CROCKETT
ENGINEERING CONSULTANTS

STORM SEWER CALCULATIONS

FOR

The Village at Discovery

Lots 5-8

PROJECT NO.

230286

July 23, 2024

1000 W. Nifong Blvd. Building 1 • Columbia, MO 65203
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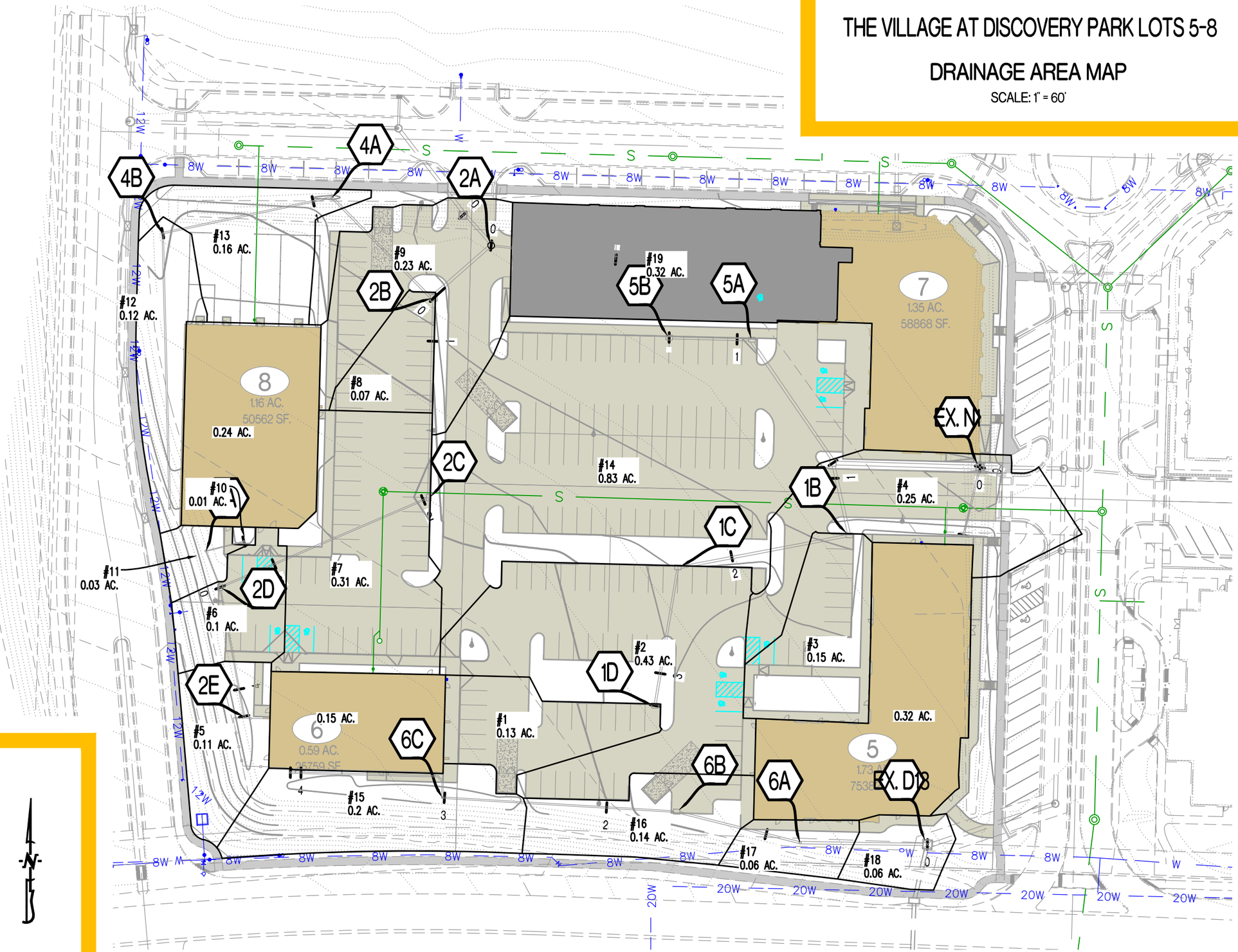
THE VILLAGE AT DISCOVERY PARK LOTS 5-8

DRAINAGE AREA MAP

SCALE: 1" = 60'



PREPARED BY:

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PROJECT: The Village at Discovery Lots 5-8

CALCULATED BY: MWB CHECKED BY: NTE

DATE: 07/19/24 PROJECT NO: 230286

STORM HYDROLOGY / GUTTER / INLET CALCLULATIONS

DESCRIPTION			OVERLAND FLOW HYDROLOGY						GUTTER AND INLET HYDRAULICS							NOTES
AREA NO.	STRUCTURE LABEL	INLET TYPE	TIME OF CONCENTRATION	RUNOFF COEFFICIENT	AREA	CA	RAINFALL INTENSITY	RUNOFF	GUTTER FLOW	GUTTER SLOPE	WIDTH OF GUTTER FLOW	DEPTH OF GUTTER FLOW	THEORETICAL INLET CAPACITY	DESIGN INLET CAPACITY	INLET BYPASS FLOW	
			min		acres	acres	in/hr	cfs	cfs	ft/ft	ft	ft	cfs	cfs	cfs	
1	1D	A		0.81	0.13	0.11	7.4	0.77					9.80	7.84	0.00	TYPE A (IN SUMP)
2	1C	A		0.81	0.14	0.11	7.4	0.83					9.80	7.84	0.00	TYPE A (IN SUMP)
3	1B	A		0.81	0.15	0.12	7.4	0.89					9.80	7.84	0.00	TYPE A (IN SUMP)
4	EX. N1	CURB		0.81	0.50	0.41	7.4	2.98					8.80	7.04	0.00	4' SIDE OPEN INLET (2.2 CFS/FT)
5	2E	AREA		0.30	0.11	0.03	7.4	0.24					0.79	0.63	0.00	10" NYLOPLAST (STANDARD GRATE) W/ 0.7' OF HEAD
6	2D	A		0.81	0.27	0.22	7.4	1.61					9.80	7.84	0.00	TYPE A (IN SUMP)
7	2C	A		0.81	0.31	0.25	7.4	1.85					0.79	0.63	0.00	TYPE A (IN SUMP)
8	2B	A		0.81	0.07	0.06	7.4	0.42					9.80	7.84	0.00	TYPE A (IN SUMP)
9	2A	CB		0.81	0.23	0.19	7.4	1.37					13.40	10.72	0.00	EJ V5636 W/ 0.4' OF HEAD
10	3B	AREA		0.30	0.01	0.00	7.4	0.02					0.73	0.58	0.00	10" NYLOPLAST (STANDARD GRATE) W/ 0.6' OF HEAD
11	3A	AREA		0.30	0.03	0.01	7.4	0.07					0.89	0.71	0.00	10" NYLOPLAST (STANDARD GRATE) W/ 0.9' OF HEAD
12	4B	AREA		0.30	0.12	0.04	7.4	0.26					1.42	1.14	0.00	12" NYLOPLAST (STANDARD GRATE) W/ 0.5' OF HEAD
13	4A	AREA		0.30	0.16	0.05	7.4	0.35					1.42	1.14	0.00	12" NYLOPLAST (DOMED GRATE) W/ 0.5' OF HEAD
14	5A	A		0.81	0.83	0.67	7.4	4.94					9.80	7.84	0.00	TYPE A (IN SUMP)
15	6C	AREA		0.30	0.20	0.06	7.4	0.44					1.27	1.02	0.00	10" NYLOPLAST (DOMED GRATE) W/ 0.5' OF HEAD
16	6B	A		0.81	0.14	0.11	7.4	0.83					9.80	7.84	0.00	TYPE A (IN SUMP)
17	6A	AREA		0.30	0.06	0.02	7.4	0.13					0.66	0.53	0.00	10" NYLOPLAST (STANDARD GRATE) W/ 0.5' OF HEAD
18	EX. D13	CB		0.30	0.06	0.02	7.4	0.13					4.10	3.28	0.00	5' SIDE OPEN INLET (0.82 CFS/FT)
19	8A	CB		0.50	0.32	0.16	7.4	1.18					13.40	10.72	0.00	EJ V5636 W/ 0.4' OF HEAD
				0.99	0.15	0.15	7.4	1.09								Lot 6
				0.99	0.24	0.24	7.4	1.75								Lot 8
				0.99	0.32	0.32	7.4	2.33								Lot 5
				0.99	0.57	0.56	7.4	4.18								Lot 7

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STORM DRAIN PIPE SIZE

DESCRIPTION		STORM DRAIN HYDRAULICS										NOTES
AREA NO.	UPSTREAM STRUCTURE LABEL	TIME OF CONCENTRATION	CA		RAINFALL INTENSITY	RUNOFF	STORM DRAIN SLOPE	STORM DRAIN DIAMETER	STORM DRAIN MATERIAL	CAPACITY FLOWING FULL	VELOCITY FLOWING FULL	
			ADDED	CUMUL					RCP, CMP, PVC, OR HDPE			
		min	acres	acres	in/hr	cfs	ft/ft	in		cfs	fps	
LINE 1												
1	1D	<5	0.12	0.12	7.35	0.89	0.020	12	HDPE	5.46	6.95	
2	1C	<5	0.41	0.53	7.35	3.87	0.020	15	HDPE	9.89	8.06	
3	1B	<5	0.03	0.56	7.35	4.11	0.020	18	HDPE	16.09	9.11	
LINE 5	1A	<5	0.67	1.23	7.35	9.05	0.020	24	HDPE	34.64	11.03	
LINE 2												
5	2E	<5		0.03	7.35	0.24	0.015	8	PVC	1.75	5.01	
6 + LINE 3	2D	<5	0.23	0.26	7.35	1.94	0.015	12	HDPE	4.72	6.02	
7	2C	<5	0.25	0.51	7.35	3.78	0.015	15	HDPE	8.57	6.98	
8 + LINE 4	2B	<5	0.38	0.89	7.35	6.56	0.010	18	HDPE	11.37	6.44	
9 + LINE 8	2A	<5	0.35	1.24	7.35	9.11	0.020	18	HDPE	16.09	9.11	
LINE 3												
10	3B	<5		0.00	7.35	0.02	0.040	6	PVC	1.33	6.75	
11	3A	<5	0.01	0.01	7.35	0.09	0.040	6	PVC	1.33	6.75	
LINE 4												
ROOF (LOT 8)	4C	<5	0.24	0.24	7.35	1.75	0.010	10	PVC	2.59	4.75	
12	4B	<5	0.04	0.27	7.35	2.01	0.020	10	PVC	3.66	6.71	
13	4A	<5	0.05	0.32	7.35	2.36	0.010	12	HDPE	3.86	4.91	
LINE 5												
14	5A	<5	0.67	0.67	7.35	4.94	0.010	18	HDPE	11.37	6.44	
LINE 6												
ROOF (LOT 6)	6D	<5	0.15	0.15	7.35	1.09	0.010	10	PVC	2.59	4.75	
15	6C	<5	0.06	0.21	7.35	1.53	0.010	10	PVC	2.59	4.75	
16	6B	<5	0.11	0.32	7.35	2.37	0.010	12	HDPE	3.86	4.91	
17	6A	<5	0.02	0.34	7.35	2.50	0.005	15	HDPE	4.95	4.03	
LINE 7												
ROOF (LOT 5)	7A	<5		0.32	7.35	2.33	0.010	12	HDPE	3.86	4.91	
LINE 8												
19	8A	<5		0.16	7.35	1.18	0.007	10	PVC	2.17	3.97	

Nyloplast Inlet Capacity Table

DISCLAIMER: SAFETY FACTORS ARE NOT INCLUDED IN THESE CALCULATIONS. ACTUAL CALCULATIONS SHOULD BE CARRIED OUT AND VERIFIED BY THE DESIGN ENGINEER TAKING INTO ACCOUNT ALL LOCAL CONDITIONS. NYLOPLAST RECOMMENDS USING A MINIMUM SAFETY FACTOR OF 1.25 FOR PAVED AREAS AND 2.0 FOR TURF AREAS. ADS/NYLOPLAST IS NOT RESPONSIBLE FOR MISUSE OF THIS TOOL.

Input	
Type of Grate	10" Standard
Head (ft)	0.5

Properties	
Orifice Flow Area (in)	**28.28**
Orifice Flow Area (ft)	**0.20**
Weir Flow Perimeter (in)	**27.48**
Weir Flow Perimeter (ft)	**2.29**

Solution	
Capacity (cfs)	**0.66**
Capacity (gpm)	**298.05**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

$g = Gravitational\ Constant\ \left(32.2\frac{ft}{s^2}\right)$

$H = Depth\ of\ Water\ Above\ Center\ of\ Orifice\ (ft)$

REV 2.1.21

Nyloplast Inlet Capacity Table

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Input	
Type of Grate	10" Standard
Head (ft)	0.6

Properties	
Orifice Flow Area (in)	**28.28**
Orifice Flow Area (ft)	**0.20**
Weir Flow Perimeter (in)	**27.48**
Weir Flow Perimeter (ft)	**2.29**

Solution	
Capacity (cfs)	**0.73**
Capacity (gpm)	**326.49**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

$g = Gravitational\ Constant\ \left(32.2\frac{ft}{s^2}\right)$

$H = Depth\ of\ Water\ Above\ Center\ of\ Orifice\ (ft)$

REV 2.1.21

Nyloplast Inlet Capacity Table

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Input	
Type of Grate	10" Standard
Head (ft)	0.7

Properties	
Orifice Flow Area (in)	**28.28**
Orifice Flow Area (ft)	**0.20**
Weir Flow Perimeter (in)	**27.48**
Weir Flow Perimeter (ft)	**2.29**

Solution	
Capacity (cfs)	**0.79**
Capacity (gpm)	**352.65**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

$g = Gravitational\ Constant\ \left(32.2\frac{ft}{s^2}\right)$

$H = Depth\ of\ Water\ Above\ Center\ of\ Orifice\ (ft)$

REV 2.1.21

Nyloplast Inlet Capacity Table

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Input	
Type of Grate	10" Standard
Head (ft)	0.9

Properties	
Orifice Flow Area (in)	**28.28**
Orifice Flow Area (ft)	**0.20**
Weir Flow Perimeter (in)	**27.48**
Weir Flow Perimeter (ft)	**2.29**

Solution	
Capacity (cfs)	**0.89**
Capacity (gpm)	**399.87**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

$g = Gravitational\ Constant\ \left(32.2\frac{ft}{s^2}\right)$

$H = Depth\ of\ Water\ Above\ Center\ of\ Orifice\ (ft)$

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Input	
Type of Grate	10" Dome
Head (ft)	0.5

Properties	
Orifice Flow Area (in)	**54.00**
Orifice Flow Area (ft)	**0.37**
Weir Flow Perimeter (in)	**32.30**
Weir Flow Perimeter (ft)	**2.69**

Solution	
Capacity (cfs)	**1.27**
Capacity (gpm)	**569.11**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

$g = Gravitational\ Constant\ \left(32.2\frac{ft}{s^2}\right)$

$H = Depth\ of\ Water\ Above\ Center\ of\ Orifice\ (ft)$

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Input	
Type of Grate	12" Standard
Head (ft)	0.5

Properties	
Orifice Flow Area (in)	**60.62**
Orifice Flow Area (ft)	**0.42**
Weir Flow Perimeter (in)	**43.75**
Weir Flow Perimeter (ft)	**3.65**

Solution	
Capacity (cfs)	**1.42**
Capacity (gpm)	**638.88**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

$g = Gravitational\ Constant\ \left(32.2\frac{ft}{s^2}\right)$

$H = Depth\ of\ Water\ Above\ Center\ of\ Orifice\ (ft)$

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Input	
Type of Grate	12" Dome
Head (ft)	0.5

Properties	
Orifice Flow Area (in)	**70.37**
Orifice Flow Area (ft)	**0.49**
Weir Flow Perimeter (in)	**34.56**
Weir Flow Perimeter (ft)	**2.88**

Solution	
Capacity (cfs)	**1.65**
Capacity (gpm)	**741.64**

$$Q_{weir} = CLH^{3/2}$$

$C = 3.33\ Weir\ Discharge\ Coefficient$

$L = Perimeter\ of\ Grate\ Opening\ (ft)$

$H = Flow\ Height\ of\ Water\ Surface\ Above\ Weir\ (ft)$

$$Q_{orifice} = CA\sqrt{2gh}$$

$C = 0.60\ Orifice\ Discharge\ Coefficient$

$A = Area\ of\ the\ Orifice\ (ft^2)$

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