6.00	6.40	5.48	18	0.010	12.43	4.34	3.58	0.44	0.68
CB 1-5	WQU 1-2	10	0.21	0.14	0.24	0.24	6.00	6.40	1.52	12	0.010	4.21	3.31	2.58	0.36	0.06
WQU 1-2	FES 1-1	39	0.00	0.00	0.00	1.09	6.00	6.40	7.00	18	0.020	17.57	6.13	4.92	0.40	0.13
			1.08	*0.35*												
CB 1-4	WQU 1-1	50	0.06	0.12	0.10	0.10	6.00	6.40	0.61	12	0.005	2.98	2.34	1.55	0.21	0.54
CB 1-3	WQU 1-1	30	0.06	0.08	0.08	0.08	6.00	6.40	0.51	12	0.005	2.98	2.34	1.47	0.17	0.34
CB 1-2	WQU 1-1	21	0.00	0.11	0.04	0.04	6.00	6.40	0.26	12	0.005	2.98	2.34	1.20	0.09	0.29
WQU 1-1	FES 1-2	6	0.00	0.00	0.00	0.22	6.00	6.40	1.38	12	0.005	2.98	2.34	1.96	0.47	0.05
OCS 3-1	FES 3	50	0.00	0.00	0.00	0.00	6.00	6.40	0.44	12	0.005	2.98	2.34	1.41	0.15	0.59
OCS 2-1	FES 2	166	0.00	0.00	0.00	0.00	6.00	6.40	1.31	12	0.005	2.98	2.34	1.93	0.44	1.43
OCS 1-2	DMH 1-2	166	0.00	0.00	0.00	0.00	6.00	6.40	1.40	12	0.040	8.42	6.61	4.11	0.17	0.67

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Line		Length	Imperv. Area	Perv. Area	c*A	SUM (c*A)	Time of Conc. (BASIN)	Rainfall*	Req. Cap.	Pipe	Slope	Flow Full		Design Vel.	Qd/Qf	Time in Pipe
From	To	(ft)	(acres)	(acres)	(acres)	(acres)	(min.)	I (in./hr.)	Qd (cfs)	(in)	(ft/ft)	Qf (cfs)	Vf (fps)	Vd (fps)		(min)
OCS 1-1	DMH 1-2	28	0.00	0.00	0.00	0.00	6.00	6.40	0.82	12	0.005	2.98	2.34	1.68	0.28	0.28
DMH 1-2	DMH 1-1	37	0.00	0.00	0.00	0.00	6.00	6.40	2.22	12	0.005	2.98	2.34	2.25	0.75	0.27
CB 1-1	DMH 1-1	8	0.03	0.03	0.04	0.04	6.00	6.40	0.25	12	0.005	2.98	2.34	1.19	0.08	0.11