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APPENDIX C

Hydraulic Computations



INLET ON A CONTIN	iuous g	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲Lo (C)۶		5		
H-Curb				
H-Vert Wo				
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10/61				
÷ (0)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAIOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		15.00	5.00	ft
Clogging Eactor, for a Single Unit Grate (typical min, value = 0.5)	vv _o = C-G =	N/A N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'	_	MINOR	MAJOR	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_0 =$	8.5	19.9	cfs
Water Spread Width	T =	13.2	16.0	ft
Water Depth at Street Crown (or at T)	_ = u	3.8	5.0	linches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.183	0.130	
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	6.6	16.4	cfs
Discharge within the Gutter Section W	Q _w =	1.5	2.5	cfs
Discharge Behind the Curb Face	$Q_{BACK} =$	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	6.3	0.32	sq π fns
Water Depth for Design Condition		6.8	8.0	linches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	_ L=	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE} = $	N/A MINOP		
Minimum Velocity Where Grate Splash-Over Begins	V. = [N/A	N/A	fns
Interception Rate of Frontal Flow	R _f =	N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	$Q_i =$	N/A	N/A	cfs
Under Clogging Condition	CrotoCoof -	MINOR		7
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A N/A	N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	_
Actual Interception Capacity	$\mathbf{n}_{\mathbf{x}} = \mathbf{n}_{\mathbf{x}}$		N/A N/A	cfs
Carry-Over Flow = O_0 - O_0 (to be applied to curb opening or next d/s inlet)	$Q_a = 0_b = 0$	N/A	N/A N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.087	0.068	ft/ft
Required Length L _T to Have 100% Interception	L _T = L	18.41 MINOR	31.80	ft
Effective Length of Curb Opening or Slotted Inlet (minimum of L. L.)	ı – F	15.00	15 00	ft
Interception Capacity	Q _i =	7.7	12.9	cfs
Under Clogging Condition		MINOR	MAJOR	_
Clogging Coefficient	CurbCoef =	1.31	1.31	_
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Actual Interception Capacity	с _е = О. =	7.7	14.54	- Cfs
Carry-Over Flow = Q _{b(GRATE)} -Q _a	$\vec{Q}_{b} =$	0.8	7.1	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	7.7	12.8	cfs
Canture Percentage = Ω_{2}/Ω_{2} =	Q _b =	90	64	

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Allo	owable Flow Depth and Spread)
c: Grandview Reserve	
Gutter Geometry: Maximum Alloughla Width for Sproad Robind Curb	T _ 75 A
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$I_{BACK} = 7.5$ ft Source = 0.020 ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{\text{BACK}} = 0.020$ Tyle
	11BACK - 0.020
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00 inches
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft
Gutter Width	W = 0.83 ft
Street Transverse Slope	$S_{x} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _W = 0.083 ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	$I_{MAX} = 16.0$ 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = 4.4$ /./ inches
Check boxes are not applicable in SUMP conditions	
Maximum Canacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	v = 3.84 3.84 linches
Vertical Depth between Gutter Lin and Gutter Flowline (usually 2")	$d_c = 0.8$ 0.8 inches
Gutter Depression ($d_c = (W * S_c * 12))$	a = 0.63 0.63 inches
Water Depth at Gutter Flowline	d = 4.47 4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_{\rm x} = 15.2$ 15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eg. ST-7)	$E_0 = 0.149$ 0.149
Discharge outside the Gutter Section W, carried in Section T_x	$Q_x = 0.0 0.0 cfs$
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 \text{ cfs}$
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm Major Storm
Theoretical Water Spread	T _{TH} = 15.6 29.4 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X TH} = 14.7 28.6$ ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.153 0.079$
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	$Q_{X TH} = 0.0 0.0 cfs$
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_{\rm X} = 0.0 0.0 {\rm cfs}$
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_{W} = 0.0 0.0 \text{ cfs}$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
I otal Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow velocity Within the Gutter Section	v = 0.0 0.0 tps
Vra Product: Flow Velocity Times Gutter Flowline Depth	$v^{\star}a = 0.0 \qquad 0.0$
Suble-based Depth Safety Reduction Factor for Major & Minor ($a \ge b^{-}$) Storm May Flow Pased on Allowable Dopth (Safety Factor Applied)	
Produtant Flow Donth at Cutter Flowling (Safety Factor Applied)	d - SUMP SUMP CIS
Resultant Flow Depth at Street Crown (Safety Factor Applied)	
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Maior Storm
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm Qallow = SUMP SUMP cfs

		R SAG LOC	ATION		
	بر لاحمان المراجع	5.01 (April 2021)			
	H-Vert Wo		_		
	wet				
ſ	CDOT Type R Curb Opening		MINOR	MAJOR	
	Type of Inlet	Type =	CDOT Type R	Curb Opening]
	Local Depression (additional to continuous gutter depression 'a' from above)	a _{local} =	3.00	3.00	inches
	Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	inches
	Grate Information		MINOR	MAJOR	
	Length of a Unit Grate Width of a Unit Grate	$L_{o}(G) =$	N/A	N/A	feet
	Area Opening Ratio for a Grate (typical values 0.15-0.90)	A _{ratio} =	N/A	N/A	
	Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_{f}(G) =$	N/A	N/A	
	Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	4
	Curb Opening Information	C ₀ (G) =	MINOR	MAIOR	
	Length of a Unit Curb Opening	$L_{o}(C) =$	20.00	5.00	feet
	Height of Vertical Curb Opening in Inches	H _{vert} =	6.00	6.00	inches
	Height of Curb Orifice Throat in Inches	H _{throat} =	6.00	6.00	inches
na 1	Angle of Throat (see USDCM Figure ST-5) Side Width for Depression Pan (typically the gutter width of 2 feet)	W ₋ =	2.00	2.00	feet
<u>,</u> -	Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f(C) =$	0.10	0.10	
	Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w(C) =$	3.60	3.60	
	Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_{o}(C) =$	0.67	0.67	
	Clogging Coefficient for Multiple Units	Coef =	N/A	MAJOR N/A	7
	Clogging Factor for Multiple Units	Clog =	N/A	N/A	
	Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	-
	Interception without Clogging		N/A	N/A	cfs
	Grate Capacity as a Orifice (based on Modified HEC22 Method)	Q _{wa} –	MINOR	MAJOR	
	Interception without Clogging	Q _{oi} =	N/A	N/A	cfs
	Interception with Clogging	Q _{oa} =	N/A	N/A	cfs
	Grate Capacity as Mixed Flow	оГ	MINOR N/A	MAJOR N/A	Tefs
	Interception without clogging		N/A	N/A N/A	cfs
	Resulting Grate Capacity (assumes clogged condition)	Q _{Grate} =	N/A	N/A	cfs
	Curb Opening Flow Analysis (Calculated)	а (Г	MINOR	MAJOR	7
	Clogging Coefficient for Multiple Units	Coet =	1.33	1.33	-
	Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
	Interception without Clogging	Q _{wi} =	10.0	35.4	cfs
	Interception with Clogging	Q _{wa} =	9.7	34.3	cfs
	Curb Opening as an Orifice (based on Modified HEC22 Method)	0Г	MINOR 33.6	MAJOR 43.9	lcfs
	Interception without clogging	$Q_{00} = $	32.5	42.4	cfs
	Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	_
	Interception without Clogging	Q _{mi} =	17.0	36.7	cfs
	Interception with Clogging Resulting Curb Opening Canacity (assumes clogged condition)		<u>16.5</u> 9.7	35.5 34.3	cfs
ŀ	Resultant Street Conditions	Curb	MINOR	MAJOR	
	Total Inlet Length	L = [20.00	20.00	feet
	Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
		u _{CROWN} =	0.0	3.2	
	Low Head Performance Reduction (Calculated)		MINOR	MAJOR	_
	Depth for Grate Midwidth	d _{Grate} =	N/A	N/A	ft
	Depth for Curb Opening Weir Equation		0.29	0.57	- ^{rr}
	Curb Opening Performance Reduction Factor for Long Inlets	RF _{Curb} =	0.67	0.72	1
	Grated Inlet Performance Reduction Factor for Long Inlets	RF _{Grate} =	N/A	N/A]
	Total Inlet Intercention Capacity (assumes closed condition)	0 - = □	MINOR 9.7	MAJOR 34.3	cfs
	rotar inter interception capacity (assumes clogged condition)		212	5.15	

Warning 1 Note: This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm
(Based on Regulated Criteria for Maximum Allo	owable Flow Depth and Spread)
(D: Basin A-3 (DP3)	
TBACKTCROWN	
Gutter Geometry:	
Maximum Allowable Width for Spread Behind Curb	T _{BACK} = 7.5 ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.020
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00 linches
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft
Gutter Width	W = 2.00 ft
Street Transverse Slope	$S_x = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} = 0.016
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	$I_{MAX} = 16.0$ 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = 4.4$ /./ inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	v = 3.84 3.84 linches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	$d_c = 2.0$ 2.0 inches
Gutter Depression (d_c - (W * S _v * 12))	a = 1.51 1.51 inches
Water Depth at Gutter Flowline	d = 5.35 5.35 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_x = 14.0$ 14.0 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.372 0.372$
Discharge outside the Gutter Section W, carried in Section T_x	$Q_x = 0.0 0.0 cfs$
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_{W} = 0.0 0.0 \text{ cfs}$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Canacity for 1/2 Street based on Allowable Denth	Minor Storm Major Storm
Theoretical Water Spread	$T_{rel} = \begin{bmatrix} 11.9 \\ 25.7 \end{bmatrix} ff$
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{VTI} = 99$ 23.7 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Fg. ST-7)	$F_0 = 0.497 = 0.228$
Theoretical Discharge outside the Gutter Section W, carried in Section T_{VTH}	$O_{VTH} = 0.0 0.0 cfs$
Actual Discharge outside the Gutter Section W. (limited by distance T _{CROWN})	$Q_x = 0.0$ 0.0 cfs
Discharge within the Gutter Section W ($Q_d - Q_v$)	$Q_{W} = 0.0 0.0 \text{ cfs}$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$O_{BACK} = 0.0 0.0 cfs$
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	O = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Depth Safety Reduction Factor for Maior & Minor $(d > 6")$ Storm	R = SUMP SUMP
Max Flow Based on Allowable Depth (Safety Factor Applied)	
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = linches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches
Incontant now Depth at Succe crown (Sarety Factor Applied)	
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm

INLET IN A SUMP OR SAG LOCATION MHFD-Inlet, Version 5.01 (April 2021) -Lo (C) H-Curb H-Vert Wo w Lo (G) CDOT Type R Curb Opening -Design Information (Input) MINOR MAJOR Type of Inlet CDOT Type R Curb Opening Type = Local Depression (additional to continuous gutter depression 'a' from above) 3.00 inches a_{local} Number of Unit Inlets (Grate or Curb Opening) Water Depth at Flowline (outside of local depression) Override Depths $N_0 =$ Ponding Depth = 4.4 inches Grate Information MINOF MAJOR Length of a Unit Grate $L_{o}(G) =$ N/A feet Width of a Unit Grate $W_o =$ N/A N/A feet Area Opening Ratio for a Grate (typical values 0.15-0.90) A_{ratio} = N/A Clogging Factor for a Single Grate (typical value 0.50 - 0.70) $C_f(G) =$ N/A N/A Grate Weir Coefficient (typical value 2.15 - 3.60) C_w (G) = N/A Grate Orifice Coefficient (typical value 0.60 - 0.80) Ĉ₀ (G) N/A Curb Opening Information MINOR MAJOR Length of a Unit Curb Opening $L_{o}(C) =$ 5.00 feet Height of Vertical Curb Opening in Inches 6.00 inches H_{vert} = Height of Curb Orifice Throat in Inches inches 6.00 H_{throat} = Angle of Throat (see USDCM Figure ST-5) Theta = 63.40 degrees Side Width for Depression Pan (typically the gutter width of 2 feet) $W_p =$ 2.00 eet Clogging Factor for a Single Curb Opening (typical value 0.10) 0.10 $C_{f}(C) =$ 0.10 Curb Opening Weir Coefficient (typical value 2.3-3.7) Curb Opening Orifice Coefficient (typical value 2.3-0.70) $C_{w}(C) = C_{o}(C) =$ 3.60 0.67 Grate Flow Analysis (Calculated) MINOF MAJOR Clogging Coefficient for Multiple Units Coef = N/A N/A N/A MAJOR Clogging Factor for Multiple Units Clog = N/A Grate Capacity as a Weir (based on Modified HEC22 Method) MINOR Q_{wi} = N/A Interception without Clogging N/A lcfs Interception with Clogging Grate Capacity as a Orifice (based on Modified HEC22 Method) Q_{wa} = N/A N/A cfs MINOR MAJOR Interception without Clogging N/A N/A cfs Q_{oi} : Interception with Clogging $Q_{oa} =$ N/A N/A lcfs Grate Capacity as Mixed Flow MINOF MAJOR Interception without Clogging Q_{mi} = cfs N/A N/A Interception with Clogging Q_{ma} = N/A N/A cfs Resulting Grate Capacity (assumes clogged of Curb Opening Flow Analysis (Calculated) QGrate = N/A N/A cfs clogged condition MINO Major Clogging Coefficient for Multiple Units Coef = 1.00 1.00 Clogging Factor for Multiple Units Clog = 0.10 0.10 Curb Opening as a Weir (based on Modified HEC22 Method) MINO MAJOR Interception without Clogging Q_{wi} = 10.1 cfs 2.7 Interception with Clogging Q_{wa} = 2.4 9.1 cfs Curb Opening as an Orifice (based on Modified HEC22 Method) MINOR MAJOR Interception without Clogging cfs $Q_{0i} =$ 8.4 11.0 Interception without clogging Interception with Clogging Curb Opening Capacity as Mixed Flow 7.6 9.9 $Q_{oa} =$ cfs MINOR MAJOR

Interception without Clogging Q_{mi} = 4.4 9.8 cfs Interception with Clogging Q_{ma} = 4.0 88 cfs Q_{Curb} Resulting Curb Opening Capacity (assumes clogged condition) Resultant Street Conditions 2.4 8.8 cfs MINOF MAJOR Total Inlet Length 5.00 feet 1 = 5.00 ft.>T-Crown 25.7 Resultant Street Flow Spread (based on street geometry from above) T = 11.9 Resultant Flow Depth at Street Crown d_{CROWN} = 0.0 2.3 inches Low Head Performance Reduction (Calculated) MINOR MAJOR Depth for Grate Midwidth $d_{Grate} =$ N/A 0.20 N/A 0.47 ft Depth for Curb Opening Weir Equation ft d_{Curb} = Combination Inlet Performance Reduction Factor for Long Inlets RF_{Combination} = 0.56 0.98 RF_{Curb} Curb Opening Performance Reduction Factor for Long Inlets 1.00 1.00 $\mathsf{RF}_{\mathsf{Grate}}$ Grated Inlet Performance Reduction Factor for Long Inlets N/A N/A MINOR MAJOR **Q**_a = Total Inlet Interception Capacity (assumes clogged condition) 2.4 8.8 cfs

Q PEAK REQUIRED =

1.6

3.0

cfs

MHFD-A Basin Inlets v5.01.xlsm, Basin A-3 (DP3)



INLET ON A CONTIN	NUOUS G	RADE		
MHFD-Inlet, Version 5.0	01 (April 2021)			
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H-Curb H-Vert		-		
- Wo				
Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAJOR	_
Type of Inlet	Type =	CDOT Type R	Curb Opening	linchos
Total Number of Units in the Inlet (Grate or Curb Opening)	alocal =	<u> </u>	3.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)	L ₀ =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	_
Street Hydraulics: OK - O < Allowable Street Capacity'	ل- <i>ل</i> = ا	MINOR	MA10R	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	Q ₀ =	9.8	22.8	cfs
Water Spread Width	Т =	14.2	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.0	5.3	inches
Water Depth at Street Crown (or at T _{MAX}) Ratio of Gutter Flow to Decign Flow	a _{crown} =	0.0	0.9	Inches
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	8.1	20.0	cfs
Discharge within the Gutter Section W	Q _w =	1.7	2.8	cfs
Discharge Behind the Curb Face	Q _{BACK} =	0.0	0.0	cfs
How Area within the Gutter Section W	A _W =	0.25	0.34	sq ft
Water Depth for Design Condition		7.0	8.3	linches
Grate Analysis (Calculated)	entra	MINOR	MAJOR	
Total Length of Inlet Grate Opening	_ L=	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE} = $	N/A MINOP		
Minimum Velocity Where Grate Splash-Over Begins	V. = [N/A	N/A	fps
Interception Rate of Frontal Flow	$R_f =$	N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	$Q_i = L$	N/A MINOP		cts
Clogging Condition Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V ₀ =	N/A	N/A N/A	- tps
Interception Rate of Side Flow	R _v =	N/A	N/A	-
Actual Interception Capacity	$\hat{\mathbf{Q}_a} =$	N/A	N/A	cfs
Carry-Over Flow = $Q_0 - Q_a$ (to be applied to curb opening or next d/s inlet)	Q _b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)	s _[MINOR	MAJOR	
Required Length L _T to Have 100% Interception	З _е – Lт =	20.84	35.80	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L = [15.00	15.00	ft
Interception Capacity	$Q_i = [$	8.8 MINOP	14.2 MAJOR	cts
Clogging Condition	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L _e =	13.03	13.03	ft
Actual Interception Capacity	Q _a =	8.6	13.8	cfs
Isummary	Q _b =	MINOR	MAJOR	
Total Inlet Interception Capacity	Q = [8.6	13.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _b =	1.2	9.0	cfs
ICapture Percentage = Ω_{c}/Ω_{c} =	C% =	88	61	10/2



INLET ON A CONTIN	NUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲				
H-Curb Thursen				
H-Vert Wo	-			
Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)	-	MINOR	MAJOR	_
Type of Inlet	Type =	CDOT Type R	Curb Opening	linchos
Total Number of Units in the Inlet (Grate or Curb Opening)	aLOCAL =	<u> </u>	3.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_0 =$	15.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C _f -G =	N/A 0.10	N/A 0.10	_
Street Hydraulics: OK - Q < Allowable Street Capacity'	CF-C = 1	MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	$Q_o = [$	6.5	15.2	cfs
Water Spread Width	T =	12.1	16.0	ft
Water Depth at Flowline (outside of local depression) Water Depth at Street Crown (or at T)	= D =	3.5	4./	inches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.200	0.142	inches
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	5.2	13.1	cfs
Discharge within the Gutter Section W	Q _w =	1.3	2.2	cfs
Discharge Behind the Curb Face	$Q_{BACK} = \Delta \dots = \Delta$	0.0	0.0	cts
Velocity within the Gutter Section W	V _w =	6.0	7.4	fps
Water Depth for Design Condition	d _{LOCAL} =	6.5	7.7	inches
Grate Analysis (Calculated)	, г	MINOR	MAJOR	
I otal Length of Inlet Grate Opening Ratio of Grate Flow to Design Flow	E courre =	N/A N/A	N/A N/A	_π
Under No-Clogging Condition	-GRATE -	MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	_
Interception Rate of Side Flow	$R_x = 0$	N/A N/A	N/A N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Minimum Velocity Where Grate Splash-Over Begins	L _e = V _o =	N/A N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	
Interception Rate of Side Flow	$R_x =$	N/A	N/A	
Actual Interception Capacity Carry-Over Flow = $\Omega_{-}\Omega_{-}$ (to be applied to curb opening or pext d/s inlet)	$Q_a = 0$	<u>N/A</u>	N/A N/A	cts
Curb or Slotted Inlet Opening Analysis (Calculated)	Q b =	MINOR	MAJOR	
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.093	0.072	ft/ft
Required Length L _T to Have 100% Interception	$L_T = L$	15.94	27.68	ft
Effective Length of Curb Opening or Slotted Inlet (minimum of L. L.)	1 = [10.00	MAJOR 10.00	Tft .
Interception Capacity	Q _i =	5.4	8.4	cfs
Under Clogging Condition		MINOR	MAJOR	_
Clogging Coefficient	CurbCoef =	1.25	1.25	-
Effective (Uncloaged) Length		8.75	8.75	⊣ _{ft} ∣
Actual Interception Capacity	$\mathbf{Q}_{a}^{e} =$	5.2	8.1	cfs
$Carry-Over Flow = Q_{b/(GRATE)} - Q_a$	Q _b =	1.3	7.1	cfs
Summary	o_[MINOR 5 2	MAJOR 91	Cfe
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q = 0, =	1.3	7.1	cfs
Capture Percentage = O_3/O_0 =	C% =	80	53	%

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ALLOWABLE CAPACITY FOR ONE-HALF	OF STREET ((Minor & Ma	ajor Storr
(Based on Regulated Criteria for Maximum /	lowable Flow Depth	and Spread)	
DP 4			
I Teacor I Transmi			
т, тих			
SOACK W Tr			
STREET			
B P S S CIONN			
I O S			
Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5 ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	SBACK = 0.	020 ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.	020	
Unight of Own at Oather Flow Line			
Distance from Curb Economic Character Convert	H _{CURB} = 6	.00 incnes	
Distance from Curb Face to Street Crown	$I_{CROWN} = 1$	6.0 ft	
Gutter Width	W = 2	.00 ft	
Street Transverse Slope	$S_X = 0.$	020 ft/ft	
Guiller Gross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = 0.$	U83 IT/It	
Street Longitudinal Slope - Enter U for sump condition	$S_0 = 0.$	000 ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.$	016	
	Minor	Storm Major Stor	m
Max. Allowable Spread for Minor & Major Storm	T _{MAX} = 1	6.0 16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =	1.4 7.7	inches
Check boxes are not applicable in SUMP conditions			
Maximum Canacity for 1/2 Street based On Allowable Spread	Minor	- Storm Major Stor	m
Water Depth without Cutter Depression (Eq. ST-2)			linches
Vertical Depth between Gutter Lin and Gutter Flowline (usually 2")	y =	$\frac{101}{20}$	linches
Gutter Depression ($d_{e} = (W * S * 12)$)	a = 1	51 1 51	linches
Water Dept as Gutter Flowline	d = 5	35 5 35	linches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_v = 1$	40 140	ff
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0$	372 0.372	
Discharge outside the Gutter Section W. carried in Section T _v	$O_{\rm v} = 0$	0.0	cfs
Discharge within the Gutter Section W ($O_T - O_Y$)		0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)		0.0	cfs
Maximum Flow Based On Allowable Spread			cfs
Flow Velocity within the Gutter Section	V = (0.0 0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0	0.0 0.0	
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor	Storm Major Stor	m
Theoretical Water Spread		19 257	 Ift
Theoretical Spread for Discharge outside the Gutter Section W (T - W)		2.5 23.7	${ft}$
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0	497 0 228	
Theoretical Discharge outside the Gutter Section W, carried in Section Tyre	О _{У ТН} = (0.0 0.0	cfs
Actual Discharge outside the Gutter Section W. (limited by distance Topoun)		0.0	drfs
Discharge within the Gutter Section W ($O_d - O_v$)		0.0	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)).0 0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)		0.0	cfs
Average Flow Velocity Within the Gutter Section	v =	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Denth	v=	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor $(d > 6")$ Storm			
Max Flow Based on Allowable Depth (Safety Factor Applied)			cfs
Resultant Flow Denth at Gutter Flowline (Safety Factor Applied)			
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} =		inches
		a	
MINUK STUKM Allowable Capacity is based on Depth Criterion	Minor	r Storm Major Stor	<u>m</u>
MAJOR STORM Allowable Canacity is based on Donth Criterion		IMD CITE	

INLET IN A SUMP OR SAG LOCATION MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAIOR	
Type of Inlet	Type -	CDOT Type R	Curb Opening	ן ו
Legal Depression (additional to continuous suttor depression is) from above)	Type –	2.00		inchos
Local Depression (additional to continuous gutter depression a from above)	d _{local} =	3.00	5.00	Inches
Number of Unit Inlets (Grate or Curb Opening)	NO =	1	1	-
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	linches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	$L_{0}(G) =$	N/A	N/A	feet
Width of a Unit Grate	W ₀ =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0,15-0,90)	A _{ratio} =	N/A	N/A	1
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_{c}(G) =$	N/A	N/A	- 1
Grate Weir Coefficient (typical value 2.15 - 3.60)		N/A	NI/A	- 1
Crate Orifice Coefficient (typical value 0.60 - 0.90)		N/A	N/A	-
	C ₀ (G) = [IN/A	IN/A]
Curb Opening Information		MINOR	MAJOR	7.
Length of a Unit Curb Opening	$L_0(C) =$	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H _{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W. =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_{\ell}(C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2 3-3 7)	$C_{(0)} = 1$	3.60	3.60	-
Curb Opening Orifice Coefficient (typical value 2.5 5.7)	$C_{w}(c) = 0$	0.67	0.67	-
Crate Flow Applying Coloulated		MINOD	MAJOD	<u> </u>
Grate Flow Analysis (Calculated)		MINOR	MAJOR	-
Clogging Coefficient for Multiple Units	Coet =	N/A	N/A	
Clogging Factor for Multiple Units	Clog =	N/A	N/A	
Grate Capacity as a Weir (based on Modified HEC22 Method)	_	MINOR	MAJOR	_
Interception without Clogging	Q _{wi} =	N/A	N/A	cfs
Interception with Clogging	Q _{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	-
Interception without Clogging	0 _{0i} =	N/A	N/A	lcfs
Interception with Clogging	0=	N/A	N/A	cfs
Grate Canacity as Mixed Flow	-COa	MINOR	MAIOR	
Interception without Clogging	0 -1	N/A	N/A	lefe
Interception with Obraging		N/A	N/A	cis
	Q _{ma} =	N/A	N/A	
Resulting Grate Capacity (assumes clogged condition)	℃ Grate −	N/A	N/A	LIS
<u>Curb Opening Flow Analysis (Calculated)</u>		MINOR	MAJOR	-
Clogging Coefficient for Multiple Units	Coef =	1.31	1.31	
Clogging Factor for Multiple Units	Clog =	0.04	0.04	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	_
Interception without Clogging	Q _{wi} =	3.9	19.2	cfs
Interception with Clogging	Q _{wa} =	3.8	18.4	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)	1	MINOR	MAJOR	-
Interception without Clogging	O _{oi} =	25.2	32.9	lcfs
Interception with Clogging	õ =	24.1	31.5	l cfs
Curb Opening Canacity as Mixed Flow	~ ₀a − [MINOD	MA10D	
Curb Opening Capacity as Mixed 110W	o _l		11AUUK	lefe
	Q _{mi} =	9.2	23.4	
Interception with Clogging	Q _{ma} =	8.8	22.4	crs
Resulting Curb Opening Capacity (assumes clogged condition)	Q _{Curb} =	3.8	18.4	CTS
Resultant Street Conditions		MINOR	MAJOR	_
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	11.9	25.7	ft.>T-Crown
Resultant Flow Depth at Street Crown	d _{CROWN} =	0.0	2.3	inches
				-
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d	N/A	N/A	Tft I
Depth for Curb Opening Weir Equation	d	0.20	0.47	
Combination Inlat Porformance Deduction Eactor for Long Inlate		0.20	0.77	
Combination Theorem Provide Reduction Factor for Long Thets	KF _{Combination} =	0.41	0.72	-
Curb Opening Performance Reduction Factor for Long Inlets	KF _{Curb} =	0.6/	0.88	-
Grated Injet Performance Reduction Factor for Long Injets	RF _{Grate} =	N/A	N/A]
		MINOR	MAJOR	_
Total Inlet Interception Capacity (assumes clogged condition)	Q _a =	3.8	18.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>O PEAK)	Q PEAK REQUIRED =	2.5	16.1	cfs

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF C	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum All ct: Grandview Reserve	owable Flow Depth and Spread)
D: Basin A-5 (DP5)	
Teack Torown	
Т. Тыхх	
SBACK W Tx	
STREET	
I O S	
Gutter Geometry:	
Maximum Allowable Width for Spread Behind Curb	T _{BACK} = 7.5 ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.020
Height of Curb at Gutter Flow Line	Hours = 6.00 linches
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft
Gutter Width	W = 2.00 ft
Street Transverse Slope	$S_{X} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	T _{MAX} = 16.0 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} = 4.4 7.7 inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = 3.84 3.84 inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	$d_c = 2.0$ 2.0 inches
Gutter Depression (d _C - (W * S _x * 12))	a = <u>1.51</u> <u>1.51</u> inches
Water Depth at Gutter Flowline	d = 5.35 5.35 inches
Allowable Spread for Discharge outside the Gutter Section W (1 - W)	$I_{\rm X} = 14.0$ 14.0 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. SI-7)	$E_0 = 0.372 0.372 0.66$
Discharge within the Gutter Section W ($\Omega_{-2} \Omega_{-1}$)	$Q_X = 0.0 0.0 \text{ crs}$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{W} = 0.0$ 0.0 cfs
Maximum Flow Based On Allowable Spread	$O_T = SUMP$ SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Capacity for 1/2 Street based on Allowable Denth	Minor Storm Major Storm
Theoretical Water Spread	$T_{TH} = \begin{bmatrix} 11.9 \\ 11.9 \end{bmatrix} = \begin{bmatrix} 25.7 \\ 11.9 \end{bmatrix} ft$
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{XTH} = 9.9$ 23.7 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.497 0.228$
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 0.0 0.0 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_{\rm X} = 0.0 0.0$ cfs
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_W = 0.0 0.0 \text{ cfs}$
Discharge Benind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 \text{ cfs}$
Average Flow Velocity Within the Cutter Section	Q = 0.0 0.0 crs
Average flow velocity Within the Gutter Flowline Denth	v = 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0
Slope-Based Depth Safety Reduction Factor for Maior & Minor $(d > 6")$ Storm	
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = SUMP SUMP cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm
MATOR STORM Allowable Capacity is based on Depth Criterion	
IMA IUR STURM Allowable Cabacity is based on Debut Chiedon	



MHFD-Inlet, Version 5.01	(April 2021)	
ALLOWABLE CAPACITY FOR ONE-HALF C	F STREET (Mind	or & Major Storm)
(Based on Regulated Criteria for Maximum All	owable Flow Depth and Spr	read)
t: Grandview Reserve		
Basin A-6 (DP6)		
Succe T. Turke W Tr D D D S STREET CROWN		
Gutter Geometry:	T 75	10
Maximum Allowable Width for Spread Benind Curb	$I_{BACK} = 7.5$	
Side Slope Benind Curb (leave blank for no conveyance credit benind curb)	$S_{BACK} = 0.020$	1 ^{TT/TL}
	11BACK - 0.020	1
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00	linches
Distance from Curb Face to Street Crown	T _{CROWN} = 16.0	ft.
Gutter Width	W = 0.83]ft
Street Transverse Slope	S _x = 0.020]ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _W = 0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S ₀ = 0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} = 0.016	
	Min ou Chause	Maian Channa
Max Allowable Spread for Minor & Major Storm		Major Storm
Max. Allowable Spredu for Millior & Major Storm Max. Allowable Denth at Gutter Flowling for Minor & Major Storm	$I_{MAX} = 16.0$	16.0 IL
Allow Elow Depth at Street Crown (check box for yes, leave blank for no)	u _{MAX} =	
Allow Flow Deput at Street Crown (check box for yes, leave blank for ho)		•
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm	Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = 3.84	3.84 inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _c = 0.8	0.8 inches
Gutter Depression (d_c - (W * S_x * 12))	a = 0.63	0.63 inches
Nater Depth at Gutter Flowline	d = 4.47	4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _x = 15.2	15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.149$	0.149
Discharge outside the Gutter Section W, carried in Section T_x	$Q_{\rm X} = 7.3$	7.3 cfs
Discharge within the Gutter Section W ($Q_T - Q_X$)	Q _W = <u>1.3</u>	1.3 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0$	0.0 cfs
Maximum Flow Based On Allowable Spread	$Q_{T} = 8.5$	8.5 cts
Flow Velocity within the Gutter Section	V = 0.8	0.8 tps
*a Product: Flow velocity times Gutter Flowline Depth	V*d = 0.3	0.3
Maximum Capacity for 1/2 Street based on Allowable Denth	Minor Storm	Maior Storm
Theoretical Water Spread	T _{TH} = 16.7	29.4 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} = 15.8	28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.142	0.079
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 8.2	39.3 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _x = 8.2	34.1 cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q _w = <u>1.4</u>	3.4 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} = 0.0	0.7 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 9.5	38.2 cfs
Average Flow Velocity Within the Gutter Section	V = 0.8	1.2 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.3	0.7
Siope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R = 1.00	
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = 9.5	38.2 Cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = 4.63	/.68 inches
Resultant now Deput at Street Clowin (Salety Factor Applied)	ucrown = 0.17	J.22 Inches
MINOR STORM Allowable Capacity is based on Spread Criterion	Minor Storm	Maior Storm
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = 8.5	38.2 cfs
Minor storm max. allowable capacity GOOD - greater than the design flow giv	en on sheet 'Inlet Managem	ient'
Major storm max. allowable capacity GOOD - greater than the design flow giv	en on sheet 'Inlet Managem	ient'



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	7
Length of a Single Unit Inlet (Grate or Curb Opening)	L ₀ =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W. Gutter Width)	W_ =	N/A	N/A	Tft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	CG =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min, value = 0.1)	C-C =	0.10	0.10	1
Street Hydraulics: OK - O < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	0 ₀ =	4.6	10.7	lcfs
Water Spread Width	Т =	12.6	16.0	ft
Water Denth at Flowline (outside of local depression)	d =	3.7	4.8	linches
Water Depth at Street Crown (or at T _{MAX})	dcrown =	0.0	0.4	linches
Ratio of Gutter Flow to Design Flow	F. =	0 191	0.136	
Discharge outside the Gutter Section W. carried in Section T.	0. =	3.7	9.2	cfs
Discharge within the Gutter Section W	Q =	0.9	1.5	
Discharge Rehind the Curb Face	0	0.0	0.0	cfs
Flow Area within the Gutter Section W		0.22	0.30	Isa ft
Velocity within the Gutter Section W	V =	3.9	4.8	Ins
Water Denth for Design Condition	duccu =	6.7	7.8	linches
Grate Analysis (Calculated)	MIDIAI -	MINOR	MATOR	Inches
Total Length of Inlet Grate Opening	=	N/A	N/A	Πft
Ratio of Grate Flow to Design Flow	E. CONTE =	N/A	N/A	-1.
Under No-Clogging Condition	LO-GRATE -	MINOR	MATOR	_
Minimum Velocity Where Grate Splash-Over Begins	v -	N/A		fns
Intercention Rate of Frontal Flow	V ₀ – R. –	N/A	N/A	
Interception Rate of Frontal How		N/A	N/A	-
	N _X -	N/A	N/A	ofc
Under Clogging Condition	Qi - [MINOR	MAIOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef -	N/A		٦
Clogging Eactor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	-
Effective (uncloaged) Length of Multiple-unit Grate Inlet		N/A	N/A	
Minimum Valacity Where Crate Splach Over Regine		N/A	N/A	fnc
Intercention Pate of Frontal Flow	v ₀ –	N/A	N/A	
Interception Rate of Flow	R -	N/A	N/A	-
Actual Interception Canacity		N/A	N/A	ofe
Carra = 0 ver Elow = 0 = 0. (to be applied to curb opening or payt d/c inlet)	Qa -	N/A	N/A N/A	ofo
Curb or Slotted Inlet Opening Applysis (Calculated)	Qh - 1	MINOP		
Equivalent Slope S. (based on grate carry-over)	s –I	0.000		
Pequired Length L to Have 100% Intercention	5 _e –	12.88	22.25	
Under No-Clogging Condition	LT - [12.00 MINOD	MA10D	_In:
Effective Length of Curb Opening or Slotted Inlat (minimum of L. L.)	ı _1	10.00	10.00	∃⊕
		10.00	10.00	
Under Clogging Condition	Qi - [MINOR		
Clogging Coefficient	CurbCoof -	1 25	1 25	7
Clogging Eactor for Multiple-upit Curb Opening or Slotted Inlat		0.06	1.25	-1
Effective (Incloged) Length		0.00	0.00	- _#
Actual Intercention Consciev		9.3/	9.37	
Actual Interception Capacity	Q ₂ =	4.2	2.9	
$\frac{ Cally-Over Flow}{= Q_{b(GRATE)} - Q_a}$	Q _b = [U.4 MINOR	<u> </u>	icis
Summer Participation Conscience	n – I] of c
Total Inter Ception Capacity	Q =	4.2	2.9	
Canture Percentage $= 0 / 0 =$	Qb =	0.4	5.0	
$V_{A}U_{A}U_{A}U_{A}U_{A}U_{A}U_{A}U_{A}U$	L-70 = 1	34	. 04	1 (1)

Provided the provided of the	MHFD-Inlet, Version 5.01	1 (April 2021)		
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread) (Fight Care Resonance Control Regulated Criteria for Maximum Allowable Flow Depth and Spread) (Suffer Geometry: (Suffer Geometry: Maximum Allowable With for Spread Belind Curb Suffer Geometry: Maximum Allowable With for Spread Belind Curb Taxce = 7.5 ft See Size Belind Curb (break beach for no conveyance credit behind curb) Taxce = 0.020 n/n* Maximum Allowable With for Spread Belind Curb Taxce = 0.020 n/n* Statuse from Curb Face to Street Crown 500 n n Catter Transmer Stopp 1000 n/n* 1000 n/n* Gatter Cross Stope (typically 2 Inches over 24 inches or 0.083 ft/ft) Singer Storm 1000 n/n* Max. Allowable Spread for Minor & Major Storm Taxee = 10.000 n/n* 10.000 n/n* Max. Allowable Spread for Minor & Major Storm Taxee = 10.000 n/n* 10.000 n/n* Max. Allowable Spread for Minor & Major Storm Taxee = 10.000 n/n* 10.000 n/n* 10.000 n/n*	ALLOWABLE CAPACITY FOR ONE-HALF C	DF STREET (Min	or & Major St	orm)
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Sector V (c) (c)Sector V (c)Summary ControlSummary ControlMary ControlMary ControlMary ControlSummary ControlMary Control <t< th=""><th>C Grandview Reserve</th><th></th><th></th><th></th></t<>	C Grandview Reserve			
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Maximum Capacity for 1/2 Street based On Allowable SpreadMinor StormMajor StormWater Depth without Gutter Depression (Eq. 5T-2) $y = 3.84$ 3.84 3.84 inchesVertical Depth between Gutter Ip and Gutter Flowline (usually 2") $a = 1.51$ 1.51 inchesGutter Depression ($d_c - (W * S_k * 12)$) $a = 1.51$ 1.51 inchesWater Depth at Gutter Flowline $d = 5.35$ 5.35 inchesAllowable Spread for Discharge outside the Gutter Section W (T - W) $T_x = 14.0$ 14.0 14.0 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.372$ 0.372 0.372 Discharge outside the Gutter Section W ($Q_T - Q_x$) $Q_w = 34.8$ 34.8 44.8 Discharge behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{acx} = 0.0$ 0.0 0.0 Maximum Flow Based On Allowable Spread $Q_T = 93.5$ 93.5 cfs Flow Velocity within the Gutter Section W ($T - W$) $T_{TH} = 11.9$ 25.7 ft Maximum Capacity for 1/2 Street based on Allowable Depth $T_{TH} = 0.497$ 0.228 70.7 Theoretical Spread for Discharge outside the Gutter Section W ($T - W$) $T_{TH} = 0.497$ 22.8 70.7 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $Q_{ax} = 23.1$ 23.1 $23.9.0$ cfs Maximum Capacity for 1/2 Street based on Allowable Capeth $V^*d = 21.4$ 21.4 21.4 21.4 21.4 Maximum Capacity for 1/2 Street based on Allowable Capeth $V^*d = 21.4$ 22.8 70.7	Allow How Depth at Street Crown (check box for yes, leave blank for no)		V	
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Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d, - (W * S_x * 12)) $d_c =$ 2.0 2.0 inchesGutter Depression (d, - (W * S_x * 12)) $d_c =$ 2.0 2.0 inchesAllowable Spread for Discharge outside the Gutter Section W (T · W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $d =$ 5.35 5.35 inchesDischarge within the Gutter Section W (Qr · Q_x) $Q_x =$ 58.7 58.7 fs Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{aexx} =$ 0.0 0.0 fs Maximum Capacity for 1/2 Street based on Allowable Depth $V =$ 48.0 48.0 fs Maximum Capacity for 1/2 Street based on Allowable Depth $V =$ 21.4 21.4 21.4 Maximum Capacity for 1/2 Street based on Allowable Depth $T_{TH} =$ 11.9 25.7 ft Theoretical Spreadfrow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $Q_x =$ 23.1 239.0 cfs Catter Flow to Design Flow Ratio by HWA HEC-22 method (Eq. ST-7) $Q_x =$ 23.1 217.0 cfs Theoretical Spread for Discharge outside the Gutter Section W, (arried in Section T_{XTH}) $Q_x =$ 23.1 217.0 cfs Actual Discharge outside the Gutter Section W, (arried in Section T_{XTH}) $Q_x =$ 23.1 217.0 cfs Discharge within the Gutter Section W, (limited by distance T_{GOWN}) $Q_w =$ 23.1 217.0 cfs Discharge within the Gutter Section W, (limited by distance T_{GOWN}	Water Depth without Gutter Depression (Eq. ST-2)	y = 3.84	3.84 inches	
Gutter Depression $(d_{\mathbb{C}} - (W * S_x * 12))$ a = 1.51 1.51 1.51 inchesWater Depth at Gutter FlowlineGutter Flowlined = 5.35 5.35 inchesAllowable Spread for Discharge outside the Gutter Section W (T - W) $T_X = 14.0 14.0 14.0 trGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E_0 = 0.372 0.372 trDischarge outside the Gutter Section W (Q_T - Q_x)Q_W = 34.8 34.8 trDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns)Q_W = 34.8 34.8 trMaximum Flow Based On Allowable SpreadV = 48.0 48.0 trFlow Velocity within the Gutter Section W (T - W)V = 48.0 48.0 trMaximum Capacity for 1/2 Street based on Allowable DepthV = 21.4 21.4 trTheoretical Discharge outside the Gutter Section W (T - W)T_{TH} = 9.9 23.7 trGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E_0 = 0.497 0.228 trTheoretical Discharge outside the Gutter Section W (T - W)T_{TH} = 9.9 23.7 trGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E_0 = 0.497 0.228 trTheoretical Discharge outside the Gutter Section W (Q_1 - Q_2)Q_W = 22.8 70.7 trDischarge outside the Gutter Section W (Q_1 - Q_2)Q_W = 22.8 70.7 trDischarge flow Velocity Within the Gutter Section W (Pre-Safety Factor)Q_H = 24.9 295.0 trAverage Flow Velocity Within the Gutter Section W (A_2 - Q_2)Q_W = 22.8 70.7 trDischarge flow Velocity Within the Gutter Section W (A_2 - Q_2)Q_{W} = 22.8 70.7 trDischarge flow Velocity Within the Gutter Section W (Q_2 - Q_2)Q_{W} = 22.8 70.7 trDischarge Flow Velocity Wi$	Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _C = 2.0	2.0 inches	
Water Depth at Gutter Flowlined f f f Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge within the Gutter Section W (Q_r - Q_x) $T_x = 14.0$ 14.0 14.0 14.0 Discharge outside the Gutter Section W (Q_r - Q_x) $Q_x = 58.7$ 58.7 58.7 58.7 58.7 Discharge within the Gutter Section W (Q_r - Q_x) $Q_w = 34.8$ 34.8 48.0 65 Maximum Flow Based On Allowable Spread $Q_r = 93.5$ 93.5 cfs Flow Velocity within the Gutter Section $V = 48.0$ 48.0 fps V*d Product: Flow Velocity times Gutter Flowline Depth $V^*d = 21.4$ 21.4 21.4 Maximum Capacity for $1/2$ Street based on Allowable Depth $V^*d = 21.4$ 21.4 21.4 Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ $Q_{X,TH} = 9.9$ 23.7 $7t$ Discharge within the Gutter Section W, (Imited by distance T_{GOWN}) $Q_x = 23.1$ 217.0 215.0 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{w} = 22.8$ 70.7 $7t$ Discharge off Major & Minor Storm (Pre-Safety Factor) $Q_x = 45.9$ 295.0 cfs Actual Discharge for Major & Minor (d $\geq 6^n$) Storm $Q_d = 6.2$ 10.8 $9t$ Max Flow Based on Allowable Depth $Gater Flowline (Safety Factor Applied)$ $Q_d = 6.2$ <t< td=""><td>Gutter Depression (d_c - (W * S_x * 12))</td><td>a = 1.51</td><td>1.51 inches</td><td></td></t<>	Gutter Depression (d_c - (W * S_x * 12))	a = 1.51	1.51 inches	
Allowable Spread for Discharge outside the Gutter Section W (T - W) $T_x = \begin{bmatrix} 14.0 & 14.0 \\ 0.372 & 0.372 \\ 0.37 & 0.0 \\ 0.0 & 0.0 & 0.0 \\ 0.0 & 0$	Water Depth at Gutter Flowline	d = 5.35	5.35 inches	
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E_0 = 0.3720.3720.372Discharge outside the Gutter Section W (Q _T - Q _X)CS8.7S8.7S6.7S8.7cfsDischarge within the Gutter Section W (Q _T - Q _X)Q _X =0.3720.3720.3720.372O.375O.375O.375O.375O.3	Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _x = <u>14.0</u>	14.0 ft	
Discharge outside the Gutter Section W, carried in Section Tx Discharge within the Gutter Section W (Q _T - Q _X)Qx = S8.758.7fs S8.7fs cfsDischarge within the Gutter Section W (Q _T - Q _X)Qw =34.834.8cfsMaximum Flow Based On Allowable SpreadQT =93.593.5cfsFlow Velocity within the Gutter SectionV =48.048.0fpsV*d Product: Flow Velocity times Gutter Flowline DepthV*d =21.421.421.4Maximum Capacity for 1/2 Street based on Allowable DepthV*d =11.925.7ftTheoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section Tx TH Actual Discharge outside the Gutter Section W, carried in Section Tx TH Qx TH =Qx =23.123.0cfsActual Discharge outside the Gutter Section W (Q _d - Q _X)Qw =22.870.7cfsDischarge flow Velocity Within the Gutter Section W (Q_d - Q_X)Qw =22.870.7cfsDischarge flow Velocity Within the Gutter SectionQ =45.9295.0cfsAverage Flow Velocity Within the Gutter SectionV =0.007.4cfsStope-Based Depth Safety Ractor for Major & Minor (d ≥ 6") StormR =0.130.04Max Flow Based on Allowable DepthGafety Factor Applied)G =2.432.89inchesResultant Flow Depth at Gutter Flowline (Safety Factor Applied)G =2.432.89i	Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.372$	0.372	
Discharge within the Gutter Section W (Q ₁ - Q _X) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowline Depth Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, climited by distance T _{CROWN}) Discharge Within the Gutter Section W (Q ₁ - Q _X) Discharge Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section Puth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Dast on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm	Discharge outside the Gutter Section W, carried in Section T_{χ}	Q _X = 58.7	58.7 cfs	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} =$ 0.00.0cfsMaximum Flow Based On Allowable Spread $Q_T =$ 93.593.5cfsFlow Velocity within the Gutter SectionV =48.048.0fpsV*d Product: Flow Velocity times Gutter Flowline DepthV*d =21.421.4frsMaximum Capacity for 1/2 Street based on Allowable DepthV*d =21.421.4ftTheoretical Water SpreadTheoretical Spread for Discharge outside the Gutter Section W (T - W)Tx =9.923.7ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Eo =0.4970.228ftActual Discharge outside the Gutter Section W, (limited by distance T CROWN)Qx =23.1239.0cfsDischarge Rehind the Curb (e.g., sidewalk, driveways, & lawns)QaACK =0.07.4cfsDischarge Flow Velocity Within the Gutter SectionWinor (d \geq 6") StormQaACK =0.07.4cfsN*d Product: Flow Velocity Times Gutter Flowline DepthV*d =14.840.6fpsfpsV*d Product: Flow Velocity Within the Gutter SectionWinor (d \geq 6") StormR =0.130.04fpsMax Flow Based On Allowable Depth (Safety Factor Applied)Qa6.210.8cfsResultant Flow Depth at Gutter Flowline (Safety Factor Applied)d =2.432.89inchesMax Flow Depth at Street Crown (Safety Factor Applied)d =2.432.89inchesMax Flow Depth at Street	Discharge within the Gutter Section W ($Q_T - Q_X$)	Q _W = 34.8	34.8 cfs	
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With a product. How velocity unles dutter Howme DepthWith a protect of the stress of the	How Velocity within the Gutter Section	V = 48.0	48.0 tps	
Maximum Capacity for 1/2 Street based on Allowable DepthMinor StormMajor StormTheoretical Water SpreadTheoretical Spread for Discharge outside the Gutter Section W (T - W) $T_{TH} = 11.9$ 25.7ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.497$ 0.228ftTheoretical Discharge outside the Gutter Section W, carried in Section Tx TH $Q_X TH = 23.1$ 239.0cfsActual Discharge outside the Gutter Section W (Q _a - Q _x) $Q_w = 22.8$ 70.7cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_BACK = 0.0$ 7.4cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q_a = 45.9$ 295.0cfsAverage Flow Velocity Within the Gutter SectionV = 40.663.4fpsV*d Product: Flow Velocity Times Gutter Flowline DepthV*d =14.840.6Slope-Based Depth Safety Ractor for Major & Minor (d ≥ 6") Storm $R = 0.13$ 0.04Max Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 2.43$ 2.89inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d = 2.43$ 2.89inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMinor StormMinor Storm	V ^{**} d Product: Flow velocity times Gutter Flowline Depth	V**u =21.4	21.4	
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Theoretical Spread for Discharge outside the Gutter Section W (T - W) $T_{X TH} = 9.9$ 23.7 ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.497$ 0.228 0.497 0.228 Theoretical Discharge outside the Gutter Section W, (limited in Section $T_{X TH}$ $Q_{X TH} = 23.1$ 239.0 cfsActual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_X = 23.1$ 217.0 cfsDischarge within the Gutter Section W ($Q_d - Q_X$) $Q_W = 22.8$ 70.7 cfsDischarge Plow Velocity Within the Gutter Section $V = 45.9$ 295.0 cfsAverage Flow Velocity Within the Gutter Section $V = 40.6$ 63.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 14.8$ 40.6 fpsSlope-Based Depth Safety Raduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R = 0.13$ 0.04 fsResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 2.43$ 2.89 inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d = 2.43$ 2.89 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm	Theoretical Water Spread	T _{TH} = 11.9	25.7 ft	
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.497 citor 0.228$ Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} $Q_{XTH} = 23.1 citor 0.238$ Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) $Q_X = 23.1 citor 0.231 citor 0.228$ Discharge within the Gutter Section W ($Q_2 - Q_X$) $Q_W = 22.8 citor 0.0 citor 0.77 citor 0.228 citor 0.0 citor 0.231 citor 0.231$	Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} = 9.9	23.7 ft	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X TH}$ $Q_{X TH} = 23.1$ 239.0 cfsActual Discharge outside the Gutter Section W ($Q_d - Q_X$) $Q_x = 23.1$ 217.0 cfsDischarge within the Gutter Section W ($Q_d - Q_X$) $Q_w = 22.8$ 70.7 cfsDischarge behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} = 0.0$ 7.4 cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q = 45.9$ 295.0 cfsAverage Flow Velocity Within the Gutter Section $V = 40.6$ 63.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 14.8$ 40.6 6.2 10.8 Stope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^\circ$) Storm $R = 0.13$ 0.04 cfs Max Flow Based on Allowable Depth (Safety Factor Applied) $d = 2.43$ 2.89 inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d = 2.43$ 2.89 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm	Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.497	0.228	
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$\begin{array}{c c} \text{Discharge within the Gutter Section W} (Q_{d} - Q_{x}) \\ \text{Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)} \\ \text{Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)} \\ \text{Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)} \\ \text{Discharge Flow Velocity Within the Gutter Section} \\ \text{Average Flow Velocity Within the Gutter Section} \\ \text{Average Flow Velocity Within the Gutter Section} \\ \text{V*d Product: Flow Velocity Times Gutter Flowline Depth} \\ \text{Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6^{\circ}) Storm \\ \text{Max Flow Based on Allowable Depth (Safety Factor Applied)} \\ \text{Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)} \\ \text{Resultant Flow Depth at Street Crown (Safety Factor Applied)} \\ \text{MINOR STORM Allowable Capacity is based on Depth Criterion} \\ \end{array}$	Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _x = 23.1	217.0 cfs	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} =$ 0.0 7.4 cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q =$ 45.9 295.0 cfsAverage Flow Velocity Within the Gutter Section $V =$ 40.6 63.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d =$ 14.8 40.6 63.4 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm $R =$ 0.13 0.04 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 6.2 10.8 cfsResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ 2.43 2.89 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor StormMajor Storm	Discharge within the Gutter Section W ($Q_d - Q_x$)	Q _W = 22.8	70.7 cfs	
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Average How Velocity Within the Gutter Section $V = 40.6$ 63.4 fps V*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 14.8$ 40.6 Stope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^\circ$) Storm $R = 0.13$ 0.04 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 6.2$ 10.8 cfs Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 2.43$ 2.89 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm	Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 45.9	295.0 cfs	
V^*a product: How Velocity I imes Gutter Howine Depth V^*d = 14.8 40.6 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R =$ 0.13 0.04 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 6.2 10.8 cfs Resultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ 2.43 2.89 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm	Average Flow Velocity Within the Gutter Section	V = 40.6	63.4 fps	
Resultant Flow Depth 1 Safety Reduction Factor for Major & Minor ($d \ge b$) StormR =0.130.04Max Flow Based on Allowable Depth (Safety Factor Applied) $\mathbf{Q}_d =$ 6.2 10.8 \mathbf{cfs} Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ 2.43 2.89 inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ 0.00 0.00 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm	V*a Product: Flow Velocity Times Gutter Flowline Depth	$V^*d = 14.8$	40.6	
Index how based on Autowable Deput (valuely factor Applied) $Q_d = 0.2$ 10.8CTSResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 2.43$ 2.89inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm	Solution Pactor for Major & Minor ($a \ge 6^{\circ}$) Storm May Flow Based on Allowable Depth (Safety Factor Applied)	R = 0.13		
Minor Storm Minor Storm	Pacultant Flow Dastu on Allowable Deputi (Safety Factor Applieu)	$\mathbf{Q}_{d} = \begin{bmatrix} 0.2 \\ 2.42 \end{bmatrix}$		
MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm	Resultant Flow Depth at Street Crown (Safety Factor Applied)	d = 2.43 $d_{CROWN} = 0.00$	0.00 inches	
MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm	······································			
	MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion $Q_{allow} = 6.2$ 10.8 cfs	MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = 6.2	10.8 cfs	
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Minor storm max. allowable capacity GOOD - greater than the design flow give	ven on sheet 'Inlet Manage	ment'	



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	7
Length of a Single Unit Inlet (Grate or Curb Opening)	L _n =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W ₀ =	N/A	N/A	Tft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C _f -G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	1
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_0 = [$	1.1	2.0	lcfs
Water Spread Width	τ ₌ Γ	1.3	1.6	
Water Depth at Flowline (outside of local depression)	d =	1.3	1.6	linches
Water Depth at Street Crown (or at T _{MAX})	d _{CROWN} =	0.0	0.0	linches
Ratio of Gutter Flow to Design Flow	E _o =	1.012	1.000	
Discharge outside the Gutter Section W. carried in Section T.	0, =	0.0	0.0	cfs
Discharge within the Gutter Section W	0=	1.1	2.0	
Discharge Behind the Curb Face		0.0	0.0	
Flow Area within the Gutter Section W		0.05	0.10	Iso ft
Velocity within the Gutter Section W	v = H	22.0	19.2	Ins
Water Denth for Design Condition	duoqui =	4 3	4.6	linches
Grate Analysis (Calculated)	GIOLAL -	MINOR	MATOR	Inches
Total Length of Inlet Grate Opening	ı – [N/A		70
Patio of Grate Flow to Design Flow	E	N/A	N/A	
Under No-Clogging Condition				
Minimum Valasity Where Crote Splach Over Peging	v _F	N/A		Ifor
Interception Date of Frontal Flow	v° -	N/A	N/A	
Interception Rate of Florida Flow		N/A	N/A	
	R _x =	N/A	N/A	
Under Clogging Condition	Qi – L			
Classing Coefficient for Multiple unit Crote Inlet		MINUR		7
Clogging Coemclent for Multiple-unit Grate Inlet	GrateCoer =	IN/A	IN/A	-
Clogging Factor for Multiple-Unit Grate Inlet	GrateClog =	N/A	N/A	- <u>-</u>
Effective (unclogged) Length of Multiple-unit Grate Inlet		N/A	N/A	
Infinimum velocity where Grate Splash-Over Begins	v _o = -	N/A	N/A	-I ^{rps}
Interception Rate of Frontal Flow	R _f =	N/A	N/A	4
Interception Rate of Side Flow	R _x =	N/A	N/A	4.
Actual Interception Capacity	Q _a =	N/A	N/A	cts
Carry-Over Flow = $Q_0 - Q_0$ (to be applied to curb opening or next d/s inlet)	Q _b =	<u>N/A</u>	N/A	cts
Curb or Slotted Inlet Opening Analysis (Calculated)	а Г	MINOR	MAJOR	-
Equivalent Slope S_e (based on grate carry-over)	S _e =	0.208	0.208	ft/ft
Required Length L_T to Have 100% Interception	L _T = [5.50	7.47	ft
Under No-Clogging Condition	-	MINOR	MAJOR	٦.
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L = _	5.00	5.00	ft
Interception Capacity	$Q_i = $	1.1	1.7	cfs
Under Clogging Condition	-	MINOR	MAJOR	_
Clogging Coefficient	CurbCoef =	1.00	1.00	4
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.10	0.10	_
Effective (Unclogged) Length	L _e =	4.50	4.50	ft
Actual Interception Capacity	Q _a =	1.0	1.6	cfs
Carry-Over Flow = Q _{b/GRATE} -Q _a	Q _b =	0.1	0.4	cfs
Summary		MINOR	MAJOR	_
Total Inlet Interception Capacity	Q =	1.0	1.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _b =	0.1	0.4	cfs
		05		1.01

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF C	DF STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Al ect: Grandview Reserve	lowable Flow Depth and Spread)
ID: Basin A-9(DP7a)	
Succe Totomy Succe W Tr Common Single Common Single Comm	
Gutter Geometry: Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$T_{BACK} = \underbrace{7.5}_{S_{BACK}} ft$ $S_{BACK} = \underbrace{0.020}_{BACK} ft/ft$
Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter Width Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020)	
Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions	$T_{MAX} = \frac{Minor Storm}{16.0} \qquad Major Storm ft \\ d_{MAX} = \frac{4.4}{7.7} \qquad model{eq:max}$
Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (dc - (W * Sx * 12)) Water Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W, carried in Section Tx Discharge within the Gutter Section W (QT - Qx) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section Ved Product: Flow Velocity times Gutter Flowline Depth	$\begin{array}{c ccccc} & \mbox{Minor Storm} & \mbox{Major Storm} \\ y = & 3.84 & 3.84 & $$inches$ \\ d_c = & 0.8 & 0.8 & $$inches$ \\ a = & 0.63 & 0.63 & $$inches$ \\ d = & 4.47 & 4.47 & $inches$ \\ d = & 4.47 & 4.47 & $inches$ \\ T_x = & 15.2 & 15.2 & ft \\ E_0 = & 0.149 & 0.149 & \\ Q_x = & 0.0 & 0.0 & cfs \\ Q_w = & 0.0 & 0.0 & cfs \\ Q_w = & 0.0 & 0.0 & cfs \\ Q_{BACK} = & 0.0 & 0.0 & cfs \\ Q_{BACK} = & 0.0 & 0.0 & cfs \\ Q_{T} = & $SUMP$ & $SUMP$ \\ V = & 0.0 & 0.0 & fps \\ V*d = & 0.0 & 0.0 \\ \end{array}$
$ \begin{array}{l} \label{eq:main_section} \end{tabular} \\ \begin{tabular}{lllllllllllllllllllllllllllllllllll$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm Qallow SUMP SUMP



Warning 1 Note:

This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF C	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum All	owable Flow Depth and Spread)
ID: Basin A-10(DP7b)	
Tomore Tomore Succession T. Tune Street CROWN	
Gutter Geometry: Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter Width Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$\begin{array}{c} T_{BACK} = & \hline 7.5 & \text{ft} \\ S_{BACK} = & 0.020 & \text{ft/ft} \\ n_{BACK} = & 0.020 & \\ H_{CURB} = & \hline 6.00 & \text{inches} \\ T_{CROWN} = & 16.0 & \text{ft} \\ W = & 0.83 & \text{ft} \\ S_X = & 0.020 & \\ S_W = & 0.083 & \text{ft/ft} \\ \end{array}$
Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm	$S_{O} = \underbrace{0.000}_{N_{STREET}} \text{ft/ft}$ $M_{IOT} \text{ Storm} M_{ajor} \text{ Storm}$ $T_{MAX} = \underbrace{16.0} 16.0 \text{ft}$
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions	d _{MAX} = 4.4 7.7 inches
Maximum Lapacity for 1/2 Street Dased On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) Water Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W, carried in Section T _x Discharge within the Gutter Section W (Q _T - Q _x)	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowline Depth	$\begin{array}{c ccccc} Q_{BACK} = & 0.0 & 0.0 & cfs \\ \hline Q_T = & SUMP & SUMP & cfs \\ V = & 0.0 & 0.0 & fps \\ V^*d = & 0.0 & 0.0 & \end{array}$
Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W (Q _d - Q _X) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$\begin{array}{c} \mbox{Minor Storm} & \mbox{Major Storm} \\ T_{TH} = & \begin{tabular}{lllllllllllllllllllllllllllllllllll$
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm Qallow SUMP SUMP SUMP



Warning 1 Note:

This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Allo	owable Flow Depth and Spread)
(D: Basin B-1 (DP 9)	
Maximum Allowable Width for Spread Behind Curb	$T_{\text{party}} = 75$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.020
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00 inches
Distance from Curb Face to Street Crown	$I_{CROWN} = 16.0$ ft
Gutter Width	W = 0.83 ft
Street Transverse Slope	$S_{\rm X} = 0.020$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_W = 0.083 \text{ ft/ft}$
Street Longitudinal Slope - Enter 0 for Sump condition Manning's Poughness for Street Section (typically between 0.012 and 0.020)	$S_0 = 0.000 \ \pi/\pi$
Maining's Roughness for Suleet Section (typically between 0.012 and 0.020)	
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	T _{MAX} = 16.0 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} = 4.4 7.7 inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. 51-2)	y = 3.84 3.84 inches
Cutter Depression (d = (W * S * 12))	$u_c = 0.8$ 0.8 inches
Succession $(u_c = (w + S_x + 12))$	d = 0.05 0.05 inches
Water Deput at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section $W(T - W)$	u = 4.47 4.47 incres
Gutter Flow to Design Flow Patio by FHWA HEC-22 method (Fg. ST-7)	$F_0 = 0.140 0.140$
Discharge outside the Gutter Section W, carried in Section T_x	$O_{\rm v} = 0.0$ 0.145 cfs
Discharge within the Gutter Section W ($O_T - O_V$)	$Q_{W} = 0.0$ 0.0 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Canacity for 1/2 Street based on Allowable Donth	Miner Champ Main Champ
Theoretical Water Spread	$T_{-1} = \begin{bmatrix} 15.6 \\ 15.6 \\ 29.4 \end{bmatrix}$
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{\text{TH}} = 15.0$ 29.4 It
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Fg. ST-7)	$F_{0} = 0.153 0.079$
Theoretical Discharge outside the Gutter Section W_{c} carried in Section T_{VTH}	$O_{\rm V,TH} = 0.0$ 0.0 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_x = 0.0$ 0.0 cfs
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_{W} = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} = 0.0 0.0 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm	R = SUMP SUMP
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = SUMP SUMP cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	a = inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	u _{crown} = incres
MINOR STORM Allowable Canacity is based on Depth Criterion	Minor Storm Major Storm
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm Oallow = SUMP SUMP cfs

	INLET IN A SUMP C	R SAG LOC 5.01 (April 2021)	ATION		
	۲				
	H-Curb H-Vert				
	£ 20(0)				
	CDOT Type R Curb Opening				
Ī	Design Information (Input)		MINOR	MAJOR	
	Type of Inlet	Type =	CDOT Type F	R Curb Opening	
	Local Depression (additional to continuous gutter depression 'a' from above)	a _{local} =	3.00	3.00	inches
	Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	Override Dep
	Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	inches
	Grate Information		MINOR	MAJOR	Ifaat
	Width of a Unit Grate	$L_0(G) = -$	N/A	N/A	feet
	Area Opening Ratio for a Grate (typical values 0 15-0 90)	Δ=	N/Α	N/A	
	Clogging Factor for a Single Grate (typical values 0.15 0.50)	$C_{f}(G) =$	N/A	N/A	-
	Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_{w}^{(G)} =$	N/A	N/A	
	Grate Orifice Coefficient (typical value 0.60 - 0.80)	$\ddot{C}_{o}(G) =$	N/A	N/A	
	Curb Opening Information		MINOR	MAJOR	-
	Length of a Unit Curb Opening	$L_{o}(C) =$	15.00	15.00	feet
	Height of Vertical Curb Opening in Inches	H _{vert} =	6.00	6.00	inches
	Height of Curb Orifice Throat in Inches	H _{throat} =	6.00	6.00	inches
. 1	Angle of Infoat (see USDUM Figure SI-5) Side Width for Depression Pan (typically the gutter width of 2 feet)	ineta =	2.00	2.00	degrees
9 1	Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_{(0)} = $	0.10	0.10	
	Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_{m}(C) =$	3.60	3.60	-
	Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$\widetilde{C}_{0}(\widetilde{C}) =$	0.67	0.67	
	Grate Flow Analysis (Calculated)		MINOR	MAJOR	_
	Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
	Clogging Factor for Multiple Units	Clog =	N/A	N/A	
	Grate Capacity as a Weir (based on Modified HEC22 Method)	- -	MINOR	MAJOR	7.
	Interception without Clogging	Q _{wi} =	N/A	N/A	cts
	Interception with Clogging Grate Capacity as a Orifice (based on Medified HEC22 Method)	Q _{wa} =	N/A MINOR	I N/A	CTS
	Intercention without Clogging	0=[
	Interception with Clogging	Q ₀₀ =	N/A	N/A	cfs
	Grate Capacity as Mixed Flow		MINOR	MAJOR	
	Interception without Clogging	Q _{mi} =	N/A	N/A	cfs
	Interception with Clogging	Q _{ma} =	N/A	N/A	cfs
	Resulting Grate Capacity (assumes clogged condition)	Q _{Grate} =	N/A	N/A	cfs
	Curb Opening Flow Analysis (Calculated)	а (Г	MINOR	MAJOR	-
	Clogging Coefficient for Multiple Units	Coer =	1.31	1.31	_
	Curb Opening as a Weir (based on Medified HEC22 Method)		0.04 MINOR	0.04 MA1OR	
	Interception without Clogging	0.=	6.3	1 22 5	
	Interception with Clogging	Q _{wn} =	6.1	21.5	cfs
	Curb Opening as an Orifice (based on Modified HEC22 Method)	-Cwa	MINOR	MAJOR	
	Interception without Clogging	Q _{oi} =	25.2	32.9	cfs
	Interception with Clogging	Q _{oa} =	24.1	31.5	cfs
	Curb Opening Capacity as Mixed Flow	_	MINOR	MAJOR	- -
	Interception without Clogging	Q _{mi} =	11.8	25.3	cfs
	Interception with Clogging		11.2	24.2	
	Resultant Street Conditions	Curb -		MA100	
	Total Inlet Length	I – E	15.00	15.00	feet
	Resultant Street Flow Spread (based on street geometry from above)		15.6	29.4	ft.>T-Crown
	Resultant Flow Depth at Street Crown	d _{CROWN} =	0.0	3.2	inches
					_
	Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
	Depth for Grate Midwidth	d _{Grate} =	N/A	N/A	ft
	Depth for Curb Opening Weir Equation	d _{Curb} =	0.29	0.57	ft
	Combination Inlet Performance Reduction Factor for Long Inlets	RF _{Combination} =	0.41	0.72	4
	Curb Opening Performance Reduction Factor for Long Inlets	RF _{Curb} =	0.67	0.88	4
	Grated Inlet Performance Reduction Factor for Long Inlets	RF _{Grate} =	N/A	I N/A	
			MINOD	MAIOD	
	Tabl Islah Islam (constitut (construction alogned constitution)	o - 🗆	61	1 21 5	-fe
	LIOTAL INIET INTERCENTION CADACITY (ASSUMES CIORDED CONDITION)	U	V.1	61.1	ICIS

Warning 1 Note: This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STRE	ET (Mino	or & Maj	<u>or Storm)</u>
(Based on Regulated Criteria for Maximum All	lowable Flow	Depth and Spr	ead)	
): Basin B-2 (DP 10a)				
Succe T. Tux W T. D D D Street CROWN				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5]ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S _{BACK} =	0.020]ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020		
			•	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	linches	
Distance from Curb Face to Street Crown	I CROWN =	16.0	ft	
Gutter Width	w =	0.83	ft ovo	
Street Transverse Slope	$S_{\chi} =$	0.020	π/π	
Gutter Cross Slope (typically 2 inches over 24 inches or $0.083 \text{ tr/tr})$	S _W =	0.083	π/π	
Street Longitudinal Slope - Enter 0 for Sump condition	S ₀ =	0.020	π/π	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	IISTREET =	0.016	1	
		Minor Storm	Major Storm	
Max, Allowable Spread for Minor & Major Storm	Тмах = [16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Maior Storm	d _{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	-MAX		v	
		1	Record Control of Cont	
Maximum Capacity for 1/2 Street based On Allowable Spread	-	Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _c =	0.8	0.8	inches
Gutter Depression (d_c - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	_d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_X =$	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. S1-7)	$E_0 =$	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_{χ}	$Q_{\rm X} =$	10.3	10.3	CTS
Discharge within the Gutter Section W ($Q_T - Q_X$)	Qw =	1.8	1.8	- CTS
Maximum Flow Based On Allowable Spread		0.0	0.0	
Flaw Valesity within the Cyster Castion	Q T -	11	12.1	fine
Flow velocity within the Gutter Section	= v - b*V	0.4	0.4	- ips
a riodaet. Now velocity times dater nowine bepan	v u - L	0.1	0.1	
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T _{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	Т _{х тн} =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X тн} =	9.5	55.6	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _X =	9.5	48.2	cfs
Discharge within the Gutter Section W ($Q_d - Q_X$)	Q _W =	1.7	4.8	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} =$	0.0	1.0	cts
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	11.2	54.0	cfs
Average Flow Velocity Within the Gutter Section	V =	1.1	1.6	tps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.4	1.0	4
ISope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R =	1.00	0.83	
Man Else Desert en Allevis ble Denth (Cefet Else Allevis b	0.=	11.2	45.0	
Max Flow Based on Allowable Depth (Safety Factor Applied)	•ea = -		. /17	Inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	7.17	linchos
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	d = d _{CROWN} =	4.36 0.00	2.70	inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	d = d _{CROWN} =	4.36 0.00	2.70	inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	d = d = d _{CROWN} = [4.36 0.00 Minor Storm 11.2	7.17 2.70 Major Storm 45.0	inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max. allowable capacity GOOD - greater than the design flow give	Q allow = [(yen on sheet ']	4.36 0.00 Minor Storm 11.2	7.17 2.70 Major Storm 45.0	inches cfs

INLET ON A CONTIN	iuous g	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲Lo (C)۶		5		
H-Curb		-		
H-Vert Wo				
/w / hand >				
To (G)				
£0(0)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAIOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		10.00	10.00	ft
Clogging Eactor, for a Single Unit Grate (typical min, value = 0.5)	vv _o = C-G =	N/A N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity		MINOR	MAJOR	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_0 =$	7.1	16.7	cfs
Water Spread Width	T =	13.1	16.0	ft
Water Depth at Flowing (outside of local depression)	depower	0.0	0.5	inches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.184	0.131	
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	5.8	14.5	cfs
Discharge within the Gutter Section W	Q _w =	1.3	2.2	cfs
Discharge Behind the Curb Face	$Q_{BACK} =$	0.0	0.0	cfs
Velocity within the Gutter Section W	Aw = V =	5.7	6.9	fns
Water Depth for Design Condition	d _{LOCAL} =	6.8	8.0	inches
Grate Analysis (Calculated)	-	MINOR	MAJOR	
Total Length of Inlet Grate Opening	_ L=	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE} = $	N/A MINOP		
Minimum Velocity Where Grate Splash-Over Begins	V. =[N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	$Q_i = [$	N/A	N/A	cfs
<u>Under Clogging Condition</u> Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef -			7
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet	$L_e = [$	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	<u>N/A</u>	N/A	_
Actual Interception Capacity	0 . =	N/A	N/A	cfs
Carry-Over Flow = Q_0 - Q_a (to be applied to curb opening or next d/s inlet)	$\vec{Q}_{b} =$	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	_
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.087	0.068	ft/ft
Required Length L _T to Have 100% Interception	$L_T = L$	16.94 MINOR	29.43 MA10P	ft
Effective Length of Curb Opening or Slotted Inlet (minimum of L. L.)	I = [10.00	10.00	Tft
Interception Capacity	Q _i =	5.7	8.8	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	4
Clogging Factor for Multiple-Unit Curb Opening or Slotted Inlet		8.75	0.06	
Actual Interception Capacity	O _a =	5.5	8.4	cfs
Carry-Over Flow = $Q_{b(GRATE)}-Q_a$	Q _b =	1.6	8.3	cfs
Summary		MINOR	MAJOR	
I otal Inlet Interception Capacity	Q =	5.5	8.4	cts
Capture Percentage = Ω_s/Ω_c =	Q _b = _	77	50	

	1 (April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Al	llowable Flow Depth and Spread)
D: Basin B-3 (DP 10b)	
+ TBACK + - TCROWN	
SHACK W T.	
Gutter Geometry:	
Maximum Allowable Width for Spread Behind Curb	T _{BACK} = 7.5 ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.020
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00 inches
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft
Gutter Width	W = 0.83 ft
Street Transverse Slope	$S_{x} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = 16.0$ 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} = 4.4 7.7 inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = <u>3.84</u> <u>3.84</u> inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	$d_{\rm C} = 0.8$ 0.8 inches
Gutter Depression (d_c - (W * S_x * 12))	a = 0.63 0.63 inches
Water Depth at Gutter Flowline	d = 4.47 4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_{\rm X} = 15.2$ ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. S1-7)	$E_0 = 0.149 0.149$
Discharge outside the Gutter Section W, carried in Section T_X	$Q_X = 0.0 0.0 \text{ cfs}$
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 0.0 0.0 \text{ crs}$
Discharge Benind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 \text{ crs}$
Maximum Flow Based On Allowable Spread	$Q_T = SUMP SUMP CTS$
V*d Product: Flow Velocity times Gutter Flowline Depth	V = 0.0 0.0 Tps V*d = 0.0 0.0
Mavimum Canacity for 1/2 Street baced on Allowable Donth	Minor Champ Main Champ
Maximum Capacity for 1/2 Suleet Dased on Allowable Depth	
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{\rm HH} = 15.0$ 29.4 It
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Fg. ST-7)	$F_{-} = 0.153$ 0.079
Theoretical Discharge outside the Gutter Section W carried in Section Type	$\Omega_{\rm VIII} = 0.0$ 0.0 cfs
Actual Discharge outside the Gutter Section W. (limited by distance T _{COVID})	$O_{\rm Y} = 0.0$ 0.0 cfs
Discharge within the Gutter Section W ($Q_d - Q_x$)	$Q_{\rm W} = 0.0 0.0 \text{ cfs}$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0$ 0.0 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R = SUMP SUMP
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = SUMP SUMP cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = linches
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm

	INLET IN A SUMP C	OR SAG LOC 5.01 (April 2021)	ATION		
	ب ۲ ــــــــــــــــــــــــــــــــــــ				
	H-Curb				
	H-Vert Wo		_		
	Lo (G)				
5	CDOT Type R Curb Opening		MINOD	MAJOR	
	<u>Design Information (Input)</u> Type of Inlet	Type =		MAJOR Curb Opening	
	Local Depression (additional to continuous gutter depression 'a' from above)	a _{local} =	3.00	3.00	inches
	Number of Unit Inlets (Grate or Curb Opening)	No =	4	4	🔽 Override Dep
	Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.4	7.7	inches
	Grate Information		MINOR	MAJOR	76+
	Lengui oi a Unit Grate Width of a Unit Grate	$L_0(G) =$	N/A	N/A N/A	feet
	Area Opening Ratio for a Grate (typical values 0.15-0.90)		N/A	N/A	
	Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_{f}(G) =$	N/A	N/A	1
	Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w(G) =$	N/A	N/A	
	Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_{0}(G) =$	N/A	N/A	
	Loroth of a Unit Curb Opening		MINOR	MAJOR	Tfact
	Lengur or a onit Curb Opening Height of Vertical Curb Opening in Inches	L ₀ (L) =	5.00	5.00	linches
	Height of Curb Orifice Throat in Inches	H _{throat} =	6.00	6.00	inches
	Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
g 1	Side Width for Depression Pan (typically the gutter width of 2 feet)	W _p =	2.00	2.00	feet
	Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_{f}(C) =$	0.10	0.10	_
	Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_{w}(C) = C_{w}(C) $	3.60	3.60	-
	Grate Flow Analysis (Calculated)	C ₀ (C) =	MINOR	MA1OR	
	Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	7
	Clogging Factor for Multiple Units	Clog =	N/A	N/A	
	Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
	Interception without Clogging	Q _{wi} =	N/A	N/A	cfs
	Grate Capacity as a Orifice (based on Modified HEC22 Method)	Q _{wa} =			
	Interception without Clogging	Q _{oi} =	N/A	N/A	cfs
	Interception with Clogging	Q _{oa} =	N/A	N/A	cfs
	Grate Capacity as Mixed Flow		MINOR	MAJOR	- -
	Interception without Clogging	$Q_{mi} =$	N/A	N/A	cfs
	Interception with Clogging Resulting Crate Capacity (assumes clogged condition)				crs
	Curb Opening Flow Analysis (Calculated)	Colate	MINOR	MAJOR	10.0
	Clogging Coefficient for Multiple Units	Coef =	1.33	1.33	7
	Clogging Factor for Multiple Units	Clog =	0.03	0.03	
	Curb Opening as a Weir (based on Modified HEC22 Method)	а Г	MINOR	MAJOR	7.
	Interception without Clogging		10.0	35.4	crs
	Curb Opening as an Orifice (based on Modified HEC22 Method)	Q _{wa} =	9.7 MINOR	<u> </u>	
	Interception without Clogging	Q _{oi} =	33.6	43.9	cfs
	Interception with Clogging	Q _{oa} =	32.5	42.4	cfs
	Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
	Interception without Clogging	Q _{mi} =	17.0	36.7	cfs
	unierception with Clogging Resulting Curb Opening Capacity (assumes clogged condition)		10.5 9.7	35.5	
	Resultant Street Conditions	Curb –	MINOR	MAJOR	
	Total Inlet Length	L = [20.00	20.00	feet
	Resultant Street Flow Spread (based on street geometry from above)	Т = [15.6	29.4	ft.>T-Crown
	Resultant Flow Depth at Street Crown	d _{CROWN} =	0.0	3.2	inches
	I ow Head Performance Reduction (Calculated)		MINOD	MAIOD	
	Denth for Grate Midwidth	Г	N/A	N/A	Tft
	Depth for Curb Opening Weir Equation	$d_{\text{Curb}} =$	0.29	0.57	⊣ft
	Combination Inlet Performance Reduction Factor for Long Inlets	RF _{Combination} =	0.41	0.72	
	Curb Opening Performance Reduction Factor for Long Inlets	RF _{Curb} =	0.67	0.88	
	Grated Inlet Performance Reduction Factor for Long Inlets	RF _{Grate} =	N/A	N/A	
			MINOD	MAJOD	
	Total Inlet Interception Capacity (assumes clogged condition)	0 . = [9,7	34.3	cfs
	real siles siles copuers (assumes clogged condition)				

Warning 1 Note: This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Alle	owable Flow Depth and Spread)
t: Grandview Reserve	
Gutter Geometry:	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 8.0$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.013$
Height of Curb at Gutter Flow Line	Hours = 6.00 linches
Distance from Curb Face to Street Crown	$T_{CROWN} = 17.0$ ft
Gutter Width	W = 2.00 ft
Street Transverse Slope	$S_{x} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} = 0.016
	Miner Champ Main Champ
Max Allowable Spread for Minor & Major Storm	T = 115 170 ft
Max. Allowable Donth at Cutter Flowling for Minor & Major Storm	d = 60 80 inches
Check beyon are not applicable in CLIMD conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = 2.76 4.08 inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _c = 2.0 2.0 inches
Gutter Depression (d _C - (W * S _x * 12))	a = 1.51 1.51 inches
Water Depth at Gutter Flowline	d = 4.27 5.59 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _x = 9.5 15.0 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.511 0.350$
Discharge outside the Gutter Section W, carried in Section T _x	$Q_X = 0.0 0.0 cfs$
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm Major Storm
Theoretical Water Spread	T _{TH} = 18.7 27.0 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{XTH} = 16.7$ 25.0 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.318 0.216$
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	$Q_{XTH} = 0.0 0.0 cfs$
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_{\rm X} = 0.0 0.0 {\rm cfs}$
Discharge within the Gutter Section W ($Q_d - Q_x$)	$Q_W = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} = 0.0 0.0 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R = SUMP SUMP
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = SUMP SUMP cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches
MINOR STORM Allowable Canacity is based on Dopth Criterion	Minor Storm Major Storm
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm



MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STRE	ET (Mino	or & Maj	jor Storm)
(Based on Regulated Criteria for Maximum All	lowable Flow	Depth and Spr	ead)	
Basin B-5 (DP 12a)				
Succe T. Tux W Tr Succe Street CROWN				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5]ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S _{BACK} =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020	1	
			-	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	linches	
Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft	
Gutter Width	W =	0.83	ff	
Street Transverse Slope	Sv =	0.020	ff/ff	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	s =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	So =	0.000	ft/ft	
Manning's Boughness for Street Section (typically between 0.012 and 0.020)	nemer -	0.020		
rianning's Roughness for Succe Section (typically between 0.012 and 0.020)	IISTREET -	0.010	1	
		Minor Storm	Major Storm	
Max Allowable Spread for Minor & Major Storm	т = Г	16.0	16.0	ft
Max Allowable Depth at Gutter Flowline for Minor & Major Storm	dury =	4.4	77	inches
Allow Elow Depth at Street Crown (check box for yes, leave blank for no)	umax -	т.т —	<u> </u>	Inches
Allow How Deput at Street Clowit (check box for yes, leave blank for ho)			v	
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Denth without Gutter Depression (Eq. ST-2)	v = [3.84	3.84	linches
Vertical Depth without Outler Depression (Eq. 51.2)	d	0.8	0.8	linches
Gutter Depression (d $_{-}$ (W \leq \leq 12))	u _c =	0.62	0.62	linches
Water Deptersion (u_{C} (W S_{X} 12))	a –	0.05	0.03	inches
Mater Depth at Gutter Flowline	u =	4.4/	4.4/	- Incries
Allowable Spiedu for Discillarge outside the Gutter Section w (1 - w)		15.2	15.2	
Guiller Flow to Design Flow Ratio by FRWA REC-22 Inteniou (Eq. ST-7)		0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T_X	$Q_{\rm X} =$	10.3	10.3	
Discharge within the Gutter Section W ($Q_T - Q_X$)	Qw =	1.8	1.8	
Discharge Benind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} =$	0.0	0.0	crs
Maximum Flow Based On Allowable Spread	Q _T =	12.1	12.1	cts
Flow Velocity within the Gutter Section	V =	1.1	1.1	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	
Maximum Canacity fay 1/2 Street based on Allowable Douth				
The sustice Water Canad	- r	Minor Storm	Major Storm	74
Theoretical Water Spread		15.6	29.4	- "L
Cutton Spread for Discharge outside the Gutter Section W (1 - W)	1 x TH =	14./	28.6	- ' ^t
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. S1-7)	_ ^E ₀ =	0.153	0.0/9	4.
I neoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	$Q_{XTH} =$	9.5	55.6	Lcts
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_X =$	9.5	48.2	cts
Discharge within the Gutter Section W ($Q_d - Q_X$)	Q _W =	1.7	4.8	cts
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} =$	0.0	1.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	11.2	54.0	cfs
Average Flow Velocity Within the Gutter Section	V =	1.1	1.6	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.4	1.0	
	R =	1.00	0.83	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm		44.0	45.0	cfs
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied)	$Q_d =$	11.2	45.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	Q _d = d =	4.36	7.17	inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	Q _d = d = d _{CROWN} =	4.36 0.00	7.17	inches inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	$\mathbf{Q}_{\mathbf{d}} = $ $\mathbf{d} = $ $\mathbf{d}_{CROWN} = $	4.36 0.00	7.17 2.70	inches inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAIOR STORM Allowable Capacity is based on Depth Criterion	$\mathbf{Q}_{d} = \begin{bmatrix} \\ d \\ d \\ c_{ROWN} \end{bmatrix} \begin{bmatrix} \\ c \\ c_{ROWN} \end{bmatrix}$	4.36 0.00 Minor Storm	7.17 2.70 Major Storm	inches inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MADOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Malowable Capacity is based on Depth Criterion	$\mathbf{Q}_{d} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	11.2 4.36 0.00 Minor Storm 11.2	43.0 7.17 2.70 Major Storm 45.0	inches inches cfs

INLET ON A CONTIN	NUOUS G	RADE		
MHFD-Inlet, Version 5.0	01 (April 2021)			
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H-Curb		_		
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In IGI				
£0(0)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAIOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_0 =$	5.00	5.00	ft
Clogging Eactor, for a Single Unit Grate (typical min, value = 0.5)	vv _o =	N/Α	N/A N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.3)	C _f -C =	0.10	0.10	-
Street Hydraulics: OK - Q < Allowable Street Capacity'	_	MINOR	MAJOR	_
Design Discharge for Half of Street (from Inlet Management)	Q ₀ =	7.9	18.5	cfs
Water Spread Width	T =	13.6	16.0	ft
Water Depth at Flowline (outside of local depression) Water Depth at Street Crown (or at T)	= D =	3.9	5.2	inches
Ratio of Gutter Flow to Design Flow	E _c =	0.177	0.126	Inches
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	6.5	16.2	cfs
Discharge within the Gutter Section W	Q _w =	1.4	2.3	cfs
Discharge Behind the Curb Face	Q _{BACK} =	0.0	0.0	cfs
How Area within the Gutter Section W	A _W =	0.24	0.33	sq ft
Water Denth for Design Condition	= wv	5.8	7.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	Inches
Total Length of Inlet Grate Opening	L = [N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE} =$	N/A	N/A	
Under No-Clogging Condition Minimum Velecity Where Crate Splach Over Regins	v _F	MINOR	MAJOR	fnc
Intercention Rate of Frontal Flow	$V_0 = R_f = I$	N/A N/A	N/A N/A	ips
Interception Rate of Side Flow	R _v =	N/A	N/A	
Interception Capacity	Q _i =	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	_
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	_
Effective (uncloaged) Length of Multiple-unit Grate Inlet		N/A N/A	N/A N/A	-ft
Minimum Velocity Where Grate Splash-Over Begins	$\vec{v}_{o} =$	N/A	N/A	fps
Interception Rate of Frontal Flow	$R_f =$	N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Actual Interception Capacity	$Q_a =$	<u>N/A</u>	N/A	cfs
Carry-Over Flow = $Q_0^{-}Q_0^{-}$ (to be applied to carb opening of next d/s milet)	Q _b –	MINOR	MAIOR	CIS
Equivalent Slope S_{e} (based on grate carry-over)	Se =	0.084	0.066	ft/ft
Required Length L_T to Have 100% Interception	L _T =	18.17	31.40	ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective length of Curb Opening of Slotted Inlet (minimum of L, L_T)		10.00	10.00	
Under Clogging Condition	$Q_i = [$	MINOR	1 9.2 MA1OR	
Clogging Coefficient	CurbCoef =	1.25	1.25	7
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	
Effective (Unclogged) Length	$L_e = $	9.37	9.37	ft
Actual Interception Capacity	Q _a =	5.9	9.0	cfs
$U_{anty} = Q_{b(GRATE)} = Q_{a}$	Q _b =	MINOR	MAIOR	
Total Inlet Interception Capacity	Q = [5.9	9.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$\mathbf{Q}_{\mathbf{b}} =$	2.0	9.5	cfs
Capture Percentage = Ω_2/Ω_0 =	C% =	75	49	%



INLET ON A CONTINUOUS GRADE				
MHFD-Inlet, Version 5.0	1 (April 2021)			
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Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
I otal Number of Units in the Iniet (Grate or Curb Opening)	NO =	<u> </u>	5.00	-ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) Street Hydraulics: OK - O < Allowable Street Canacity'	(_f -(=)	0.10 MINOR	MA10R	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	Q _o =	3.7	8.7	cfs
Water Spread Width	T =	10.2	14.1	ft
Water Depth at Flowline (outside of local depression) Water Depth at Street Crown (or at T)	= b b	3.1	4.0	inches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.240	0.170	inches
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	2.8	7.2	cfs
Discharge within the Gutter Section W	Q _w =	0.9	1.5	cfs
Flow Area within the Gutter Section W	$Q_{BACK} = A_W = $	0.18	0.25	sq ft
Velocity within the Gutter Section W	V _w =	4.8	5.9	fps
Water Depth for Design Condition	d _{LOCAL} =	6.1	7.0	inches
Total Length of Inlet Grate Opening	L = [N/A	MAJOR N/A	Tft
Ratio of Grate Flow to Design Flow	E _{o-GRATE} =	N/A	N/A	
Under No-Clogging Condition	v _F	MINOR	MAJOR	Ifee
Interception Rate of Frontal Flow	$V_0 = R_f = I$	N/A N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	Q _i =	N/A	N/A	cfs
Clogging Condition Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	MAJOR N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	$L_e =$	N/A	N/A	ft
Interception Rate of Frontal Flow	$v_0 = R_f = I$	N/A N/A	N/A N/A	- ips
Interception Rate of Side Flow	R _x =	N/A	N/A	
Actual Interception Capacity	Q _a =	<u>N/A</u>	N/A	cfs
Carry-Over Flow = $Q_0 - Q_0$ (to be applied to carb opening or flext a/s inlet) Curb or Slotted Inlet Opening Analysis (Calculated)	Q _b =	MINOR	MAJOR	crs
Equivalent Slope S_e (based on grate carry-over)	S _e =	0.107	0.082	ft/ft
Required Length L _T to Have 100% Interception	L _T =	11.03	19.34	ft
Effective Length of Curb Opening or Slotted Inlet (minimum of L. L.)	L = [10.00	MAJOR 10.00	Tft
Interception Capacity	Q _i =	3.6	6.4	cfs
Under Clogging Condition	Curb Coof [MINOR	MAJOR	-
Cloaging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbCoef =	0.06	0.06	-
Effective (Unclogged) Length	L _e =	9.37	9.37	ft
Actual Interception Capacity	Q _a =	3.6	6.2	cfs
$\frac{Uarry-Uver riow}{Varry-Uver riow} = \frac{V_{b/GRATE}-V_a}{Varry-Uver riow}$	Q _b =	MINOR	MAJOR	cis
Total Inlet Interception Capacity	Q =[3.6	6.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b =$	0.1	2.5	cfs
	1 2/0 =	wx.		1 7/0


INLET ON A CONTIN	IUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
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H-Curb H-Vert		-		
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Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
I otal Number of Units in the Inlet (Grate or Curb Opening)	NO =	<u> </u>	2 5.00	-ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) Street Hydraulics: OK - O < Allowable Street Canacity'	C _f -C = [0.10 MINOR	MA10R	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_o =$	1.6	3.8	cfs
Water Spread Width	T =	7.3	10.3	ft
Water Depth at Flowline (outside of local depression) Water Depth at Street Crown (or at T)	= b	2.4	3.1	inches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.339	0.238	inches
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	1.1	2.9	cfs
Discharge within the Gutter Section W	Q _w =	0.5	0.9	cfs
Flow Area within the Gutter Section W	$Q_{BACK} = A_W = $	0.14	0.19	sq ft
Velocity within the Gutter Section W	V _W =	4.0	4.9	fps
Water Depth for Design Condition	d _{LOCAL} =	5.4	6.1	inches
Total Length of Inlet Grate Opening	L = [N/A	MAJOR N/A	Tft
Ratio of Grate Flow to Design Flow	E _{o-GRATE} =	N/A	N/A	
Under No-Clogging Condition	v – [MINOR	MAJOR	Ifee
Interception Rate of Frontal Flow	$v_0 = R_f = I$	N/A N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	$Q_i =$	N/A	N/A	cfs
Clogging Condition Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	MAJOR N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Interception Rate of Frontal Flow	$v_0 = R_f = I$	N/A N/A	N/A N/A	- ips
Interception Rate of Side Flow	R _x =	N/A	N/A	
Actual Interception Capacity	Q _a =	<u>N/A</u>	N/A	cfs
Carry-Over Flow = $Q_0 - Q_0$ (to be applied to curb opening or flext d/s inlet) Curb or Slotted Inlet Opening Analysis (Calculated)	Q _b =	MINOR	MAJOR	crs
Equivalent Slope S_e (based on grate carry-over)	S _e =	0.143	0.106	ft/ft
Required Length L_T to Have 100% Interception	L _T =	6.31	11.23	ft
Effective Length of Curb Opening or Slotted Inlet (minimum of L. L.)	L = [6.31	MAJOR 10.00	Tft
Interception Capacity	$Q_i =$	1.6	3.7	cfs
Under Clogging Condition	Currh Coof	MINOR	MAJOR	-
Cloaging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbCoef =	0.06	0.06	-
Effective (Unclogged) Length	$L_e = $	9.37	9.37	ft
Actual Interception Capacity	Q _a =	1.6	3.7	cfs
Icarry-over riow = Q _{b/GRATE} -Q _a	Q _b =	MINOR	MAJOR	cis
Total Inlet Interception Capacity	Q =[1.6	3.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b =$	0.0	0.1	cfs
	1 2/0 =			1 7/0

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm
(Based on Regulated Criteria for Maximum Allo	owable Flow Depth and Spread)
C: Grandview Reserve	
- TBACK TCROWN	
Maximum Allowable Width for Spread Behind Curb	$T_{PACK} = 7.5$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$
Height of Curb at Cutter Flow Line	Have - 6.00 linches
Distance from Curb Eace to Street Crown	$T_{CORB} = 0.00$ inches
Gutter Width	10.0 IL
Street Transverse Slone	$S_{v} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{x} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREFT}} = 0.016$
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = 16.0$ 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} = 4.4 7.7 Inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = 3.84 3.84 inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _c = 0.8 0.8 inches
Gutter Depression (d_c - (W * S_x * 12))	a = 0.63 0.63 inches
Water Depth at Gutter Flowline	d = 4.47 4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _X = 15.2 15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.149 0.149$
Discharge outside the Gutter Section W, carried in Section T_x	Q _X = 0.0 0.0 cfs
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Maximum Flow Based On Allowable Spread	Q _T = <u>SUMP</u> SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm Major Storm
Theoretical Water Spread	T _{TH} = 15.6 29.4 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} = 14.7 28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.153 0.079
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 0.0 0.0 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_X = 0.0 0.0 cfs$
Discharge within the Gutter Section W ($Q_d - Q_x$)	$Q_W = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Siope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{"}$) Storm	K = SUMP SUMP
In a riow based on Allowable Depth (Safety Factor Applied)	
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = inches
Resultant riow Depth at Street Crown (Safety Factor Applied)	u _{CROWN} = incnes
	Miner Storm Major Storm
MINOR STORM Allowable Capacity is based on Depth Criterion	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = SUMP SUMP cfs



MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Alle	owable Flow Depth and Spread)
ID: Basin B-9 (DP 13)	
Tomore Succe W T. Ture W Tr Tomore Succe T. Ture Tr CROWN	
Gutter Geometry: Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter Width Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$\begin{array}{c} T_{BACK} = & 7.5 & \text{ft} \\ S_{BACK} = & 0.020 & \text{ft/ft} \\ n_{BACK} = & 0.020 & \text{inches} \\ \end{array}$ $\begin{array}{c} H_{CURB} = & 6.00 & \text{inches} \\ T_{CROWN} = & 16.0 & \text{ft} \\ W = & 0.83 & \text{ft} \\ S_X = & 0.020 & \text{ft/ft} \\ S_W = & 0.083 & \text{ft/ft} \\ \end{array}$
Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm	$S_{0} = \underbrace{0.000}_{N_{STREET}} ft/ft$ $T_{MAX} = \underbrace{\frac{\text{Minor Storm}}{16.0}}_{\text{Major Storm}} ft$
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions	d _{MAX} = <u>4.4 7.7</u> inches
Water Depth without Gutter Depression (Eq. ST-2) Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) Water Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W, carried in Section T _x Discharge within the Gutter Section W (Q _t - Q _x)	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowline Depth	$\begin{array}{c c} Q_{\text{BACK}} = & 0.0 & 0.0 & \text{cfs} \\ \hline \mathbf{Q}_{\text{T}} = & & \textbf{SUMP} & \textbf{SUMP} & \textbf{cfs} \\ V = & 0.0 & 0.0 & \text{fps} \\ V^{*}d = & 0.0 & 0.0 \end{array}$
Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge within the Gutter Section W (Q _a - Q _X) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section W V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Denth at Gutter Flowline (Safety Factor Anplied)	$\begin{array}{c c} \mbox{Minor Storm} & \mbox{Major Storm} \\ \mbox{T}_{TH} = & \mbox{15.6} & \mbox{29.4} & \mbox{ft} \\ \mbox{15.6} & \mbox{29.4} & \mbox{ft} \\ \mbox{T}_{X TH} = & \mbox{14.7} & \mbox{28.6} & \mbox{ft} \\ \mbox{D}_{C T 1} = & \mbox{0.153} & \mbox{0.079} \\ \mbox{Q}_{X T 1} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{Q}_{X T 1} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{Q}_{W} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{Q}_{BACK} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{Q}_{BACK} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{Q}_{BACK} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{V} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{V} = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{V}^{*} d = & \mbox{0.0} & \mbox{0.0} & \mbox{cfs} \\ \mbox{Q}_{A} = & \mbox{SUMP} & \mbox{SUMP} & \mbox{cfs} \\ \mbox{Q}_{A} = & \mbox{SUMP} & \mbox{SUMP} & \mbox{cfs} \\ \mbox{d} = & \mbox{d} = & \mbox{d} \mbox{d} \\ \mbox{d} = & \mbox{d} \mbox{d} \mbox{d} \mbox{d} \\ \mbox{d} = & \mbox{d} \mbox{d} \mbox{d} \mbox{d} \\ \mbox{d} = & \mbox{d} \mbo$
Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	d _{CROWN} = inches d _{CROWN} = inches Minor Storm Major Storm Q _{allow} = SUMP cfs



MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STRE	ET (Mino	or & Maj	or Storm)
(Based on Regulated Criteria for Maximum All	lowable Flow	Depth and Spr	ead)	
: Basin C-1 (DP 17b)				
Succe W T. W T. Class Street CROWN				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	TRACK =	7.5	lft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	SBACK =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020	1	
· · · · · · · · · · · · · · · · · · ·	BRCK		1	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	linches	
Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft	
Gutter Width	W =	0.83	ft	
Street Transverse Slope	S _x =	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _w =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	S _o =	0.025	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{street} =	0.016	1	
	-		-	
	_	Minor Storm	Major Storm	_
Max. Allowable Spread for Minor & Major Storm	T _{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)			v	
Maximum Capacity for 1/2 Street based On Allowable Spread	г	Minor Storm	Major Storm	-
Water Depth without Gutter Depression (Eq. S1-2)	y =	3.84	3.84	inches
Cutter Depth between Gutter Lip and Gutter Flowline (usually 2")	$a_{\rm C} =$	0.8	0.8	inches
Guiller Depression ($u_c = (w + S_x + 12)$)	d =	0.63	0.63	inches
Milewable Spread for Discharge outside the Cutter Section W (T - W)	u =	4.4/	4.47	- Inches
Cutter Flow to Decign Flow Datio by FHWA HEC 22 method (Fg. CT. 7)		15.2	15.2	-1"·
Discharge outside the Gutter Section W, carried in Section T _v		11.5	11.5	cfs
Discharge within the Gutter Section W ($\Omega_{r} - \Omega_{v}$)	0=	2.0	2.0	ofs
Discharge Behind the Curb (e.g., sidewalk, driveways & lawns)		0.0	2.0	ofs
Maximum Flow Based On Allowable Spread		13.5	13.5	cfs
Flow Velocity within the Gutter Section	v =	12	12	fns
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.5	0.5	- 195
			,	_
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	_
Theoretical Water Spread	T _{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	Т _{х тн} =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} =	10.6	62.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _X =	10.6	53.9	cfs
Discharge within the Gutter Section W ($Q_d - Q_X$)	Q _W =	1.9	5.3	Lcfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} =$	0.0	1.2	cts
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	12.5	60.4	cfs
Average Flow Velocity Within the Gutter Section	V =	1.2	1.8	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.4	1.2	4
Siope-ваsed Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{"}$) Storm	K =	1.00	0.70	
Max Flow Based on Allowable Depth (Safety Factor Applied)	$Q_d = $	12.5	42.1	
Resultant How Depth at Gutter Flowline (Safety Factor Applied)	_ d = [4.36	6.69	Inches
	d _{CROWN} =	0.00	2.22	Inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	-CKOWN			
Resultant Flow Depth at Street Crown (Safety Factor Applied)		Minor Chains	Maio: Char	
Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	0	Minor Storm	Major Storm	
Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = [Minor Storm 12.5	Major Storm	cfs

INLET ON A CONTIN	IUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲−−−− Lo (C) −−−−−۶				
H-Curb H-Vert	_	_		
Wo				
IN I E I				
Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
I orat Number of Units in the Iniet (Grate or Curb Opening)		5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W. =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) Street Hydraulics: OK - O < Allowable Street Capacity'	(_f -(=)	0.10 MINOR	0.10 MA10R	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_o =$	6.8	16.0	cfs
Water Spread Width	T =	12.3	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.6	4.7	inches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.196	0.139	
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	5.5	13.8	cfs
Discharge within the Gutter Section W	Q _w =	1.3	2.2	cfs
Flow Area within the Gutter Section W	QBACK =	0.22	0.0	sa ft
Velocity within the Gutter Section W	V _w =	6.1	7.5	fps
Water Depth for Design Condition	d _{LOCAL} =	6.6	7.7	inches
Grate Analysis (Calculated) Total Length of Inlet Grate Opening	1 = [N/A	MAJOR N/A	Tft
Ratio of Grate Flow to Design Flow	E _{o-GRATE} =	N/A	N/A	
Under No-Clogging Condition	- Г	MINOR	MAJOR	
Minimum velocity where Grate Splash-Over Begins	$V_0 = R_f = 0$	N/A N/A	N/A N/A	Tps
Interception Rate of Side Flow	$R_x =$	N/A	N/A	
Interception Capacity	Q _i =	N/A	N/A	cfs
Under Clogging Condition	GrateCoef -	MINOR N/A	MAJOR	7
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	$V_0 = $	N/A	N/A N/A	fps
Interception Rate of Side Flow	$R_x =$	N/A	N/A	-
Actual Interception Capacity	Q _a =	N/A	N/A	cfs
Carry-Over Flow = Q_0 - Q_a (to be applied to curb opening or next d/s inlet)	Q _b =	N/A MINOP	N/A MATOP	cfs
Equivalent Slope S_{ρ} (based on grate carry-over)	Se =	0.091	0.071	ft/ft
Required Length L_T to Have 100% Interception	L _T =	16.42	28.60	ft
Under No-Clogging Condition	F	MINOR 15.00	MAJOR 15.00	T _A
Interception Capacity	Q _i =	6.7	11.8	cfs
Under Clogging Condition		MINOR	MAJOR	_
Clogging Coefficient	CurbCoef =	1.31	1.31	4
Effective (Uncloaaed) Lenath		14.34	14.34	- _{ft}
Actual Interception Capacity	Q a =	6.7	11.7	cfs
$\frac{\text{Carry-Over Flow} = Q_{h(\text{GRATF})} - Q_a}{\text{Summary}}$	Q _b =	0.1	4.3	cfs
Total Inlet Interception Capacity	o = [6.7	11.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_{b} =$	0.1	4.3	cfs
$\ C_{anture} Percentage = \Omega_{-}/\Omega_{-} =$	C% =	98	1 73	9/2

MHFD-Inlet, Version 5.01	1 (April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STRE	ET (Mino	or & Maj	jor Storm)
(Based on Regulated Criteria for Maximum Ai	lowable Flow	Depth and Spr	ead)	
: Basin C-2 (DP 17a)				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5	lft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	SBACK =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020	1	
			-	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	inches	
Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft	
Gutter Width	W =	0.83	lft	
Street Transverse Slope	S _x =	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _w =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 =$	0.025	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} =	0.016	1	
			-	
	_	Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T _{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)			~	
Maximum Capacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	Transferra
Water Depth without Gutter Depression (Eq. S1-2)	y =	3.84	3.84	
Cutter Deput between Gutter Lip and Gutter Flowline (usually 2)	u _C =	0.8	0.8	
Guiller Depression ($d_c = (w + S_x + 12)$)	a =	0.63	0.63	linches
Milewable Spread for Discharge outside the Cutter Section W (T _ W)	u =	4.4/	4.47	
Cutter Elew to Design Elew Batio by EHWA HEC 22 method (Eq. ST.7)		13.2	15.2	
Discharge outside the Gutter Section W, carried in Section T.	0	11 5	11 5	cfs
Discharge within the Gutter Section $W_1(\Omega_{-1}, \Omega_{-1})$	Qx -	2.0	20	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Qw -	2.0	2.0	
Maximum Flow Baced On Allowable Spread		13.5	13.5	
Flow Velocity within the Cutter Section	4 7 –	12	12	
V*d Product: Flow Velocity times Gutter Flowline Depth	= • = b*V	0.5	0.5	
		0.0	0.0	
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	T _{TH} =	15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E _O =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH}	Q _{X TH} =	10.6	62.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _x =	10.6	53.9	cfs
Discharge within the Gutter Section W (Q _d - Q _X)	Q _W =	1.9	5.3	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} =	0.0	1.2	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	12.5	60.4	cfs
	V =	1.2	1.8	fps
Average Flow Velocity Within the Gutter Section		0.4	1.2	4
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	011		1
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	V*d = R =	1.00	0.70	
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied)	V*d = R = Q d =	1.00 12.5	0.70 42.1	cfs
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	V*d = R = Q d = d =	1.00 12.5 4.36	0.70 42.1 6.69	cfs inches
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	V*d = R = Q_d = d = d _{CROWN} =	1.00 12.5 4.36 0.00	0.70 42.1 6.69 2.22	cfs inches inches
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$V^*d = R = $ $Q_d = $ $d_{CROWN} = $	1.00 12.5 4.36 0.00	0.70 42.1 6.69 2.22	cfs inches inches
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	$V^*d = \begin{bmatrix} R \\ R \\ d \\ d \\ d \\ d_{CROWN} \end{bmatrix}$	1.00 12.5 4.36 0.00 Minor Storm	0.70 42.1 6.69 2.22 Major Storm	cfs inches inches
Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	$V^*d = \begin{bmatrix} R \\ R \\ Q_d \\ d \\ d_{CROWN} \end{bmatrix}$	1.00 12.5 4.36 0.00 Minor Storm 12.5	0.70 42.1 6.69 2.22 Major Storm 42.1	cfs inches inches cfs

INLET ON A CONTIN	IUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
بر ــــــــــــــــــــــــــــــــــــ		÷		
H-Curb H-Vert		-		
Wo				
L0 (G)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_0 =$	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5) Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -G = C _f -C =	0.10	0.10	-
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	$Q_0 =$	11.3	26.3	cfs
Water Spread Width Water Depth at Flowline (outside of local depression)	d =	4.2	5.6	 inches
Water Depth at Street Crown (or at T _{MAX})	d _{CROWN} =	0.0	1.1	inches
Ratio of Gutter Flow to Design Flow	E ₀ =	0.160	0.116	ofe
Discharge within the Gutter Section W	Q _x = Q _w =	1.8	3.0	cfs
Discharge Behind the Curb Face	Q _{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	0.26	0.36	sq ft
Water Depth for Design Condition	d _{LOCAL} =	7.2	8.6	inches
Grate Analysis (Calculated)	. г	MINOR	MAJOR	
Total Length of Inlet Grate Opening Ratio of Grate Flow to Design Flow		N/A N/A	Ν/Α Ν/Δ	- ^{ft}
Under No-Clogging Condition	-0-GRATE	MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f = _	N/A N/A	N/A N/A	_
Interception Capacity	$\hat{Q_i} =$	N/A	N/A	cfs
Under Clogging Condition	CrotoCoof -	MINOR	MAJOR	-
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A N/A	N/A N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet	$L_e =$	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Side Flow	$R_x =$	N/A	N/A N/A	_
Actual Interception Capacity	Q _a =	N/A	N/A	cfs
Carry-Over Flow = $Q_0 - Q_0$ (to be applied to curb opening or next d/s inlet) (Curb or Slotted Inlet Opening Analysis (Calculated)	Q _b =	MINOR	MA1OR	cts
Equivalent Slope S_e (based on grate carry-over)	S _e =	0.078	0.062	ft/ft
Required Length L _T to Have 100% Interception	L _T =	22.86	39.13	ft
Effective Length of Curb Opening or Slotted Inlet (minimum of L. L.)	L = [15.00	MAJOR 15.00	Tft
Interception Capacity	Q _i =	9.6	15.3	cfs
Under Clogging Condition		MINOR	MAJOR	7
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	-
Effective (Unclogged) Length	L _e =	14.34	14.34	ft
Actual Interception Capacity	Q _a =	9.6	15.1	cfs
Summary	¥b =	MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	9.6	15.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _b =	1./	<u> </u>	

MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF O	OF STRE	ET (Mino	or & Maj	<u>or Storm)</u>
(Based on Regulated Criteria for Maximum All	owable Flow	Depth and Spr	ead)	
C: Grandview Reserve				
SALCK W Tr W Tr STREET CROWN				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5]ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S _{BACK} =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020	1	
	-		-	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	inches	
Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft	
Gutter Width	W =	0.83	lft	
Street Transverse Slope	S _x =	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _w =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 =$	0.020	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} =	0.016		
			•	
		Minor Storm	Maior Storm	
Max. Allowable Spread for Minor & Major Storm	T _{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	-		v	
Maximum Capacity for 1/2 Street based On Allowable Spread	_	Minor Storm	Major Storm	_
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _C =	0.8	0.8	inches
Gutter Depression (d_c - (W * S _x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T _x	Q _X =	10.3	10.3	cfs
Discharge within the Gutter Section W ($Q_T - Q_X$)	Q _W =	1.8	1.8	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} =$	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	$Q_T =$	12.1	12.1	cfs
Flow Velocity within the Gutter Section	V =	1.1	1.1	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	
Maximum Capacity for 1/2 Street based on Allowable Depth	- F	Minor Storm	Major Storm	٦٩
	_ ^{ITH} =	15.6	29.4	$-\frac{\pi}{2}$
Cutter Elevate Design Elevation by Elevation (1 - w)	1 _{X TH} =	14.7	28.6	- ^π
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. S1-7)	E ₀ =	0.153	0.0/9	- ,
Incoretical Discharge outside the Gutter Section W, carried in Section I _{X TH}	Q _{X TH} =	9.5	55.6	CTS
Actual Discharge outside the Gutter Section W, (limited by distance Γ_{CROWN})	$Q_{\rm X} =$	9.5	48.2	CTS
Discharge within the Gutter Section W ($Q_d - Q_X$)	Qw =	1./	4.8	
Discharge Berlind the Curb (e.g., sidewalk, Oriveways, & lawns)	QBACK =	0.0	1.0	
Liocal Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	11.2	54.0	
Average row velocity within the Gutter Section	V =	1.1	1.6	
Vra Product: Flow velocity Limes Gutter Flowline Depth	v^d =	0.4	1.0	-
ISOPE-DASED DEPUTES A REDUCTION FACTOR FOR MAJOR & MINOR ($a \ge 6^{\circ}$) Storm	к= _	1.00	0.83	-
Max Flow Racad on Allowable Donth (Safet: Faster Applied)	Va =	11.2	45.0	
Max Flow Based on Allowable Depth (Safety Factor Applied)		<i>a n</i> .	1 7.17	linches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.30	2 70	inchoc
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	d = d _{CROWN} =	0.00	2.70	inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	d = d _{CROWN} =	4.30 0.00	2.70	inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	$d = \begin{bmatrix} d \\ d_{CROWN} \end{bmatrix}$	4.30 0.00 Minor Storm	2.70 Major Storm	inches
Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	d = [d _{CROWN} = [Q _{allow} = [4.30 0.00 Minor Storm 11.2	2.70 Major Storm 45.0	inches

INLET ON A CONTIN	IUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲−−−− Lo (C) −−−−−۶				
H-Curb H-Vert		_		
Wo Wo				
Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAJOR	
lype of Inlet	lype =	CDOT Type R	Curb Opening	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	alocal =	3	3	inches
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_0 =$	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	G-G =	N/A 0.10	N/A	-
Street Hydraulics: OK - Q < Allowable Street Capacity'	CF-C =]	MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	$Q_o =$	5.8	20.8	cfs
Water Spread Width	T =	12.1	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.5	5.4	inches
Ratio of Gutter Flow to Design Flow	E _c =	0.200	0.121	
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	4.7	18.3	cfs
Discharge within the Gutter Section W	Q _w =	1.2	2.5	cfs
Discharge Behind the Curb Face	$Q_{BACK} =$	0.0	0.0	cfs
Velocity within the Gutter Section W	A _W = V _W =	5.4	7.3	lfns
Water Depth for Design Condition	d _{LOCAL} =	6.5	8.4	inches
Grate Analysis (Calculated)		MINOR	MAJOR	_
Total Length of Inlet Grate Opening	_ L=	N/A	N/A	ft
Under No-Clogging Condition	Co-GRATE -	MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	
Interception Rate of Side Flow	$R_x =$	N/A	N/A	
Under Clogging Condition	$Q_i = L$	MINOR	MA1OR	cis
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		N/A	N/A	ft
Interception Rate of Frontal Flow	v _o – R _f =	N/A N/A	N/A	- ips
Interception Rate of Side Flow	R _x =	N/A	N/A	
Actual Interception Capacity	Q _a =	N/A	N/A	cfs
Carry-Over Flow = Q_0 - Q_a (to be applied to curb opening or next d/s inlet)	Q _b =	N/A MINOR	N/A	cfs
Equivalent Slope S _o (based on grate carry-over)	S. =[0.093	0.064	ft/ft
Required Length L _T to Have 100% Interception	L _T =	14.91	33.79	ft
Under No-Clogging Condition		MINOR	MAJOR	
Intercention Capacity		<u>14.91</u> 5.8	15.00	
Under Clogging Condition	Qi = [MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	4, 1
Effective (Unclogged) Length Actual Interception Capacity		14.34	14.34	
Carry-Over Flow = $Q_{h/GRATE}$ - Q_a	$\mathbf{Q}_{\mathbf{h}} =$	0.0	7.4	cfs
Summary		MINOR	MAJOR	_
Total Inlet Interception Capacity	Q =	5.8	13.4	cfs
Canture Percentage - 0 /0 -	$Q_b = $	100	64	

MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STRE	ET (Mino	or & Maj	or Storm)
(Based on Regulated Criteria for Maximum All	owable Flow	Depth and Spr	ead)	
Basin C-5 (DP 17d)				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	TRACK =	7.5	lft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	SBACK =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	nBACK =	0.020	1	
· · · · · · · · · · · · · · · · · · ·	BROK		1	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	linches	
Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft	
Gutter Width	W =	0.83	ft	
Street Transverse Slope	S _x =	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _w =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	S ₀ =	0.015	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} =	0.016	1	
			-	
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T _{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)			¥	
Maximum Capacity for 1/2 Street based On Allowable Spread	F	Minor Storm	Major Storm	-
Water Depth without Gutter Depression (Eq. S1-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	a _c =	0.8	0.8	inches
Gutter Depression ($a_c = (W + S_x + 12)$)	a =	0.63	0.63	
Water Depth at Gutter Flowline		4.4/	4.4/	Inches
Allowable Spread for Discharge outside the Gutter Section W (1 - W)	1 _X =	15.2	15.2	- ⁿ
Discharge outside the Cutter Section W, carried in Section T	<u> </u>	0.149	0.149	ofc
Discharge within the Gutter Section $W_1(\Omega_{-} - \Omega_{-})$	Qx =	1.6	0.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways & lawns)	Qw =	1.0	1.0	cfs
Maximum Flow Baced On Allowable Spread		10.5	10.5	cis
Flow Velocity within the Gutter Section	v -	1.0	1.0	fnc
V*d Product: Flow Velocity times Gutter Flowline Denth	v= =	0.4	0.4	
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	Т _{тн} = [15.6	29.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} =	14.7	28.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E _o =	0.153	0.079	
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} =	8.2	48.1	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _X =	8.2	41.7	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q _W =	1.5	4.1	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} =	0.0	0.9	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	9.7	46.8	cfs
Average Flow Velocity Within the Gutter Section	V =	0.9	1.4	fps
IV*d Product: Flow Velocity Times Gutter Flowline Denth	V*d =	0.3	0.9	4
a riouded riou velocity rines date riounite beput	R =	1.00	1.00	4.
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm			160	cfs
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d =	9.7	40.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	Q _d = d =	9.7 4.36	7.68	inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$\mathbf{Q}_{\mathbf{d}} = \mathbf{d}_{\mathbf{CROWN}}$	9.7 4.36 0.00	7.68 3.22	inches inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$\mathbf{Q}_{\mathbf{d}} = \begin{bmatrix} \mathbf{d} \\ \mathbf{d} \\ \mathbf{d} \end{bmatrix}$ $\mathbf{d}_{CROWN} = \begin{bmatrix} \mathbf{d} \\ \mathbf{d} \end{bmatrix}$	9.7 4.36 0.00	7.68	inches inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	$\mathbf{Q}_{d} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	9.7 4.36 0.00 Minor Storm	7.68 3.22 Major Storm	inches inches
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	$\mathbf{Q}_{d} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	9.7 4.36 0.00 Minor Storm 9.7	46.8 7.68 3.22 Major Storm 46.8	inches inches cfs

INLET ON A CONTIN	NUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲				
H-Curb		_		
		-		
Lo (G)				
CDOT Type R Curb Opening				
Design Information (Input)	r	MINOR	MAJOR	_
Type of Inlet	Type =	CDOT Type R	Curb Opening	inchos
Total Number of Units in the Inlet (Grate or Curb Opening)	a _{LOCAL} =	3.0	3.0	inches
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_0 =$	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W _o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C _f -G =	N/A	N/A	_
Street Hydraulics: OK - O < Allowable Street Capacity'	ل-1 = [0.10 MINOR	<u>0.10</u> ΜΔ1ΩR	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_0 = \int$	5.5	20.2	cfs
Water Spread Width	T =	12.5	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.6	5.6	inches
Water Depth at Street Crown (or at I _{MAX})	a _{crown} =	0.0	1.1	incnes
Discharge outside the Gutter Section W, carried in Section T_x	$D_{v} = 0$	4.4	17.9	cfs
Discharge within the Gutter Section W	$Q_w =$	1.1	2.3	cfs
Discharge Behind the Curb Face	$Q_{BACK} =$	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	0.22	0.36	sq ft
Water Depth for Design Condition		6.6	8.6	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	_ L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE} = [$	N/A MINOP		
Minimum Velocity Where Grate Splash-Over Begins	V. =[N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	$Q_i = [$	N/A MINOR		cfs
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	MAJOR N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	$L_e =$	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V ₀ =	N/A	N/A	fps
Interception Rate of Fide Flow	R _f = . R _v = .	N/A N/A	N/A	-
Actual Interception Capacity	Q _a =	N/A	N/A	cfs
Carry-Over Flow = $Q_0 - Q_a$ (to be applied to curb opening or next d/s inlet)	Q _b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)	s _[MINOR	MAJOR	A/A
Required Length L_{τ} to Have 100% Interception	5 _e –	14.40	33.15	- ft
Under No-Clogging Condition	-, L	MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	14.40	15.00	ft
Interception Capacity	$Q_i = [$	5.5 MINOR	13.4 MAJOR	cfs
Clogging Condition	CurbCoef =	1.31	1.31	7
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L _e =	14.34	14.34	ft
Actual Interception Capacity	$Q_a =$	5.5	13.2	cfs
Summary	Q _b =	MINOR	MAJOR	
Total Inlet Interception Capacity	Q = [5.5	13.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _b =	0.0	7.0	cfs
ICapture Percentage = Ω_2/Ω_2 =	C% =	100	65	10/0

MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF O	OF STRE	ET (Mino	or & Maj	jor Storm)
(Based on Regulated Criteria for Maximum All t: Grandview Reserve	owable Flow	Depth and Spr	ead)	
): Basin C-6 (DP 17e)				
Succe T. Ture W T. Company Company Company CROWN				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	TRACK =	7.5	Tft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	SBACK =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	DRACK =	0.020	1910	
	· · DACK	0.020	1	
Height of Curb at Gutter Flow Line	Hounn =	6.00	linches	
Distance from Curb Face to Street Crown	TCDOWN =	16.0	ft	
Gutter Width	W -	0.83	ft ft	
Street Transverse Slope	S	0.03	ft/ft	
Cutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	Sx =	0.020	H() H	
Street Longitudinal Slone Enter 0 for sume condition		0.065		
Manning's Doughtness for Street Section (typically between 0.012 and 0.020)	, ³ 0 –	0.015		
rial initig's Roughness for Suleet Section (typically between 0.012 and 0.020)	IISTREET -	0.016	1	
		Minor Storm	Major Storm	
Max Allowable Spread for Minor & Major Storm	т – Г	16.0		1ft
Max. Allowable Depth at Cutter Flowline for Minor & Major Storm		10.0	77	linches
Allow Elow Dopth at Street Crown (check bey for yes, loave blank for no)	UMAX -		<u> </u>	linches
Allow Flow Deput at Suleet Clowit (Check box for yes, leave blank for ho)			V	
Maximum Canacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Denth without Gutter Depression (Fg. ST-2)	v = [3.84	3.84	linches
Vertical Depth without outlet Depression (Eq. 51.2)	d	0.8	0.04	linches
Gutter Depression $(d_{-}, (W \times S, \times 12))$	a_	0.63	0.63	linches
Water Deptersion (dc (W S ₂ 12))	d –	4.47	4.47	linches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	т	15.2	15.7	
Cutter Flow to Design Flow Patio by EHWA HEC-22 method (Eq. ST-7)	F	0.140	0.140	
Discharge outside the Cutter Section W. carried in Section T		0.149	0.149	ofo
Discharge within the Cutter Section $W(Q = Q)$	Qx _	<u> </u>	0.9	
Discharge within the Guiller Section W ($Q_T - Q_X$)	Qw =	1.6	1.6	
Discharge Benning the Curb (e.g., sidewalk, griveways, & idwins)	QBACK =	0.0	0.0	
Maximum Flow Based On Allowable Spread	Q _T =	10.5	10.5	CTS
Flow Velocity within the Gutter Section	V =	1.0	1.0	tps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	
Maximum Canacity for 1/2 Street based on Allowable Donth		Minor Charma	Majar Charm	
Theoretical Water Spread	т – Г	15.6		1 #
Theoretical Spread for Discharge outside the Cutter Section W/(T _ W)		14.7	29.4	- "- #
Cutter Flow to Design Flow Datio by FUWA UEC 22 method (Fg. CT. 7)	'XTH -	14.7	26.0	- ^{'''}
Gutter Flow to Design Flow Ratio by FRWA HEC-22 method (Eq. ST-7)	_ [⊑] 0 =	0.153	0.079	
Theoretical Discharge outside the Cutter Section W. carried in Section T	1 1/201	ö.2	48.1	
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}		0.7	1 1 7	1015
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	$Q_X =$	8.2	41.7	ofe
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$)	$Q_X H = Q_X = Q_W = Q_$	8.2 1.5	41.7 4.1	cfs
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_X = Q_W = Q_{BACK} = Q_{CK}$	8.2 1.5 0.0	41.7 4.1 0.9	cfs cfs
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor)	$Q_X = Q_W = Q_{BACK} = Q_{CK} = Q_{CK$	8.2 1.5 0.0 9.7	41.7 4.1 0.9 46.8	cfs cfs cfs
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X TH}$ Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge flow Velocity Within the Gutter Section	$Q_X H = Q_X = Q_W = Q_{BACK} = Q = Q = V = Q$	8.2 1.5 0.0 9.7 0.9	41.7 4.1 0.9 46.8 1.4	cfs cfs cfs fps
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth	$Q_{X \text{ IH}} = Q_{W} = Q_{W} = Q_{BACK} = Q_{W} = Q_{BACK} = Q_{W} = Q_{W} = V = V = Q_{W} = V = V = V = V = V = V = V = V = V = $	8.2 1.5 0.0 9.7 0.9 0.3	41.7 4.1 0.9 46.8 1.4 0.9	cfs cfs cfs fps
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	$Q_X H = Q_X = Q_W = Q_W = Q_BACK = Q_Z = Q_Z = V = Q_Z = V*d = R = Q_Z = Q_Z$	8.2 1.5 0.0 9.7 0.9 0.3 1.00	41.7 4.1 0.9 46.8 1.4 0.9 1.00	cfs cfs cfs fps
$\label{eq:transformation} \begin{tabular}{lllllllllllllllllllllllllllllllllll$	$\begin{array}{c} Q_X = \\ Q_W = \\ Q_{BACK} = \\ Q_{BACK} = \\ V = \\ V = \\ V * d = \\ R = \\ \mathbf{Q}_d = \end{array}$	8.2 1.5 0.0 9.7 0.9 0.3 1.00 9.7	41.7 4.1 0.9 46.8 1.4 0.9 1.00 46.8	cfs cfs cfs fps cfs
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ Actual Discharge outside the Gutter Section W (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	$\begin{array}{c} Q_X = \\ Q_X = \\ Q_W = \\ Q_{BACK} = \\ Q = \\ V = \\ V^*d = \\ R = \\ \mathbf{Q_d} = \\ d = \end{array}$	8.2 1.5 0.0 9.7 0.9 0.3 1.00 9.7 4.36	41.7 4.1 0.9 46.8 1.4 0.9 1.00 46.8 7.68	cfs cfs cfs fps cfs fps cfs inches
$eq:started_st$	$\begin{array}{c} Q_{X} = \\ Q_{W} = \\ Q_{W} = \\ Q_{BACK} = \\ Q = \\ V = \\ V * d = \\ R = \\ \mathbf{Q}_{d} = \\ d = \\ d_{CROWN} = \end{array}$	8.2 1.5 0.0 9.7 0.9 0.3 1.00 9.7 4.36 0.00	41.7 4.1 0.9 46.8 1.4 0.9 1.00 46.8 7.68 3.22	cfs cfs cfs fps cfs cfs inches
Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$Q_{X} = Q_{W} = Q_{W$	8.2 1.5 0.0 9.7 0.9 0.3 1.00 9.7 4.36 0.00	41.7 4.1 0.9 46.8 1.4 0.9 1.00 46.8 7.68 3.22	cfs cfs cfs fps cfs inches inches
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion	$Q_{X} = Q_{X} = Q_{X$	8.2 1.5 0.0 9.7 0.9 0.3 1.00 9.7 4.36 0.00 Minor Storm	41.7 4.1 0.9 46.8 1.4 0.9 1.00 46.8 7.68 3.22 Major Storm	cfs cfs cfs fps cfs inches
Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	$Q_{X} = Q_{W} = Q_{W$	8.2 1.5 0.0 9.7 0.9 0.3 1.00 9.7 4.36 0.00 Minor Storm 9.7	41.7 4.1 0.9 46.8 1.4 0.9 1.00 46.8 7.68 3.22 Major Storm 46.8	cfs cfs cfs fps cfs inches inches cfs

INLET ON A CONTIN	IUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲Lo (C)				
H-Curb H-Vert		-		
Wo No				
Lo (G)				
Design Information (Input)		MINOR	MAIOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	4.
Length of a Single Unit Inlet (Grate or Curb Opening)		5.00 N/A	5.00	
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C⊧-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	Q ₀ =	3.3	11.7	cfs
Water Spread Width	T =	10.3	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.1	4.6	inches
Ratio of Gutter Flow to Design Flow	u _{CROWN} = _	0.0	0.2	linches
Discharge outside the Gutter Section W, carried in Section $T_{\rm v}$	$O_{\rm v} =$	2.5	10.1	cfs
Discharge within the Gutter Section W	Q _w =	0.8	1.7	cfs
Discharge Behind the Curb Face	Q _{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	0.19	0.29	sq ft
Velocity within the Gutter Section W	_ V _w =	4.2	5.7	fps
Water Depth for Design Condition	$d_{LOCAL} =$	6.1 MINOR	/.6 MA1OR	linches
Total Length of Inlet Grate Opening	I = [N/A	N/A	∃fr
Ratio of Grate Flow to Design Flow	E _{o-GRATE} =	N/A	N/A	-
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	$R_f =$	N/A	N/A	_
Interception Rate of Side Flow	$R_x =$	N/A	N/A	
Inder Clogging Condition	$Q_i = L$			
Clogging Contraction	GrateCoef =	N/A	N/A	7
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	_
Interception Rate of Side Flow	R _x =	N/A	N/A N/A	cfe
Carry-Over Flow = O_2 - O_2 (to be applied to curb opening or next d/s inlet)	Qa = Ob =	N/A	N/A N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S_e (based on grate carry-over)	S _e =	0.106	0.072	ft/ft
Required Length L _T to Have 100% Interception	L _T =	10.30	23.52	ft
Under No-Clogging Condition	. г	MINOR	MAJOR	-
Intercention Capacity		7 JU:30	15.00	
Under Clogaing Condition	vi - L	MINOR	MAIOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L _e =	14.34	14.34	ft
Actual Interception Capacity	Q _a =	3.3	9.7	cfs
$\frac{ Cdffy-Uverriew}{ Cdffy-Uverriew} = \frac{Q_{h/GRATE}}{Q_a}$	Q _b =	MINOP	<u> </u>	CIS
Total Inlet Interception Capacity	o = [3,3	9.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _h =	0.0	2.0	cfs
Canture Percentage - 0 /0 -	<u> </u>	100	83	10/2



INLET ON A CONTIN	IUOUS G	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			
۲				
H-Curb				
Wo Wo				
Lo (G)				
		MINOR	MAIOD	
<u>Design Information (Input)</u> Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Width of a Unit Grate (Grate or Curb Opening)	L _o = W _o =	5.00 N/A	5.00 N/A	
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - O < Allowable Street Capacity Design Discharge for Half of Street (from <i>Inlet Management</i>)	0 ₀ =	8.6	MAJOR 20.0	lcfs
Water Spread Width	T =	13.8	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	3.9	5.2	inches
Water Depth at Street Crown (or at I _{MAX}) Ratio of Gutter Flow to Design Flow	a _{crown} = F =	0.0	0.7	inches
Discharge outside the Gutter Section W, carried in Section T_x	$\overline{Q}_{x} =$	7.1	17.5	cfs
Discharge within the Gutter Section W	Q _w =	1.5	2.5	cfs
Discharge Behind the Curb Face	$Q_{BACK} = \Delta \dots = \Delta$	0.0	0.0	Cfs
Velocity within the Gutter Section W	V _w =	6.1	7.5	fps
Water Depth for Design Condition	d _{LOCAL} =	6.9	8.2	inches
Grate Analysis (Calculated)	F	MINOR	MAJOR	_⊷
Ratio of Grate Flow to Design Flow	E _{O-GRATE} =	N/A N/A	N/A	- "
Under No-Clogging Condition		MINOR	MAJOR	_
Minimum Velocity Where Grate Splash-Over Begins	V ₀ =	N/A	N/A	fps
Interception Rate of Side Flow	R _f = _	N/A N/A	N/A	-
Interception Capacity	$\hat{Q_i} =$	N/A	N/A	cfs
Under Clogging Condition	CrateCoof -	MINOR	MAJOR	- I
Clogging Eactor for Multiple-unit Grate Inlet	GrateClog =	N/A N/A	N/A N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V ₀ =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f = R _v =	N/A N/A	N/A N/A	-
Actual Interception Capacity	$\hat{\mathbf{Q}_{a}} =$	N/A	N/A	cfs
Carry-Over Flow = $Q_0 - Q_a$ (to be applied to curb opening or next d/s inlet)	Q _b =	N/A	N/A	cfs
<u>Curb or Slotted Injet Opening Analysis (Calculated)</u> Equivalent Slope S ₂ (based on grate carry-over)	S. =	0.083	0.065	ft/ft
Required Length L_T to Have 100% Interception	L _T =	19.17	32.97	ft
Under No-Clogging Condition	. г	MINOR	MAJOR	
Interception Capacity	L = 0; =	<u> </u>	13.3	ft
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	-
Effective (Uncloaged) Length		0.04	0.04	- _{ft}
Actual Interception Capacity	$\mathbf{Q}_{\mathbf{a}} = \mathbf{Q}_{\mathbf{a}}$	8.0	13.1	cfs
$Carry-Over Flow = Q_{b/(GRATE)} - Q_a$	Q _b =	0.6	6.9	cfs
Total Inlet Interception Capacity	o = [MINUK 8.0	MAJOK 13.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	\mathbf{Q}_{b} =	0.6	6.9	cfs
Capture Percentage = Ω_3/Ω_0 =	C% =	93	66	%

MHFD-Inlet, Version 5.01	(April 2021)	
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Min	or & Major Storm)
(Based on Regulated Criteria for Maximum Allo	wable Flow Depth and Spi	read)
roject: Grandview Reserve		
Such W Tr Tr CROWN		
Gutter Geometry:	T _ 75	1.0
Maximum Allowable Width for Spread Benind Curb Cide Clane Behind Curb (legue blank for no converges credit behind curb)	$I_{BACK} = 7.5$	IT AVA
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$S_{BACK} = 0.020$	-rt/rt
	HBACK - 0.020	1
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00	linches
Distance from Curb Face to Street Crown	T _{CROWN} = 16.0	ft
Gutter Width	W = 0.83	ft
Street Transverse Slope	S _X = 0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _W = 0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S ₀ = 0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} = 0.016	
May Allowable Caread for Minor & Major Charm	Minor Storm	Major Storm
Max. Allowable Spread for Minor & Major Storm	$I_{MAX} = 16.0$	16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	u _{MAX} =	
Allow Flow Deput at Street Crown (check box for yes, leave blank for ho)		1×
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm	Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	v = 3.84	3.84 linches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _C = 0.8	0.8 inches
Gutter Depression (d_c - (W * S_x * 12))	a = 0.63	0.63 inches
Water Depth at Gutter Flowline	d = 4.47	4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _x = 15.2	15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.149$	0.149
Discharge outside the Gutter Section W, carried in Section T_x	Q _X = 10.3	10.3 cfs
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_{W} = 1.8$	1.8 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0$	0.0 cts
Maximum Flow Based On Allowable Spread	$Q_{T} = 12.1$	
Flow Velocity within the Gutter Section	V = 1.1	1.1 tps
V'a Product. Flow velocity times dutter Flowline Depth	v·u =0.4	0.4
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm	Maior Storm
Theoretical Water Spread	Т _{тн} = 15.6	29.4 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} = 14.7	28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.153	0.079
Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH}	Q _{X TH} = 9.5	55.6 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _X = 9.5	48.2 cfs
Discharge within the Gutter Section W (Q_d - Q_x)	Q _W = 1.7	4.8 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} = 0.0	1.0 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 11.2	54.0 cfs
Average Flow Velocity Within the Gutter Section	V = <u>1.1</u>	1.6 fps
Vrd Product: Flow Velocity Times Gutter Flowline Depth	V^d = 0.4	
Supe-dased Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm May Flow Based on Allowable Depth (Safety Factor Applied)	K = 1.00	0.83 45.0 cfs
Pecultant Flow Denth at Cutter Flowline (Safety Factor Applied)	$Q_d = 11.2$	7 17 inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	$d_{CROWN} = 0.00$	2.70 inches
MINUK STORM Allowable Capacity is based on Depth Criterion	Minor Storm	Major Storm
Minor storm max, allowable capacity COOD - greater than the design flow size	Vallow = 11.2	45.0 Crs
Major storm max. allowable capacity GOOD - greater than the design flow give	en on sheet 'Inlet Managen	nent'



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	1
Length of a Single Unit Inlet (Grate or Curb Opening)	L ₀ = [5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	$C_{f}-C =$	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	$Q_0 = [$	6.2	20.0	cfs
Water Spread Width	т = Г	12.4	16.0	ft
Water Depth at Flowline (outside of local depression)	d = [3.6	5.3	linches
Water Depth at Street Crown (or at T _{MAX})	d _{CROWN} =	0.0	0.8	linches
Ratio of Gutter Flow to Design Flow	$E_0 = $	0.195	0.123	
Discharge outside the Gutter Section W, carried in Section T,	0, =	5.0	17.5	cfs
Discharge within the Gutter Section W	o = [1.2	2.4	lcfs
Discharge Behind the Curb Face	OPACK =	0.0	0.0	cfs
Flow Area within the Gutter Section W	Aw =	0.22	0.34	Iso ft
Velocity within the Gutter Section W	V =	5.5	7.3	fns
Water Depth for Design Condition		6.6	8.3	linches
Grate Analysis (Calculated)	GIULAI	MINOR	MAIOR	Interies
Total Length of Inlet Grate Opening	ı = [N/A	N/A	Tft
Patio of Grate Flow to Design Flow	E cours -	N/A	N/A	-1"
Under No-Clogging Condition	LO-GRATE -L	MINOR	MATOR	
Minimum Velocity Where Crate Splach-Over Begins	v - F	N/A		Ifoc
Interception Date of Frontal Flow	v _o =	N/A N/A	N/A	- 145
Interception Rate of Fide Flow		N/A	N/A	-
Interception Rate of Side Flow		N/A	N/A	ofc
Under Clogging Condition	Qi – L			
Clogging Coefficient for Multiple-unit Crate Inlet	GrateCoof -	MINOR N/A		7
Clogging Eactor for Multiple unit Crate Inlet	CrateClea -	N/A		-
Effortive (uncloaged) Length of Multiple unit Crote Inlet		N/A	N/A	
Minimum Valasity Where Crete Calash Quer Begins		N/A	N/A	
	v _o =	N/A	N/A	-l ^{ips}
		N/A	IN/A	-
Interception Rate of Side Flow	R _x =	N/A	N/A	-
Actual Interception Capacity	Q _a =	N/A	N/A	
Carry-Over Flow = $Q_0 - Q_0$ (to be applied to curb opening or flext d/s inlet)	Q _b =	N/A MINOD		CTS
Curb of Siotled Iniel Opening Analysis (Calculated)	с — Г			
Equivalent Slope S_e (Dased on grate carry-over)	Se =	0.091	0.065	
Required Length L _T to Have 100% Interception		15.52	32.93	_π
		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)		15.00	15.00	_π_
Interception Capacity	$Q_i = [$	6.2	13.3	lcts
Under Clogging Condition		MINOR	MAJOR	-
	CurbCoet =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	4
Effective (Unclogged) Length	L _e =	14.34	14.34	_Itt
Actual Interception Capacity	Qa =	6.2	13.1	cfs
Carry-Over How = $Q_{h(GRATE)} - Q_a$	Q _b =	0.0	6.8	cts
Summary	-	MINOR	MAJOR	- -
Total Inlet Interception Capacity	Q =	6.2	13.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _b =	0.0	6.8	cfs
Captura Parcaptaga - 0 /0 -	C % -	100	66	0/2

MHFD-Inlet, Version 5.01	(April 2021)	
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Stor	rm)
(Based on Regulated Criteria for Maximum All	owable Flow Depth and Spread)	
t ID: Basin C-9b (DP17h)		
Gutter Geometry:		
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 7.5$ ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft	
Maining's Roughness Benning Curb (typically between 0.012 and 0.020)	11 _{BACK} = 0.020	
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00 inches	
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft	
Gutter Width	W = 0.83 ft	
Street Transverse Slope	$S_{\rm X} = 0.018$ ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = 0.083$ ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$	
	Minor Storm Major Storm	
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = 16.0$ 16.0 ft	
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} = 4.4 7.7 inches	
Check boxes are not applicable in SUMP conditions		
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm	
Water Depth without Gutter Depression (Eq. 51-2)	y = 3.46 3.46 Inches	
Gutter Depression ($d_c - (W * S * 12)$)	a = 0.65 0.65 inches	
Water Depth at Gutter Flowline	$d = \frac{0.05}{4.10}$ inches	
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_{\rm x} = 15.2$ 15.2 ft	
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.151 0.151$	
Discharge outside the Gutter Section W, carried in Section T _x	$Q_{\rm X} = 0.0 0.0$ cfs	
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 0.0 0.0 cfs$	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$	
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs	
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps	
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0	
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm Major Storm	
Theoretical Water Spread	$T_{TH} = 17.2$ 32.6 ft	
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} = 16.4 31.7 ft	
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.140 0.071	
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 0.0 0.0 cfs	
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_X = 0.0 0.0 cfs$	
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_W = 0.0$ 0.0 cfs	
Discharge Benind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0$ 0.0 cfs	
Average Flow Velocity Within the Gutter Section	Q = 0.0 0.0 Cfs	
Average Llow velocity Within the Gutter Flowline Denth		
Slope-Based Depth Safety Reduction Factor for Major & Minor $(d > 6^{\circ})$ Storm		
Max Flow Based on Allowable Depth (Safety Factor Applied)	$Q_d = SUMP$ SUMP cfs	
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = inches	
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches	
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = SUMP SUMP cfs	



MHFD-Inlet, Version 5.01	(April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STRE	ET (Mino	or & Maj	or Storm)
(Based on Regulated Criteria for Maximum All	owable Flow	Depth and Spr	ead)	
): Basin C-7b (DP 18b)				
Succe T. Ture W Tr Co Co Structure CROWN				
Gutter Geometry:				
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5	lft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S _{BACK} =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020	1	
			-	
Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	inches	
Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft	
Gutter Width	W =	0.83	ft	
Street Transverse Slope	S _x =	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _w =	0.083	ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	S ₀ =	0.022	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} =	0.016	1	
			4	
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T _{MAX} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =	4.4	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)	-		¥	_
Maximum Capacity for 1/2 Street based On Allowable Spread	-	Minor Storm	Major Storm	-
Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _c =	0.8	0.8	inches
Gutter Depression (d_c - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	4.47	4.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T _X =	15.2	15.2	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ =	0.149	0.149	
Discharge outside the Gutter Section W, carried in Section T _x	$Q_X =$	10.8	10.8	cfs
Discharge within the Gutter Section W ($Q_T - Q_X$)	Q _w =	1.9	1.9	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	Q _T =	12.7	12.7	cfs
Flow Velocity within the Gutter Section	V =	1.2	1.2	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	
Maximum Capacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	7.
Theoretical Water Spread	_ITH =	15.6	29.4	nt .
Theoretical Spread for Discharge outside the Gutter Section W (1 - W)	I _{X TH} =	14./	28.6	π
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 =$	0.153	0.079	4.
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} =	10.0	58.3	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_X =$	10.0	50.6	cfs
Juscharge within the Gutter Section W ($Q_d - Q_x$)	Q _w =	1.8	5.0	CIS
	()-···· -	0.0	1.1	CIS
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	QBACK -			Icfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor)	$Q_{BACK} = Q$	11.8	56.6	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section	QBACK = Q = V =	11.8 1.1	56.6 1.7	fps
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth	Q = Q = V = V*d =	11.8 1.1 0.4	56.6 1.7 1.1	fps
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6''$) Storm	QBACK = Q = V = V*d = R =	11.8 1.1 0.4 1.00	56.6 1.7 1.1 0.77	fps
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied)	Q BACK = Q = V = V*d = R = Q _d =	11.8 1.1 0.4 1.00 11.8	56.6 1.7 1.1 0.77 43.8	fps cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	Q = V = V*d = Q_d = d = d = Q_d = V = C =	11.8 1.1 0.4 1.00 11.8 4.36	56.6 1.7 1.1 0.77 43.8 6.96	fps cfs inches
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6''$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$Q_{BACK} = Q_{d} = Q$	11.8 1.1 0.4 1.00 11.8 4.36 0.00	56.6 1.7 1.1 0.77 43.8 6.96 2.49	fps cfs inches inches
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6''$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	$Q_{BACK} = Q_{CROWN}$ $Q = Q_{CROWN}$ $Q = Q_{d} = Q_{d}$ $Q_{d} = Q_{d}$	11.8 1.1 0.4 1.00 11.8 4.36 0.00	56.6 1.7 1.1 0.77 43.8 6.96 2.49	fps cfs inches inches
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MINOR STORM Allowable Capacity is based on Depth Criterion	$Q_{BACK} = Q_{CROWN}$ $Q = Q_{CROWN}$ $Q = Q_{CROWN}$	11.8 1.1 0.4 1.00 11.8 4.36 0.00 Minor Storm	56.6 1.7 1.1 0.77 43.8 6.96 2.49 Major Storm	fps cfs inches inches
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	$Q_{BACK} - Q = Q = V = V = V = Q = Q = Q = Q = Q =$	11.8 1.1 0.4 1.00 11.8 4.36 0.00 Minor Storm 11.8	56.6 1.7 1.1 0.77 43.8 6.96 2.49 Major Storm 43.8	fps cfs inches inches cfs

INLET ON A CONTIN	NUOUS G	RADE		
MHFD-Inlet, Version 5.0	01 (April 2021)			
۲Lo (C)۶		÷.		
H-Curb H-Vert				
W F				
Lo (G)				
CDOT Type R Curb Opening		MINOD	MAJOD	
<u>Design Information (Input)</u> Type of Inlet	Type =	CDOT Type R	MAJOR Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	L ₀ =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W ₀ =	N/A	N/A	_nt
Clogging Factor for a Single Unit Curb Opening (typical Init). Value = 0.5)	C-C =	0.10	0.10	-
Street Hydraulics: OK - O < Allowable Street Capacity'	0f C = 1	MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	Q ₀ =	11.0	26.4	cfs
Water Spread Width	T =	15.2	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.3	5.8	inches
Water Depth at Street Crown (or at I _{MAX})	a _{crown} =	0.0	1.3	incnes
Discharge outside the Gutter Section W. carried in Section T.	$L_0 = 0$	9.3	23.4	cfs
Discharge within the Gutter Section W	Q _x =	1.7	3.0	cfs
Discharge Behind the Curb Face	Q _{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	0.27	0.37	sq ft
Velocity within the Gutter Section W	V _W =	6.5	8.1	fps
Water Depth for Design Condition	d _{LOCAL} =	7.3 MINOR	8.8 MA10D	Inches
Total Length of Inlet Grate Opening	1 = [ft
Ratio of Grate Flow to Design Flow	E _{o-GRATE} =	N/A	N/A	-"
Under No-Clogging Condition		MINOR	MAJOR	
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	_
Interception Rate of Side Flow	R _x =	N/A	N/A N/A	ofs
Under Clogging Condition	Qi - [MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Interception Rate of Frontal Flow	V _o =	N/A	N/A	Tps
Interception Rate of Fide Flow	R _f = . R _v = .	N/A N/A	N/A N/A	
Actual Interception Capacity	Q _a =	N/A	N/A	cfs
Carry-Over Flow = $Q_0 - Q_a$ (to be applied to curb opening or next d/s inlet)	Q _b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)	r	MINOR	MAJOR	_
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.077	0.061	ft/ft
Inder No-Clogging Condition	L _T = [ZZ.49 MINOP	1 39.20 MA1OR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =[15.00	15.00	ft
Interception Capacity	$Q_i =$	9.5	15.3	cfs
Under Clogging Condition	-	MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	_
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Actual Intercention Canacity	с _е = О_ =	9.4	14.54	- cfs
Carry-Over Flow = $Q_{h/GRATE}$ - Q_a	$\mathbf{Q}_{h} = \mathbf{Q}_{h}$	1.6	11.3	cfs
Summary		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	9.4	15.1	cfs
I otal Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b =$	1.6	11.3	
	L.%n =	65	1 57	1 - 7/0

Provide the product of the product of the function of the product of the product of the function of the product of the produc	MHFD-Inlet, Version 5.01	(April 2021)				
Regulated Criteria for Maximum Allowable Flow Depth and Spread TMather is seried of Carlo is seried Carlo is seried of Carlo is seried Carlo is seried of Carlo is seried Carlo is seried Carlo is seried of Carlo is seried	ALLOWABLE CAPACITY FOR ONE-HALF C	OF STREE	T (Minc	or & Maj	or Storm)	
Project individuel Mediarde Individuel Mediarde	(Based on Regulated Criteria for Maximum All	owable Flow De	pth and Spre	ead)		
$ \begin{array}{c} \label{eq:construction} \hline \begin{tabular}{lllllllllllllllllllllllllllllllllll$	roject: Grandview Reserve let ID: Basin C-7h (DP 18h)					
$ \begin{array}{c} \hline \\ \hline $						
Gutter Geometry: Maximum Capacity (F) (22 Street Lased on Allowable Spread Fourier Depression (G (W * S, *12))Task: = 7.5 Succ. = 7.5 Succ. = 7.5 Succ. = 0.020 http: http: http: http: http: http: http: http: http: http: http: http: http:Task: = 7.5 Succ. = 0.020 http: http: http: http: http: http: http: http: http: http: http: http: http: http: http: http: http: http:Task: = 7.5 Succ. = 0.020 http:Task: = 7.5 Succ. = 0.020 http:<	Successor T, Two T, Two T, Two T, T, Two T, T, Two T, T, Two T,					
Maximum Allowable with for Spread Berlind Curb Side Single Behlind Curb (typically between 0.012 and 0.020) $I_{Back} = \frac{1}{0.020}$ $I_{WC} = \frac{1}{0.020}$ $I_{WC} = \frac{1}{0.020}$ Height of Curb a Cutbr Flow Line Distance from Curb Face to Street Corvin Gutter Width Street Transverse Stope Gutter Coros Stope (typically 2 inches ore 24 inches or 0.083 ft/ft) Street Longuitania Sago = there 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) $V_{Cast} = \frac{1}{0.020}$ $V_{WE} = \frac{1}{0.020}$ V_{WE	Gutter Geometry:			~		
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Maximum Allowable Width for Spread Behind Curb	I _{BACK} =	7.5	ft		
$ \begin{array}{c} \operatorname{Heining} \operatorname{Stock}(\operatorname{hole} \operatorname{Lun}(\operatorname{Cub}(\operatorname{Street} \operatorname{Fow}(\operatorname{Inc}\operatorname{Cub}(\operatorname{Street}\operatorname{Fow}(\operatorname{Inc}\operatorname{Street}\operatorname{Fow}(\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}\operatorname{Street}\operatorname{Street}\operatorname{Street}\operatorname{Fow}\operatorname{Inc}\operatorname{Street}Street$	Side Slope Benind Curb (leave blank for no conveyance credit benind curb) Mapping's Roughness Behind Curb (typically between 0.012 and 0.020)	S _{BACK} =	0.020	rt/rt		
Height of Curb at Cutter Flow line Distance from Curb Face to Street Crown Gutter Width Street Longitudinal Stope - Enter 0 for sump condition Maximum Street Scalpe (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Stope - Enter 0 for sump condition Maximum Capacity for 1/2 Street Scalpe (typically between 0.012 and 0.020) Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Max. Allowable Depth at Street Crown (cleck box for yes, leave blank for no) Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Flowline Allow Flow Tables The Outer Section (Leg. 51-2) Vertical Depth Detween Gutter Flowline (usually 2') Gutter Flow to Design Flow Katlo by FHWA HEC-22 method (Eq. 51-7) Discharge outside the Gutter Section (Leg. 51-7) Discharge definit the Gutter Section (Leg. 51-7) Discharge definit the Gutter Secti	Marining's Roughness bening curb (typically between 0.012 and 0.020)	HBACK -	0.020			
Distance from Curb Face to Street Crown Gutter With Street Transverse Stope Gutter Toross Stope (typically 2 inches ore 24 inches or 0.083 fr(f) Street Longitudinal Stope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Toperssion (G ₁ , GT - T) Discharge outside the Gutter Section W (T - W) Cutter Toperssion (G ₁ , GT - C) Discharge outside the Gutter Section W (T - W) Cutter Toperssion (G ₁ , GT - C) Discharge outside the Gutter Section W (T - W) Cutter Tow Design Flow Raito by FHMW HEC: 22 method (Gf, ST - 7) Theoretical Spread for Discharge outside the Gutter Section W (T - W) Cutter Tow Doesign Flow Raito by FHMW HEC: 22 method (Gf, ST - 7) Theoretical Spread for Discharge outside the Gutter Section W (T - W) Cutter Tow Natio N (T - W)	Height of Curb at Gutter Flow Line	H _{CURB} =	6.00	inches		
Cutter WidthGutter Transverse SlopeGutter Transverse SlopeMinor Storm Prove Transverse SlopeMinor Storm Major StormMax. Allowable Spread for Minor & Major StormMinor Storm Major Storm<	Distance from Curb Face to Street Crown	T _{CROWN} =	16.0	ft		
Street Transverse Slope Gutter Transverse Slope Gutter Transverse Slope Gutter Cross Slope (typically 2) inches or 0.083 ft/ft) Street LongBudinal Slope - Enter 1 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm (theck box for yes, leave blank for no) Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth at Gutter Flowline (Gaustly 2'') Gutter Depression (G ₁ - St ⁻²) Water Depth at Gutter Flowline (susally 2'') Gutter Depression (G ₁ - (W * S ₁ * 12)) Water Depth at Gutter Flowline (Susally 2'') Gutter Section VV, carried in Section T _x Discharge outside the Gutter Section V(T · W) Discharge outside the Gutter Section V(T - W) Discharge and the Cutter Section (V, carried in Section T _x Discharge and for Discharge outside the Gutter Section V(T - W) Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Stread for Discharge outside the Gutter Section W(T - W) Maximum Flow Based for Minor & Ruiter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Stread for Discharge outside the Gutter Section W(T - W) Stortarge Behind the Cutter Section W(Q ₁ - Q ₂) Discharge Behind the Gutter Section W(Q ₁ - Q ₂) Cutter Flow Velocity times Gutter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Storage outside the Gutter Section W(T - W) Storage within the Gutter Section W(Q ₁ - Q ₂) Cutter Flow Velocity Times Gutter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Water Sp	Gutter Width	W =	0.83	ft		
Gutter Cross Slope (typically 2) inches or 24 inches or 0.083 ft/ft)Sw = 0.083 0.083 0.083 ft/ft Street Englighting Slope - Enter 0 for sump condition $S_{W} = 0.022$ ft/ft Minor Skinglor Storm ft/ft Max: Allowable Spread for Minor & Major Storm ft/ft Minor Storm Major Storm $ft/ftMinor Storm Major Stormft/ftMinor Storm Major StormMinor Storm Major StormMinor Storm Major StormMinor Storm Major StormWater Depth without Gutter Flowline (Gr. ST-7)Upticating outside the Gutter Section W (T · W)Gutter Flow Incharge outside the Gutter Flowline DepthMinor Storm Major Storm (Carl Store Section W (Qr · Q_2)Discharge outside the Gutter Flowline DepthMinor Storm Major Storm (Pre Sately Flow Charge outside the Gutter Section W (T · W)Gutter Flow Incharge outside the Gutter Flowline DepthTheoretical Water Flowline Curl (Gr. Str.2)Minor Storm Major Storm (Pre Sately$	Street Transverse Slope	S _X =	0.020	ft/ft		
Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) $S_{DO} = 0.022$ $D_{THET} = 0.016$ Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Allow Flow Depth at Street Crown (check box for yes, leave blank for no) $T_{WS} = 0.021$ 16.0 16.0 16.0 16.0 16.0 Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Gutter Depth storme Gutter Lip and Gutter Flowine (usually 2") Gutter Depth at Street Flowine How beeph at Gutter Flowine Gutter Plower Gutter Section W (T - W) Gutter Depth storme Gutter Section W (G - Q_2) Discharge outside the Gutter Section Tx. Discharge Builth the Gutter Section W (G - Q_2) Discharge Builth the Gutter Section W (G - Q_3) Discharge Builth the Gutter Section W (G - Q_4) Cutter Flow Velocity times Gutter Flowine Lag and Diabable Spread Flow Velocity times Gutter Flowine Depth $T_{HI} = \frac{1155}{12.2}$ $11.2.7.7$ 17.5 10.8	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _W =	0.083	ft/ft		
Manning's Roughness for Street Section (typically between 0.012 and 0.020) $n_{STREET} = 0.016$ Max. Allowable Spread for Minor & Major Storm Allow Flow Depth at Street Crown (check box for yes, leave blank for no) $Minor Storm Major Storm Major Stormd_{MX} = 1.44 - 7.7 inchesMaximum Capacity for 1/2 Street based On Allowable SpreadWater Depth without Gutter Depression (Eq. (1** 5)ettal Depth Expression (Eq. (1** 5))Winor Storm Major Stormd_{MX} = 1.52 - 15.2Water Depth without Gutter PorvsineGutter Flowine Cauter FlowineMinor Storm Portside the Gutter Section V (T · W)Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 57-7)Discharge outside the Gutter Section T VDischarge Behind the Cuth (e.g., silewalk, driveways, & lawns)Maximum Flow Based On Allowable DepthTheoretical Water SpreadFlow Velocity times Gutter Flowline DepthWind StormV = 1.2 - 1.27 - 12.7 - 15.5 - 15.2 -$	Street Longitudinal Slope - Enter 0 for sump condition	S ₀ =	0.022	ft/ft		
Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Allow Flow Depth at Street Crown (check box for yes, leave blank for no) $T_{Mex} = 16.0 \\ 1$	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{street} =	0.016			
Max. Allowable Spread for Minor & Major Storm $T_{MAX} = \begin{bmatrix} 16.0 & 116$			Aire and Channes	Maine Charma		
Has. Allowable Spread for Timbur & Hight Sum $y_{WA} = \frac{10.00}{4.4}$ 10.00	Max Allowable Spread for Minor & Major Storm	т _ [16.0	Major Storm	T _{ft}	
Next information of the sector of the sec	Max. Allowable Spread for Minor & Major Storm	d	10.0	10.0	linches	
Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Guter Poperssion (Eq. 5T-2) Verical Depth between Gutter Flowline (usually 2') Gutter Depression (Cq (W * S, * 12))Minor Storm Major Storm d =Water Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Discharge within the Gutter Section W (Qr - Qa) Discharge ethni the Gutter Section W (Qr - Qa) Discharge outside the Gutter Section W (Qr - Qa) Water Dept Steel Control (Section Tx Discharge outside the Gutter Section W (Qr - Qa) Water Depth at Gutter Flowline Depthy = $\frac{3.84}{3.84}$ inches inches d = $4.4.7$ 4.4.7Maximum Flow Dased On Allowable Spread Flow Velocity times Gutter Flowline Depth $Q_x = 10.8$ 1.3 1.2 1.2 1.2 1.2 fs $Q_x = 10.8$ 1.3 10.8 1.3 1.3 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow Velocity times Gutter Flowline Depth $V = 12.7$ 1.2 1.2 1.2 1.2 1.2 1.2 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow Velocity times Gutter Flowline Depth $V_x = 10.0$ 0.4 0.6 0.11 0.4 Maximum Gapacity for 1/2 Street based on Allowable Capacity for 1/2 Street based on Allowable Capacity for 1/2 Street based on Allowable Capacity for 1.2 0.2 and 0.3 0.6 0.5 $0.$	Allow Flow Denth at Street Crown (check box for yes, leave blank for no)			7.7		
Maximum Capacity for 1/2 Street based On Allowable SpreadMinor StormMajor StormWater Depth without Gutter Depression ($d_c - (W + S_r + 12)$) $d_c = 0.8$ 0.8 inchesGutter Depth at Gutter Flowine $d = 4.4.7$ $4.4.7$ inchesWater Depth at Gutter Flowine $d = 4.4.7$ $4.4.7$ inchesMinor StormMater Depth at Gutter Flowine $d = 4.4.7$ $4.4.7$ Mater Depth at Gutter Flowine $d = 4.4.7$ $4.4.7$ inchesGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.149$ 0.149 Discharge outside the Gutter Section W, carried in Section Tx $Q_x = 10.8$ 10.8 10.8 Discharge within the Gutter Section W ($T - Q_x$) $Q_w = 1.9$ 1.9 1.9 fs Discharge within the Gutter Section W ($T - Q_x$) $Q_w = 0.0$ 0.0 0.0 fs Maximum Capacity for 1/2 Street based on Allowable Depth $V'd = 0.4.4$ $0.4.4$ $0.4.4$ Maximum Capacity for 1/2 Street based on Allowable Depth $V'd = 0.153$ 0.079 fs Theoretical Spread for Discharge outside the Gutter Section W ($T - W$) $T_{TH} = 14.7$ 28.6 ft Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $C_{TH} = 10.0$ 58.3 cfs Discharge outside the Gutter Section W ($q_1 - Q_0$) $Q_{XTH} = 10.0$ 58.3 cfs Obscharge within the Gutter Section W ($Q_1 - Q_0$) $Q_{XTH} = 10.0$ 58.6 ft Maximum Capacity for Used the Gutter Section W ($q_1 - Q_0$) $Q_{XTH} = 10.0$ 58.6 <td>Allow How Depth at Succe clowin (check box for yes, leave blank for hoy</td> <td></td> <td>1</td> <td></td> <td></td>	Allow How Depth at Succe clowin (check box for yes, leave blank for hoy		1			
Water Depth without Gutter Depression (Eq. ST-2)y = 3.843	Maximum Capacity for 1/2 Street based On Allowable Spread	4	4inor Storm	Major Storm		
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") $d_c =$ 0.8 0.8 inchesGutter Depression ($d_c - (W + S_x * 12)$) $a =$ 0.63 0.63 inchesWater Depth at Gutter Flowline $d =$ 4.47 4.47 inchesAllowable Spread for Discharge outside the Gutter Section W (T - W) $T_x =$ 15.2 15.2 15.2 Gutter Flow To Poisson Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $T_x =$ 10.8 10.8 10.8 Discharge within the Gutter Section W ($q_r - Q_x$) $Q_w =$ 1.9 1.9 1.9 d_s Discharge within the Gutter Section W ($q_r - Q_x$) $Q_w =$ 1.2 1.2 fs Maximum Flow Based On Allowable Spread $Q_{rec} =$ 0.0 0.0 drs How Velocity within the Gutter Section W $V =$ 1.2 1.2 fs V de Ucotty Within the Gutter Section W ($T - W$) $V =$ 1.2 1.2 fs Maximum Capacity for $1/2$ Street based on Allowable Depth $V =$ 0.4 0.4 0.4 Theoretical Discharge outside the Gutter Section W ($T - W$) $T_{TT} =$ 15.6 29.4 ft Gutter Flow to ledgin Flow Ratio by HWA HEC-22 method (E_x ST-7) $T_{C_y} =$ 0.153 0.079 Theoretical Discharge outside the Gutter Section W ($T - W$) $T_{TT} =$ 15.6 29.4 ft Actual Discharge outside the Gutter Section W ($T - W$) $T_{TT} =$ 11.6 1.7 28.6 Discharge Within the Gutter Section W ($T - W$) $T_{TT} =$	Water Depth without Gutter Depression (Eq. ST-2)	y =	3.84	3.84	inches	
Gutter Depression (dc - (W * S, * 12))a = 0.630.63inchesWater Depth at Gutter Flow Ined4.474.474.47Allowable Spread for Discharge outside the Gutter Section W (T - W)TTtGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Ep< 0.1490.	Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d _C =	0.8	0.8	inches	
Water Depth at Gutter Flowlined = 4.474.47inchesAllowable Spread for Discharge outside the Gutter Section W (Q - Q_A)TTDischarge outside the Gutter Section W (Q - Q_A)C0.1490.1490.149Discharge outside the Gutter Section W (Q - Q_A)CTTTTDischarge outside the Gutter Section W (Q - Q_A)QW1.12.71.2.71.2.765Minor Storm (Pr = Section W (C - Q_A)V = 0.40.00.0CMinor Storm (T = C_A)WTTTTTTDischarge outside the Gutter Section WC0.1490.153 <th co<="" td=""><td>Gutter Depression (d_c - (W * S_x * 12))</td><td>a =</td><td>0.63</td><td>0.63</td><td>inches</td></th>	<td>Gutter Depression (d_c - (W * S_x * 12))</td> <td>a =</td> <td>0.63</td> <td>0.63</td> <td>inches</td>	Gutter Depression (d_c - (W * S_x * 12))	a =	0.63	0.63	inches
Allowable Spread for Discharge outside the Gutter Section W (1 - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge within the Gutter Section W, carried in Section T _x Discharge within the Gutter Section W ($T - Q_{\lambda}$) Discharge within the Gutter Section W ($Q_T - Q_{\lambda}$) Discharge behind the Curb (e.g., sidewalk, driveways, & lawns) W*d Product: Flow Velocity times Gutter Flowline Depth Theoretical Vater Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W ($Q_d - Q_{\lambda}$) Discharge within the Gutter Section W, (limited by distance T _{CROWN}) Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section W ($Q_d - Q_{\lambda}$) W*d Product: Flow Velocity Within the Gutter Section M ($d \ge 6^{\circ}$) Storm Max Flow Based on Allowable Depth Gifety Factor Applied) Resultant Flow Depth at Staret Crown (Safety Factor Applied) Resultant Flow Depth at Staret Crown (Safety Factor Applied) Resultant Flow Depth at Staret Crown (Safety Factor Applied) Minor Storm Malowable Capacity is based on Depth Criterion MAOR STORM Allowable Capacity is based on Depth Criterion MAOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable Capacity is based on Depth Criterion Minor storm max, allowable Capacity is based on Depth Criterion Minor storm max, allowable Capacity is based	Water Depth at Gutter Flowline	_d =	4.47	4.47	linches	
Cutter How to Design How Ratio by HWA REC-22 method (Eq. S1-7) Discharge outside the Gutter Section W, carried in Section T _x Discharge behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section W ⁺ d Product: Flow Velocity times Gutter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by HWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by HWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by HWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W (Imited by distance T _{GROWN}) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet Minor storm max. allowable capacity for ODD - greater than the design flow given on sheet Intel Management!	Allowable Spread for Discharge outside the Gutter Section W (1 - W)	_x =	15.2	15.2	ft	
Discharge within the Gutter Section W, carried in Section 1_x Discharge behind the Gutter Section W ($c_1 - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowline Depth Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Spread for Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge outside the Gutter Section W, Carried in Section T_{XTH} Actual Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section M V*d Product: Flow Velocity Within the Gutter Section M V*d Product: Flow Velocity Within the Gutter Section Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) Minor storm Max. Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Mayor storm max. Allowable Capacity GODD - greater than the design flow given on sheet Tintlet Management for the fourter section found the design flow given on sheet Tintlet Management for the found the design flow given on sheet Tintlet Management for the fo	Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. SI-7)	E0 =	0.149	0.149	-6-	
Discharge within the Gutter Section W ($y_{T} = Q_{0}$) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowine Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Water Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, carried in Section T _{X TH} Actual Discharge outside the Gutter Section W (Q - Q _X) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Call Discharge For Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Times Gutter Flowline Depth V*d Product: Flow Velocity Times Gutter Flowline Depth Stope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq 6^{n}$) Storm Max Flow Based on Allowable Capacity is based on Depth Criterion MINOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet Tintlet Management'	Discharge outside the Gutter Section W, carried in Section T_{χ}		10.8	10.8	crs	
Discharge behind the Cub (e.g., sidewalk, driveways, & rawits) $C_{BACK} = 0.0$ 0.0	Discharge Rehind the Curb (a.g., cidewalk, drivewaye, & lawse)	Qw =	1.9	1.9	- crs	
How Velocity within the Gutter Section $V = 1.2$ 1.2 1.2 1.2 1.5 V*d Product: Flow Velocity times Gutter Flowline Depth $V^*d = 0.4$ 0.4 0.4 0.4 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread $V^*d = 0.4$ 0.4 0.4 Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $V_{0} = 0.153$ 0.079 Theoretical Discharge outside the Gutter Section W, (arried in Section T_{XTH} $V_{0} = 0.153$ 0.079 Theoretical Discharge outside the Gutter Section W, (arried in Section T_{XTH} $V_{x} = 10.0$ 58.3 cfs Actual Discharge outside the Gutter Section W ($Q_{0} - Q_{X}$) $Q_{x} = 10.0$ 50.6 cfs Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{x} = 0.0$ 1.1 ffs Total Discharge for Major & Minor Storm (Pre-Safety Factor) $V^*d = 0.4$ 1.1 1.7 Average Flow Velocity Times Gutter Flowline Depth $V^*d = 0.4$ 1.1 1.7 Slope-Based Depth Safety Reduction Factor Applied) $Q_{a} = 11.8$ 43.8 cfs Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $Q_{a} = 0.00$ 2.49 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Major Storm $M_{a} = 43.8$ cfs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheetTinted Management*Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet<	Maximum Flow Based On Allowable Spread		127	127	rfs	
V*d Product: Flow Velocity times Gutter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T _{X,TH} Actual Discharge outside the Gutter Section W, (Imited by distance T _{CROWN}) Discharge within the Gutter Section W (Q _d - Q _X) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management' Max for Maye are and wable capacity GOOD - greater than the design flow given on sheet Tinlet Management' Max for max, allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management'	Flow Velocity within the Gutter Section	V =	12.7	12.7	fns	
Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water SpreadMinor StormMajor StormTheoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ Actual Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ Discharge within the Gutter Section W (Qa - Qa) Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Within the Gutter Section Provide & Minor (d $\geq 6^{\circ}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied)Minor Storm (Agir Storm Total Discharge beth at Street Crown (Safety Factor Applied)Ne =11.843.8cfsMinor Storm Major Storm Max Flow Depth at Gutter Flowline (Safety Factor Applied)Ne =11.843.8cfsMinor Storm Major S	V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.4	0.4	1,53	
Maximum Capacity for 1/2 Street based on Allowable DepthMajor StormTheoretical Water Spread $T_{TH} = 15.6$ 29.4Theoretical Spread for Discharge outside the Gutter Section W (T - W) $T_{TH} = 14.7$ 28.6Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.153$ 0.079Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ $Q_{X,TH} = 10.0$ 58.3cfsActual Discharge outside the Gutter Section W (a - Q_x) $Q_x = 10.0$ 50.6cfsDischarge Bitch the Curb (e.g., sidewalk, driveways, & lawns) $Q_x = 1.8$ 50.01.1Total Discharge for Major & Minor Storm (Pre-Safety Factor) $Q = 11.8$ 56.6cfsAverage Flow Velocity Within the Gutter Section M $Q = 6^{1}$ Storm $R = 1.000$ 0.77Max Flow Based on Allowable Depth $Q_x = 1.8$ 6.96inchesSlope-Based Depth Safety Factor Applied) $d = 4.36$ 6.96inchesResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 4.36$ 6.96inchesMINOR STORM Allowable Capacity is based on Depth CriterionMajor Storm Major StormMajor StormfsMinor Storm MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Major StormfsMinor storm max, allowable Capacity GOOD - greater than the design flow given on sheetTinlet Management'Minor storm max, allowable capacity GOOD - greater than the design flow given on sheetTinlet Management'					-	
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$ \begin{array}{c} \text{Ineoretical Spread tor Discharge outside the Gutter Section W (T - W) \\ \text{Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) \\ \text{Theoretical Discharge outside the Gutter Section W, carried in Section Tx_{TH} \\ \text{Actual Discharge outside the Gutter Section W, carried in Section Tx_{TH} \\ \text{Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) \\ \text{Discharge within the Gutter Section W (Q_d - Q_t) \\ \text{Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) \\ \text{Total Discharge for Major & Minor Storm (Pre-Safety Factor) \\ \text{Average Flow Velocity Within the Gutter Section N (Q_d - Q_t) \\ \text{V*d Product: Flow Velocity Times Gutter Flowline Depth \\ Slope-Based Depth Safety Reduction Factor Applied) \\ \text{Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) \\ \text{Resultant Flow Depth at Street Crown (Safety Factor Applied) \\ \text{MINOR STORM Allowable Capacity is based on Depth Criterion \\ MAJOR STORM Allowable Capacity is based on Depth Criterion \\ \text{Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max, allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable Capacity Store Construction flow circuity construction for the optimal flow between the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable Capacity Good - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable Capacity Good - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management' \\ \text{Major storm max} allowable capacity Good - greater than the design flow given on sheet Tinl$	Theoretical Water Spread	_T _{TH} =	15.6	29.4	lft	
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Interview outside the Gutter Section W, Carried in Section 1xTH $Q_{XTH} = 10.0$ S8.3CfsActual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_X = 10.0$ 50.6 cfsDischarge within the Gutter Section W ($Q_d - Q_d$) $Q_W = 1.8$ 5.0 cfsDischarge behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} = 0.0$ 1.1 cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q_{BACK} = 0.0$ 1.1 cfsAverage Flow Velocity Within the Gutter Section $V = 1.1$ 1.7 fpsV*d Product: Flow Velocity Within the Gutter Section M $V = 0.4$ 1.1 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V*d = 0.4$ 1.1 fpsSlope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^n$) Storm $R = 1.00$ 0.77 Max Flow Based on Allowable Depth (Safety Factor Applied) $d = 4.36$ 6.96 inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d = 4.36$ 6.96 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMajor StormMajor StormMajor StormMinor storm max. allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management'Major StormMinor storm max. allowable capacity GOOD - greater than the design flow given on sheet Tinlet Management'ffs	Gutter How to Design How Ratio by FHWA HEC-22 method (Eq. ST-7)	_ ^E ₀ =	0.153	0.079	- fo	
Pactor Discharge outside the Gutter Section W ($q_1 - Q_X$) $Q_X = 10.0$ 50.6 CfsDischarge within the Gutter Section W ($q_2 - Q_X$) $Q_W = 1.8$ 5.0 cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} = 0.0$ 1.1 cfsTotal Discharge Flow Velocity Within the Gutter Section $Q = 11.8$ 56.6 cfsAverage Flow Velocity Within the Gutter Section $V = 1.1$ 1.7 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 0.4$ 1.1 1.7 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^\circ$) Storm $R = 1.00$ 0.77 cfs Max Flow Based on Allowable Depth (Safety Factor Applied) $d = 4.36$ 6.96 inchesResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 4.36$ 6.96 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMajor Storm $Major Storm$ $Major Storm$ Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' $dsie file Management'$	Actual Discharge outside the Gutter Section W, Carried In Section I _{XTH}		10.0	58.3		
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Discharge within the Gutter Section W (Ω_{-1} , Ω_{-1})		10.0	50.6		
Total bischarge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Discharge Rehind the Curb (e.g., sidewalk, driveways, & lawns)		1.0	5.0	los	
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V*d Product: Flow Velocity Times Gutter Flowline DepthV*d =1.1Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) StormR = 1.00 0.77 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 11.8 43.8 cfsResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ 4.36 6.96 inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ 4.36 6.96 inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor StormMajor StormMinor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'Cfs	Average Flow Velocity Within the Gutter Section	v =	1.1	1.7	fps	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.4	1.1	1''	
Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 11.8 43.8 cfs Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ 4.36 6.96 inches Resultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ 4.36 6.96 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm Major Storm 6fs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' 11.8 43.8 cfs	Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R =	1.00	0.77	1	
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 4.36$ 6.96 inches Resultant Flow Depth at Street Crown (Safety Factor Applied) $d_{CROWN} = 0.00$ 2.49 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm Major Storm MINOR STORM Allowable Capacity is based on Depth Criterion Qallow 11.8 43.8 cfs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' On the storm max' clowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d =	11.8	43.8	cfs	
Resultant Flow Depth at Street Crown (Safety Factor Applied) $d_{CROWN} = $ 0.00 2.49 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm Major Storm MJOR STORM Allowable Capacity is based on Depth Criterion Qallow = 11.8 43.8 cfs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' Nanagement' Nanagement'	Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =	4.36	6.96	inches	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' Major storm max allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} =	0.00	2.49	inches	
MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm MAJOR STORM Allowable Capacity is based on Depth Criterion Qallow = 11.8 43.8 cfs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' State and the sta						
Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' Main storm max allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	MINOR STORM Allowable Capacity is based on Depth Criterion	•	1 Alinor Storm	Major Storm		
minor storm max, allowable capacity GOOD - greater than the design flow given on sheet "Inter Management"	IMAJOK STOKM Allowable Capacity is based on Depth Criterion	Q _{allow} =	11.8	43.8	CTS	
	Major storm max, allowable capacity GOOD - greater than the design flow giv Major storm max, allowable capacity GOOD - greater than the design flow giv	en on sneet 'Ini	et Managem	ent'		



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)	$L_0 = $	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W ₀ =	N/A	N/A	
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	CG =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C-C =	0.10	0.10	
Street Hydraulics: OK - O < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	$Q_0 = [$	11.0	26.4	lcfs
Water Spread Width	т = Г	15.2	16.0	ft
Water Depth at Flowline (outside of local depression)	d =	4.3	5.8	linches
Water Depth at Street Crown (or at T_{max})	d _{CROWN} =	0.0	1.3	inches
Ratio of Gutter Flow to Design Flow	E. =	0.158	0.113	
Discharge outside the Gutter Section W. carried in Section T.	0. =	9.3	23.4	ofs
Discharge within the Gutter Section W	0 =	1.7	3.0	
Discharge Behind the Curb Face	0mcr =	0.0	0.0	
Flow Area within the Gutter Section W	Aw =	0.27	0.37	Isa ft
Velocity within the Gutter Section W	V =	6.5	81	fns
Water Denth for Design Condition	duoqui =	7 3	8.8	linches
Grate Analysis (Calculated)	GIULAI - I	MINOR	MAIOR	Inches
Total Length of Inlet Grate Opening	ı – Г	N/A		74
Patio of Grate Flow to Design Flow	E [N/A	N/A	
Under No-Clogging Condition	Lo-GRATE -	MINOP	MATOR	
Minimum Valasity Where Crote Splach Over Peging	v _F			fnc
Interception Date of Frontal Flow	v _o =	N/A	N/A	
	R _f =	N/A	N/A	-
	R _x =	N/A	N/A	
Under Clogging Condition	Qi – L			
Clogging Coefficient for Multiple unit Crote Inlet	CrotoCoof -	MINOR		-
Clogging Coemcient for Multiple-unit Grate Inlet	GrateCoel =	N/A	N/A	-
Clogging Factor for Multiple-unit Grate Intel	Grateciog =	N/A	N/A	- <u>-</u> -
Minimum Valenity Ware Custo Culoch Over Desire		N/A	IN/A	
Infinimum velocity where Grate Splash-Over Begins	v _o = -	N/A	N/A	rps
	$R_f = -$	N/A	N/A	-
Interception Rate of Side Flow	R _x =	N/A	N/A	4.
Actual Interception Capacity	Q _a =	N/A	N/A	crs
Carry-Over Flow = $Q_0 - Q_0$ (to be applied to curb opening or next d/s inlet)	Q _b =	N/A		cts
Curb or Slotted Inlet Opening Analysis (Calculated)	а Г	MINOR	MAJOR	-
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.077	0.061	ft/ft
Required Length L _T to Have 100% Interception	L _T = [22.49	39.20	ft
Under No-Clogging Condition	-	MINOR	MAJOR	_
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L = [_	15.00	15.00	ft
Interception Capacity	$Q_i = \lfloor$	9.5	15.3	cfs
Under Clogging Condition	-	MINOR	MAJOR	_
Clogging Coefficient	CurbCoef =	1.31	1.31	_
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	
Effective (Unclogged) Length	L _e =	14.34	14.34	ft
Actual Interception Capacity	Qa =	9.4	15.1	cfs
Carry-Over Flow = $Q_{h(GRATE)}$ - Q_a	Q _b =	1.6	11.3	cfs
Summary		MINOR	MAJOR	_
Total Inlet Interception Capacity	Q =	9.4	15.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q _b =	1.6	11.3	cfs
Capture Bercontago - 0 /0 -	C % –	85	57	0/2

MHFD-Inlet, Version 5.01	1 (April 2021)			
ALLOWABLE CAPACITY FOR ONE-HALF C	OF STREE	ET (Min	or & Ma	jor Storm)
(Based on Regulated Criteria for Maximum Al	llowable Flow D	Depth and Sp	read)	
t: Grandview Reserve				
D: Basin C-10 (DP 18C)				
SILCE W T. SILCE W T. T. Turk T. Turk T. Turk STREET CROWN				
Gutter Geometry:			7	
Maximum Allowable Width for Spread Behind Curb	T _{BACK} =	7.5	ft	
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S _{BACK} =	0.020	ft/ft	
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} =	0.020		
Usisht of Curb at Cuttor Flow Line	и – Е	6.00		
Distance from Curb Toos to Street Crown		6.00	incries	
Distance from Curb Face to Street Crown	CROWN =	16.0	π c	
Gutter Width	W =	0.83	ft	
Street Transverse Slope	$S_X =$	0.020	ft/ft	
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _W =	0.083	_ft/ft	
Street Longitudinal Slope - Enter 0 for sump condition	S ₀ =	0.000	ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{street} =	0.016		
		Minor Charm	Majar Charm	
Mary Alleymolds Caused for Minor O. Maior Chause	- -	Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	I _{MAX} =	16.0	16.0	TT
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	a _{MAX} =	4.4	1./	inches
Check boxes are not applicable in SUMP conditions				
Maximum Canacity for 1/2 Street based On Allowable Spread		Minor Storm	Major Storm	
Water Depth without Cutter Depression (Eq. ST-2)	v – [3.84	3.84	linches
Vartical Depth without Gutter Lin and Gutter Flowline (usually 2")	d	0.0	0.04	linches
Cutter Depression $(d_{-1})(W \neq S_{-1} \neq 12))$	uc	0.62	0.62	linches
Water Deptession ($u_c = (w + S_x + 12)$)	a –	0.03	0.03	linches
Water Depth at Gutter Flowline		4.47	4.47	
Allowable Spread for Discharge outside the Gutter Section w (1 - w)		15.2	15.2	I''
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. S1-7)	E0 = -	0.149	0.149	-l.
Discharge outside the Gutter Section W, carried in Section I_X	$Q_X = $	0.0	0.0	CTS
Discharge within the Gutter Section W ($Q_T - Q_X$)	Q _w =	0.0	0.0	CTS
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} =$	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	Q _T =	SUMP	SUMP	cfs
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	
Maximum Canacity for 1/2 Street based on Allowable Depth		Minor Storm	Major Storm	
Theoretical Water Spread	тГ	15.6	20.4	_ ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	Turu =	14.7	29.4	- ft
Cutter Elow to Design Elow Patio by EHWA HEC-22 method (Eq. ST-7)	'XTH -	0.152	20.0	
Theoretical Discharge outside the Gutter Section W. carried in Section T	_ [⊷] _⊢	0.133	0.079	
Actual Discharge outside the Gutter Section W. (limited by distance T		0.0	0.0	
Discharge within the Cutter Section $W(O = O)$	~ <u>~</u> _	0.0	0.0	
Discharge within the Gutter Section W ($Q_d - Q_X$)	_ _{2w} = ⊢	0.0	0.0	
Table Discharge Dening the Curb (e.g., sidewalk, driveways, & lawns)	QBACK =	0.0	0.0	
I otal Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = L	0.0	0.0	
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	-I ^{rps}
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	4
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	_R =	SUMP	SUMP	4.
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d =	SUMP	SUMP	cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} =			inches
MINOR STORM Allowable Capacity is based on Depth Criterion	• -	Minor Storm	Major Storm	_ -e-

INLET IN A SUMP OR SAG LOCATION MHFD-Inlet, Version 5.01 (April 2021)



	Design Information (Input)		MINOR	MAJOR	
	Type of Inlet	Type =	CDOT Type R	Curb Opening	
	Local Depression (additional to continuous gutter depression 'a' from above)	a _{local} =	3.00	3.00	linches
	Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	1
	Water Depth at Flowline (outside of local depression)	Ponding Depth $=$	4.4	7.7	inches
	Grate Information	· · · · · · · · · · · · · · · · ·	MINOR	MAJOR	Override Depths
	Length of a Unit Grate	L. (G) =	N/A	N/A	lfeet
	Width of a Unit Grate	-0 (0) W =	N/A	N/A	feet
	Area Opening Ratio for a Grate (typical values 0.15-0.90)	Δ	N/A	N/A	
	Clogging Eactor for a Single Grate (typical values 0.15 0.50)	C (C) -	N/A	N/A	-
	Crote Weir Coefficient (typical value 2.15 - 2.60)		N/A	N/A	-
	Crate Orifice Coefficient (typical value 0.60 - 0.80)		N/A	N/A	-
	Grate Online Coefficient (typical value 0.00 - 0.00)	C ₀ (G) = [IN/A	IN/A]
	Curb Opening Information		MINOR	MAJOR	76h
	Length of a Unit Curb Opening	$L_{0}(C) = -$	5.00	5.00	reet
	Height of Vertical Curb Opening in Inches	H _{vert} =	6.00	6.00	Inches
	Height of Curb Orifice Throat in Inches	H _{throat} =	6.00	6.00	Inches
	Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Warning 1	Side Width for Depression Pan (typically the gutter width of 2 feet)	W _p =	2.00	2.00	feet
	Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_{f}(C) =$	0.10	0.10	
	Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w(C) =$	3.60	3.60	
	Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_{0}(C) =$	0.67	0.67	
	Grate Flow Analysis (Calculated)		MINOR	MAJOR	
	Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	
	Clogging Factor for Multiple Units	Clog =	N/A	N/A	1
	Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	-
	Interception without Clogging	O _{wi} = [N/A	N/A	cfs
	Interception with Clogging	O _{wa} =	Ń/A	N/A	cfs
	Grate Capacity as a Orifice (based on Modified HEC22 Method)	Civa L	MINOR	MAJOR	_
	Interception without Clogging	0 _{ci} = [N/A	N/A	cfs
	Interception with Clogging	0 =	N/A	N/A	cfs
	Grate Canacity as Mixed Flow	•coa − L	MINOP	MAIOP	
	Intercention without Clogging	o -F	N/A		lefe
	Interception with Clogging		N/A	N/A	cis
	Regulting Crate Capacity (accumes cleared condition)	0 cma =	N/A	N/A	rfs
	Curb Opening Flow Applysis (Calculated)	CGrate	MINOP	MATOR	
	Classing Coefficient for Multiple Units	Coof -	1 21		٦
	Clogging Coefficient for Multiple Units	Coer =	1.31	1.31	-
	Clogging Factor for Multiple Units		0.04	0.04	
	Curb Opening as a weir (based on Modified HEC22 Method)	о Г	MINOR	MAJOR	٦ <i>.</i>
	Interception without Clogging	$Q_{wi} = $	7.5	26.6	crs
	Interception with Clogging	Q _{wa} =	7.2	25.4	cts
	Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	٦.
	Interception without Clogging	Q _{oi} =	25.2	32.9	cts
	Interception with Clogging	Q _{oa} =	24.1	31.5	lcts
	Curb Opening Capacity as Mixed Flow	-	MINOR	MAJOR	_
	Interception without Clogging	Q _{mi} =	12.8	27.5	cfs
	Interception with Clogging	Q _{ma} =	12.2	26.3	cfs
	Resulting Curb Opening Capacity (assumes clogged condition)	Q _{Curb} =	7.2	25.4	cts
	Resultant Street Conditions		MINOR	MAJOR	
	Total Inlet Length	L = [15.00	15.00	feet
	Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
	Resultant Flow Depth at Street Crown	d _{CROWN} =	0.0	3.2	inches
		-			
	Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
	Depth for Grate Midwidth	d _{Grate} =	N/A	N/A	ft
	Depth for Curb Opening Weir Equation	d _{Curb} =	0.29	0.57	ft
	Combination Inlet Performance Reduction Factor for Long Inlets	RF _{Combination} =	0.41	0.72	1
	Curb Opening Performance Reduction Factor for Long Inlets	RF _{Curb} =	0.67	0.88	1
	Grated Inlet Performance Reduction Factor for Long Inlets	RFcmt =	N/A	N/A	1
	······	- Gidle			-
			MINOR	MAJOR	
	Total Inlet Interception Capacity (assumes clogged condition)	o ₂ = [7.2	25.4	cfs
	Inlet Capacity IS GOOD for Minor and Major Storms(>O PEAK)	Q PEAK REQUIRED =	6.8	23.4	cfs
1	We mine 4. Dimension entered is not a trained dimension for inlat terms				•

ALLOWABLE CAPACITY FOR ONE-HALE OF STREET (Minor 2 Major Storm) (aradiew Reserve and Regulated Criteria for Maximum Allowable Flow Depth and Spread) The aradiew Reserve and the start of the star	MHFD-Inlet, Version 5.01	(April 2021)	
(Based n Regulated Criteria for Maximum Allowable Flow Depth and Spread) Extre Genome/use Selfe C-11 (DP 3) Use Selfe C-11 (DP 3) Sel	ALLOWABLE CAPACITY FOR ONE-HALF C	F STREET (Minor & Major Stor	m)
Minimum Capacity for X12 Street Based on Allowable SpreadMinimum Capacity for X12 Street Based on Allowable DepthMinimum Capacity for X12 Street Bas	(Based on Regulated Criteria for Maximum All	owable Flow Depth and Spread)	
Summary Allowable Within for Spread Behind Curb Side Stope Behind Curb Spread Behind Curb Manning's Roughness Behind Curb (Synaphy Carbon Curb At Curb At Curb (Transverse Stope Curb at Curb At Curb Crown Curter With Manning's Roughness Behind Curb (Synaphy 2 Inches over 24 Inches or 0.083 ft/ft) Street Longalinational Slope - Street Crown 	ID: Basin C-11 (DP 19)		
Image: the set of the set			
Cutter Geometry: Maximum Allowable Waft for Spread Behind CurbMaximum AllowableCurb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020)T_Max = $\frac{7.5}{90cx} + \frac{10}{0.020}$ ftHeight of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter WidthHouse = $\frac{10000}{1000}$ $\frac{10000}{1000}$ $\frac{100000}{1000}$ Street Transverse Stope Gutter Cross Stope (typically 2 inches over 24 inches or 0.083 ft/t) Street Longitudinal Stope - Enter 0 for sump condition Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Fowline for Minor & Major Storm Max. Allowable Depth at Gutter Fowline for Minor & Major Storm Max. Allowable Capacity for 1/2 Street based on Allowable Spread Water Depth at Gutter Fowline Gutter Upper solin (Eq. 57:2)Minor Storm Major Storm Max. Allowable Spread for Minor & Major Storm Max. Allowable Check Steph Vinto Gutter Expension (Cq. (VF S, 12.)) Water Depth at Gutter Flowline Gutter Depression (Cq. (VF S, 12.))Major Storm Major StormMax. Howable Kaped for Mator Major Storm Max. Howable Check Section W (Cr (V) Gutter Depression (Cq. (VF S, 12.))Major Storm Major StormMax. Howable Check Max. Spread for Storage outside the Gutter Section W (T · W) Gutter How to Design Flow Kabo M HWA HEC-22 method (Eq. ST-7) Decharge outside the Gutter Section W (T · W) Gutter How Depth at			
Maximum Alowable Width for Spread Behind Curb Side Sige Behind Curb (spread for Micri Spread Behind Curb (spread for Micri Spread Street Crown Gutter Width Breet Transverse Stope Gutter Cross Stope (typically 2 inches or 0.083 ft/ft) Street Transverse Stope Gutter Cross Stope (typically 2 inches or 0.083 ft/ft) Street Transverse Stope Gutter Cross Stope (typically 2 inches or 0.083 ft/ft) Street Transverse Stope Gutter Cross Stope (typically 2 inches or 0.083 ft/ft) Street Transverse Stope Gutter Cross Stope (typically 2 inches or 0.083 ft/ft) Street Transverse Stope Gutter Cross Stope (typically 2 inches or 0.083 ft/ft) Street Transverse Stope Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Powersion (fc, ST-2) Water Depth without Gutter Depression (fc, ST-2) Uvertical Depth between Gutter I pain Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow besign Flow Ratio by FHWA HIG-22 method (fc, ST-7) Discharge within the Gutter Section W, carried in Section Tx Discharge within the Gutter Section W, carried in Section Tx Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HIG-22 method (fc, ST-7) Discharge outside the Gutter Section W, carried in Section Tx Discharge outside the Gutter Section W, carried in Section Tx m Actual Discharge outside the Gutter Section W, (T - W) Gutter Flow to Design Flow Ratio M, filmer Subter Flowline DepthMinor Sorm Major Sorm Major Sorm Train Echarge Inducide the Gutter Section W, (T - W) Gutter Flow to Design Flow Ratio M, filmer BepthMinor Sorm Major Sorm Major Sorm Train Echarge Inducide the Gutter Section W, (T - W) Gutter Flow to Design Flow Ratio M, filmer Scottor Tx m Actual Discharge outside the Gutter Section W, (T - W) Gutter Flow to Design Flow Ratio M, filmer Scottor	Gutter Geometry:		
Side Slope Behind Lurb (leve blank for no conveyance credit behind curb) Manning's Roughness Behind Lurb (typically between 0.012 and 0.020)Succ = 0.020 0.020 $fr(t)$ ft Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter With Street Transverse Slope (Gutter Coros Slope (typically 2 inches over 24 inches or 0.083 ft/t) Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) $H_{Guiter} = $	Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 7.5$ ft	
Provide Status Provide Struct Provide Struct Provide Struct Provide Struct Provide Struct Cross Stope (Cypically 2 Inches or 0.033 ft/ft)Struct Transverse StopeGutter VidthStruct Transverse StopeGutter Cross Stope (Cypically 2 Inches over 24 Inches or 0.033 ft/ft)Struct Transverse StopeGutter Cross Stope (Cypically 2 Inches over 24 Inches or 0.033 ft/ft)Struct Transverse StopeGutter Cross Stope (Cypically Content of Struct Stru	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft	
Height of Curb at Gutter Flow Line Distance from Curb Face to Street Corown Gutter Width Street Transverse Stope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Stope - Enter O for sump condition Manning 5 Stope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Stope - Enter O for sump condition Manning 5 Roughness for Street Section (typically between 0.012 and 0.020)Here is a construction of the strength of the stre	Manning's Roughness Benind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$	
Defance from Curb Face to Street Crown Gutter Width $T_{corown} = \frac{16.0}{2.00}$ ftGutter Vidth $T_{corown} = \frac{16.0}{2.00}$ ftGutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) $S_w = 0.020$ ftStreet Longitudinal Slope - Enter 0 for sump condition $S_w = 0.020$ ftManning's Roughness for Street Section (typically between 0.012 and 0.020) $S_w = 0.000$ ftMax. Allowable Spread for Minor & Major Storm $T_{wax} = \frac{16.0}{4.4}$ ftMax. Allowable Spread for Minor & Major Storm $T_{wax} = \frac{16.0}{4.4}$ ftMaxer Depth without Gutter Depression (Eq. 5T-2) $W = \frac{15.0}{2.0}$ ftVertical Dept between Gutter Lip and Gutter Flowline $T_w = \frac{15.0}{2.0}$ ftMater Depth between Gutter Lip and Gutter Flowline (usually 2'') $q_e = \frac{2.0}{2.0}$ ftGutter Popression (Eq. (W * \$, * 12)) $q_e = \frac{15.1}{2.51}$ inchesWater Depth between Gutter Lip and Gutter Flowline (usually 2'') $q_e = \frac{10.0}{2.0}$ ftGutter Popression (Eq. (W * \$, * 12)) $q_e = \frac{0.00}{0.0}$ ftUser Large Behind the Gutter Section W (T · W) $T_w = \frac{0.00}{0.0}$ ftAllowable Spread $T_w = 0.00$ 0.00Maximum Flow Based On Allowable Spread $Q_w = 0.00$ 0.00Maximum Gapacity for 1/2 Street based on Allowable DepthTheoretical Spread for Discharge outside the Gutter Section X (T · W)Maximum Gapacity for 1/2 Street based on Allowable DepthTheoretical Spread for Discharge outside the Gutter Section X (T · W)Gutter How boelsing Flow (Win the Gutter Section W (T · W)Discharge within the Gutter Section W (M (T · W))Maximum Gapacit	Height of Curb at Gutter Flow Line	Hours = 6.00 inches	
Gutter WidthWe find the sour 24 inches or 0.083 ft/ft)Street Torss Stope (typically 2 inches over 24 inches or 0.083 ft/ft)Street Torss Stope (typically 2 inches over 24 inches or 0.083 ft/ft)Street Torss Stope (typically 2 inches over 24 inches or 0.083 ft/ft)Street Torss Stope (typically 2 inches over 24 inches over 24 inches or 0.083 ft/ft)Street Torss Stope (typically 2 inches over 24 inche	Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft	
Speet Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) $S_{ye} = 0.020$ 0.000 ft/ftMax. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Check boxes are not applicable in SUMP conditions $S_{ye} = 0.020$ 0.000 ft/ftMax. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Discharge outside the Gutter Flowline (usually 2') Gutter Popression (fd (W * S, * 12)) $V = Minor Storm Major StormMajor StormMaximum Capacity for 1/2 Street based On Allowable SpreadWater Depth without Gutter I pand Gutter Flowline (usually 2')Gutter Porvine Natio by HMM HEC-22 method (fd., ST-7)Discharge outside the Gutter Section W (T - W)Rischarge outside the Gutter Section W (T - W)Rischarge outside the Gutter Section W (T - W)Rischarge outside the Gutter Section W (T - W)Gutter Flow Natio b FIMM HEC-22 method (fd., ST-7)Discharge outside the Gutter Section W (T - W)Gutter Flow Natio b FIMM HEC-22 method (fd., ST-7)Discharge outside the Gutter Section W (T - W)Gutter Flow Natio b FIMM HEC-22 method (fd., ST-7)Discharge outside the Gutter Section W (T - W)Gutter Flow Natio b FIMM HEC-22 method (fd., G. ST-7)Theoretical Water SpreadMaximum Capacity for 1/2 Street based on Allowable DepthTheoretical Water Spread for Discharge outside the Gutter Section W (T - W)Gutter Flow Natio b FIMM HEC-22 method (fd., G. ST-7)Theoretical Water Spread for Discharge outside the Gutter Section W (T - W)Gutter Flow Natio P FIMM HEC-22 method (fd., G. ST-7)Theoretical Water Spread for Discharge outside the Gutter Section W (T - W)Gutter Flow Design Flow Ratio P FIMM HEC-22 method ($	Gutter Width	W = 2.00 ft	
Gutter Cross Slope (typically 2 inches ore 124 inches or 0.083 ft/ft) Street Longitudinal Stope - Enter 0 for sump condition $S_{y} = 0.083$ 0.016 V/ft $S_{y} = 0.083$ 0.016 Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm $Max. = 44.4$ 16.4 $1.4.4$ $1.7.7$ inchesMax. Allowable Depth at Gutter Flowline for Minor & Major Storm Max. Allowable Depth at Gutter Flowline (usually 2") Gutter Depression (c - (W + S_s + 12)) Water Depth at Gutter Flowline (usually 2") Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge within the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W, Qr - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge outside the Gutter Section W (Q - Q _b) Discharge Beinind the Curb (e.g., sid	Street Transverse Slope	$S_x = 0.020$ ft/ft	
Street Longitudinal Slope - Enter 10 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020)So =0.000ft/ftMax. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (C_1 , $C_1 > 2$) Water Depth without Gutter Depression (C_1 , $C_1 > 2$) Water Depth between Gutter Flowline (usually 2") Gutter Depression (C_1 , $(W * S, * 12)$) Water Depth between Gutter Flowline (usually 2") Gutter Depression (C_2 , $(W * S, * 12)$) Water Depth without Gutter Section W ($T - W$) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (E_1 , ST-2) Uscharge outside the Gutter Section W ($T - W$) Gutter Flow to Ledgin Flow Ratio by FHWA HEC-22 method (E_1 , ST-2) Eco are cluster flow the Gutter Section W ($T - W$) Bicharge outside the Gutter Section W ($T - W$) Gutter Flow to Ledgin Flow Ratio by FHWA HEC-22 method (E_1 , ST-2) Uscharge outside the Gutter Section W ($T - W$) Gutter Flow to Ledgin Flow Ratio by FHWA HEC-22 method (E_1 , ST-2) $V = 0.0$ $0.0 0.0$ 0.0 $T_X = \frac{14.0 14.0 }{14.0 }$ ft $T_X = \frac{14.0 14.0 }{14.0 }$ ft $T_X = \frac{14.0 }{0.0 }$ fo $T_X = \frac{14.0 }{0.0 }$ fo $T_X = \frac{14.0 }{0.0 }$ ft $T_X = \frac{14.0 }{0.0 }$ ft 	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S _W = 0.083 ft/ft	
Manning's Roughness for Street Section (typically between 0.012 and 0.020) $n_{\text{STREET}} = 0.016$ Max. Allowable Spread for Minor & Major Storm m_{Max} . Allowable Spread for Minor & Major Storm $m_{\text{Max}} = \frac{M_{\text{Inor}} Storm}{M_{\text{Max}}} = \frac{M_{\text{Inor}} Storm}{M_{$	Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft	
Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions $T_{MXX} = \frac{Minor Storm}{16.0} \frac{Major Storm}{$	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} = 0.016	
Max. Allowable Spread for Minor & Major StormTMAXInducationInducationMax. Allowable Depth at Gutter Flowline for Minor & Major Storm $I_{MAX} = 16.0$ $I_{MAX} = 16.0$ $I_{MAX} = 16.0$ Maximum Capacity for 1/2 Street based On Allowable Spread $Minor Storm$ $Major Storm$ $Major Storm$ Mater Depth without Gutter Depth Source on the person ($Q_c - (W + S_c + 12)$) $Q_c = 2.0$ 2.0 inchesWater Depth at Gutter Flowline(usually 2") $Q_c = 2.0$ 2.0 inchesGutter Elow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $Q_c = 0.0372$ 0.372 0.372 Discharge Within the Gutter Section W ($Q_r - Q_a$) Q_c $Q_c = 0.0$ 0.0 0.0 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{axex} = 0.0$ 0.0 0.0 Maximum Tapacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 0.0 Maximum Capacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 0.0 Maximum Garacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 0.0 Maximum Garacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 0.0 Maximum Flow Based on Allowable Seried $V_c = 0.0$ 0.0 0.0 Maximum Flow Dased on Pick Section W ($Q_c - Q_c$) $Q_{axex} = 0.0$ 0.0 0.0 Discharge outside the Gutter Section W ($Q_c - Q_c$) $Q_{axex} = 0.0$ 0.0 0.0 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{axex} = 0.0$ 0.0 0.0		Minor Storm Major Storm	
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions $d_{\text{MAX}} = 4.4$ 7.7InchesMaximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Vertical Depth between Gutter Lip and Gutter Flowline (usually 2') Gutter Depression (C $(V + 5, + 12)$) $W_{1} = 0.2.0$ $M_{1} = 3.53$ inchesMain or Storm Gutter Depression (C $(V + 5, + 12)$) $d_{c} = 2.0$ 2.0 2.0 inchesMater Depth at Gutter Flowline Gutter Tow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W ($Q_{T} - Q_{A}$) $Q_{w} = 0.0$ 0.0 d_{s} Discharge uthis the Gutter Section W ($Q_{T} - Q_{A}$) $Q_{w} = 0.0$ 0.0 d_{s} d_{s} Haximum Capacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 d_{s} d_{s} Maximum Capacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 d_{s} Maximum Capacity for 1/2 Street based on Allowable Capenth $V = 0.0$ 0.0 d_{s} Maximum Capacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 d_{s} Maximum Capacity for Natio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W (T - W) $V = 0.0$ 0.0 Gutter Flow Velocity within the Gutter Section W, carried in Section T_X tri Actual Discharge outside the Gutter Section W (C - CX) $V = 0.0$ 0.0 Gutter Flow Velocity Times Gutter Flowline Depth $V = 0.0$ 0.0 d_{s} Maximum Capacity for Minor Storm (Pre-Safety Factor)	Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = \begin{bmatrix} 16.0 & 16.0 & ft \end{bmatrix}$	
Check boxes are not applicable in SUMP conditionsMaximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Gutter Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section V (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Pow Velocity within the Gutter Section W (Cq - Q _A) Pow Velocity within the Gutter Section W (Cq - Q _A) Theoretical Spread for Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Theoretical Spread for Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge outside the Gutter Section W (Cq - Q _A) Discharge behind the Curb (ca, , , sidewalk, driveways, & lawns) <br< td=""><td>Max. Allowable Depth at Gutter Flowline for Minor & Major Storm</td><td>$d_{MAX} = 4.4$ 7.7 inches</td><td></td></br<>	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = 4.4$ 7.7 inches	
Maximum Capacity for 1/2 Street based on Allowable SpreadMinor StormMajor StormWater Depth without Gutter Depression (Eq. ST-2) $y = 3.84$ 3.84 inchesVertical Depth between Gutter Lip and Gutter Rowline (usually 2') $d \in 2.0$ 2.0 2.0 Gutter Depression (Cr. (W * S, *12)) $a = 1.51$ 1.51 inchesWater Depth at Gutter Flowline $d = 5.35$ 5.35 inchesAllowable Spread for Discharge outside the Gutter Section W (T - W) $T_x = 14.0$ 14.0 t_t Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.3722$ 0.372 0.372 Discharge outside the Gutter Section W (Q ₁ - Q ₂) $Q_{w} = 0.0$ 0.0 0.0 cfs Discharge outside the Gutter Section V (Q ₁ - Q ₂) $Q_{w} = 0.0$ 0.0 cfs Maximum Flow Based On Allowable Spread $V = 0.0$ 0.0 0.0 Theoretical Water Spread $V = 0.0$ 0.0 0.0 Maximum Capacity for 1/2 Street based on Allowable Depth $V^*d = 0.0$ 0.0 0.0 Metter Storm W (Q ₁ - Q ₂) $V^*d = 0.0$ 0.0 0.0 Discharge outside the Gutter Section W (T - W) $T_{TH} = 9.9$ 23.7 t_t Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $V^*d = 0.0$ 0.0 dfs Discharge outside the Gutter Section W (T - W) $T_{TH} = 9.9$ $0.3.7$ t_t Gutter Flow to Design Flow Ratio by Cristorm $T_{TH} = 9.9$ $0.3.7$ t_t Theoretical Water Spread 0.0 0.0 <td>Check boxes are not applicable in SUMP conditions</td> <td></td> <td></td>	Check boxes are not applicable in SUMP conditions		
Maximum Capacity. for 1/2 Street based On Allowable SpreadMajor StormMajor StormWater Depth without Gutter Plowsino (Ge, ST-2) $d_{c} = 2.0$ 2.0 inchesGutter Depth at Gutter Flowline $d = 5.35$ 5.35 inchesAllowable Spread for Discharge outside the Gutter Section W, Carried in Section Tx $d = 5.325$ 5.35 inchesDischarge behind the Gutte Section W, Carried in Section Tx $Q_x = 0.0$ 0.0 ff Discharge behind the Gutte Section W, Carried in Section Tx $Q_x = 0.0$ 0.0 ff Discharge behind the Gutte Section W ($Q_T - Q_x$) $Q_{x} = 0.0$ 0.0 ff Maximum Flow Based On Allowable Spread $Q_x = 0.0$ 0.0 ff How Velocity within the Gutter Section W ($T - W$) $Q_x = 0.0$ 0.0 ff Maximum Capacity for 1/2 Street based on Allowable Depth $V^*d = 0.0$ 0.0 ff Theoretical Spread for Discharge outside the Gutter Section W ($T - W$) $T_{TH} = 9.223.7$ ft Maximum Capacity for 1/2 Street based on Allowable Depth $T_{TH} = 9.223.7$ ft Theoretical Spread for Discharge outside the Gutter Section W ($T - W$) $T_{TH} = 9.223.7$ ft Theoretical Spread for Discharge outside the Gutter Section W ($T - W$) $Q_x = 0.0$ 0.0 fs Discharge within the Gutter Section W ($Q_T - Q_x$) $Q_x = 0.0$ 0.0 fs Discharge within the Gutter Section W ($Q_T - Q_x$) $Q_x = 0.0$ 0.0 fs Discharge within the Gutter Section W ($Q_T - Q_x$) $Q_x = 0.0$ 0.0 fs </td <td></td> <td></td> <td></td>			
Water Depth without Gutter Depression (d_{-} (Jr + S_r + 12))y = $\frac{3.84}{2.0}$ $\frac{3.84}{2.0}$ inchesGutter Depression (d_{-} (W + S_r + 12)) $d_{-} = \frac{3.0}{2.0}$ 2.0 inchesWater Depth at Gutter FlowlineGutter Flowline $d_{-} = \frac{3.51}{2.5}$ 1.51 inchesAllowable Spread for Discharge outside the Gutter Section W (T - W) $d_{-} = \frac{3.32}{2.0}$ 3.322 0.3722 0.3722 Discharge outside the Gutter Section W ($Q_{T} - Q_{A}$) $Q_{A} = 0.0$ 0.0 cfs Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{A} = \frac{0.0}{0.0}$ 0.0 cfs Maximum Capacity for $1/2$ Street based on Allowable Depth $V = 0.0$ 0.0 0.0 Maximum Capacity for $1/2$ Street based on Allowable Depth $V = 0.0$ 0.0 0.0 Metter Spread $T_{TH} = \frac{11.9}{25.7}$ T_{C} Theoretical Spread for Discharge outside the Gutter Section W (T - W) $T_{TH} = \frac{11.9}{22.7}$ T_{C} Maximum Capacity for $1/2$ Street based on Allowable Depth $T_{TH} = \frac{9.9}{2.3.7}$ T_{C} Theoretical Spread for Discharge outside the Gutter Section W (T - W) $Q_{ATH} = 0.0$ 0.0 Discharge outside the Gutter Section W, carried in Section T _{X TH} $Q_{A} = 0.0$ 0.0 Discharge outside the Gutter Section W, Carried in Section T _{X TH} $Q_{A} = 0.0$ 0.0 Actual Discharge outside the Gutter Section W, Carried in Section T _{X TH} $Q_{A} = 0.0$ 0.0 Discharge beihind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{A} = 0.0$ 0.0 Total Dis	Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm	
Write a Depth of Detween Gutter Tup and Gutter Tup and Gutter Poression $(C_c = 1.0)$ $C_c = 2.0$ $C_c = 1.0$ $C_$	Water Depth without Gutter Depression (Eq. S1-2)	y = <u>3.84</u> <u>3.84</u> inches	
Water Depit at Gutter FlowlineAllowable Spread for Discharge outside the Gutter Section W (T - W)Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Discharge outside the Gutter Section W (Q Q_x)Discharge behind the Curb (e.g., sidewalk, driveways, & lawns)Maximum Flow Based On Allowable SpreadFlow Velocity within the Gutter SectionWeter Flow Velocity times Gutter Flowline DepthMaximum Capacity for 1/2 Street based on Allowable DepthMaximum Capacity for 1/2 Street based on Allowable DepthMaximum Capacity for 1/2 Street based on Allowable DepthTheoretical Water SpreadTheoretical Spread for Discharge outside the Gutter Section W (T - W)Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Theoretical Discharge outside the Gutter Section W, Carried in Section T_XTHActual Discharge outside the Gutter Section W, Carried in Section T_XTHActual Discharge outside the Gutter Section W, Carried in Section T_XTHActual Discharge for Major & Minor Storm (Pre-Safety Factor)Actual Discharge for Major & Minor Storm (Pre-Safety Factor)Actual Discharge for Major & Minor Storm (Pre-Safety Factor)Average folow Velocity Within the Gutter SectionV*d Product: Flow Velocity Times Gutter Flowline DepthSlope-Based Depth At Street Crown (Safety Factor Applied)Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)Resultant Flow Depth at Street Crown (Safety Factor Applied)MANOR STORM Allowable Capacity is based on Depth CriterionMANOR STORM Allowable Capacity is based on Depth CriterionMANOR STORM Allowable Cap	$(W \neq S \neq 12)$	$u_{\rm C} = 2.0$ 2.0 Inches	
Water Depin a Gutter Flowing Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge within the Gutter Section W ($Q_T - Q_2$) Discharge bind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowline Depth $T_x = 14.0 + 1$	Suffer Depression ($u_c = (w + S_x + 12)$) Water Depth at Cutter Elemine	d = 1.51 1.51 inches	
Normality of Discharge outside the Gutter Section W (T + W)Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)Maximum Capacity for 1/2 Street based on Allowable DepthTheoretical Spread for Discharge outside the Gutter Section W (T - W)Gutter Flow Velocity times Gutter Flowline DepthMaximum Capacity for 1/2 Street based on Allowable DepthMinor Storm (Y = 0.0Minor Storm (Y = 0.0)Outer Flow Velocity Within the Gutter Section W (Imited by distance T _{CROWN})Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)Discharge Flow Velocity Within the Gutter Section W (Q ₂ - Q ₂)Discharge Flow Velocity Within the Gutter Section M (G $_2$ G") StormMax Flow Based on Allowable Depth (Safety Factor Applied)Resultant Flow Depth at Guter Flowline Capacity is based on Depth CriterionMINOR STORM Allowable Capacity is based on Depth CriterionMAJOR STORM Allowable Capacity is based on Depth CriterionMAJOR STORM Allowable Capacity is based on Depth Criterion<	Allowable Spread for Discharge outside the Gutter Section W (T - W)	u = 5.35 5.35 Increas T = 14.0 14.0 ft	
Discharge outside the Gutter Section W, carried in Section Tx Discharge behind the Gutter Section W (Q _T - Q _A) $Q_X = 0.0 +$	Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Fg. ST-7)	$F_0 = 0.372 = 0.372$	
Discharge within the Gutter Section W ($Q_1 - Q_x$) $Q_W = 0.0$ 0.0 0.0 cfs Discharge within the Gutter Section W ($Q_1 - Q_x$) $Q_W = 0.0$ 0.0 0.0 cfs Maximum Flow Based On Allowable Spread $V = 0.0$ 0.0 0.0 cfs Flow Velocity within the Gutter Section $V = 0.0$ 0.0 0.0 cfs V*d Product: Flow Velocity times Gutter Flowline Depth $V = 0.0$ 0.0 0.0 fs Maximum Capacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 0.0 fs Theoretical Spread for Discharge outside the Gutter Section W (T - W) $V = 0.0$ 0.0 0.0 fs Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $T_{TH} = 0.0$ 0.0 0.0 fs Theoretical Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_x = 0.0$ 0.0 cfs Discharge within the Gutter Section W ($Q_d - Q_x$) $Q_W = 0.0$ 0.0 cfs Discharge flow Velocity Within the Gutter Section W ($Q_d - Q_x$) $Q_W = 0.0$ 0.0 cfs Discharge flow Velocity Within the Gutter Section M ($Q_2 - Q_x$) $Q_{BACK} = 0.0$ 0.0 cfs Discharge flow Velocity Within the Gutter Section M ($Q_2 - Q_x$) $Q_{BACK} = 0.0$ 0.0 cfs Nearge Flow Velocity Within the Gutter Section M ($Q_2 - Q_x$) $Q_{BACK} = 0.0$ 0.0 fs Nearge Flow Velocity Within the Gutter Section M ($Q_2 - G_x$) $V^*d = 0.0$ 0.0 fs Nearge Flow Velocity Within the Gutter Section	Discharge outside the Gutter Section W. carried in Section T.	$\Omega_{\rm v} = 0.0$ 0.0 cfs	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} = \frac{0.0}{0.0}$ 0.0 0.0 crs Maximum Flow Based On Allowable SpreadFlow Velocity within the Gutter Section $V = 0.0$ 0.0 0.0 frs Maximum Capacity for 1/2 Street based on Allowable Depth $V = 0.0$ 0.0 0.0 frs Theoretical Water SpreadTheoretical Spread for Discharge outside the Gutter Section W (T - W) $V = 0.0$ 0.0 0.0 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $T_{TH} = \frac{11.9}{9.9}$ 23.7 ftTheoretical Discharge outside the Gutter Section W, climited by distance T_{CROWN}) $Q_{XTH} = 0.0$ 0.0 0.0 Discharge within the Gutter Section W (Qa - Q _X) $Q_W = 0.0$ 0.0 0.0 cfs Discharge for Major & Minor Storm (Pre-Safety Factor) $Q_W = 0.0$ 0.0 cfs Average Flow Velocity Within the Gutter Section W (Qa - Q _X) $Q_W = 0.0$ 0.0 cfs Discharge flow Velocity Within the Gutter Section W (Qa - Q _X) $Q_W = 0.0$ 0.0 cfs Average Flow Velocity Within the Gutter Section W (Qa - Q _X) $Q_W = 0.0$ 0.0 cfs Stope-Based Depth Safety Reduction Factor for Major & Minor Storm (Ya F Softy Factor Applied) $R = SUMP$ $SUMP$ Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d_{CROWN} = 0.0$ 0.0 frs MINOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm$ $Major Storm$ $Major Storm$ MINOR STORM Allowable Capacity is based on Depth Criterion <td>Discharge within the Gutter Section W ($O_T - O_v$)</td> <td>$Q_{\rm W} = 0.0$ 0.0 cfs</td> <td></td>	Discharge within the Gutter Section W ($O_T - O_v$)	$Q_{\rm W} = 0.0$ 0.0 cfs	
Maximum Flow Based On Allowable Spread \mathbf{V}^{*} dSUMPcfsFlow Velocity within the Gutter Section \mathbf{V}^{*} d	Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{\text{BACK}} = 0.0 0.0 \text{ cfs}$	
Flow Velocity within the Gutter SectionV*d Product: Flow Velocity times Gutter Flowline Depth $V = 0.0$ 0.0 fpsMaximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread $V*d = 0.0$ 0.0 0.0 Theoretical Water Spread $V*d = 0.0$ 0.0 0.0 0.0 Theoretical Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X TH}$ $V=0.0$ 0.0 0.0 cfs Actual Discharge outside the Gutter Section W (Imitted by distance T_{CROWN}) 	Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs	
V*d Product: Flow Velocity times Gutter Flowline DepthV*d = 0.0 0.0 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, climited by distance T_{CROWN}) Discharge within the Gutter Section W (Q _d - Q _x) $Minor Storm$ $T_{TH} =$ $G_{0.0}$ $G_{0.0}$ Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge Brind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section W*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)Winor Storm Major Storm Major Storm (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionV*d = 0.0 0.0 MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm$ Major Storm $Minor Storm$ $Major StormMajor StormMajor Storm$	Flow Velocity within the Gutter Section	V = 0.0 0.0 fps	
Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water SpreadMinor StormMajor StormTheoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, climited by distance T_{CROWN}) Discharge within the Gutter Section W (Q _d - Q _X) Discharge flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq 6^{\circ}$) Storm Max Flow Based on Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Total Discharge for Major Storm (Pre-Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)Minor Storm CfsMINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Major StormMinor Storm Major StormMinor Storm Major Storm	V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0	
IndicationIndicationIndicationIndicationTheoretical Water SpreadTheoretical Spread for Discharge outside the Gutter Section W (T - W)Theoretical Spread for Discharge outside the Gutter Section W (T - W)Theoretical Spread for Discharge outside the Gutter Section W (T - W)Theoretical Discharge outside the Gutter Section W, Carnel on Section Tx TH 9.9 23.7 ftCutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 = 0.497$ 0.228 fsTheoretical Discharge outside the Gutter Section W, Climited by distance T _{CROWN}) $Q_{x TH} = 0.0$ 0.0 cfs Discharge within the Gutter Section W (Q _d - Q _x) $Q_{w} = 0.0$ 0.0 cfs Discharge flow Velocity Within the Gutter Section $V_{mintot} Storm$ $Q = 0.0$ 0.0 cfs Average Flow Velocity Within the Gutter Section $V = 0.0$ 0.0 cfs fs Average Flow Velocity Within the Gutter Section Tactor for Major & Minor (d ≥ 6") Storm $R = SUMP$ $SUMP$ fs Max Flow Based on Allowable Depth (Safety Factor Applied) $R = SUMP$ $SUMP$ fs Resultant Flow Depth at Street Crown (Safety Factor Applied) $d = 0.0$ $d_{CROWN} = 0.0$ $d_{cROWN} = 0.0$ MINOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm$ $Major Storm$ $Major Storm$ MAJOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm$ $Major Storm$ $Major Storm$	Maximum Capacity for 1/2 Street based on Allowable Donth	Minor Storm Moior Storm	
Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, (arried in Section T _{X TH} Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_x$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge flow Velocity Within the Gutter Section Average Flow Velocity Within the Gutter Section Tarm ($Pe-Safety$ Factor) Average Flow Velocity Within the Gutter Section $Perton Pre-Safety$ Factor) Average Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm Max Flow Depth at Gutter Flowline Csafety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Theoretical Water Spread	$T_{Tru} = \begin{bmatrix} 11.9 \\ 12.5 7 \end{bmatrix} ft$	
Note that any outside the Gutter Section V, carried in Section Tx TH Actual Discharge outside the Gutter Section W, carried in Section Tx TH Actual Discharge outside the Gutter Section W, carried in Section Tx TH Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) Discharge behind the Curb (e.g., sidewalk, driveways, & lawns) Discharge Flow Velocity Within the Gutter Section Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Gutter Crown (Safety Factor Applied)N/H SUMP CfsMINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Major StormMinor Storm Major Storm	Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{\rm WTH} = 0.9$ 23.7 ft	
Theoretical Discharge outside the Gutter Section W, carried in Section Tx TH Actual Discharge outside the Gutter Section W, (limited by distance TCROWN) Discharge within the Gutter Section W ($Q_d - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Within the Gutter Section Provide: Flow Velocity Flow Inse Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm Max Flow Dased on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Major StormMinor Storm Major StormMINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm Major StormMinor Storm Major Storm	Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.497$ 0.228	
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_X = 0.0$ $O.0$ $O.0$ $CrsDischarge within the Gutter Section W (Q_d - Q_x)Q_w = 0.0O.0O.0CrsCrsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns)Q_w = 0.0O.0O.0CrsTotal Discharge for Major & Minor Storm (Pre-Safety Factor)Q_w = 0.0O.0O.0CrsAverage Flow Velocity Within the Gutter SectionV = 0.0O.0O.0frsV*d Product: Flow Velocity Times Gutter Flowline DepthV*d = 0.0O.0O.0frsSlope-Based Depth Safety Reduction Factor for Major & Minor (d \ge 6^n) StormR = SUMPSUMPfrsMax Flow Based on Allowable Depth (Safety Factor Applied)d = d = inchesResultant Flow Depth at Gutter Flowline (Safety Factor Applied)d = d_{CROWN} = inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor StormMajor StormMAJOR STORM Allowable Capacity is based on Depth CriterionSUMPSUMPCrs$	Theoretical Discharge outside the Gutter Section W, carried in Section TxTH	$O_{XTH} = 0.0 0.0 cfs$	
Discharge within the Gutter Section W $(Q_d - Q_d)$ Discharge within the Gutter Section W $(Q_d - Q_d)$ $Q_W = 0.0 0.0 cfs$ Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_W = 0.0 0.0 cfs$ Total Discharge for Wajor & Minor Storm (Pre-Safety Factor) $Q = 0.0 0.0 cfs$ Average Flow Velocity Within the Gutter Section $V = 0.0 0.0 cfs$ V*d Product: Flow Velocity Times Gutter Flowline Depth $V*d = 0.0 0.0 cfs$ Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R = SUMP SUMP$ Max Flow Based on Allowable Depth (Safety Factor Applied) $d = SUMP SUMP$ Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = sump sump$ Resultant Flow Depth at Street Crown (Safety Factor Applied) $d = sump sump$ MINOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm Major Storm$ MAJOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm Major Storm$	Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_{\rm X} = 0.0 0.0 \text{ cfs}$	
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} = 0.0 0.0 cfs$ Total Discharge for Major & Minor Storm (Pre-Safety Factor) $Q = 0.0 0.0 cfs$ Average Flow Velocity Within the Gutter Section $V = 0.0 0.0 cfs$ V*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 0.0 0.0 cfs$ Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{n}$) Storm $R = SUMP SUMP$ Max Flow Depth at Gutter Flowline (Safety Factor Applied) $R = SUMP SUMP$ Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d_{CROWN} = 0.0 cfs$ MINOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm Major Storm$ MAJOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm Major Storm$	Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_W = 0.0 0.0 cfs$	
Total Discharge for Major & Minor Storm (Pre-Safety Factor) $Q = 0.0 0.0$ Cfs Average Flow Velocity Within the Gutter Section $V = 0.0 0.0$ Cfs V^*d product: Flow Velocity Within the Gutter Flowline Depth $V^*d = 0.0 0.0$ Cfs Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R = SUMP$ $SUMP$ Max Flow Based on Allowable Depth (Safety Factor Applied) $d = 0.0$ $d = 0.0$ Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 0.0$ $d = 0.0$ MINOR STORM Allowable Capacity is based on Depth Criterion $Minor Storm$ $Major Storm$ MAJOR STORM Allowable Capacity is based on Depth Criterion $Q_{allow} = SUMP$ $SUMP$ Cfs	Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$	
Average Flow Velocity Within the Gutter Section $V = 0.0$ 0.0 fps V*d Product: Flow Velocity Times Gutter Flowline Depth $V*d = 0.0$ 0.0 fps Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R = SUMP$ $SUMP$ Max Flow Based on Allowable Depth (Safety Factor Applied) $d = $ $d = $ Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = $ $d = $ MINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor StormMAJOR STORM Allowable Capacity is based on Depth Criterion $SUMP$ $SUMP$ Cfs	Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs	
V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{"}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)V*d =0.00.0MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionV*d =0.00.0MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionV*d =0.00.0MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth CriterionMinor Storm SUMPMajor Storm SUMP	Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps	
Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) StormRMax Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ SUMPSUMPResultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ inchesResultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ inchesMINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor StormMAJOR STORM Allowable Capacity is based on Depth CriterionSUMPSUMPCfs	V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0	
Imax now based on Allowable Depth (Safety Factor Applied) Vd = SUMP Cfs Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) d = inches Resultant Flow Depth at Street Crown (Safety Factor Applied) d = inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm MAJOR STORM Allowable Capacity is based on Depth Criterion SUMP SUMP Cfs SUMP SUMP Cfs	Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm	R = SUMP SUMP	
Inches a =	Imax Flow Based on Allowable Depth (Safety Factor Applied)		
MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm MAJOR STORM Allowable Capacity is based on Depth Criterion Qallow = SUMP SUMP cfs	Resultant flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	a = Inches	
MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm MAJOR STORM Allowable Capacity is based on Depth Criterion Qallow = SUMP SUMP	Content from Depth at Succe crowin (Succe) ractor Applica		
MAJOR STORM Allowable Capacity is based on Depth Criterion Q _{allow} = SUMP SUMP cfs	MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm	
	MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = SUMP SUMP cfs	

INLET IN A SUMP OR SAG LOCATION MHFD-Inlet, Version 5.01 (April 2021) -Lo (C) H-Curb H-Vert Wo w Lo (G) CDOT Type R Curb Opening • Design Information (Input) MINOR MAJOR Type of Inlet CDOT Type R Curb Opening Type = Local Depression (additional to continuous gutter depression 'a' from above) 3.00 inches a_{local} Number of Unit Inlets (Grate or Curb Opening) Water Depth at Flowline (outside of local depression) Override Depths $N_0 =$ Ponding Depth = 4.4 inches Grate Information MINOF MAJOR Length of a Unit Grate $L_{o}(G) =$ N/A feet Width of a Unit Grate $W_o =$ N/A N/A feet Area Opening Ratio for a Grate (typical values 0.15-0.90) A_{ratio} = N/A Clogging Factor for a Single Grate (typical value 0.50 - 0.70) $C_f(G) =$ N/A N/A Grate Weir Coefficient (typical value 2.15 - 3.60) C_w (G) = N/A Grate Orifice Coefficient (typical value 0.60 - 0.80) Ĉ₀ (G) N/A Curb Opening Information MINOR MAJOR Length of a Unit Curb Opening $L_{o}(C) =$ 5.00 feet Height of Vertical Curb Opening in Inches 6.00 inches H_{vert} = Height of Curb Orifice Throat in Inches inches 6.00 H_{throat} = Angle of Throat (see USDCM Figure ST-5) Theta = 63.40 degrees Side Width for Depression Pan (typically the gutter width of 2 feet) $W_p =$ 2.00 eet Clogging Factor for a Single Curb Opening (typical value 0.10) 0.10 $C_f(C) =$ 0.10 Curb Opening Weir Coefficient (typical value 2.3-3.7) Curb Opening Orifice Coefficient (typical value 2.3-0.70) $C_{w}(C) = C_{o}(C) =$ 3.60 0.67 Grate Flow Analysis (Calculated) MINOF MAJOR Clogging Coefficient for Multiple Units Coef = N/A N/A N/A MAJOR Clogging Factor for Multiple Units Clog = N/A Grate Capacity as a Weir (based on Modified HEC22 Method) MINOR Q_{wi} = N/A Interception without Clogging N/A lcfs Interception with Clogging Grate Capacity as a Orifice (based on Modified HEC22 Method) Q_{wa} = N/A N/A cfs MINOR MAJOR Interception without Clogging N/A N/A cfs Q_{oi} : Interception with Clogging $Q_{oa} =$ N/A N/A lcfs Grate Capacity as Mixed Flow MINOF MAJOR Q_{mi} = cfs Interception without Clogging N/A N/A Interception with Clogging Q_{ma} = N/A N/A cfs Resulting Grate Capacity (assumes clogged of Curb Opening Flow Analysis (Calculated) QGrate = N/A N/A cfs clogged condition MINO MAJOR Clogging Coefficient for Multiple Units Coef = 1.00 1.00 Clogging Factor for Multiple Units Clog = 0.10 0.10 Curb Opening as a Weir (based on Modified HEC22 Method) MINO MAJOR Interception without Clogging Q_{wi} = 10.1 cfs 2.7 Interception with Clogging Q_{wa} = 2.4 9.1 cfs Curb Opening as an Orifice (based on Modified HEC22 Method) MINOR MAJOR Interception without Clogging cfs $Q_{0i} =$ 8.4 11.0 Interception with Clogging 7.6 9.9 $Q_{oa} =$ cfs Curb Opening Capacity as Mixed Flow MINOR MAJOR Interception without Clogging Q_{mi} = 4.4 9.8 cfs Interception with Clogging Q_{ma} = 4.0 88 cfs Q_{Curb} Resulting Curb Opening Capacity (assumes clogged condition) Resultant Street Conditions 2.4 8.8 cfs MINOF MAJOR Total Inlet Length 5.00 feet 1 = 5.00 ft.>T-Crown 25.7 Resultant Street Flow Spread (based on street geometry from above) T = 11.9 Resultant Flow Depth at Street Crown d_{CROWN} = 0.0 2.3 inches Low Head Performance Reduction (Calculated) MINOR MAJOR Depth for Grate Midwidth $d_{Grate} =$ N/A 0.20 N/A 0.47 ft Depth for Curb Opening Weir Equation ft d_{Curb} = Combination Inlet Performance Reduction Factor for Long Inlets RF_{Combination} = 0.56 0.98 RF_{Curb} Curb Opening Performance Reduction Factor for Long Inlets 1.00 1.00 $\mathsf{RF}_{\mathsf{Grate}}$ Grated Inlet Performance Reduction Factor for Long Inlets N/A N/A MINOR MAJOR 8.8 cfs

 $Q_a =$ Total Inlet Interception Capacity (assumes clogged condition) 2.4 Q PEAK REQUIRED = 1.0

2.3

cfs

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Allo	owable Flow Depth and Spread)
D: Basin C-12 (DP 20)	
TBACK TCROWN	
Seack T, Twax	
2 > Q STREET CROWN	
P P	
Gutter Geometry:	T _ 75 %
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$I_{BACK} = 7.5$ ft Space = 0.020 ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = 0.020$
Height of Curb at Gutter Flow Line	$H_{CURB} = 6.00$ inches
Distance from Curb Face to Street Crown	$I_{CROWN} = 16.0$ ft
Street Transverse Slope	$S_{v} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
	Minor Storm Major Storm
Max, Allowable Spread for Minor & Major Storm	$T_{MAX} = \begin{bmatrix} 16.0 \\ 16.0 \end{bmatrix} = \begin{bmatrix} 16.0 \\ 16.0 \end{bmatrix} $
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = 4.4$ 7.7 inches
Check boxes are not applicable in SUMP conditions	
Mavimum Canacity for 1/2 Street based On Allowable Spread	Miner Chause Maine Chause
Water Depth without Gutter Depression (Eq. ST-2)	Minor Storm Major Storm
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	$d_c = 0.8$ 0.8 inches
Gutter Depression (d_c - (W * S_x * 12))	a = 0.63 0.63 inches
Water Depth at Gutter Flowline	d = 4.47 4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_x = 15.2$ 15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. S1-7)	$E_0 = 0.149 0.149$
Discharge within the Gutter Section W ($\Omega_{r} = \Omega_{v}$)	$Q_{\chi} = 0.0 0.0 \text{ crs}$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{W} = 0.0$ 0.0 cfs
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Canacity for 1/2 Street based on Allowable Denth	Minor Storm Major Storm
Theoretical Water Spread	$T_{T_{T_{T_{T_{T_{T_{T_{T_{T_{T_{T_{T_{T$
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{XTH} = 14.7$ 28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.153 0.079$
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 0.0 0.0 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_x = 0.0 0.0 cfs$
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_{W} = 0.0 0.0 \text{ cfs}$
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	$Q_{BACK} = 0.0 0.0 \text{ CTS}$
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fm
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R = SUMP SUMP
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = SUMP SUMP cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = inches
Resultant How Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches
MINOR STORM Allowable Capacity is based on Denth Criterion	Minor Storm Major Storm
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = SUMP SUMP cfs
	h



MHFD-Inlet, Version 5.	.01 (April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF	OF STREET (Minor & Major Storm)
Based on Regulated Criteria for Maximum t: Grandview Reserve	Allowable Flow Depth and Spread)
D: Basin D-1 (DP 22)	
SINCE TO THE CROWN	~
Gutter Geometry: Maximum Allowable Width for Sprond Babind Curb	T _ 75 %
Maximum Allowable with for Spread bening Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$\begin{array}{c c} I_{BACK} = & 7.5 & \pi\\ S_{BACK} = & 0.020 & ft/ft\\ n_{BACK} = & 0.020 & \end{array}$
Usinghi of Curk at Cutter Flow Line	
Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown	$H_{CURB} = 6.00$ inches
Gutter Width	W = 0.83 ft
Street Transverse Slope	$S_{\rm X} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_W = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.010$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = 16.0$ 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = 4.4$ /./ inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for ho)	v
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = <u>3.84</u> <u>3.84</u> inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d $_{-}$ (W * S * 12))	$d_{\rm C} = 0.8 0.8$ inches
Water Deptession ($u_c = (w + 3_x + 12)$) Water Depth at Gutter Flowline	d = 0.03 0.03 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_x = 15.2$ 15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.149 0.149$
Discharge outside the Gutter Section W, carried in Section T_{χ}	Q _X = 7.3 7.3 cfs
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 1.3$ 1.3 cfs
Discharge Benind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread	$Q_{BACK} = 0.0 0.0 \text{ cts}$
Flow Velocity within the Gutter Section	V = 0.8 0.8 frs
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.3 0.3
Maximum Capacity for 1/2 Street baced on Allowable Donth	Minor Charm Major Charm
Theoretical Water Spread	$T_{m} = \begin{bmatrix} 15.6 \\ 29.4 \end{bmatrix} ff$
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{XTH} = 14.7$ 28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.153 0.079
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 6.7 39.3 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_x = 6.7$ 34.1 cfs
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_W = 1.2$ 3.4 Cts
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 7.9 38.2 cfs
Average Flow Velocity Within the Gutter Section	V = 0.8 1.2 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.3 0.7
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R = 1.00 1.00
Imax Flow Based on Allowable Depth (Safety Factor Applied)	$V_d = 7.9$ 38.2 Cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	d = 4.36 7.68 inches $d_{CROWN} = 0.00$ 3.22 inches
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = 7.9 38.2 cfs
Minor storm max. allowable capacity GOOD - greater than the design flow	given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow	given on sheet 'Inlet Management'



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	1
Length of a Single Unit Inlet (Grate or Curb Opening)	L, =	5.00	5.00	Tft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	w ₀ =	N/A	N/A	∃ft
Clogging Factor for a Single Unit Grate (typical min, value = 0.5)	C-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min, value = 0.1)	C-C =	0.10	0.10	
Street Hydraulics: OK - O < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from <i>Inlet Management</i>)	0 ₀ = [5.4	12.7	lcfs
Water Spread Width	т = Г	13.4	16.0	
Water Denth at Flowline (outside of local depression)	d = [3.9	5.1	linches
Water Depth at Street Crown (or at Tww)	denown =	0.0	0.6	linches
Ratio of Gutter Flow to Design Flow	F. =	0 179	0.128	
Discharge outside the Gutter Section W, carried in Section T		4.4	11 1	- cfs
Discharge within the Gutter Section W	0 =	1.0	16	
Discharge Rehind the Curb Face	0	0.0	0.0	cfs
Flow Area within the Gutter Section W		0.0	0.32	
Velocity within the Gutter Section W	~~	4 1	5.0	fnc
Water Depth for Design Condition	d	6.0	9.1	linches
Grate Applycic (Calculated)	ULOCAL -	MINOP	MA10P	linches
Total Length of Inlet Grate Opening	ı – [T ft
Patio of Grate Flow to Decign Flow	E	N/A	N/A	
Under No-Clogging Condition	Lo-GRATE -		MAIOP	
Minimum Valacity Where Crete Calach Over Begins	<u>м</u> – Г	MINOR		
Intersection Date of Evental Flow	v _o =	N/A	IN/A	
		N/A	N/A	-
	R _x =	N/A	IN/A	
Under Clogging Condition	Qi – L			
Clagging Coofficient for Multiple unit Crote Inlet	CrateCoof -	MINOR		7
Clogging Coemcient for Multiple-unit Grate Inlet	GrateCoel =	IN/A	N/A	-
Clogging Factor for Multiple-unit Grate Intel	GrateClog =	N/A	IN/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		N/A	N/A	
Minimum velocity where Grate Splash-Over Begins	v _o =	N/A	N/A	TPS
	R _f =	N/A	N/A	_
Interception Rate of Side Flow	R _x =	N/A	N/A	
Actual Interception Capacity	Q _a =	N/A	N/A	cts
Carry-Over Flow = Q_0 - Q_a (to be applied to curb opening or next d/s inlet)	Q _b =	N/A		cts
Curb or Slotted Inlet Opening Analysis (Calculated)	с Г	MINOR	MAJOR	
Equivalent Slope S _e (based on grate carry-over)	$S_e =$	0.085	0.066	
Required Length L _T to Have 100% Interception	L _T = L	14.30	24.81	_π
Under No-Clogging Condition		MINOR	MAJOR	7.
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	10.00	10.00	ft
Interception Capacity	$Q_i = L$	4.8	7.7	cfs
Under Clogging Condition		MINOR	MAJOR	-
Clogging Coerricient	CurbCoef =	1.25	1.25	4
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	4.
Effective (Unclogged) Length	L _e =	9.37	9.37	tt
Actual Interception Capacity	Qa =	4.7	7.5	cfs
Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a	Q _b =	0.7	5.2	cfs
Summary	-	MINOR	MAJOR	- -
Total Inlet Interception Capacity	Q =	4.7	7.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b =$	0.7	5.2	cfs
ICapture Percentage - 0 /0 -	<u>C0/2 – </u>	87	50	10/2

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm (lased no Regulated Citics for Maximum Allowable Flow Depth and Spread) Cater on Regulated Citics for Maximum Allowable Flow Depth and Spread) Cater Commonstree Maximum Allowable With for Spread Beind Curb Sed: Singe Phand Curb (sev back for no convegence credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) Tack: * Height of Curb at Cutter Flow Line Distance from Curb Face to Street Cown Gatter With Street Transverse Slope Catter Coros Slope (typically 2 Inches or 0.083 trft) Street Cransverse Slope Catter Coros Slope (typically 2 Inches or 0.083 trft) Street Cransverse Slope Catter Coros Slope (typically 2 Inches or 0.083 trft) Street Cransverse Slope Catter Coros Slope (typically 2 Inches or 0.083 trft) Max. Allowable Spread for Minor & Major Storm Alow Flow Depth at Street Crown (check box for yes, leave blank for no) Ymme Minor Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Alow Flow Depth at Street Crown (check box for yes, leave blank for no) Ymme Minor Storm Type: * Ymme Minor Storm Type: * Ymme Minor Storm Type: * Minor Storm Type: * Minor Storm Type: * Max. Allowable Spread Flow Velocity within the Gutter Section W (r) r-W) Xmme Minor Storm Type: * Ymme Minor Storm Type: * Max. Allowable Spread Flow Velocity within the Gutter Section W (r) r-W) Ymme Minor Storm ft Type: * Ymme Minor Majo	MHFD-Inlet, Version 5.01	(April 2021)			
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)(Basin D-2 (0P 23)Sumption of the second se	ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Min	or & Major	Storm)	
Construction: Basin P-2 (DP 23)Sum P 2 (DP 23)Minor Sum P 2 (DP 24)Minor	(Based on Regulated Criteria for Maximum All	owable Flow Depth and Spr	read)		
$ \begin{array}{c} \hline \textbf{Cutter Geometry:} \\ \hline Wainrum Allowable With for Spread Behind Curb Side Slope Behind Curb (Side Slope Behind Slope Slope (From Slope (From Slope (From Slope Behind Curb (Side Slope Behind Slope Chrome Slope (From Slope $	t: Grandview Reserve				
$ \begin{array}{c} \hline \\ \hline $					
Gutter Geornetry: Maximum Alwable Width for Spread Behind Curb Sues Stope Behind Curb (taybically between 0.012 and 0.020)Tunce = 7.5 Tunce = 7.5 The first stope of the table of table	Successor T. Tuxx W Tr D D D S S STREET CROWN				
Maximum Allowable Width for Spread Behind CurbTack =Tack =ZTSide Slope Behind Curb (typically between 0.012 and 0.020)Function Curb Face to Street CrownSucc =0.020ft/ftHeight of Curb at Gutter Flow LineHouse = 10.020 ft/ft 10.020 ft/ftDistance from Curb Face to Street CrownStreet Transverse Slopeft/ft $S_{ve} = 0.020$ ft/ftGutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)Sv = 0.020 ft/ftStreet transverse Slopeft/ftSv = 0.020 ft/ftMaximum Gapacity for 1/2 Street Section (typically between 0.012 and 0.020) $S_{ve} = 0.010$ ft/ftMax. Allowable Spread for Minor & Major StormMax = 10.00 ftMax. Allowable Spread for Minor & Major Storm $T_{tax} = \frac{10.00}{16.00}$ ftMaximum Capacity for 1/2 Street based On Allowable SpreadWinor StormMay =Maxe Tepth tetwoen Gutter Lip and Gutter Flowline (usually 2') $d = 4.47$ 4.47Gutter Depression (fc, (S, *, 21)) $d = 4.47$ 4.47Urbickarge outside the Gutter Section W (Gr - 0.) $V_{v} = \frac{15.2}{0.03}$ ftGutter Depression (fc, (S, *, 21)) $d = 4.47$ 6.63inchesHowable Spread for Discharge outside the Gutter Section W (Gr - 0.) $V_{v} = \frac{14.7}{0.3}$ ftGutter Flow tho Design Flow Ratio by FHWA HEC22 method (Eq. ST-7) $E_{0} = 0.00$ 0.00 Discharge Behind the Curb (e., sidewald, driveways, 8 lawns) $V_{w} = 0.3$ 0.3 Maximum Flow Based On Allowable	Gutter Geometry:		-		
Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Marinning's Roughness Behind Curb (typically between 0.012 and 0.020) Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter Widh Street Transverse Slope Gutter Widh Street Transverse Slope Gutter Curb at Subject Flow Line Distance from Curb Face to Street Crown Marining's Roughness For Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Allow Flow Depth at Street Crown (check box for yes, leave blank for no) Marting Store for Decharge outside the Gutter Section W (T - W) Gutter Depression (dc, (Y + 0, 12) Water Depth at Gutter Flowline (for ULC) 2 method (fgr. 51-7) Water Depth Between Gutter Lip and Gutter Flowline (usually 2') Gutter Depression (dc, (Y + 0, 12)) Water Depth Max Gutter Flowline Curter Section W (T - W) Gutter Elow Based On Allowable Spread Flow Velocity within the Gutter Section W (Q - Q_2) Discharge within the Gutter Section W (Q - Q_2) Discharge within the Gutter Section W (Q - Q_2) Discharge solution the Gutter Section W (G - Q_2) Maximum Capacity for 1/2 Street based on Allowable Depth Maximum Capacity for 1	Maximum Allowable Width for Spread Behind Curb	T _{BACK} = 7.5	ft		
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$	ft/ft		
Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter Width Street Transverse Siope Gutter Vidth $H_{CUBE} = 6.00$ 16.0 $1t$ 0.020 $1t$ $5v = 0.020$ $1ft$ $5v = 0.010$ $1ft$ $5v = 0.010$ $1ft$ $5v = 0.010$ $1ft$ $5v = 0.010$ $1ft$ $5v = 0.010$ $1ft$ $5v = 0.010$ $1ft$ Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm $1dt = 10$ $T_{Max} = 16.0$ $1dt = 10$ $1dt = 10$ $1ft$ $1dt = 100$ $1dt = 100$ Max. Howable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm $1dt = 10$ $1dt = 10$ $T_{Max} = 16.0$ $1dt = 100$ $1dt = 100$ Max. To perform the Source Town (check bor for yes, leave blank for no) $T_{Max} = 16.0$ $1dt = 100$ $1dt = 100$ $1dt = 100$ Max. To perform the Source Town (fex User Flowline (susally 2') $0dt = 0.03$ $0dt = 100$ $1dt = 100$ $1dt = 100$ Maxter Depth to belown Gutter Flowline (susally 2') $0dt = 152$ 152.2 15	Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.020]		
Distance from Curb Face to Street Crown Gutter Width Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Max. Tabue To between Gutter Flowline for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Mater Depth without Gutter Depression (Eq. ST-2) Vertical Depth Between Gutter Flowline (usually 2') Gutter Flow ta Gutter Flowline (usually 2') Gutter Flow tabesign Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W (T - W) Maximum Flow Based On Allowable Spread Y d Product: Flow Velocity times Gutter Flowline Depth Theoretical Water Spread Y d Product: Flow Velocity times Gutter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread No besign Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W (T - W) Gutter Flow Velocity times Gutter Flowline Depth Y d Product: Flow Velocity times Gutter Flowline Depth Y d Product: Flow Velocity times Gutter Flowline Depth Maximum Gaped for J1/2 Street based on Allowable Depth Theoretical Water Spread No besign Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W (T - W) Gutter Flow Velocity Within the Gutter Section W (T - W) Gutter Flow Velocity Within the Gutter Section W (T - W) Gu	Height of Curb at Gutter Flow Line	House = 6.00	linches		
Cutter WidthControl with the sum conditionStreet Transverse SlopeStreet Transverse SlopeMinor Street Folding for Minor & Major StormMax. Allowable Spread for Minor & Major StormMax. Allowable Depth at Street Crown (check box for yes, leave blank for no)Maximum Capacity for 1/2 Street based On Allowable SpreadMinor StormWater Depth between dutter Up and Gutter Flowline (usually 2')y =Minor Storm Major StormWater Depth ta Gutter Flowlinedift FlowlineAllow Flow Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Bischarge within the Gutter Section W (T - W)Gutter Flow Beadon Allowable SpreadMaximum Capacity for 1/2 Street based on Allowable DepthTypeSteps Blind the Curb (e.g., sidewalk, driveways, & lawns)Discharge within the Gutter Section W (Cr - Q)Qave =Maximum Capacity for 1/2 Street based on Allowable DepthVel =Maximum Capacity for 1/2 Street based on Allowable DepthVel =Maximum Capacity for 1/2 Street based on Allowable DepthMinor Storm Major StormMaximum Capacity for 1/2 Street based on Allowable DepthVel =Ma	Distance from Curb Face to Street Crown	$T_{COMM} = 16.0$	ft		
Street Transverse Stope Gutter Transverse Stope Gutter Cross Stope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Stope = There 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Max. Mowable Spread for Minor & Major Storm Max. Mowable Spread for Minor & Major Storm Max. Mowable Spread for Minor & Major Storm (Leg. ST-2) Water Depth without Gutter Depression (Eq. ST-2) Vertical Depth between Gutter Iip and Gutter Flowline (usually 2') Gutter Depression (Leg. ST \$< 12) Water Depth at Gutter Flowline Mlowable Spread for Discharge outside the Gutter Section W (T · W) Gutter Depresed for Discharge outside the Gutter Section Tx Discharge outside the Gutter Section W (Q - Q_0) Discharge outside the Gutter Section W (Q - Q_	Gutter Width	W = 0.83	ft		
Cutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)Street Longitudinal Stope - Enter 0 for sump condition $S_{y_{eff}} = 0.000$ Manning's Roughness for Street Section (typically between 0.012 and 0.020) $S_{y_{eff}} = 0.000$ Max. Allowable Spread for Minor & Major Storm $T_{Mex} = 0.000$ Max. Allowable Depth at Street Crown (check box for yes, leave blank for no) $I_{Mor} = 0.000$ Max. Manuble Depth at Street Crown (check box for yes, leave blank for no) $I_{Mor} = 0.63$ Max. To Perform the Up and Cutter Flowline (busually 2") $q = 0.63$ Gutter Depression (dc, -(W * S, * 12)) $q = 0.63$ Water Depth at Gutter Flowline (busually 2") $q = 0.149$ Gutter Depression (dc, -(W * S, * 12)) $q = 0.149$ Water Depth at Gutter Flowline (busually 2") $q = 0.149$ Gutter Tows Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $Q_{v} = 1.3$ Discharge outside the Gutter Section W (T · W) $Q_{v} = 1.3$ Discharge outside the Gutter Section V (Qr - Q_{v}) $Q_{v} = 0.00$ Discharge outside the Gutter Section W (Qr - Q_{v}) $Q_{v} = 0.130$ Maximum Flow Based On Allowable Spread $W = 0.33$ Maximum Capacity for 1/2 Street based on Allowable Depth $W = 0.33$ Maximum Capacity for 1/2 Street based on Allowable Depth $W = 0.152$ Maximum Capacity for 1/2 Street based on Allowable Depth $W = 0.152$ Maximum Flow Based On Allowable Spread $W = 0.152$ N'd Product: Flow Velocity times Gutter Flowline Depth $W = 0.152$ Maximum Capacity for 1/2 Street based on Allowable Capacity Giveways, & law	Street Transverse Slope	$S_{x} = 0.020$	ft/ft		
Street Longitudinal Siope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Street Crown (check box for yes, leave blank for no) Maximum Capacity for 1/2 Street Dased On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Water Depth without Gutter Depression (Eq. ST-2) Water Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W 5 \leq * 12)) Water Depth at Gutter Flowline Gutter Depression (d _c - (W 5 \leq * 12)) Water Depth at Gutter Flowline Gutter Depression (d _c - (W 5 \leq * 12)) Water Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge within the Gutter Section W (Q ₁ - Q ₂) Discharge outside the Gutter Section W (Q ₁ - Q ₂) Discharge outside the Gutter Section W (Q ₁ - Q ₂) Discharge outside the Gutter Flowline Depth Maximum Capacity for 1/2 Street Dased on Allowable Depth Theoretical Discharge outside the Gutter Section W (T - W) Gutter Flow Velocity within the Gutter Section W (Imited by distance Traown) Discharge sublich the Gutter Section W (Imited by distance Traown) Discharge outside the Gutter Section W (Imited by distance Traown) Discharge outside the Gutter Section W (Imited by distance Traown) Discharge for Major & Minor Storm (Mes-Site Flowline (d s ST-7) Theoretical Discharge outside the Gutter Section W (Imited by distance Traown) Discharge Behin the Gutter Section W (Imited by distance Traown) Discharge Behin the Gutter Section W (Imited by distance Traown) Discharge Behin the Gutter Section W (Imited by distance Traown) Discharge Behin the Gutter Section W (Imited by distance Traown) Discharge Behin the Gutter Section W (Imited by distance Traown) Discharge Behin the Gutter Section W (Imited by distance Traown) Discharge	Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$	ft/ft		
Manning's Roughness for Street Section (typically between 0.012 and 0.020) $n_{STREET} = 0.016$ Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Allow Flow Depth at Street Crown (check box for yes, leave blank for no) $T_{Max} = 0.016$ Max. Miowable Depth at Gutter Flowline for Minor & Major Storm Max. Miowable Depth at Street Crown (check box for yes, leave blank for no) $T_{Max} = 0.016$ Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Gz. 5T-2) Gutter Depression (Gz (W * S. * 12)) $y = 0.08 0.8$ Matro Depth between Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T · W) Gutter Flow Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread for Ved Orduct: Flow Velocity times Gutter Flowline Depth $W_{1.3}$ 1.3 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Discharge outside the Gutter Section W (T · W) Gutter Flow Velocity times Gutter Flowline Depth $W_{1.4}$ 7.3 7.3 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Discharge outside the Gutter Section W (T · W) Gutter Flow Velocity times Gutter Flowline Depth $W_{1.4}$ 7.3 7.3 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Discharge outside the Gutter Section W (G · C) Outscharge behind the Curb (e.g., sidewalk, driveways, & lawns) Discharge Behind the Curb (e.g.,	Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.010$	ft/ft		
Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Street Crown (check box for yes, leave blank for no)T_Max = $ \frac{Minor Storm}{16.0} \frac{Major Storm}{16.0} titd_{wax} = \frac{4.4}{4.4} \frac{7.7}{1.2} tirches and the form (check box for yes, leave blank for no)Maximum Capacity for 1/2 Street Dased On Allowable SpreadWater Depth without Gutter Depression (Eq. ST-2)(Gutter Poression (Eq. ST-2))Winor Storm Major Stormminor Storm Major Storma = 0.630 0.631 inchesa = 0.630 0.631 inchesd = 4.47 4.47 4.47inchesinchesinchesinchesa = 0.0149 0.149 0.149Older Porestaf for Discharge outside the Gutter Section W (T - W)Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Discharge within the Gutter Section W, crimed in Section T_XPorduct: Flow Velocity times Gutter Flowline DepthWa = 0.3 0.3 0.3 0.3 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5$	Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n _{STREET} = 0.016	1.4.2		
Max. Allowable Spread for Minor & Major StormThus to main the second state of th			-		
Max. Allowable Spead for Minor & Major Storm $T_{WX} = 16.0$ 16.0ftMax. Allowable Depth at dutter Flowline for Minor & Major Storm $d_{WX} = 4.4$ 7.7 inchesAllow Flow Depth at Street Crown (check box for yes, leave blank for no) $V = 4.4$ 7.7 inchesMaximum Capacity for 1/2 Street based On Allowable Spread $V = 3.84$ 3.84 inchesWater Depth without Gutter Depression ($f_{C} - (W * S_x * 12)$) $d = 4.47$ 4.47 inchesVertical Depth between Gutter Flowline $d = 4.47$ 4.47 inchesAllowable Spread for Discharge outside the Gutter Section W ($T - W$) $T_x = 15.2$ 15.2 15.2 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method ($f_{C} S^{T-7}$) $G_0 = 0.149$ 0.149 Discharge outside the Gutter Section W ($Q_T - Q_x$) $Q_w = 1.3$ 1.3 1.3 Discharge outside the Gutter Section W ($Q_T - Q_x$) $Q_w = 1.3$ 1.3 1.3 Discharge outside the Gutter Flowline Depth $V = 0.8$ 0.8 0.8 Haximum Capacity for 1/2 Street based on Allowable Depth $V = 0.8$ 0.3 0.3 Theoretical Water Spread $V = 0.5$ 0.53 0.079 Maximum Capacity for 1/2 Street based on Allowable Depth $T_{TH} = 14.7$ 28.6 ftMaximum Capacity for 1/2 Street based on Allowable Depth $T_{TH} = 6.7$ 39.3 cfsMaximum Capacity for 1/2 Street based on Allowable Capacity in the Gutter Section W, (arried in Section $T_{X,TH}$ $Q_x = 6.7$ 34.1 cfsGutter Flow Neolo Strim MWA HEC-22 method		Minor Storm	Major Storm		
Max. Allowable Depth at Gutter Flowline for Minor & Major Stormd _{MAX} =4.47.7InchesAllow Flow Depth at Street Crown (check box for yes, leave blank for no)Image: Comparison of the com	Max. Allowable Spread for Minor & Major Storm	T _{MAX} = 16.0	16.0 ft		
Allow Flow Depth at Street Crown (check box for yes, leave blank for no) $\square \square $	Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} =4.4	7.7 in	ches	
Maximum Capacity for 1/2 Street based On Allowable SpreadMinor StormMajor StormWater Depth without Gutter Depression (Eq. ST-2)y = 3.84 3.84 inchesVertical Depth between Gutter Lip and Gutter Flowline (usually 2")a = 0.63 0.63 inchesGutter Depth at Gutter Flowlinea = 0.63 0.63 inchesAllowable Spread for Discharge outside the Gutter Section W (T - W)Tx = 15.2 15.2 ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E _O = 0.149 0.149 0.149 Discharge within the Gutter Section W (Qr - Q)Qw = 7.3 7.3 CfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns)Qacx = 0.0 0.0 0.0 Maximum Flow Based On Allowable Spread $\mathbf{V} =$ 0.8 0.8 0.8 Product: Flow Velocity within the Gutter Section M (Qr - Q) $\mathbf{V} * d$ 0.3 0.3 0.3 V*d Product: Flow Velocity times Gutter Flowline Depth $\mathbf{V} * d$ 0.3 0.3 0.3 Maximum Capacity for 1/2 Street based on Allowable Depth $\mathbf{T}_{TH} =$ 15.6 29.4 \mathbf{ft} Theoretical Discharge outside the Gutter Section W (T - W) $\mathbf{X}_{TH} =$ 14.7 28.6 \mathbf{ft} Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) \mathbf{E}_O 0.149 0.149 0.149 Gutter Flow Velocity times Gutter Flowline Depth $\mathbf{V} * d$ 0.57 0.57 0.56 <t< td=""><td>Allow Flow Depth at Street Crown (check box for yes, leave blank for no)</td><td></td><td>\checkmark</td><td></td></t<>	Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		\checkmark		
$\begin{array}{l l l l l l l l l l l l l l l l l l l $	Maximum Courseth for 1/2 Church board On Allowable Coursed		M : Ci		
Water Depth between Cutter Lip and Gutter Flowline (usually 2")y =3.843.84InchesGutter Depth between Cutter Lip and Gutter Flowline (usually 2")d =0.630.63inchesGutter Depth at Gutter Flowlined =4.474.47inchesAllowable Spread for Discharge outside the Gutter Section W (T - W)Tx =15.215.2ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E ₀ =0.1490.1490.149Discharge outside the Gutter Section W (Q _T - Q _X)Q _W =1.31.3cfsDischarge within the Gutter Section W (Q _T - Q _X)Q _W =0.80.8ftDischarge within the Gutter Section W (Q _T - Q _X)Q _W =0.00.0cfsPowel Section W collega section TxV =0.80.8fsPice Velocity within the Gutter Section NV =0.80.8fsV*d Product: Flow Velocity times Gutter Flowline DepthV*d =0.30.3fsMaximum Capacity for 1/2 Street based on Allowable DepthT _{TH} =15.629.4ftTheoretical Spread for Discharge outside the Gutter Section W, carried in Section Tx THQ _X =6.734.1cfsDischarge within the Gutter Section W (Imited by distance T _{CROWN})Q _w =1.23.4cfsDischarge within the Gutter Section W (Q ₁ - Q _N)Q _w =1.23.4cfsDischarge within the Gutter Section W (Q ₁ - Q _N)Q _w =1.23.4cfsDischarge within the Gutter Section	Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm	Major Storm		
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a a = 0.830.05InclussWater Dept at Gutter Flowlined a = 0.830.05InclussAllowable Spread for Discharge outside the Gutter Section W (T - W)TTS0.05InclussGutter Flow Natio by FHWA HEC-22 method (Eq. ST-7)E0.1490.1490.1490.1490.1490.1490.1490.05InclussDischarge outside the Gutter Section W (QT - Qx)QR5RSSS <th colsp<="" td=""><td>Vertical Depth Detween Gutter Lip and Gutter Flowline (usually 2) Cutter Depression (d $(W \times S \times 12))$</td><td>$u_{\rm C} = 0.8$</td><td>0.62</td><td>ches</td></th>	<td>Vertical Depth Detween Gutter Lip and Gutter Flowline (usually 2) Cutter Depression (d $(W \times S \times 12))$</td> <td>$u_{\rm C} = 0.8$</td> <td>0.62</td> <td>ches</td>	Vertical Depth Detween Gutter Lip and Gutter Flowline (usually 2) Cutter Depression (d $(W \times S \times 12))$	$u_{\rm C} = 0.8$	0.62	ches
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Control	Gutter Flow to Design Flow Patio by FHWA HEC-22 method (Fg. ST-7)	$F_{2} = 13.2$	0 140		
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Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{"}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable Capacity GOOD - greater than the design flow given on sheet "Inlet Management"	Discharge within the Gutter Section W ($Q_d - Q_X$)	Qw = 1.2	3.4 CT	5	
Velocity Distringe for Hayd & Minior Storm (Pre-Safety Factor) $Q = \frac{7.9}{38.2}$ 38.2 CfsAverage Flow Velocity Within the Gutter Section $V = 0.8$ 1.2 fpsY*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 0.3$ 0.7 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R = \frac{1.00}{1.00}$ 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = \frac{7.9}{38.2}$ 38.2 Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = \frac{4.36}{4.36}$ 7.68 Resultant Flow Depth at Street Crown (Safety Factor Applied) $d_{CROWN} = 0.00$ 3.22 MINOR STORM Allowable Capacity is based on Depth Criterion $Q_{allow} = Minor Storm Major StormMinor storm max, allowable capacity GOOD - greater than the design flow given on sheetThet Management'$	Total Discharge for Major & Minor Storm (Pro Safah Satar)			5	
Verage now vectory within the Gutter Section $v = 0.8$ 1.2TpsV*d Product: Flow Velocity Times Gutter Flowline Depth $v^*d = 0.3$ 0.7Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq 6^{\circ}$) StormR =1.001.00Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 7.938.2Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ 4.367.68Resultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ 4.367.68MINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor StormMAJOR STORM Allowable Capacity is based on Depth Criterion T_{9} 38.2cfsMinor storm max, allowable capacity GOOD - greater than the design flow given on sheetThet Management'cfs	Average Flow Velecity Within the Cutter Section	Q = 7.9	JO.2 CT	5	
V U = 0.3 0.7 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm R = 1.00 1.00 Max Flow Based on Allowable Depth Safety Factor Applied) Q _d = 7.9 38.2 cfs Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) d = 4.36 7.68 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm Major Storm Major Storm MAIOR STORM Allowable Capacity is based on Depth Criterion Qallow = 7.9 38.2 cfs	V*d Product: Flow Velocity Times Cutter Flowline Depth	v = <u>0.8</u>		5	
Max Flow Based on Allowable Depth (Safety Factor Applied) $R = 1.00$ 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 7.9$ 38.2 Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 4.36$ 7.68 Resultant Flow Depth at Street Crown (Safety Factor Applied) $d = 0.00$ 3.22 MINOR STORM Allowable Capacity is based on Depth Criterion $Q_{allow} = 7.9$ 38.2 Minor Storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Sone-Based Donth Safety Reduction Factor for Major & Minor $(d > 6")$ Storm	P = 1.00	1.00		
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' Comparison of the storm of the store	Max Flow Based on Allowable Depth (Safety Factor Applied)	0, = 70	38.2 cf	s	
Resultant Now Depth a Street Forwine (Safety Factor Applied) $d_{CROWN} = \frac{7.30}{0.00}$ 1000 3.22 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm Major Storm Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet The Management' fs	Resultant Flow Denth at Gutter Flowline (Safety Factor Applied)	d - 436	7.68	choc	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	Resultant Flow Depth at Street Crown (Safety Factor Applied)	$d_{CROWN} = 0.00$	3.22 in	ches	
MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm MAJOR STORM Allowable Capacity is based on Depth Criterion Qallow = 7.9 38.2 cfs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management' Storm Storm Storm		· · ·			
MAJOR STORM Allowable Capacity is based on Depth Criterion Q _{allow} = 7.9 38.2 cfs Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm	Major Storm		
Minor storm max, allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = 7.9	38.2 cf	s	
	Minor storm max. allowable capacity GOOD - greater than the design flow give	en on sheet 'Inlet Managen	nent'		



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	1
Length of a Single Unit Inlet (Grate or Curb Opening)	L ₀ =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W ₀ =	N/A	N/A	Tft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	$C_{f}-G =$	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - O < Allowable Street Capacity'		MINOR	MAJOR	
Design Discharge for Half of Street (from Inlet Management)	$Q_0 = \Gamma$	1.7	4.0	lcfs
Water Spread Width	τ ₌ Γ	8.6	12.0	lft l
Water Depth at Flowline (outside of local depression)	d =	2.7	3.5	linches
Water Depth at Street Crown (or at T _{MAX})	dcpown =	0.0	0.0	inches
Ratio of Gutter Flow to Design Flow	E _c =	0.287	0.202	
Discharge outside the Gutter Section W. carried in Section T.	0. =	1.2	3.2	cfs
Discharge within the Gutter Section W	o =	0.5	0.8	
Discharge Rehind the Curb Face	0,,,,,,=	0.0	0.0	cfs
Flow Area within the Gutter Section W		0.0	0.0	lon ft
Velocity within the Gutter Section W	V	3.1	3.8	fnc
Water Denth for Design Condition	d	5.7	6.5	linches
Crate Analysis (Calculated)	GLOCAL - I	MINOP	MA10P	Inches
Total Length of Inlet Grate Opening	ı – F			70
Patie of Crate Flow to Design Flow		N/A	N/A	
Hado of Grate Flow to Design Flow	⊏o-GRATE -	MINOR		
Minimum Valasity Where Crete Calash Quer Begins	<u>м</u> – Г	MINOR		6.00
Infinimum velocity where Grate Splash-Over Begins	v _o = -	N/A	N/A	Tps
	R _f =	N/A	N/A	-
Interception Rate of Side Flow	R _x =	N/A	N/A	- ,
Interception Capacity	$Q_i = L$	N/A	N/A	
Under Clogging Condition		MINOR	MAJOR	-
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoet =	N/A	N/A	4
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet		N/A	N/A	_ft
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	_
Interception Rate of Side Flow	R _x =	N/A	N/A	
Actual Interception Capacity	Q _a =	N/A	N/A	cfs
Carry-Over Flow = Q_0 - Q_a (to be applied to curb opening or next d/s inlet)	Q _b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)	-	MINOR	MAJOR	_
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.124	0.094	_ft/ft
Required Length L _T to Have 100% Interception	L _T =	6.67	11.75	_ft
Under No-Clogging Condition		MINOR	MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T)	L =	6.67	10.00	ft
Interception Capacity	Q _i =	1.7	3.9	cfs
Under Clogging Condition	-	MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.25	1.25	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.06	0.06	7
Effective (Unclogged) Length	L, = [9.37	9.37	ft
Actual Interception Capacity	Q_ =	1.7	3.8	cfs
Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a	Q _n =	0.0	0.2	cfs
Summary	5 12	MINOR	MAJOR	
Total Inlet Interception Capacity	o = [1.7	3.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	o. =	0.0	0.2	cfs

MHFD-Inlet, Version 5.0	01 (April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF	OF STREET (MINOR & Major Storn Allowable Flow Denth and Spread)
: Grandview Reserve	anowable from Departana opready
: Basin D-3 (DP 24)	
TBACK TCROWN	
TT	
SBACK W I T.	
STREET	
R > Q G Sx CROWN	
£ +	
Cutter Committee	
Guiler Geometry: Maximum Allaurida Midth fan Grund Babind Curb	T T T T T T
Maximum Allowable Width for Spread Benind Curb	$I_{BACK} = 7.5$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n _{BACK} = 0.020
Height of Curb at Gutter Flow Line	H _{CURB} = 6.00 inches
Distance from Curb Face to Street Crown	$T_{CROMM} = 16.0$ ft
Gutter Width	W = 0.83 ft
Street Transverse Slope	6 - 0.000 ft/ft
Cutter Grass Clans (traiselly 2 inches over 24 inches or 0.002 ft/ft)	$S_{\rm X} = 0.020$ IV/I
Guiller Cross Slope (typically 2 inches over 24 inches or 0.065 it/it)	$S_W = 0.083 \text{ ft/ft}$
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
	Minor Storm Major Storm
Max, Allowable Spread for Minor & Maior Storm	$T_{MAX} = 16.0$ 16.0 ft
Max, Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{\text{max}} = 44$ 7.7 inches
Check haves are not applicable in SLIMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Ctorm Major Storm
Water Denth without Cutter Denression (Eq. CT.2)	
Water Depth without Gutter Depression (Eq. 51-2)	y = <u>3.84</u> <u>3.84</u> Inches
vertical Depth Detween Gutter Lip and Gutter Flowline (usually 2")	$a_c = 0.8$ 0.8 Incres
Gutter Depression (d_c - (W * S_x * 12))	a = 0.63 0.63 inches
Water Depth at Gutter Flowline	d = 4.47 4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_x = 15.2$ 15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.149 0.149$
Discharge outside the Gutter Section W, carried in Section T_{y}	$O_{\rm Y} = 0.0 0.0 {\rm cfs}$
Discharge within the Gutter Section W ($\Omega_{T} - \Omega_{V}$)	$\Omega_{\rm W} = 0.0$ 0.0 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways & lawns)	
Maximum Flow Paced On Allowable Spread	
	QT - SUMP CIS
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm Major Storm
Theoretical Water Spread	T _{TH} = 15.6 29.4 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{XTH} = 14.7$ 28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Fg. ST-7)	$F_0 = 0.153 = 0.079$
Theoretical Discharge outside the Gutter Section W, carried in Section T	$\Omega_{\rm eff} = 0.0$ 0.0 cfs
Actual Discharge subside the Cutter Section W, (limited by distance T	$Q_{X fH} = 0.0$ 0.0 cfs
Actual Discharge outside the Gutter Section W, (Inflited by distance T _{CROWN})	$Q_{\rm X} = 0.0 0.0 {\rm cm}$
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_W = 0.0 0.0$ Cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Denth Safety Reduction Factor for Major & Minor $(d > 6")$ Storm	
May Flow Based on Allowable Denth (Safety Factor Applied)	
That how based on Allowable Depth (Salety Factor Applied)	
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =inches
Resultant How Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = SUMP SUMP cfs
INLET IN A SUMP OR SAG LOCATION MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	1
Local Depression (additional to continuous gutter depression 'a' from above)	allocal =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
Water Denth at Flowline (outside of local depression)	Ponding Denth =	4.4	77	inches
Grate Information		MINOR	MAIOR	V Override Depths
Length of a Unit Grate	L (G) =	N/A	N/A	Ifeet
Width of a Unit Grate		N/A	N/A	foot
Area Opening Batio for a Crate (tynical values 0.15.0.00)	, ^{vv} ° _	N/A	N/A	
Clogging Eactor for a Single Crate (typical values 0.15-0.50)		N/A	N/A	-
Crote Weir Coefficient (typical value 2.15 - 2.60)	$C_{f}(0) = -$	N/A	N/A	-
Grate Weir Coefficient (typical value 2.15 - 3.00)	$C_w(G) = $	IN/A	IN/A	-
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_{o}(G) = [$	N/A	IN/A	
Curb Opening Information	. (m. 1	MINOR	MAJOR	٦.
Length of a Unit Curb Opening	$L_{o}(C) = $	5.00	5.00	reet
Height of Vertical Curb Opening in Inches	H _{vert} =	6.00	6.00	linches
Height of Curb Orifice Throat in Inches	H _{throat} =	6.00	6.00	linches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Warning 1 Side Width for Depression Pan (typically the gutter width of 2 feet)	W _p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_{f}(C) =$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C _w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_{o}(C) =$	0.67	0.67	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	_
Clogging Coefficient for Multiple Units	Coef =	N/A	N/A	1
Clogging Factor for Multiple Units	Clog =	N/A	N/A	1
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	-
Interception without Clogging	O _{wi} = [N/A	N/A	lcfs
Interception with Clogging	O _{wa} =	N/A	N/A	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)	Civia L	MINOR	MAJOR	1
Interception without Clogging	0 _{ni} = [N/A	N/A	lcfs
Intercention with Clogging	0=	N/A	N/A	cfs
Grate Canacity as Mixed Flow		MINOR	MAIOR	
Intercention without Clogging	oF	N/A		Tefe
Interception with Clogging		N/A	N/A	cfs
Deculting Crote Conscitu (perumon desped condition)			N/A N/A	
Curb Opening Flow Applysis (Calculated)	Corate	MINOR	MATOR	
Classing Coefficient for Multiple Units	Coof -	1 21		٦
Clogging Coefficient for Multiple Units		1.51	1.31	-
Clogging Factor for Multiple Units	clog = [0.04	0.04	
Curb Opening as a weir (based on Modified HEC22 Method)	0 - [] of a
		7.5	26.6	
Interception with Clogging	Q _{wa} =	7.2	25.4	CTS
Curb Opening as an Orifice (based on Modified HEC22 Method)	а Г	MINOR	MAJOR	٦.
Interception without Clogging	Q _{oi} =	25.2	32.9	cfs
Interception with Clogging	$Q_{oa} = $	24.1	31.5	lcts
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	٦.
Interception without Clogging	Q _{mi} =	12.8	27.5	cts
Interception with Clogging	$Q_{ma} =$	12.2	26.3	cts
Resulting Curb Opening Capacity (assumes clogged condition)	Q _{Curb} =	7.2	25.4	cts
Resultant Street Conditions	-	MINOR	MAJOR	_
Total Inlet Length	L =	15.00	15.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	15.6	29.4	ft.>T-Crown
Resultant Flow Depth at Street Crown	d _{CROWN} =	0.0	3.2	linches
Low Head Performance Reduction (Calculated)	-	MINOR	MAJOR	_
Depth for Grate Midwidth	d _{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d _{Curb} =	0.29	0.57	ft
Combination Inlet Performance Reduction Factor for Long Inlets	RF _{Combination} =	0.41	0.72	
Curb Opening Performance Reduction Factor for Long Inlets	RF _{Curb} =	0.67	0.88	1
Grated Inlet Performance Reduction Factor for Long Inlets	RF _{Grate} =	N/A	N/A	1
	Grate			-
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	o ₂ = [7.2	25.4	cfs
	2.0 1			
Inlet Capacity IS GOOD for Minor and Major Storms(>O PEAK)	Q PEAK REQUIRED =	6.6	19.2	cfs

Warning 1 Note: This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Alle t: Grandview Reserve	owable Flow Depth and Spread)
D: Basin D-4 (DP 25)	
TEACK TCROWN	
Succe W Tr W Tr Succe Co S STREET CROWN	
Gutter Geometry:	
Maximum Allowable Width for Spread Benind Curb	$I_{BACK} = 7.5$ ft
Side Slope Benind Curb (leave blank for no conveyance credit benind curb)	$S_{BACK} = 0.020 \ \pi/\pi$
Marining's Roughness Bennia Carb (typically between 0.012 and 0.020)	11 _{BACK} – 0.020
Height of Curb at Gutter Flow Line	Hours = 6.00 inches
Distance from Curb Face to Street Crown	$T_{CBOWN} = 16.0$ ft
Gutter Width	W = 0.83 ft
Street Transverse Slope	$S_{y} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STRFFT}} = 0.016$
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	T _{MAX} = 16.0 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d _{MAX} = 4.4 7.7 inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. ST-2)	y = <u>3.84</u> <u>3.84</u> inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	$d_c = 0.8$ 0.8 inches
Gutter Depression (d _c - (W * S _x * 12))	a = 0.63 0.63 inches
Water Depth at Gutter Flowline	d = 4.47 4.47 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$T_x = 15.2$ 15.2 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.149 0.149$
Discharge outside the Gutter Section W, carried in Section $T_{\rm X}$	$Q_{\rm X} = 0.0 0.0$ cts
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_W = 0.0 0.0$ cts
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0$ 0.0 cfs
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Capacity for 1/2 Street based on Allowable Depth	Minor Storm Major Storm
Theoretical Water Spread	T _{TH} = 15.6 29.4 ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T _{X TH} = 14.7 28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E ₀ = 0.153 0.079
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q _{X TH} = 0.0 0.0 cfs
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	Q _X = 0.0 0.0 cfs
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_W = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0$ 0.0 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	R = SUMP SUMP
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q _d = SUMP SUMP cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d = inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d _{CROWN} = inches
NTNOR CTORM Allowship Granish is based on Double China	Miner Channe M. L. Ch
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm



Warning 1 Note:

This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.



INLET ON A CONTIN	iuous g	RADE		
MHFD-Inlet, Version 5.0.	1 (April 2021)			
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H-Curb H-Vert				
Lo (G)				
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Local Number of Units in the Inlet (Grate or Curb Opening)	NO =	5	3 E 00	- ₄
Width of a Unit Grate (cannot be greater than W. Gutter Width)	Ц ₀ — W, =	N/A	N/A	
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C _f -G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'	-	MINOR	MAJOR	_
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_0 =$	9.8	22.9	cfs
Water Spread Width	T =	13.4	16.0	ft
Water Depth at Flowline (outside of local depression)	a =	3.9	5.1	inches
Ratio of Gutter Flow to Design Flow	u _{CROWN} =	0.0	0.0	linches
Discharge outside the Gutter Section W. carried in Section T.	0, =	8.1	20.0	cfs
Discharge within the Gutter Section W	Q _w =	1.8	2.9	cfs
Discharge Behind the Curb Face	Q _{BACK} =	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	0.24	0.32	sq ft
Velocity within the Gutter Section W	V _w =	7.4	9.1	fps
Water Depth for Design Condition	d _{LOCAL} =	6.9	8.1	inches
Grate Analysis (Calculated)	. r	MINOR	MAJOR	٦.
Total Length of Inlet Grate Opening	_ L=	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$\Box_{0-\text{GRATE}} = $			
Minimum Velocity Where Grate Solash-Over Begins	v =[fns
Interception Rate of Frontal Flow	•₀ = R∈ =	N/A	N/A	
Interception Rate of Side Flow	R _v =	N/A	N/A	
Interception Capacity	$\hat{Q_i} =$	N/A	N/A	cfs
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	N/A	N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet	$L_e =$	N/A	N/A	
Intercention Rate of Frontal Flow	v _o =	N/A	N/A N/A	
Intercention Rate of Side Flow	rsf = R. =	N/A	N/A	-
Actual Interception Capacity	0 , =	N/A	N/A	cfs
Carry-Over Flow = $Q_0 - Q_a$ (to be applied to curb opening or next d/s inlet)	Q _b =	N/A	N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.085	0.067	ft/ft
Required Length L _T to Have 100% Interception	L _T =	20.77	35.88	ft
Under No-Clogging Condition	. г	MINOR	MAJOR	
Interception Capacity		15.00	14.3	
Inder Clogging Condition	$Q_i = L$	MINOR	μ <u>14.3</u> ΜΔ1ΟΡ	
Clogging Condition	CurbCoef =	1.31	1.31	7
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbCloa =	0.04	0.04	1
Effective (Unclogged) Length	L _e =	14.34	14.34	ft
Actual Interception Capacity	Q _a =	8.8	14.1	cfs
Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a	Q _b =	1.0	8.8	cfs
Summary		MINOR	MAJOR	¬.
Total Inlet Interception Capacity	Q =	8.8	14.1	crs
I rotal milet carry-over riow (now bypassing linet)	Q _b =	1.0	ő.ö	



INLET ON A CONTIN	iuous g	RADE		
MHFD-Inlet, Version 5.0	1 (April 2021)			·
۲ – Lo (C) – ۲				
H-Curb				
H-Vert Wo	-			
W L				
10/61				
£0(0)				
CDOT Type R Curb Opening				
Design Information (Input)		MINOR	MAIOR	
Type of Inlet	Type =	CDOT Type R	Curb Opening	
Local Depression (additional to continuous gutter depression 'a')	a _{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	3	3	
Length of a Single Unit Inlet (Grate or Curb Opening)		5.00	5.00	ft
Clogging Factor for a Single Unit Grate (typical min, value = 0.5)		N/A N/A	N/A	- ⁿ
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C _f -C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'	_	MINOR	MAJOR	_
Design Discharge for Half of Street (from <i>Inlet Management</i>)	$Q_0 =$	10.1	23.6	cfs
Water Spread Width	T =	13.4	16.0	ft
Water Depth at Flowline (outside of local depression)	= u =	3.9	5.1	inches
Ratio of Gutter Flow to Design Flow	$E_0 =$	0.179	0.128	
Discharge outside the Gutter Section W, carried in Section T_x	Q _x =	8.3	20.6	cfs
Discharge within the Gutter Section W	Q _w =	1.8	3.0	cfs
Discharge Behind the Curb Face	$Q_{BACK} =$	0.0	0.0	cfs
Flow Area within the Gutter Section W	A _W =	0.24	0.32	sq π foc
Water Depth for Design Condition		6.9	8.1	inches
Grate Analysis (Calculated)		MINOR	MAJOR	
Total Length of Inlet Grate Opening	L =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow	$E_{o-GRATE} = $	N/A MINOR	N/A	
Minimum Velocity Where Grate Splash-Over Begins	V. = [N/A	MAJOR N/A	fns
Interception Rate of Frontal Flow	$R_f =$	N/A	N/A	
Interception Rate of Side Flow	R _x =	N/A	N/A	
Interception Capacity	Q _i =	N/A	N/A	cfs
Under Clogging Condition	CrateCoof -	MINOR	MAJOR	-, I
Clogging Coefficient for Multiple-unit Grate Inlet	GrateClog =	N/A N/A	N/A N/A	-
Effective (unclogged) Length of Multiple-unit Grate Inlet	L _e =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins	V _o =	N/A	N/A	fps
Interception Rate of Frontal Flow	R _f =	N/A	N/A	_
Interception Rate of Side Flow	R _x =	N/A	N/A	
Carry-Over Flow = O_2 - O_2 (to be applied to curb opening or next d/s inlet)	Qa = Ob =	N/A N/A	N/A N/A	cfs
Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	1
Equivalent Slope S _e (based on grate carry-over)	S _e =	0.085	0.067	ft/ft
Required Length L _T to Have 100% Interception	L _T =	21.17	36.56	ft
Under No-Clogging Condition	ı _ F	15 00	MAJOR 15.00	
Interception Capacity	Q; =	9.0	14.5	
Under Clogging Condition		MINOR	MAJOR	
Clogging Coefficient	CurbCoef =	1.31	1.31	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	0.04	0.04	-
Effective (Unclogged) Length		14.34 8 0	14.34	π cfs
Carry-Over Flow = $Q_{h(GRATE)}$ - Q_a	$Q_{h} =$	1.2	9.3	cfs
Summary	<u></u>	MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	8.9	14.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	$Q_b =$	1.2	9.3	CTS

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum All ect: Grandview Reserve	owable Flow Depth and Spread)
ID: Basin E-3 (DP 29)	
Tomax Sector W T. Tuke W Tr Tr CROWN	
Gutter Geometry: Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown Gutter Width Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Slope - Enter 0 for sump condition Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$\begin{array}{c} T_{BACK} = & \hline 7.5 \\ S_{BACK} = & 0.020 \\ m_{BACK} = & 0.020 \\ \hline t/ft \\ \hline \\ H_{CURB} = & \hline 6.00 \\ T_{CROWN} = & \hline 16.0 \\ ft \\ W = & 0.83 \\ ft \\ S_X = & 0.020 \\ ft/ft \\ S_W = & 0.083 \\ ft/ft \\ S_O = & 0.000 \\ m_{STREET} = & \hline 0.016 \\ \hline \end{array}$
Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions	$T_{MAX} = \begin{array}{ c c c } \hline Minor Storm & Major Storm \\ \hline 16.0 & 16.0 & ft \\ \hline d_{MAX} = \begin{array}{ c c } \hline 4.4 & 7.7 & inches \\ \hline \hline \end{array}$
Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) Water Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge outside the Gutter Section W, carried in Section T _x Discharge within the Gutter Section W (Q _T - Q _x) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section Vev Vev Product: Flow Velocity times Gutter Flowline Depth	$\begin{array}{c ccccc} \mbox{Minor Storm} & \mbox{Major Storm} \\ \mbox{Winor Storm} & \mbox{Major Storm} \\ \mbox{Winor Storm} & \mbox{Major Storm} \\ \mbox{Minor Storm} & \mbox{Minor Storm} \\ Minor Storm$
$\begin{array}{l} \begin{array}{l} \\ \mbox{Maximum Capacity for 1/2 Street based on Allowable Depth} \\ \hline \\ \mbox{Theoretical Water Spread} \\ \hline \\ \mbox{Theoretical Spread for Discharge outside the Gutter Section W (T - W) \\ \hline \\ \mbox{Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) \\ \hline \\ \mbox{Theoretical Discharge outside the Gutter Section W, carried in Section T_{X TH} \\ \hline \\ \mbox{Actual Discharge outside the Gutter Section W (Q_q - Q_X) \\ \hline \\ \mbox{Discharge within the Gutter Section W (Q_q - Q_X) \\ \hline \\ \mbox{Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) \\ \hline \\ \mbox{Total Discharge for Major & Minor Storm (Pre-Safety Factor) \\ \hline \\ \mbox{Average Flow Velocity Within the Gutter Section W \\ \hline \\ \mbox{V*d Product: Flow Velocity Times Gutter Flowline Depth \\ \\ \mbox{Slope-Based Depth Safety Reduction Factor for Major & Minor (d $$ 6") Storm \\ \\ \hline \\ \mbox{Max Flow Based on Allowable Depth (Safety Factor Applied) \\ \\ \\ \mbox{Resultant Flow Depth at Street Crown (Safety Factor Applied) \\ \\ \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm Qallow = SUMP SUMP cfs



Warning 1 Note:

This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

MHFD-Inlet, Version 5.01	(April 2021)
ALLOWABLE CAPACITY FOR ONE-HALF O	F STREET (Minor & Major Storm)
(Based on Regulated Criteria for Maximum Allo	owable Flow Depth and Spread)
ID: Basin E-4 (DP 30)	
SEACK W Tr.	
Gutter Geometry:	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = 7.5$ ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = 0.020$ ft/ft
Manning's Roughness Benind Curb (typically between 0.012 and 0.020)	$H_{BACK} = 0.020$
Height of Curb at Gutter Flow Line	Hours = 6.00 linches
Distance from Curb Face to Street Crown	$T_{CROWN} = 16.0$ ft
Gutter Width	W = 0.83 ft
Street Transverse Slope	$S_{X} = 0.020$ ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_{W} = 0.083$ ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	$S_0 = 0.000$ ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{\text{STREET}} = 0.016$
	Minor Storm Major Storm
Max. Allowable Spread for Minor & Major Storm	$T_{MAX} = 16.0$ 16.0 ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	$d_{MAX} = 4.4$ 7.7 inches
Check boxes are not applicable in SUMP conditions	
Maximum Capacity for 1/2 Street based On Allowable Spread	Minor Storm Major Storm
Water Depth without Gutter Depression (Eq. S1-2)	y = 3.84 3.84 inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2) Cutter Depression $(d = (W \neq S \neq 12))$	$u_{\rm C} = 0.8 0.8$ inches
Water Deptession ($u_c = (W + S_x + 12)$)	d = 0.03 0.03 inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	$u = -\frac{1}{152}$ $\frac{1}{152}$ ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Fg. ST-7)	$F_0 = 0.149 0.149$
Discharge outside the Gutter Section W, carried in Section $T_{\rm v}$	$O_{\rm Y} = 0.0 0.0 {\rm cfs}$
Discharge within the Gutter Section W ($Q_T - Q_X$)	$Q_{W} = 0.0$ 0.0 cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	$Q_{BACK} = 0.0 0.0 cfs$
Maximum Flow Based On Allowable Spread	Q _T = SUMP SUMP cfs
Flow Velocity within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d = 0.0 0.0
Maximum Canacity for 1/2 Street based on Allowable Denth	Minor Storm Major Storm
Theoretical Water Spread	$T_{T_{T}} = \begin{bmatrix} 15.6 \\ 29.4 \end{bmatrix}$ ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{\rm YTH} = 14.7$ 28.6 ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	$E_0 = 0.153 0.079$
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	$Q_{XTH} = 0.0 0.0 \text{ cfs}$
Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN})	$Q_{\rm X} = 0.0 0.0 {\rm cfs}$
Discharge within the Gutter Section W ($Q_d - Q_X$)	$Q_{W} = 0.0 0.0 cfs$
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q _{BACK} = 0.0 0.0 cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q = 0.0 0.0 cfs
Average Flow Velocity Within the Gutter Section	V = 0.0 0.0 fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d = 0.0 0.0
Stope-based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm	
Providence of Allowable Deputit (Safety Factor Applied)	Vd = SUMP SUMP CTS
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied)	denomine inches
MINOR STORM Allowable Capacity is based on Depth Criterion	Minor Storm Major Storm
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q _{allow} = SUMP SUMP cfs



Warning 1 Note:

This warning is not reflective of the transition from a ramp curb upstream of the inlet to a typical 2' wide gutter pan prior to the inlet. Inputs provided for a 2' gutter pan at the inlet are correct as shown in this calculation & there is no impact to the results provided.

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Wednesday, May 4 2022

BASIN D-7 SWALE

Trapezoidal

Trapezoidal		Highlighted	
Bottom Width (ft)	= 1.00	Depth (ft)	= 0.55
Side Slopes (z:1)	= 3.00, 3.00	Q (cfs)	= 4.000
Total Depth (ft)	= 1.54	Area (sqft)	= 1.46
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 2.74
Slope (%)	= 2.00	Wetted Perim (ft)	= 4.48
N-Value	= 0.035	Crit Depth, Yc (ft)	= 0.51
		Top Width (ft)	= 4.30
Calculations		EGL (ft)	= 0.67
Compute by:	Known Q		
Known Q (cfs)	= 4.00		



Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Jun 6 2022

SWALE A-4a

Trapezoidal		Highlighted	
Bottom Width (ft)	= 4.00	Depth (ft)	= 1.75
Side Slopes (z:1)	= 3.00, 3.00	Q (cfs)	= 125.00
Total Depth (ft)	= 2.75	Area (sqft)	= 16.19
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 7.72
Slope (%)	= 1.00	Wetted Perim (ft)	= 15.07
N-Value	= 0.020	Crit Depth, Yc (ft)	= 1.99
		Top Width (ft)	= 14.50
Calculations		EGL (ft)	= 2.68
Compute by:	Known Q		
Known Q (cfs)	= 125.00		



Reach (ft)

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Wednesday, May 4 2022

Sidewalk Chase C-7a

	Highlighted	
= 1.00	Depth (ft)	= 0.50
= 0.50	Q (cfs)	= 3.200
	Area (sqft)	= 0.50
= 1.00	Velocity (ft/s)	= 6.40
= 2.00	Wetted Perim (ft)	= 2.00
= 0.013	Crit Depth, Yc (ft)	= 0.50
	Top Width (ft)	= 1.00
	EGL (ft)	= 1.14
Known Q		
= 3.20		
	= 1.00 = 0.50 = 2.00 = 0.013 Known Q = 3.20	= 1.00 $= 0.50$ $= 1.00$ $= 1.00$ $= 2.00$ $= 0.013$ $= 0.0013$ $= 0.003$



Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

SWALE BASIN C-7a

Trapezoidal

Trapezoidal		Highlighted	
Bottom Width (ft)	= 1.00	Depth (ft) =	0.49
Side Slopes (z:1)	= 3.00, 3.00	Q (cfs) =	3.200
Total Depth (ft)	= 1.50	Area (sqft) =	1.21
Invert Elev (ft)	= 1.00	Velocity (ft/s) =	2.64
Slope (%)	= 2.00	Wetted Perim (ft) =	4.10
N-Value	= 0.035	Crit Depth, Yc (ft) =	0.45
		Top Width (ft) =	3.94
Calculations		EGL (ft) =	0.60
Compute by:	Known Q		
Known Q (cfs)	= 3.20		



Reach (ft)

Hydraulic Analysis Report

Project Data

Project Title: Grandview Reserve – Interim Condition Swale Analysis

Designer: TJE

Project Date: Friday, December 29, 2023

Notes: This includes the channel and lining analysis for the Interim Condition swales A-1, A-2, & OS-1

Channel Analysis: Swale A-1 - Channel Analysis

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data			
Station (ft	Elevation (ft)	Manning's n	
0.00	2.00	0.0467	
8.00	0.00	0.0467	
12.00	0.00	0.0467	
20.00	1.00		

Longitudinal Slope: 0.0300 ft/ft

Flow 5.0000 cfs



Result Parameters Depth 0.3586 ft	Critical Velocity 2.7526 ft/s
Area of Flow 2.2059 ft^2	Critical Slope: 0.0520 ft/ft
Wetted Perimeter 8.3696 ft	Critical Top Width 7.72 ft
Hydraulic Radius 0.2636 ft	Calculated Max Shear Stress 0.6713
Average Velocity 2.2666 ft/s	lb/ft^2
Top Width 8.3032 ft	Calculated Avg Shear Stress 0.4934 lb/ft^2
Froude Number: 0.7750	Composite Manning's n Equation: Lotter
Critical Depth 0.3100 ft	method
	Manning's n: 0.0467

Channel Lining Analysis: Swale A-1 - Channel Lining Design Analysis Notes:

Lining Input Parameters

Channel Lining Type: Vegetation

Specific Weight of Water: 62.4 lb/ft^3

Height of Vegetation: 0.333 ft

Vegetation Condition is good

Growth Form of Vegetation is mixed

Cf: 0.75

See HEC-15, Table 4.5 (default: 0.75 for Good cover factor and Mixed growth form)

soil is noncohesive

D75: 2.54 mm

Safety Factor: 1

Lining Results Cn: 0.165205

Permissible Soil Shear Stress: 0.04 lb/ft^2

Mean Boundary Shear Stress: 0.493392 lb/ft^2

Maximum Shear Stress on the Channel Bottom: 0.671292 lb/ft^2

Manning's n: 0.0466795

Soil Grain Roughness: 0.0177136

Effective Shear Stress: 0.019717 lb/ft^2

Permissible Shear Stress on Vegetation: 1.11111 lb/ft^2

This value is compared with the maximum shear stress times the safety factor to determine lining stability

This value is compared with the maximum shear stress times the safety factor to determine lining stability

Channel bottom is stable

Channel Lining Stability Results 2

The channel is stable

Channel Analysis: Swale A-2 - Channel Analysis

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data		
Station (ft	Elevation (ft)	Manning's n
0.00	3.00	0.0718
12.00	0.00	0.0718
22.00	0.00	0.0718
34.00	3.00	

Longitudinal Slope: 0.0300 ft/ft

Flow 144.2000 cfs



Result Parameters Depth 1.9076 ft

Area of Flow 33.6325 ft²

Wetted Perimeter 25.7307 ft

Hydraulic Radius 1.3071 ft

Average Velocity 4.2875 ft/s

Top Width 25.2610 ft

Froude Number: 0.6548

Critical Depth 1.5115 ft

Critical Velocity 5.9456 ft/s

Critical Slope: 0.0744 ft/ft

Critical Top Width 22.09 ft

Calculated Max Shear Stress 3.5711 lb/ft^2

Calculated Avg Shear Stress 2.4469 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0718

Channel Lining Analysis: Swale A-2 - Channel Lining Design Analysis Notes:

Lining Input Parameters

Channel Lining Type: Riprap (CDOT Type 'M')

D50: 304.80 mm (12 in.)

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 2

Calculated Safety Factor: 1.22373

Lining Results

Angle of Repose: 41.7 degrees

Relative Flow Depth: 1.3314 ft

Manning's n method: Bathurst

Manning's n: 0.0717648

Channel Bottom Shear Results V*: 1.35749

Reynold's Number: 111544

Shield's Parameter: 0.0930562

Shear stress on channel bottom: 3.57108 lb/ft^2

Permissible shear stress for channel bottom: 9.54757 lb/ft²

Channel bottom is stable

Stable D50: 228.009 mm

Channel Lining Stability Results 2

The channel is stable

Channel Analysis: Swale OS-1 - Channel Analysis

Notes:

Input Parameters

Channel Type: Custom Cross Section

Cross Section Data		
Station (ft	Elevation (ft)	Manning's n
0.00	3.00	0.0524
12.00	0.00	0.0524
16.00	0.00	0.0524
28.00	3.00	

Longitudinal Slope: 0.0050 ft/ft

Flow 55.3000 cfs



Result Parameters Depth 2.0297 ft

Area of Flow 24.5972 ft²

Wetted Perimeter 20.7372 ft

Hydraulic Radius 1.1861 ft

Average Velocity 2.2482 ft/s

Top Width 20.2375 ft

Froude Number: 0.3594

Critical Depth 1.2285 ft

Critical Velocity 5.0498 ft/s

Critical Slope: 0.0445 ft/ft

Critical Top Width 13.83 ft

Calculated Max Shear Stress 0.6333 lb/ft^2

Calculated Avg Shear Stress 0.3701 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0524

Channel Lining Analysis: Swale OS-1 - Channel Lining Design Analysis Notes:

Lining Input Parameters

Channel Lining Type: Vegetation

Specific Weight of Water: 62.4 lb/ft^3

Height of Vegetation: 0.333 ft

Vegetation Condition is good

Growth Form of Vegetation is mixed

Cf: 0.75

See HEC-15, Table 4.5 (default: 0.75 for Good cover factor and Mixed growth form)

soil is noncohesive

D75: 2.54 mm

Safety Factor: 2

Lining Results

Cn: 0.165205

Permissible Soil Shear Stress: 0.04 lb/ft^2

Mean Boundary Shear Stress: 0.370075 lb/ft^2

Maximum Shear Stress on the Channel Bottom: 0.633261 lb/ft^2

Manning's n: 0.0523705

Soil Grain Roughness: 0.0177136

Effective Shear Stress: 0.0147771 lb/ft^2

Permissible Shear Stress on Vegetation: 1.39856 lb/ft^2

This value is compared with the maximum shear stress times the safety factor to determine lining stability

This value is compared with the maximum shear stress times the safety factor to determine lining stability

Channel bottom is stable

Channel Lining Stability Results 2

The channel is stable

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APPENDIX D Water Quality Computations

Detention Pond Tributary Areas

Subdivision:Grandview ReserveLocation:CO, El Paso County

Project Name:	Grandview Reserve
Project No.:	HRG01
Calculated By:	TJE
Checked By:	BAS
Date:	3/1/22

Pond A		
Basin	Area	% Imp
A-2a	4.42	65
A-2b	2.75	88
A-3	0.36	100
A-4a	6.31	65
A-4b	3.99	65
A-5	0.35	100
A-6	2.76	65
A-7	0.23	100
A-8	5.44	75
A-9	4.91	65
A-10	1.02	65
A-11	3.56	16
Total	36.10	64.3

Pond B

Basin	Area	% Imp
B-1	3.81	56.8
B-2	4.62	63.5
B-3	4.15	65
B-4	1.37	78.5
B-5	5.12	65
B-6	2.28	65
B-7	0.89	65
B-8	3.23	65
B-9	2.42	65
B-10	1.10	2
Total	28.99	61.9

Pon	Ь	C
топ	u	U.

Basin	Area	% Imp
C-1	4.12	65
C-2	2.71	65
C-4	2.47	65
C-5	3.09	65
C-6	2.10	65
C-7a	0.81	44.7
C-7b	5.91	65
C-8	5.11	65
C-9a	3.50	65
C-9b	3.69	65
C-10	3.47	65
C-11	0.46	65
C-12	1.66	65
C-13	2.37	2
Total	41.47	61.0

Pond D

Basin	Area	% Imp
D-1	3.48	65
D-2	0.87	65
D-3	3.62	65
D-4	1.77	65
D-5	1.53	35.7
D-7b	0.88	65
Total	12.15	61.3

Pond E

Basin	Area	% Imp
E-1	5.33	65
E-2	5.42	65
E-3	3.20	65
E-4	6.28	65
E-5	1.13	2
Total	21.36	61.7

	LID	Credit	by Impe	ervious F	Reductio	n Factor	(IRF) Me	thod						
User Input			UD	-BMP (Versior	1 3.06, Novem	ber 2016)								
Calculated cells				Designer:		TJE	e (a							
***Design Storm: 1-Hour Bain Denth WOCV Event	0.60 ir	nches		Date:		May 3, 20	22							
***Minor Storm: 1-Hour Rain Depth 5-Year Event	1.50 ir	nches		Project:		Grandviev	ve Reserve							
***Major Storm: 1-Hour Rain Depth 100-Year Event	2.52 ir	nches		Location:		Pond A								
Optional User Defined Storm CUHP	2.52	licites		Looution										
JHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm 100-Year Event														
Vax Intensity for Optional User Defined Storm 0														
INFORMATION (USER-INPUT)														
Sub-basin Identifier		A-2a	A-2b	A-3	A-4a	A-4b	A-5	A-6	A-7	A-8	A-9	A-10	A-11	
Receiving Pervious Area Soil Type	Sand	dy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	4	1.420	2.750	0.360	6.310	3.990	0.350	2.760	0.230	5.440	4.910	1.020	3.560	
Directly Connected Impervious Area (DCIA, acres)	2	2.873	2.420	0.360	4.100	2.590	0.350	1.794	0.230	4.080	3.192	0.663	0.570	
Unconnected Impervious Area (UIA, acres)	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Receiving Pervious Area (RPA, acres)	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Separate Pervious Area (SPA, acres)	1	.547	0.330	0.000	2.210	1.400	0.000	0.966	0.000	1.360	1.718	0.357	2.990	
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)		с	с	с	с	с	с	с	с	с	с	с	с	
Total Calculated Area (ac, Check, against Input) Directly Connected Impervious Area (DCLA, %) Unconnected Impervious Area (RPA, %) Separate Pervious Area (RPA, %) A, (RPA, UIA) (, Check f // If or VQCV Event: f // If or 100-Year Event: f // If or 100-Year Event: IRF for Optional User Defined Storm CUHP) IRF for Svear Event: IRF for Optional User Defined Storm CUHP Total Site Imperviousness In WQCV Event: Effective Imperviousness for SV ex Event: Effective Imperviousness for SV ex Event:		1.420 55.0% 0.0% 0.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 55.0% 55.0% 55.0%	2.750 88.0% 0.0% 12.0% 0.000 1.000 1.00 1.00 1.00 1.00 1.00 88.0% 88.0% 88.0%	0.360 100.0% 0.0% 0.0% 0.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 1.00	6.310 65.0% 0.0% 0.0% 0.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0%	3.39% 64.9% 0.0% 0.0% 35.1% 0.000 1.70 0.5 0.3 1.000 1.00 1.00 1.00 1.00 1.00 1.00	0.330 100.0% 0.0% 0.0% 0.0% 0.000 1.000 1.7 0.5 0.3 1.00	2.760 65.0% 0.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0%	0.230 100.0% 0.0% 0.0% 0.0% 0.000 1.000 1.7 0.5 0.3 1.00	3,440 75.0% 0.0% 0.0% 25.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 75.0% 75.0%	4.910 65.0% 0.0% 0.0% 0.00% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	1.020 65.0% 0.0% 0.0% 0.0% 0.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0%	3.360 16.0% 0.0% 0.0% 84.0% 0.000 1.000 1.7 0.5 0.3 1.00	
Effective Imperviousness for 100-Year Event:	6	55.0%	88.0%	100.0%	65.0%	64.9%	100.0%	65.0%	100.0%	75.0%	65.0%	65.0%	16.0%	
Effective Imperviousness for Optional User Defined Storm CUHP:														
WQCV Event CREDIT: Reduce Detention By:	N/A (0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	N
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N
100-Year Event CREDIT**: Reduce Detention By: User Defined CUHP CREDIT: Reduce Detention By:	N/A (0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	N
Total Site Effective Imperv Total Site Effective Imperv	Total Site Impervio iousness for WQCV iousness for 5-Yea	ousness: V Event: ar Event:	64.3% 64.3% 64.3%		Notes: * Use Green	-Ampt averag	ge infiltration	rate values f	rom Table 3-	3. uations from	Storage Cha	nter of USDC	M.	

	L	ID Credit	t by Imp	ervious F	eductio	n Factor	(IRF) Me	thod	045 04	iculator				
			UC	-BMP (Versior	1 3.06, Novem	ber 2016)								
User Input														
Calculated cells				Designer:		TJE								
				Company:		Galloway	& Co.							
***Design Storm: 1-Hour Rain Depth WQCV Event	0.60	inches		Date:	-	May 4, 20	22							
***Minor Storm: 1-Hour Rain Depth 5-Year Event	1.50	inches		Project:		Grandviev	v Reserve							
••••Major Storm: 1-Hour Rain Depth 100-Year Event	2.52	inches		Location:		Pond B								
Optional User Defined Storm CUHP		•												
UHP) NOAA 1 Hour Rainfall Depth and Frequency 100-Year Event for User Defined Storm														
Max Intensity for Optional User Defined Storm 0														
E INFORMATION (USER-INPUT)														
Sub-basin Identifier	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10				
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam				
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	3 810	4 620	4 150	1 370	5 120	2 280	0.890	3 230	2 4 2 0	1 100				
Directly Connected Impervious Area (DCIA. acres)	2.164	2.934	2.698	1.075	3.328	1.482	0.579	2.100	1.573	0.022				
Unconnected Impervious Area (UIA. acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
Separate Pervious Area (SPA, acres)	1.646	1.686	1.453	0.295	1.792	0.798	0.312	1.131	0.847	1.078				
RPA Treatment Type: Conveyance (C),														
Volume (V), or Permeable Pavement (PP)	С	с	С	С	с	С	С	С	С	С				
CULATED RESULTS (OUTPUT) Total Calculated Area (ac, check against input) Directly Connected Impervious Area (IDCA, %) Unconnected Impervious Area (IDCA, %) Receiving Pervious Area (RPA, %) Separate Pervious Area (RPA, %)	3.810 56.8% 0.0% 0.0% 43.2%	4.620 63.5% 0.0% 0.0% 36.5%	4.150 65.0% 0.0% 35.0%	1.370 78.5% 0.0% 0.0% 21.5%	5.120 65.0% 0.0% 35.0%	2.280 65.0% 0.0% 35.0%	0.890 65.0% 0.0% 35.0%	3.230 65.0% 0.0% 35.0%	2.420 65.0% 0.0% 35.0%	1.100 2.0% 0.0% 98.0%				
۵- (RPA / ۱۱۱۵)	43.2%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				-
L Check	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000				
f / I for WOCV Event:	1.000	1.000	1.7	1.000	1.7	1.7	1.000	1.000	1.7	1.7				
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5				<u> </u>
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3				1
f / I for Optional User Defined Storm CUHP:														
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I _{total}	56.8%	63.5%	65.0%	78.5%	65.0%	65.0%	65.0%	65.0%	65.0%	2.0%				
Effective Imperviousness for WQCV Event:	56.8%	63.5%	65.0%	78.5%	65.0%	65.0%	65.0%	65.0%	65.0%	2.0%				
Effective Imperviousness for 5-Year Event:	56.8%	63.5%	65.0%	78.5%	65.0%	65.0%	65.0%	65.0%	65.0%	2.0%				
Effective Imperviousness for 100-Year Event: Effective Imperviousness for Optional User Defined Storm CUHP:	56.8%	63.5%	65.0%	78.5%	65.0%	65.0%	65.0%	65.0%	65.0%	2.0%				<u> </u>
grand and a second s				I										-
/ EFFECTIVE IMPERVIOUSNESS CREDITS	0.55	0.55	0.55	0.55	0.07	0.771	0.77	0.55	0.77	0.55				
WQCV Event CREDIT: Reduce Detention By: This line only for 10-Year Event	0.0%	0.0%	0.0%	0.0% N/A	0.0%	0.0%	0.0%	0.0%	0.0% N/A	0.0%	N/A N/A	N/A N/A	N/Α N/Δ	
100-Year Event CREDIT**: Reduce Detention By: User Defined CUHP (REDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-364.4%	N/A	N/A	N/A	
	Total Site Imp	perviousness:	61.9%]	Notes:									
Total Site Effective Imper Total Site Effective Imper Total Site Effective Impervio	viousness for viousness for ousness for 10	WQCV Event: 5-Year Event: 0-Year Event:	61.9% 61.9% 61.9%		Use Green Flood cont *** Method	Ampt average trol detention assumes the	ge infiltration n volume crea at 1-hour rain	rate values f dits based on fall depth is (rom Table 3- empirical ec equivalent to	 uations from 1-hour intens 	Storage Cha sity for calcu	pter of USDC lation purpos	M. ed	

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator LID Credit by Impervious Reduction Factor (IRF) Method														
			UC	D-BMP (Version	1 3.06, Novem	ber 2016)								
User Input														
				Docianor		TIF								
Calculated cells				Company:		Galloway	& Co.							
***Design Storm: 1-Hour Rain Depth WQCV Event	0.60	inches		Date:		May 4, 20	22							
***Minor Storm: 1-Hour Rain Depth 5-Year Event	1.50	inches		Project:		Grandviev	v Reserve							
***Major Storm: 1-Hour Rain Depth 100-Year Event	2.52	inches		Location:		Pond C								
Optional User Defined Storm CUHP														
CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm 100-Year Event														
Max Intensity for Optional User Defined Storm 0														
TE INFORMATION (USER-INPUT)														
Sub-basin Identifier	C-1	C-2	C-4	C-5	C-6	C-7a	C-7b	C-8	C-9a	C-9b	C-10	C-11	C-12	C-13
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Lc
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	4.120	2.710	2.470	3.090	2.100	0.810	5.910	5.110	3.500	3.690	3.470	0.460	1.660	2.370
Directly Connected Impervious Area (DCIA, acres)	2.678	1.762	1.606	2.009	1.365	0.362	3.842	3.322	2.275	2.399	2.256	0.299	1.079	0.047
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Separate Pervious Area (SPA, acres)	1.442	0.949	0.865	1.082	0.735	0.448	2.069	1.789	1.225	1.292	1.215	0.161	0.581	2.323
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	с	с	с	с	с	с	с	с	с	с	с	с	с	с
LLCULATED RESULTS (OUTPUT) Total Calculated Area (ac, check against input) Directly Connected Impervious Area (DCIA, %) Unconnected Impervious Area (UIA, %) Receiving Pervious Area (PAA, %) Separate Pervious Area (PAA, %) A, (RPA / UIA) I, Check f / I for VQCV Event: f / I for 100-Year Event: f / I for 100-Year Event: IRF for T00-Year Event: IRF for T00-Year Event: IRF for 100-Year Event: IRF for 200-Year Event: IRF for 200-Yea	4.120 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	2.710 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	2.470 65.0% 0.0% 35.0% 0.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0%	3.090 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	2.100 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0%	0.810 44.7% 0.0% 55.3% 0.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 44.7% 44.7%	5.910 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0%	5.110 65.0% 0.0% 35.0% 0.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	3.500 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	3.690 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% 65.0%	3.470 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0%	0.460 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0%	1.660 65.0% 0.0% 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0%	2.37/ 2.09 0.09 98.0 0.000 1.000 1.000 1.00 1.00 1.00 1.0
Effective Imperviousness for 100-Year Event: Effective Imperviousness for Optional User Defined Storm CUHP:	65.0%	65.0%	65.0%	65.0%	65.0%	44.7%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	2.0%
WOCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By: User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	-169.1
Total Site Imperviousness: 61.0% Total Site Effective Imperviousness for WQCV Event: 61.0% Total Site Effective Imperviousness for 5-Year Event: 61.0% Total Site Effective Imperviousness for 100-Year Event: 61.0%					Notes: * Use Green **Flood cont *** Method	-Ampt averag trol detention assumes that	ge infiltration n volume cre at 1-hour rair	rate values f dits based on fall depth is o	rom Table 3- empirical ec equivalent to	3. uations from 1-hour inten	Storage Cha sity for calcu	pter of USDC lation purpos	M. sed	

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| Total Site Imr | perviousness. | 61.3%
 | 1

 | Notes: | | |
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| viousness for 1 | WOCV Event | 61.2%
 | +

 | Line Creek | Amot | o infiltentia
 | rato velue - (| rom Tabla ? | 2 |
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| viousness for | 5-Year Event: | 61.3%
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 | Flood con | Ampl average trol detention | e innitration
 | iate values f
lits based on | empirical en | uations from | 1 Storage Cha
 | pter of USDC | м. | |
| usness for 10 | 0-Year Event: | 61.3%
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 | *** Method | assumes that | t 1-hour rain
 | fall depth is o | equivalent to | 1-hour inter | sity for calcu
 | lation purpos | ed | |
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	L	ID Credit	t by Imp	ervious R	Reduction	n Factor	(IRF) Me	thod						
Uses leaved			UC	D-BMP (Version	1 3.06, Novem	ber 2016)								
User Input														
Calculated cells				Designer:		TJE								
·				Company:		Galloway	& Co.							
***Design Storm: 1-Hour Rain Depth WQCV Event	0.60	inches		Date:		May 4, 20	22							
***Minor Storm: 1-Hour Rain Depth 5-Year Event	1.50	inches		Project:		Grandviev	v Reserve							
***Major Storm: 1-Hour Rain Depth 100-Year Event	2.52	inches		Location:		Pond E								
Optional User Defined Storm CUHP														
JHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm 100-Year Event														
Max Intensity for Optional User Defined Storm 0														
E INFORMATION (USER-INPUT)														
Sub-basin Identifier	E-1	E-2	E-3	E-4	E-5									
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam									
	, count	, count	. anay couli	court	, count					L				<u> </u>
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	5.330	5.420	3.200	6.280	1.130									
Directly Connected Impervious Area (DCIA, acres)	3.465	3.523	2.080	4.082	0.023									
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000									-
Receiving Pervious Area (RPA, acres)	1.966	0.000	0.000	0.000	0.000									
Separate Pervious Area (SPA, acres)	1.800	1.097	1.120	2.190	1.107									-
Volume (V), or Permeable Pavement (PP)	С	с	С	с	С									
CIII ATED RESULTS (OUTPUT)														
Total Calculated Area (ac, check against input)	5.330	5.420	3.200	6.280	1.130									1
Directly Connected Impervious Area (DCIA, %)	65.0%	65.0%	65.0%	65.0%	2.0%									
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%									
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%									
Separate Pervious Area (SPA, %)	35.0%	35.0%	35.0%	35.0%	98.0%									
A _R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000									
I _a Check	1.000	1.000	1.000	1.000	1.000									
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7									
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5									
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3									-
f / I for Optional User Defined Storm CUHP:														-
IRF for WQLV Event:	1.00	1.00	1.00	1.00	1.00									
IRE for 100 Vero Private	1.00	1.00	1.00	1.00	1.00									
IRE for Ontional Liser Defined Storm CLUBP	1.00	1.00	1.00	1.00	1.00									-
Total Site Imperviousness: 1	65.0%	65.0%	65.0%	65.0%	2.0%				+		+	1		-
Effective Imperviousness for WOCV Event	65.0%	65.0%	65.0%	65.0%	2.0%									-
Effective Imperviousness for 5-Year Event:	65.0%	65.0%	65.0%	65.0%	2.0%									
Effective Imperviousness for 100-Year Event:	65.0%	65.0%	65.0%	65.0%	2.0%									
Effective Imperviousness for Optional User Defined Storm CUHP:														
V EFFECTIVE IMPERVIOUSNESS CREDITS WOCV Event CREDIT: Reduce Detention By	0.0%	0.0%	0.0%	0.0%	0.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
100-Year Event CREDIT**: Reduce Detention By: User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	-354.7%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N
	Total Site Imp	erviousness:	61.7%]	Notes:									
Total Site Effective Imperi	iousness for 1	WOCV Event	61.7%	1	Lise Groce	Ampt avora	a infiltration	rate values	from Table 3	.2				
Total Site Effective Imperv	iousness for	5-Year Event:	61.7%	1	Flood cont	rol detention	volume cre	dits based or	empirical e	o. Subtions from	Storage Cha	anter of USDC	M.	
			1	noou com	. or acterition	· · · · · · · · · · · · · · · · · · ·	and pased Of	- ciripiritai et	autoris II Off	. Storage Clid	USDCI OI USDC			



DETENTION BASIN STAGE-STORAGE TABLE BUILDER



Denth Inc ent - 0.50 ft

Watershed Information

Silea Information		
Selected BMP Type =	EDB	
Watershed Area =	36.10	acres
Watershed Length =	2,360	ft
Watershed Length to Centroid =	1,180	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	64.30%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

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Water Quality Capture Volume (WQCV) =	0.756	acre-feet		acre-fee
Excess Urban Runoff Volume (EURV) =	2.872	acre-feet		acre-fee
2-yr Runoff Volume (P1 = 1.19 in.) =	2.125	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.788	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	3.319	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.018	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.705	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.540	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.68 in.) =	9.026	acre-feet	3.68	inches
Approximate 2-yr Detention Volume =	1.867	acre-feet		
Approximate 5-yr Detention Volume =	2.442	acre-feet		
Approximate 10-yr Detention Volume =	2.945	acre-feet		
Approximate 25-yr Detention Volume =	3.546	acre-feet		
Approximate 50-yr Detention Volume =	3.909	acre-feet		
Approximate 100-yr Detention Volume =	4.290	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.756	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.115	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.418	acre-feet
Total Detention Basin Volume =	4.290	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H _{total}) =	user	ft
Depth of Trickle Channel $(H_{TC}) =$	user	ft
Slope of Trickle Channel (S _{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S _{main}) =	user	H:V
Basin Length-to-Width Ratio $(R_{L/W}) =$	user	
		_
Initial Surcharge Area $(A_{ISV}) =$	user	ft ²
Surcharge Volume Length $(L_{ISV}) =$	user	ft

Surcharge Volume Width $(W_{ISV}) =$	user	ft
Depth of Basin Floor $(H_{FLOOR}) =$	user	ft
Length of Basin Floor $(L_{FLOOR}) =$	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A _{FLOOR}) =	user	ft ²
Volume of Basin Floor (V_{FLOOR}) =	user	ft ³
Depth of Main Basin $(H_{MAIN}) =$	user	ft
Length of Main Basin $(L_{MAIN}) =$	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A _{MAIN}) =	user	ft ²
Volume of Main Basin (V _{MAIN}) =	user	ft 3
Calculated Total Basin Volume (V _{total}) =	user	acre-feet

	Stare - Storage	Stage	Optional	Length	Width	Area	Optional Override	Area	Volume	Volume
	Description	(ft)	Stage (ft)	(ft)	(ft)	(ft ²)	Area (ft ²)	(acre)	(ft 3)	(ac-ft)
	Top of Micropool		0.00				35	0.001	520	0.012
	0971		1.00				10.771	0.047	3,725	0.012
	6972		1.50				27,585	0.633	13,313	0.306
			2.00				41,785	0.959	30,656	0.704
	6973		2.50				43,839	1.006	52,062	1.195
	6974		3.50				48,022	1.102	97,986	2.249
			4.00				50,151	1.151	122,529	2.813
	6975		4.50				52,306	1.201	148,144	3.401
	6976		5.00				56,691	1.251	202 636	4.014
			6.00				58,921	1.353	231,538	5.315
	6977		6.50				61,176	1.404	261,562	6.005
User Overrides										
acre-feet										
inches										
inches										
inches										
inches										
inches										
inches										
		-								
					-					