

PRELIMINARY DRAINAGE REPORT

GRANDVIEW RESERVE FILING NO. 1

El Paso County, Colorado

PREPARED FOR: D.R. Horton 9555 S. Kingston Court Englewood, CO

Engineering Review

04/20/2022 8:22:53 AM dsdrice JeffRice@elpasoco.com (719) 520-7877 EPC Planning & Community Development Department

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ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Brady A. Shyrock, PE #38164 For and on behalf of Galloway & Company, Inc. Date

DEVELOPER'S CERTIFICATION

I, The developer, have read and will comply with all of the requirements specified in this drainage report and plan.

By:

Date

Address: D.R. Horton 9555 S. Kingston Court Englewood, CO

EL PASO COUNTY CERTIFICATION

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

Jennifer Irvine, P.E. County Engineer/ECM Administrator Date

Conditions:

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I. Purpose

The purpose of this Preliminary Drainage Report is to identify on and offsite drainage patterns, locate and identify tributary or downstream drainage features and facilities that impact the site, and to identify which types of drainage facilities will be needed and where they will be located. This report will remain in general compliance with the approved MDDP prepared by HR Green, dated November 2020.

II. General Description

The project is a single-family residential development located in the Falcon area of El Paso County, Colorado. The site is located in a portion of the South half of Section 21, the North half of Section 28, Township 12 South, Range 64 West of the 6th Principal Meridian, County of El Paso, State of Colorado. The subject property is bounded by Eastonville Road to the west, the proposed extension of Rex Road to the north, undeveloped land proposed as future development to the east, and undeveloped land within the Waterbury Development to the south. A Vicinity Map is included in **Appendix A**.

This preliminary drainage report is the basis for the drainage facility design in conformance with the previously approved MDDP for the site prepared by HR Green, "*Grandview Reserve Master Development Drainage Plan*", HR Green, November 2020 (**MDDP**). The site consists of approximately 189.479 acres and includes 568 dwelling units.

The existing soil types within the proposed site as determined by the NRCS Web Soil Survey for El Paso County Area consist of Columbine gravelly sandy loam (hydrologic soil group A) and Stapleton sandy loam (hydrologic soil group B). See the soils map included in **Appendix A**.

III. Drainage Criteria

Hydrology calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.

The drainage calculations were based on the criteria manual Figure 6-5 and IDF equations to determine the intensity and are listed in Table 1 below.

| Return Period | One Hour Depth (in). | Intensity (in/hr) |
|----------------------|----------------------|-------------------|
| 5-year | 1.50 | 5.17 |
| 100-year | 2.52 | 8.68 |

Table 1 - Precipitation Data

The rational method was used to calculate peak flows as the tributary areas are less than 100 acres. The rational method has been proven to be accurate for basins of this size and is based on the following formula:

Q = CIA

Where:

Q = Peak Discharge (cfs)
C = Runoff Coefficient
I = Runoff intensity (inches/hour)
A = Drainage area (acres)

The runoff coefficients are calculated based on land use, percent imperviousness, and design storm for each basin, as shown in the drainage criteria manual (Table 6-6). Composite percent impervious and C values were calculated using the residential, streets, roofs, and lawns coefficients found in Table 6-6 of the manual.

The 100-year event was used as the major storm event. The 5-year event was used as the minor event. The UD-Inlets v5.01 spreadsheet was utilized for the sizing of the proposed sump inlets.

The UD-Detention v4.04 spreadsheet was utilized for the design of the proposed on-site water quality ponds, Ponds A, B, C, D, E.

IV. Existing Drainage Conditions

The site is contained fully within one major drainage basin; the Gieck Ranch Drainage Basin and is tributary to Black Squirrel Creek. The site generally drains from north to south with an average slope of 2% outside of the channel. The rational method was used to analyze the individual basins within the site because their size permits it.

There are two (2) major drainageways that currently convey existing on & off-site flows through the site to the southeast. These are the Main Stem (MS) and Main Stem Tributary Number 2 (MST) as referenced in the **MDDP**. Both drainageways generally flow to the southeast towards Highway 24, before crossing via existing drainage structures. Currently, these channels receive flows from two off-site basins, one from the west (west of Basin B1 per the **MDDP**; 0.17 mi², $Q_5 = \pm 67$ cfs, $Q_{100} = \pm 413$ cfs) and the second from the northwest of Basin C1 per the **MDDP**; 0.44 mi², $Q_5 = \pm 59$ cfs, $Q_{100} = \pm 280$ cfs) and are routed under Eastonville Road via existing pipe culverts. There is an existing 24" CMP that conveys runoff under Eastonville Road at the MS, a location approximately 650 feet north of the proposed Rex Road extension that directs runoff via overtopping Eastonville Road at MST, and a 20" x 27" ECMP that directs runoff beneath Eastonville Road at the Falcon Regional Park.

While the **MDDP** shows a total of 22 basins that were analyzed as part of the overall Grandview Reserve development, for the purposes of this report, 7 of the Basins within the MDDP will be used for analysis. These Basins include A1, B1, B2, C1, B3, and the two off-site Basins situated to the northwest of Eastonville Road.

For a more in-depth analysis of existing tributary conditions as it pertains to this phase of development, an existing basin map has been prepared. The existing map can be found in **Appendix F** and basins are described below.

Basin EX-1 (16.18 AC, $Q_5 = 4.4$ cfs, $Q_{100} = 31.5$ cfs): Located on the southwest portion of the site, this basin consists of un-developed land. Runoff from this basin will sheet flow to the southeast before channelizing and eventually out falling into Main Stem channel (**DP 1**).

Address the combined flows $\sqrt{1000}$ including flows from the west

Basin EX-2 (46.06 AC, $Q_5 = 10.3$ cfs, $Q_{100} = 72.8$ cfs): Located in the southwest portion of the site, this basin consists of un-developed land. Runoff from this basin will sheet flow to the Main Stem channel (**DP** 2).

Basin EX-3 (64.34 AC, $Q_5 = 13.1$ cfs, $Q_{100} = 93.3$ cfs): Located in the central portion of the site, this basin consists of un-developed land. Runoff from this basin will sheet flow to the southeast before channelizing and eventually out falling into Main Stem Tributary #2 channel (**DP 3**).

Basin EX-4 (2.68 AC, $Q_5 = 0.8$ cfs, $Q_{100} = 6.1$ cfs): Located on the eastern portion of the site, this basin consists of un-developed land. Runoff from this basin will sheet flow to the east into Main Stem Tributary #2 channel (**DP 4**).

Basin EX-5 (26.15 AC, $Q_5 = 6.5$ cfs, $Q_{100} = 46.5$ cfs): Located in the north central portion of the site, this basin consists of un-developed land. Runoff from this basin will sheet flow to the southeast before channelizing and eventually out falling into Main Stem Tributary #2 channel (**DP 5**).

Basin EX-6 (31.53 AC, $Q_5 = 8.6$ cfs, $Q_{100} = 60.9$ cfs): Located on the northern portion of the site, this basin consists of un-developed land. Runoff from this basin will sheet flow to the southeast before channelizing and eventually out falling into Main Stem Tributary #2 channel (**DP 6**).

Runoff generated at Design Points 3, 4, 5, and 6 combine at Design Point 7 at the southeast corner of the property within the Main Stem Tributary #2 channel (**DP 7**).

V. Four Step Process

The Four Step Process is used to minimize the adverse impacts of urbanization and is a vital component of developing a balanced, sustainable project. Below identifies the approach to the four-step process:

1. Employ Runoff Reduction Practices

This step uses low impact development (LID) practices to reduce runoff at the source. Generally, rather than creating point discharges that are directly connected to impervious areas runoff is routed through pervious areas to promote infiltration. The Impervious Reduction Factor (IRF) method was used and calculations can be found in **Appendix E.**

2. Stabilize Channels

This step implements stabilization to channels to accommodate developed flows while protecting infrastructure and controlling sediment loading from erosion in the drainageways. Erosion protection in the form of riprap pads at all outfall points to the channel to prevent scouring of the channel from point discharges. The existing channel analysis and design for the Main Stem Channel (MS) is to be completed by others and a report for the channel improvements will be submitted for review separately.

Provide Water Quality Capture Volume (WQCV)

This step utilizes formalized water quality capture volume to slow the release of runoff from the site. The EURV volume will release in 72 hours, while the WQCV will release in no less than 40 hours. Onsite water quality control volume detention ponds will provide water quality treatment for all of the developed areas, prior to the runoff being released into either of the major drainage ways. Refer to WQCV Plan in **Appendix F.**

3.

4. Consider Need for Industrial and Commercial BMPs

As this project is all residential development and no commercial or industrial development is proposed, there will be no need for any specialized BMPs which would be associated with an industrial or commercial site.

VI. Proposed Drainage Conditions

The proposed development lies completely within the Gieck Ranch Drainage Basin and consists of five (5) larger basins (A, B, C, D, &E) which have been broken down into fifty-three (53) smaller sub-basins. Site runoff will be collected via inlets & pipes and diverted to one of the nine proposed full spectrum detention ponds. All necessary calculations can be found within the appendices of this report.

According to the **MDDP**, there are two major drainageways that run through the site. As was discussed within the Existing Conditions portion of the report, both the Main Stem (MS) and Main Stem Tributary Number 2 (MST) run through the site conveying runoff from the northwest to the southeast. Presently, these channels receive flows from two off-site basins, one from the west (west of Sub-basin OS-3 per this report and Basin B1 per the **MDDP**; 0.17 mi², $Q_5 = \pm 67$ cfs, $Q_{100} = \pm 413$ cfs) and the second from the north (northwest of Sub-basin OS-1 per this report and Basin C1 per the **MDDP**; 0.44 mi², $Q_5 = \pm 59$ cfs, $Q_{100} = \pm 280$ cfs) and are routed under Eastonville Road via existing pipe culverts. There is an existing 24" CMP that conveys runoff under Eastonville Road at the MS, a location approximately 650 feet north of the proposed Rex Road extension that directs runoff via overtopping Eastonville Road at MST, and a 20" x 27" ECMP that directs runoff beneath Eastonville Road at the Falcon Regional Park.

Basin OS-1 (3.28 AC, $Q_5 = 7.2$ cfs, $Q_{100} = 15.1$ cfs) and **Basin OS-2** (2.31 AC, $Q_5 = 4.6$ cfs, $Q_{100} = 10.3$ cfs): Located at the northwestern border of the site within the public ROW for Eastonville Road, contains the proposed improvements to Eastonville Road. This drainage basin consists entirely of onsite roadway improvements outside of the project site. Runoff from this basin will sheet flow to the proposed curb & gutter along Eastonville Road. The flows will then be routed to the south where they will be captured by a combination of inlets, roadside swale, and storm sewer piping, which will convey and discharge the developed runoff into a detention pond on the north side of the MS and west of Eastonville Road (Northern Pond). Runoff will be treated prior to being released at historic rates immediately upstream from the MS and Eastonville Road.

Basin OS-3 (3.02 AC, $Q_5 = 7.0$ cfs, $Q_{100} = 15.3$ cfs) and **Basin OS-4** (3.00 AC, $Q_5 = 6.2$ cfs, $Q_{100} = 14.3$ cfs): Located at the southwestern border of the site within the public ROW for Eastonville Road, contains the proposed improvements to Eastonville Road. This drainage basin consists entirely of onsite roadway improvements outside of the project site. Runoff from this basin will sheet flow to the proposed curb & gutter along Eastonville Road. The flows will then be routed to the north where they will be captured by a combination of inlets, roadside swale, and storm sewer piping, which will convey and discharge the developed runoff into a detention pond on the north side of the MS and west of Eastonville Road (Southern Pond). Runoff will be treated prior to being released at historic rates immediately upstream from the MS and Eastonville Road.

Preliminary sizing calculations for the two FSD facilities has been completed with the northern and southern ponds requiring approximately 1.035 ac-ft and 0.522 ac-ft of storage capacity, respectively. Preliminary sizing for the MS and Eastonville Road crossing has been included as part of the "*Final Drainage Report for Eastonville Road from Future Rex Road to Londonderry Drive*", by HR Green, March

2022. This crossing will require 3-60" RCP pipes with type M riprap for 50' L x 30' W at the downstream end.

There are no proposed major channel improvements for MS associated with this development -however, MST is proposed to be re-routed. The analysis for both channels and design of MST were done by others and a separate report will be submitted for review for all channel improvements.

The site will provide five (5) Full Spectrum Extended Detention Basins (EDBs). Ponds A, B, C, D, & E, will discharge treated runoff at historic rates directly into either the MS or MST Channel. The project site will also provide two (2) Temporary Sediment Basins (TSBs). TSB-1 at Rex Road and TSB-2 at the southern corner of the church property will discharge treated runoff at historic rates directly into MST at the northern portion of the project site.

The Rex Rd. TSB or SFB will need to be sized to function as a PBMP.

As has been mentioned previously, the site is proposed to have a land use of single family residential. The site will consist primarily of 1/8 Acre lots, with some 1/4 Acre and 1/3 Acre lots, public roadways, along with dedicated Tracts for amenity and/or institutional uses. TSB?

The proposed institutional use (**Sub-basin A-1**) area flows have been included in this analysis at a preliminary level only. The Sub-basin is located on the northwest corner of the site, East of Eastonville Rd. & south of the proposed extension of Rek Rd. It is assumed that the area will have a conservative imperviousness value of 90%. Sub-basin A-1 encompasses an area of 11.23 area and proposed developed runoff for the site has been calculated to be $Q_5 = 46.4$ cfs, $Q_{100} = 90.7$ cfs. However, in the interim conditions, runoff from this basin ($Q_5 = 4.2$ cfs, $Q_{100} = 29.9$ cfs) will sheet flow from the northwest to the southeast, to a separate, temporary onsite detention and water quality facility (SPB) positioned at the southeastern corner of the property, where treated flows will be released to a proposed modified CDOT Type 'C' inlet on the west side of lyvbridge Boulevard (DP 1). Flows will then be routed under Ivybridge Boulevard, via 24" RCP, to the updated Main Stem Tributary 2 channel. It is anticipated that the property will be developed at a later date as a fill in subsequent to the proposed development of the majority of this project site. This property will need to submit a separate drainage report, complete with an updated water quality and detention design, as part of its development. Installation of an internal storm sewer system separate from the outfall for the property will be required. The development is responsible for ensuring the site drainage, once constructed, will not adversely impact any adjacent properties and downstream facilities. Preliminary pond sizing calculations have been provided in Appendix E for reference. As stated above, water quality and detention will be addressed with the future development of the institutional site.

Basin-1 (1.22 AC, $Q_5 = 4.2$ cfs, $Q_{100} = 8.4$ cfs): Located at the northern border of the site, Basin-1 contains the proposed Phase 1 improvements to Rex Rd. This drainage basin consists entirely of onsite roadway improvements within the project site. Runoff from this basin will sheet flow to the proposed curb & gutter along Rex Rd. The flows will then be routed to the east where they will be conveyed to a proposed Sand Filter Basin (SFB) where runoff will be treated prior to discharging into Main Stem Tributary #2 channel.

Basin A-2a (4.21 AC, $Q_5 = 8.1$ cfs, $Q_{100} = 18.9$ cfs): Located on the north portion of the site, this basin consists of residential lots, Tintagel Trail, and a portion of the north half of Dawlish Drive. Runoff from this basin will sheet flow from the lots to the adjacent road. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located on the northeast side of the intersection of Tintagel Trail and Dawlish Drive (**DP 2a**).

Basin A-2b (2.75 AC, $Q_5 = 8.4$ cfs, $Q_{100} = 16.7$ cfs): Located on the north portion of the site, this basin consists of residential lots, Ivybridge Boulevard, and a portion of the north half of Dawlish Drive. Runoff from this basin will sheet flow from the residential lots to the adjacent Dawlish Drive and directly from within the ROW of Ivybridge Boulevard. Flows will then be routed, via curb & gutter, to a proposed (public) 20' CDOT Type 'R' inlet in sump conditions, located on the northeast side of the intersection of Ivybridge Boulevard and Dawlish Drive (**DP 2b**).

Basin A-3 (0.36 AC, $Q_5 = 1.6$ cfs, $Q_{100} = 3.2$ cfs): Located on the north portion of the site, this basin consists of a portion of the south half of Dawlish Drive. Flows will be routed, via curb & gutter, to a proposed (public) 5' CDOT Type 'R' inlet in sump conditions, located on the southeast side of the intersection of Ivybridge Boulevard and Dawlish Drive (**DP 3**).

Basin A-4a (6.05 AC, $Q_5 = 9.4$ cfs, $Q_{100} = 21.9$ cfs): Located on the northwestern portion of the site, this basin consists of residential lots, Primley Woods Path, and a portion of the west half of Dawlish Drive. Runoff from this basin will sheet flow from the lots to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' at-grade inlet, located on the west side of Dawlish Drive **(DP 4a)**, between Primley Woods Path and St Ives Way. Bypass flows will then be routed downstream to a proposed (public) 15' CDOT Type 'R' sump inlet, located on the west side of Dawlish Drive directly across from Sparkwell Street **(DP4)**. Emergency overflows will be routed downstream via proposed curb and gutter to Design Point 7 within Sparkwell Street.

Basin A-4b (3.81 AC, $Q_5 = 6.2$ cfs, $Q_{100} = 14.5$ cfs): Located on the northwestern portion of the site, this basin consists of residential lots, St Ives Way, and a portion of the west half of Dawlish Drive. Runoff from this basin will sheet flow from the lots to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' at-grade inlet, located on the west side of Dawlish Drive **(DP 4b)**, between Primley Woods Path and St Ives Way. Bypass flows will then be routed downstream to a proposed (public) 15' CDOT Type 'R' sump inlet, located on the west side of Dawlish Drive directly across from Sparkwell Street **(DP4)**. Emergency overflows will be routed downstream via proposed curb and gutter to Design Point 7 within Sparkwell Street.

Basin A-5 (0.35 AC, $Q_5 = 1.6$ cfs, $Q_{100} = 3.1$ cfs): Located on the north portion of the site, this basin consists of a portion of the east half of Dawlish Drive. Flows will be routed, via curb & gutter, to a proposed (public) 5' CDOT Type 'R' inlet in sump conditions, located on the east side of Dawlish Drive (DP 5), Just north of the intersection of Sparkwell Street and Dawlish Drive. Emergency overflows will be routed downstream via proposed curb and gutter to Design Point 7 within Sparkwell Street.

Basin A-6 (2.76 AC, $Q_5 = 4.6$ cfs, $Q_{100} = 10.7$ cfs): Located centrally on the site, this basin consists of residential lots, Penryn Circle, and a portion of the south half of Sparkwell Street. Runoff from this basin will sheet flow from the lots to the adjacent road. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' inlet in sump conditions, located on the south side of Sparkwell Street (**DP 6**), Just southeast of the intersection of Penryn Circle & Sparkwell Street. Emergency overflows will overtop Sparkwell Street crown to Design Point 7 (**DP 7**), then overtop curb and gutter and be routed downstream via an overflow swale to proposed Pond A.

Basin A-7 (0.23 AC, $Q_5 = 1.1$ cfs, $Q_{100} = 2.0$ cfs): Located centrally on the site, this basin consists of a portion of the north half of Sparkwell Street. Runoff from this basin will sheet flow from edge of ROW to the adjacent road. Flows will then be routed, via curb & gutter, to a proposed (public) 5' CDOT Type 'R' inlet in sump conditions, located on the north side of Sparkwell Street (**DP 7**), Just northeast of the

private?

intersection of Penryn Circle & Sparkwell Street. Emergency overflows will overtop curb and gutter and be routed downstream via an overflow swale to proposed Pond A.

Basin A-8 (5.44 AC, $Q_5 = 14.7$ cfs, $Q_{100} = 30.8$ cfs): Located centrally on the site, this basin consists entirely of proposed amenity / park facilities. Runoff from this basin will sheet flow to paved parking lot and drive aisle with curb and gutter. Flows will then be routed, via curb & gutter, to a series of proposed (public) CDOT Type 'R' inlets and area inlets with storm sewer piping conveying generated runoff downstream to Design Point 8 (**DP 8**), located at the southeast corner of the park site. Emergency overflows will overtop curb and gutter and will sheet flow, across green space, to proposed Pond A.

Basin A-9 (4.91 AC, $Q_5 = 7.4$ cfs, $Q_{100} = 17.3$ cfs): Located in the central portion of the site, directly west from Pond A. This basin consists of residential lots, one-half of Pixie Place, a section of Salcombe Trail, and a section of the west half of Sparkwell Street. Runoff from this basin will sheet flow to the proposed roadways, where runoff will be directed downstream, via curb & gutter, a proposed (public) 20' CDOT Type 'R' sump inlet (**DP 7a**). Runoff is then conveyed downstream to **DP 7b** where additional runoff is added from Sub-basin A-10.

Basin A-10 (1.02 AC, $Q_5 = 2.1$ cfs, $Q_{100} = 4.9$ cfs): Located in the central portion of the site, directly west from Pond A. This basin consists of residential lots and the easter half of a section of Sparkwell Street. Runoff from this basin will sheet flow to the proposed roadway, where runoff will be directed downstream, via curb & gutter, a proposed (public) 5' CDOT Type 'R' sump inlet (**DP 7b**). Runoff is then directed downstream to the northwest corner of Pond A. Flows will then be routed to the outlet structure (**DP 8**), via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem Tributary #2 channel. Emergency overflows will overtop via an emergency spillway and be routed downstream directly to MST.

Basin A-11 (3.56 AC, $Q_5 = 2.0$ cfs, $Q_{100} = 8.6$ cfs): Located on the eastern limits of the site, adjacent to the proposed Main Stem Tributary #2 drainageway. This basin consists of the rear portion of lots along Sparkwell Street and the proposed (private) Full Spectrum Detention Pond A. Runoff from this basin will sheet flow directly to Pond A. Flows will then be routed to the outlet structure (**DP 8**), via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem Tributary #2 channel. Emergency overflows will overtop via an emergency spillway and be routed downstream directly to MST.

Basin B-1 (3.33 AC, $Q_5 = 5.3$ cfs, $Q_{100} = 12.3$ cfs): Located on the western limits of the site, adjacent to Eastonville Road. This basin consists of residential lots and the southwest portion of Pixie Place. Runoff from this basin will sheet flow from the lots to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' inlet in sump conditions, located at the end of the Cul-De-Sac of Pixie Place (DP 9). Emergency overflows will overtop curb and gutter and be routed downstream via an overflow swale to Dawlish Drive and then downstream via curb & gutter to Design Point DP 10b.

Basin B-2 (4.51 AC, $Q_5 = 7.1$ cfs, $Q_{100} = 16.5$ cfs): Located on the western limits of the site, partially adjacent to Eastonville Road. This basin consists of residential lots, the northwest portion of Pixie Place and the northwestern portion of Dawlish Drive. Runoff from this basin will sheet flow from the lots to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet **(DP 10a)**, located on the northwest side of Dawlish Drive, northeast of Marazion Way. Bypass flows are conveyed downstream via curb & gutter to **DP 10b** where a proposed (public) 15' CDOT Type 'R' at-grade inlet captures flows.

Basin B-3 (4.05 AC, $Q_5 = 7.8$ cfs, $Q_{100} = 18.2$ cfs): Located on the western portion of the site, this basin consists of residential lots, the northwest portion of Dawlish Drive, and Marazion Way. Runoff from this basin will sheet flow from the lots to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' sump inlet (DP 10b), located northeast from the intersection of Dawlish Drive and Zelda Street. on the northwest side of Dawlish Drive, northeast of Marazion Way. Emergency overflows will overtop the crown of the roadway and be conveyed downstream via curb and gutter to Design Point DP 11, DP12b, and DP13.

Basin B-4 (1.35 AC, $Q_5 = 4.5$ cfs, $Q_{100} = 9.2$ cfs): Located in the west-central portion of the site. This basin consists of the southeast portion of Dawlish Drive. Runoff from this basin will sheet flow directly to the curb & gutter and be directed downstream to a proposed (public) 10' CDOT Type 'R' inlet in sump conditions, located east of the intersection of Dawlish Drive & Zelda Street (DP 11). Emergency overflows will overtop the curb return flowline and be conveyed downstream via curb and gutter to Design Point DP 12b.

Basin B-5 (5.12 AC, $Q_5 = 7.9$ cfs, $Q_{100} = 18.5$ cfs): Located centrally on the site, this basin consists of residential lots, Marazion Way, the northwest portion of Salcombe Trail, and the southwest portion of Pixie Place. Runoff from this basin will sheet flow from the lots to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' at-grade inlet (**DP 12a**), located on the northwest side of Salcombe Trail, northeast of the intersection between Zelda Street and Salcombe Trail. Bypass flows are conveyed downstream via curb & gutter to **DP 12b**.

Basin B-6 (2.28 AC, $Q_5 = 3.7$ cfs, $Q_{100} = 8.7$ cfs): Located centrally on the site. This basin consists of residential lots and the northwest portion of Plinky Plonk Path. Runoff from this basin will sheet flow from the lots to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' at-grade inlet, located on the northwest side of Plinky Plonk Path (DP 14). Bypass flows are conveyed downstream via curb & gutter to **DP 12b**.

Basin B-7 (0.89 AC, $Q_5 = 1.6$ cfs, $Q_{100} = 3.8$ cfs): Located centrally on the site. This basin consists of residential lots and the southeast portion of Plinky Plonk Path. Runoff from this basin will sheet flow from the lots to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' at-grade inlet, located on the southeast side of Plinky Plonk Path (DP 15). Bypass flows are conveyed downstream via curb & gutter to **DP 12b**.

Basin B-8 (3.23 AC, $Q_5 = 5.3$ cfs, $Q_{100} = 12.4$ cfs): Located centrally on the site. This basin consists of residential lots, the southeast portion of Plinky Plonk Path, and the northeast portion of Zelda Street. Runoff from this basin will sheet flow from the lots to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 20' CDOT Type 'R' sump inlet, located on the southeast side of the intersection between Plinky Plonk Path and Zelda Street (**DP 12b**). Emergency overflows will overtop the crown of the roadway and be conveyed downstream via curb and gutter to Design Point **DP 13**.

Basin B-9 (2.42 AC, $Q_5 = 3.8$ cfs, $Q_{100} = 9.0$ cfs): Located centrally on the site, adjacent to the Main Stem channel. This basin consists residential lots and the southwest portion of Zelda Street. Runoff from this basin will sheet flow from the lots to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' sump inlet, located on the southwest side of the intersection between Plinky Plonk Path and Zelda Street (**DP 13**). Emergency overflows will overtop the curb & gutter of the roadway and be conveyed downstream via a graded swale into Pond B (**DP 16**).

Basin B-10 (1.10 AC, $Q_5 = 0.5$ cfs, $Q_{100} = 3.3$ cfs): Located centrally on the site, adjacent to the Main Stem channel. This basin consists of the proposed (private) Full Spectrum Detention Pond B. Runoff from this basin will sheet flow directly to Pond B. Flows will then be routed to the outlet structure **(DP 16)**, via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem channel.

Basin C-1 (4.12 AC, $Q_5 = 6.8$ cfs, $Q_{100} = 16.0$ cfs): Located on the east portion of the site, this basin consists of residential lots and the eastern half of a portion of Salcombe Trail. Runoff from this basin will sheet flow from the lots to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located on the southeast side of the intersection of Stoke Gabriel Way and Totness Terrace (**DP 17b**). Bypass flows are conveyed downstream via curb & gutter to **DP 17e**.

C Dr. and Totness Terrace

Basin C-2 (2.71 AC, $Q_5 = 4.9$ cfs, $Q_{100} = 11.4$ cfs): Located on the eastern portion of the site, this basin consists of residential lots and the southern portion of Roads O & R. Runoff from this basin will sheet flow from the lots to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet (DP 17a), located on the southwest side of the intersection of Stoke Gabriel Way and Totness Terrace. Bypass flows are conveyed downstream via curb & gutter to DP 17c.

Basin C-3 (1.56 AC, Q₅ = 3.3 cfs, Q₁₀₀ = 7.7 cfs): Located on the southeast polition of the site, this basin consists of residential lots and the eastern half of Totness Terrace. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet (DP 17a), located on the southwest side of the intersection of Stoke Gabriel Way and Totness Terrace. Bypass flows are conveyed downstream via curb & gutter to DP 17c.

Basin C-4 (2.47 AC, $Q_5 = 4.1$ cfs, $Q_{100} = 9.6$ cfs): Located on the southeast portion of the site, this basin consists of residential lots and the eastern half of Frogmore Lane. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet (**DP 17c**), located on the southwest side of the intersection of Stoke Gabriel Way and Frogmore Lane. Bypass flows are conveyed downstream via curb & gutter to **DP 17d**.

Basin C-5 (3.09 AC, $Q_5 = 5.5$ cfs, $Q_{100} = 12.8$ cfs): Located on the southeast portion of the site, this basin consists of residential lots and the western half of Stoke Gabriel Way. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet (**DP 17d**), located on the northwest side of the intersection of Stoke Gabriel Way and Galmpton Drive. Bypass flows are conveyed downstream via curb & gutter to **DP 17g**.

Basin C-6 (2.10 AC, $Q_5 = 3.2$ cfs, $Q_{100} = 7.4$ cfs): Located on the southeast portion of the site, this basin consists of residential lots and the eastern half of Stoke Gabriel Way. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet (**DP 17e**), located on the northeast side of the intersection of Stoke Gabriel Way and Galmpton Drive. Bypass flows are conveyed downstream via curb & gutter to **DP 17h**.

Basin C-7 (6.72 AC, $Q_5 = 11.3$ cfs, $Q_{100} = 26.3$ cfs): Located in the central portion of the site, this basin consists of residential lots and the **eastern** half of **Galmpton** Drive. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet **(DP 18a)**, located on the west side of the intersection of **Totness** Terrace and Galmpton Drive. Bypass flows are conveyed downstream via curb & gutter to **DP 18b**.

Basin C-8 (5.11 AC, $Q_5 = 8.6$ cfs, $Q_{100} = 20.0$ cfs): Located in the central portion of the site, this basin consists of residential lots, a portion of Totness Terrace, and the western half of Galmpton Drive. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet (DP 17f), located on the southeast side of the intersection of Totness Terrace and Galmpton Drive. Bypass flows are conveyed downstream via curb & gutter to DP 17g and DP 17h.

Basin C-9a (3.5 AC, $Q_5 = 5.6$ cfs, $Q_{100} = 13.1$ cfs): Located on the southeast corner of the site, this basin consists of residential lots, a portion of Frogmore Lane, and the northern half of Galmpton Drive. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' sump inlet (DP 17g), located on the north side of Galmpton Drive **just north of Hope Cove Loop**. Bypass flows are conveyed downstream via curb & gutter to DP 17h. Emergency overflows will overtop the crown of Galmpton Drive and be routed downstream via proposed curb and gutter to Design Point **18b** within Galmpton Drive.

Basin C-9b (3.69 AC, $Q_5 = 5.9$ cfs, $Q_{100} = 13.7$ cfs): Located on the southeast corner of the site, this basin consists of residential lots and the northern half of Galmpton Drive. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 20' CDOT Type 'R' sump inlet (DP 17h), located on the north side of Galmpton Drive just north of Hope Cove Loop. Emergency overflows will overtop the crown of Galmpton Drive and be routed downstream via proposed curb and gutter to Design Point **18b** within Galmpton Drive.

Basin C-10 (3.51 AC, $Q_5 = 5.2$ cfs, $Q_{100} = 12.2$ cfs): Located on the southeast corner of the site, this basin consists of residential lots and the southern half of Galmpton Drive. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' sump inlet (**DP 18b**), located on the south side of Galmpton Drive just north of Hope Cove Loop. Emergency overflows will overtop the curb & gutter of Galmpton Drive and be routed downstream via a graded grassed swale and curb & gutter within Hope Cove Loop to Design Point **19** within Hope Cove Loop.

Basin C-11 (0.46 AC, $Q_5 = 1.0$ cfs, $Q_{100} = 2.3$ cfs): Located on the southeast corner of the site, this basin consists of a grassed amenity area and the north half of Hope Cove Loop. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 5' CDOT Type 'R' sump inlet (**DP 19**), located on the north side of Hope Cove Loop. Emergency overflows will overtop the crown of Hope Cove Loop and be routed downstream via curb & gutter to Design Point **20** within Hope Cove Loop.

Basin C-12 (1.79 AC, $Q_5 = 3.1$ cfs, $Q_{100} = 7.2$ cfs): Located on the southeast corner of the site, this basin consists of a grassed amenity area and the north half of Hope Cove Loop. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 5' CDOT Type 'R' sump inlet (**DP 20**), located on the south side of Hope Cove Loop. Emergency overflows will overtop the curb & gutter of Hope Cove Loop and be routed downstream via a graded swale to Design Point **21** within Pond C.

Basin C-13 (2.37 AC, $Q_5 = 0.8$ cfs, $Q_{100} = 5.5$ cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists of the proposed (private) Full Spectrum Detention Pond C. Runoff from this basin will sheet flow directly to Pond C. Flows will then be routed to the outlet structure (**DP 21**), via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem channel.

Basin C-14 (1.53 AC, $Q_5 = 0.5$ cfs, $Q_{100} = 3.8$ cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists of the undeveloped area outside and downstream of the proposed (private) Full Spectrum Detention Pond C. Runoff from this basin will sheet flow directly to the Main Stem Tributary Number 2 (MST).

Verify grades, ped crossing and crosspan

Basin D-1 (2.98 AC, $Q_5 = 4.6$ cfs, $Q_{100} = 10.9$ cfs): Located on the southwest portion of the site, adjacent to Eastonville Road. This basin consists of residential lots, the west half of Kate Meadow Lane, and the north half of Brixham Drive. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' inlet in sump conditions, located on the west side of Kate Meadow Lane (DP 22), just north of the intersection of Kate Meadow Lane & Farm Close Court. Emergency overflows will overtop the crown of Kate Meadow Lane and be routed downstream via curb & gutter to Design Point 23 within Kate Meadow Lane.

enter crosspan and flow to DP24? –

Basin D-2 (0.87 AC, $Q_5 = 1.7$ cfs, $Q_{100} = 4.0$ cfs): Located on the southwest portion of the site, this basin consists of residential lots and the eastern half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' inlet in sump conditions, located on the east side of Kate Meadow Lane (**DP 23**), just southeast of the intersection of Kate Meadow Lane & Farm Close Court. Emergency overflows will pool up and be routed around the curb return at the intersection of Kate Meadow Lane and Farm Close Court downstream via curb & gutter to Design Point **24** within Farm Close Court.

Basin D-3 (3.66 AC, $Q_5 = 6.0$ cfs, $Q_{100} = 14.0$ cfs): Located on the southwest portion of the site, this basin consists of residential lots and the <u>eastern</u> half of Farm Close Court. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' inlet in sump conditions, located on the west side of Farm Close Court (**DP 24**), just southeast of the intersection of Kate Meadow Lane & Farm Close Court. Emergency overflows will overtop the crown and be routed downstream via curb & gutter in Farm Close Court to Design Point **25**.

Basin D-4 (2.00 AC, $Q_5 = 3.7$ cfs, $Q_{100} = 8.5$ cfs): Located on the southwest portion of the site, this basin consists of residential lots and the eastern half of Farm Close Court. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 10' CDOT Type 'R' inlet in sump conditions, located on the east side of Farm Close Court (**DP 25**), just southeast of the intersection of Kate Meadow Lane & Farm Close Court. Emergency overflows will overtop curb & gutter and be routed downstream via a graded swale within the maintenance access path to Pond D at Design Point **26**.

Basin D-5 (1.53 AC, $Q_5 = 2.0$ cfs, $Q_{100} = 6.0$ cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists partially of residential lots and the proposed (private) Full Spectrum Detention Pond D. Runoff from this basin will sheet flow directly to Pond D. Flows will then be routed to the outlet structure (DP 26), via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem channel.

Basin D-6 (0.83 AC, $Q_5 = 0.3$ cfs, $Q_{100} = 2.1$ cfs): Located on the southwest corner of the site, adjacent to the Main Stem channel. This basin consists of the undeveloped area outside and downstream of the proposed (private) Full Spectrum Detention Pond D. Runoff from this basin will sheet flow directly to the Main Stem channel (MS).

Grandview Reserve Filing No. 1 PDR

Address the Eastonville Road culvert crossings into Basins D1, E1, and A-4a

Basin D-7 (1.80 AC, $Q_5 = 2.5$ cfs, $Q_{100} = 6.5$ cfs): Located on the southwest corner of the site, adjacent to the Main Stem channel. This basin consists of the back portions of residential lots and a drainage swale. Runoff from this basin will sheet flow from the residential lots, into the adjacent swale and will be routed directly to Pond D.

Basin E-1 (5.13 AC, $Q_5 = 9.5$ cfs, $Q_{100} = 22.1$ cfs): Located on the southern portion of the site, this basin consists of residential lots, the southern half of Brixham Drive, Starcross Court, and the southern half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located on the southwest corner of the intersection between Kate Meadow Lane and Mill Yard Circle (**DP 27**), just north of the cul-de-sac. Bypass flows are conveyed downstream via curb & gutter to **DP 29**.

Basin E-2 (5.42 AC, $Q_5 = 10.1$ cfs, $Q_{100} = 23.6$ cfs): Located on the southern portion of the site, this basin consists of residential lots, a small portion of Mill Yard Circle, and the north half of Kate Meadow Lane. Runoff from this basin will sheet flow to the adjacent roadways. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' at-grade inlet, located on the northwest corner of the intersection between Kate Meadow Lane and Mill Yard Circle (**DP 28**), just north of the cul-de-sac. Bypass flows are conveyed downstream via curb & gutter to **DP 29**.

Basin E-3 (3.20 AC, $Q_5 = 6.0$ cfs, $Q_{100} = 14.0$ cfs): Located on the southern portion of the site, this basin consists of residential lots and the western half of Mill Yard Circle. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 15' CDOT Type 'R' sump inlet, located just northeast from the cul-de-sac of Mill Yard Circle (**DP 29**). Emergency overflows will overtop the crown of Mill Yard Circle and be routed downstream via curb & gutter to Design Point **30**.

Basin E-4 (6.28 AC, $Q_5 = 9.0$ cfs, $Q_{100} = 21.0$ cfs): Located on the southern portion of the site, this basin consists of residential lots and the eastern half of Mill Yard Circle. Runoff from this basin will sheet flow to the adjacent roadway. Flows will then be routed, via curb & gutter, to a proposed (public) 20' CDOT Type 'R' sump inlet, located just northeast from the cul-de-sac of Mill Yard Circle (**DP 30**). Emergency overflows will overtop the curb & gutter and be routed downstream via a graded swale within the maintenance access to Pond E at Design Point **31**.

Basin E-5 (1.13 AC, $Q_5 = 0.4$ cfs, $Q_{100} = 3.0$ cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists of the proposed (private) Full Spectrum Detention Pond E. Runoff from this basin will sheet flow directly to Pond E. Flows will then be routed to the outlet structure (**DP 31**), via a concrete trickle channel, where it will eventually discharge, at historic rates, into the adjacent Main Stem channel.

Basin E-6 (0.74 AC, $Q_5 = 0.3$ cfs, $Q_{100} = 1.8$ cfs): Located on the southeast corner of the site, adjacent to the Main Stem channel. This basin consists of the undeveloped area outside and downstream of the proposed (private) Full Spectrum Detention Pond E. Runoff from this basin will sheet flow directly to the Main Stem channel (MS).

VII. Storm Sewer System the south

All development is anticipated to be urban and will include storm sewer & street inlets. Storm sewers collect storm water runoff and convey the water to the water quality facilities prior to discharging. Storm sewer systems will be designed to the 100-year storm and checked with the 5-year storm. Inlets will be

placed at sump areas and intersections where street flow is larger than street capacity. UDFCD Inlet spreadsheet has been used to determine the size of all sump inlets.

There will be a minimum of 5 proposed storm systems within the site. Each of the nine storm sewer systems will discharge storm water into its correlated WQCV pond. Each system will consist of reinforced concrete pipe (RCP), CDOT Type 'R' inlets, and storm sewer manholes.

- Swales in A-1 and C-7 also?

Additionally, there is one (1) proposed drainage swale that runs along the back of the residential lots in Basin D-7. The swale was analyzed using the Bentley software FlowMaster to properly size a trapezoidal channel to convey the 100-year flows from the basin to Pond D, while providing 1.0-ft of freeboard. The sizing calculations can be found in **Appendix D.** Describe the size and provide

cross-sections on the drainage plan.

The Final drainage report will include details concerning at-grade inlet locations, street capacity, storm sewer sizing, outlet protection and location. Preliminary sump inlets have been sized and the calculations can be found in **Appendix D**. As mentioned, these sump inlets sizes are preliminary and are currently oversized. It is anticipated that the inlets will reduce in size with the addition of at-grade inlets at the time of the Final Drainage Report.

VIII. Proposed Water Quality Detention Ponds

Nine (9) Water Quality Capture Volume Detention Ponds will be provided for the proposed site, two (2) of which are temporary in nature. All of the proposed ponds are private and will be maintained by the DISTRICT, once established. These detention ponds are proposed to be full spectrum and will provide water quality and detention. The WQCV and EURV release will be controlled with an orifice plate. The release rates for the WQCV and EURV will be 40-hours and 72-hours, respectively. The 100-year volume will be controlled by orifice and/or restrictor plate and will be designed to release at or below the pre-development flow rate. Outlet structures, forebays, trickle channels, etc. will be designed with the final drainage report during final plat. The required FSD pond volumes are as described below:

Pond A: Located to the north of the site, just west of the newly routed Main Stem Tributary #2 channel. This pond will discharge into the Main Stem Tributary #2, ultimately merging with Main Stem to the south, off-site. The required volume WQCV and EURV are 0.75 Ac-Ft & 2.104 Ac-Ft, respectively. The total required detention basin volume is 4.254 Ac-Ft.

Pond B: Located centrally on the site, just east of the Main Stem drainage way. This pond will discharge into the Main Stem channel. The required volume WQCV and EURV are 0.592 Ac-Ft & 1.653 Ac-Ft, respectively. The total required detention basin volume is 3.355 Ac-Ft.

Pond C: Located on the southeast portion of the site, between the Main Stem & Main Stem Tributary #2 channels. This pond will discharge into the Main Stem channel. The required volume WQCV and EURV are 0.875 Ac-Ft & 2.405 Ac-Ft, respectively. The total required detention basin volume is 4.941 Ac-Ft.

Pond D: Located centrally on the site, just west of the Main Stem channel. This pond will discharge into the Main Stem channel. The required volume WQCV and EURV are 0.251 Ac-Ft & 0.672 Ac-Ft, respectively. The total required detention basin volume is 1.404 Ac-Ft.

Pond E: Located on the south side of the site, just west of the Main Stem channel. This pond will discharge into the Main Stem channel. The required volume WQCV and EURV are 0.426 Ac-Ft & 1.150 Ac-Ft, respectively. The total required detention basin volume is 2.395 Ac-Ft.

Provide the volumes calculated by the MHFD routed hydrographs **TSB-1:** Located on the far north side of the site, just east of the extension of Rex Road. This TSB will discharge into the Main Stem Tributary Number 2 (MST). The TSB has been sized to treat the developed runoff for water quality prior to releasing into MST. This TSB captures an upstream tributary area of approximately 1.22 acres and per the MHFD standard, this TSB has been upsized to 2-acre tributary area.

TSB-2: Located on the north side of the site, at the southeast corner of the church property. This TSB will discharge into the Main Stem Tributary Number 2 (MST This TSB captures an upstream tributary area of approximately 11.23 acres and per the MHFD standard, this TSB has been upsized to 12-acre tributary area.

Address the other 2 for Eastonville Rd.

IX. Proposed Channel Improvements

According to the **MDDP**, there are two major drainage ways that run through the site. As was discussed within the Existing Conditions portion of the report, both the Main Stem channel (MS) and Main Stem Tributary #2 channel (MST) run through the site. There are no proposed major channel improvements for MS. An analysis has been done for the Main Stem channel (MS) with both existing and future condition flows as described within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised January 2022 (**CLOMR**). Both scenarios, throughout the channel fall within the channel stability criteria.

The MST is proposed to be rerouted. As part of this rerouting of MST, offsite upstream tributary flows will be captured upstream from the proposed Rex Road extension and be conveyed via culvert to the rerouted MST. An analysis has been done for the Main Stem Tributary Number 2 (MST) with both existing and future condition flows as described within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised January 2022 (**CLOMR**). Both scenarios, throughout the channel fall within the channel stability criteria.

All developed runoff will be captured and conveyed to one of the corresponding water quality and detention facilities and release at or below historic levels. Therefore, there will be no adverse impact to downstream facilities. The analysis for both drainage ways (MS and MST), offsite upstream tributary capture, and design of MST were done by HR Green within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised January 2022 (**CLOMR**) which will be submitted separately for review. A copy of this report is included in Appendix B.

X. Maintenance

not found; also provide HEC-RAS - tables showing velocities, FR, shear, depths, etc.

After completion of construction and upon the Board of County Commissioners acceptance, it is anticipated all drainage facilities within the public Right-of-Way are to be owned and maintained by El Paso County.

All private detention ponds are to be owned and maintained by the Grandview Reserve Metropolitan District No. 2 (DISTRICT), once established, unless an agreement is reached stating otherwise. The proposed Main Stem channel (MS) and Main Stem Tributary Number 2 (MST) will be maintained by the DISTRICT. Maintenance access for all full spectrum detention facilities will be provided from public Right-of-Way. Maintenance access for MS and MST will be provided along the respective eastern top of channel bank within the proposed tracts.

XI. Wetlands Mitigation

In Appendix? Provide report title and date

There are two existing wetlands on site associated with the two major channels, MS and MST. The wetlands are both contained within the existing channels with the wetland in MS being classified as jurisdictional and the wetland in MST classified as non-jurisdictional. The wetlands will be analyzed with the channel report by others. Wetlands maintenance will be the responsibility of the the Grandview Reserve Metropolitan District No. 2 (DISTRICT).

XII. Floodplain Statement

provide final USACE determination

A portion of the project sit lies with Zone A Special Flood Hazard Area as defined by the FIRM Map number 08041C0552G and 08041C0556G effective December 7, 2018. A copy of the FIRM Panel is included in **Appendix A.** FEMA-approved floodplain elevations are required to be shown on final plats.

XIII. Drainage Fees & Maintenance

Gieck Ranch Basin is not listed as part of the El Paso County drainage basin fee program. Unless otherwise instructed, no drainage fees will be assessed. If it is found drainage basin fees are required, these will be included in the Final Drainage Report.

XIV. Conclusion

The Grandview Reserve residential subdivision lies within the Gieck Ranch Drainage Basin. Water quality for the site is provided in five on-site Full Spectrum Detention Ponds; Ponds A, B, C, D, & E as well as two Temporary Sediment Basins; TSB-1 and TSB-2. All drainage facilities within this report were sized according to the El Paso County Drainage Criteria Manuals. There are two major channels passing through the site Main Stem channel and Main Stem Tributary Number 2, which will be addressed by HR Green within the *Grandview Reserve CLOMR Report*, HR Green; September 2021; revised January 2022. The five (5) WQCV ponds will be maintained by a newly established Grandview Reserve Metropolitan District No. 2 (DISTRICT). A Final Drainage Report will be submitted along with the final plat and construction drawings.

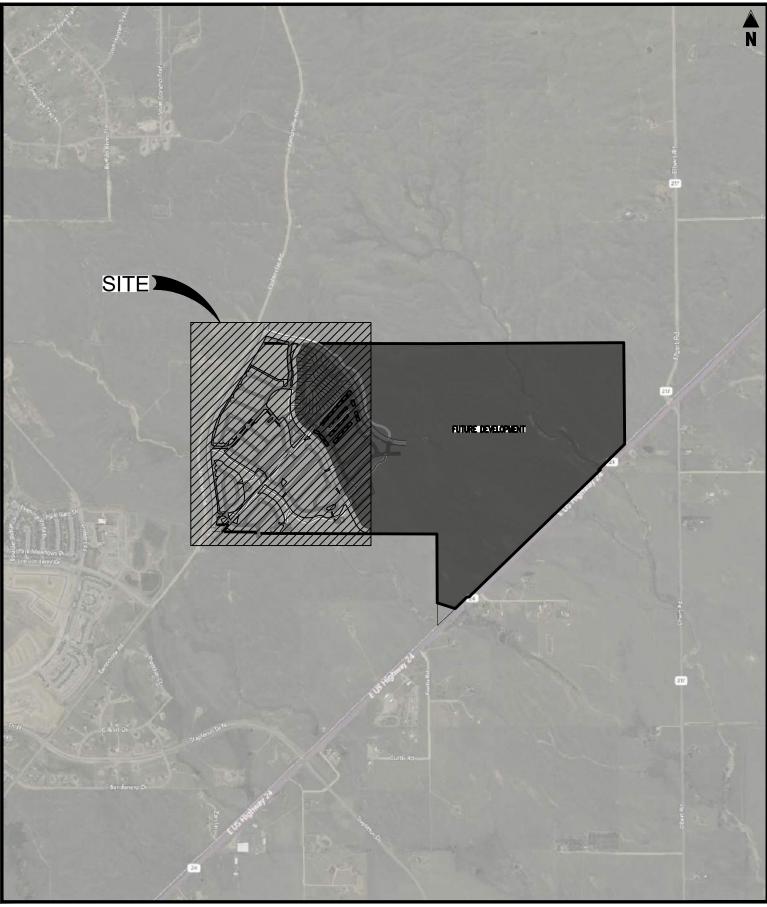
XV. References

- 1. El Paso County Drainage Criteria Manual, 1990.
- 2. Drainage Criteria Manual, Volume 2, City of Colorado Springs, 2002.
- 3. El Paso County Drainage Criteria Manual Update, 2015.
- 4. El Paso County Engineering Criteria Manual, 2020.
- 5. Urban Storm Drainage Criteria Manual, Urban Drainage and Flood Control District, January 2016 (with current revisions).
- 6. *Gieck Ranch Drainage Basin Study (DBPS),* Drexel Barrell, October 2010 (Not adopted by County).
- 7. Grandview Reserve Master Development Drainage Plan (MDDP), HR Green, November 2020.
- 8. Final Drainage Report for Eastonville Road from Future Rex Road to Londonderry Drive, by HR Green, March 2022.
- 9. Grandview Reserve CLOMR Report, HR Green; September 2021; revised January 2022.

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APPENDIX A Exhibits and Figures



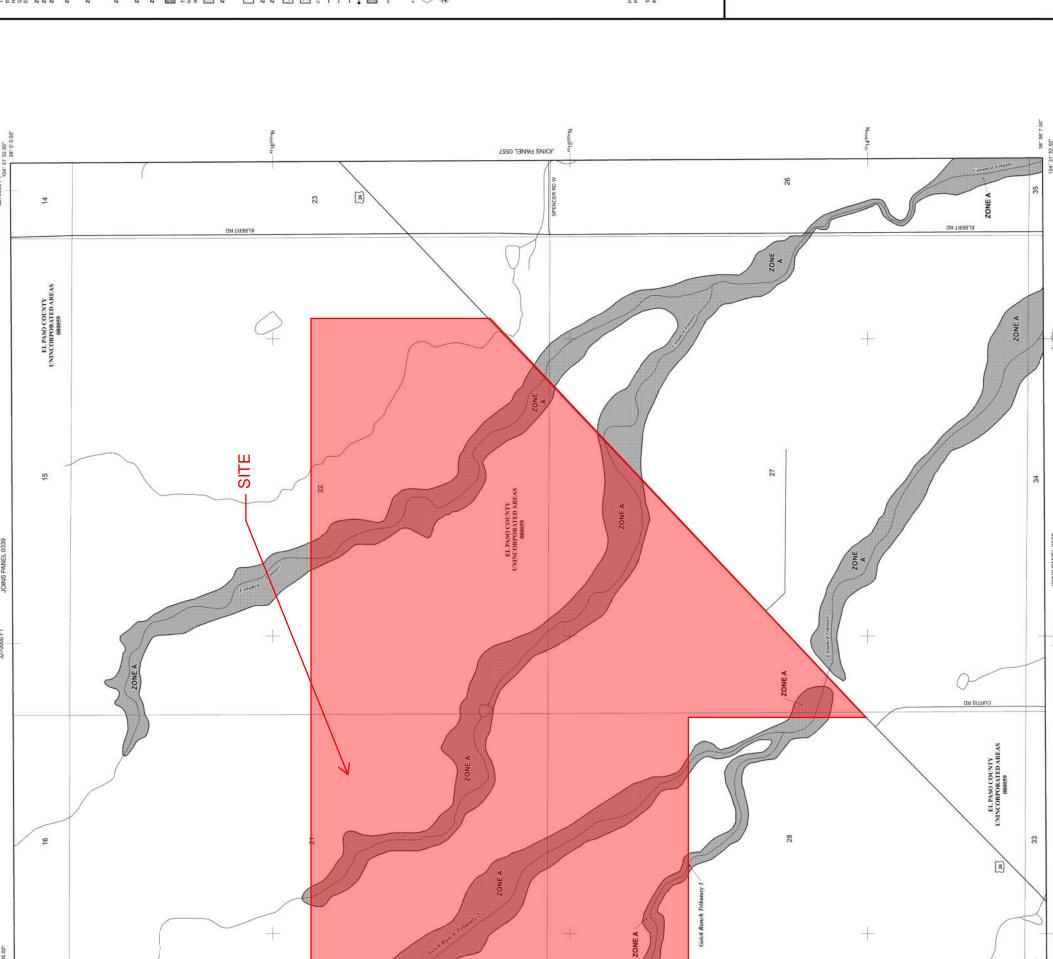
GRANDVIEW RESERVE

EASTONVILLE RD SCALE: 1"=2,000' VICINITY MAP

| Project No: | HRG1.20 |
|-------------|------------|
| Drawn By: | JDP |
| Checked By: | RGD |
| Date: | 07/26/2021 |



1155 Kelly Johnson Blvd., Suite 305 Colorado Springs, CO 80920 719.900.7220 • GallowayUS.com



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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or (Dockways have been otherinned. users are encouraged to consult the Flood Profiles and Floodway. Data and/or Summary of Stillwather Elevations tables contained within the Flood Insurance Study (FIS) report that accomparies this FIRM. Users should be avaient that EFEs alrow on the FIRM represent to unded whole-boot elevations. These BFEs are intended for food insurance raining purposes only and should not be used as the sole score of flood elevation information. Accordingly, the FIRM for purposes of construction and/or floodplan management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0 North American Victual Datum of 1988 (NAVDBS). Users of the FRM should be aware that coastal froad elevations are also provided in the Summary of Silivatar Elevations table in the Flood returner could be used for construction and/or floodplaim management purposes when they are higher than the elevations shown on this FIRM.

1425000 FT

Boundaries of the floodways were computed at cross sections and interpolated Between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report (for this juriadiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood contro structures**. Refer to section 2.4 Flood Protection Measures' of the Flood Insuranc Study report for information on flood control structures for this jurisdiction.

the land The projection used in the preparation of this map was Universal Transver-tation (UTIX) cone 13. The horizontial datum was Vaniversal Transver Differences in datum, spheroid, projection or UTIX zones zones used in 1 Differences in map diagent jurisdictions may result in slight positio differences in map disartes across jurisdiction boundaries. These differences do a differences of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum** of **1368 (NAVD88)**. These flood elevations must be compared to structure and ground elevations tenerocial on branne write. The atom. For findmation regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey webies at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following dates.

NGS Information Services NOAA, NNGS12 Notional Geodetic Survey SSMC-3, #9202 1315 East-West Highway Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the information for Services Blanch of the National Geodetic Survey at (301) 77.5-32.2 or visit its websile at http://www.ngs.neas.gov.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Ubilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date stream channel configurations and foodpain defineations than those shown on the previous FIRM for its jurisdiction. The floodpains defineations than those shown on the previous FIRM may take been adjusted to controm to these new stream channel confluencions. As a result, the Flood channel and the previous FIRM may result, the Flood Preview and Floodoway Data tables in the Rlood Instrance Sludy Report (which containes authoritative hydraulic data) may reflect stream channel distances that differ from while is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles baselines may deviate significantly, from the new base map channel report and Hoodowy Data Tables in the FIS report. As a result, the profile baselines may deviate significantly, from the new base map channel reports and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publicator. Because changes are uso anreasations or de-annexations thave concurred after this map was published. map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map parelise, community map reposition didresser and a lasting of Communities table containing National Flood insurance Program dates for each community as well as a listing of the panels on which each community is located. Contact FEMA Map Service Center (INSC) via the FEMA Map Information eXchange (FMIX). 4-377-355-750 for information on available products and with this FFMIX. Available products may include previously seaved Letters of Map Change. a Flood Instrumente Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-355-9520 and its website at Mtp///www.msc.fema.gov/

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/infp.

Offset (ft) El Paso County Vertical Datum Offset Table Flooding Source

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map

-E

This Digital Flood Insurance Rate Map (DFIRM) was produced through a cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).



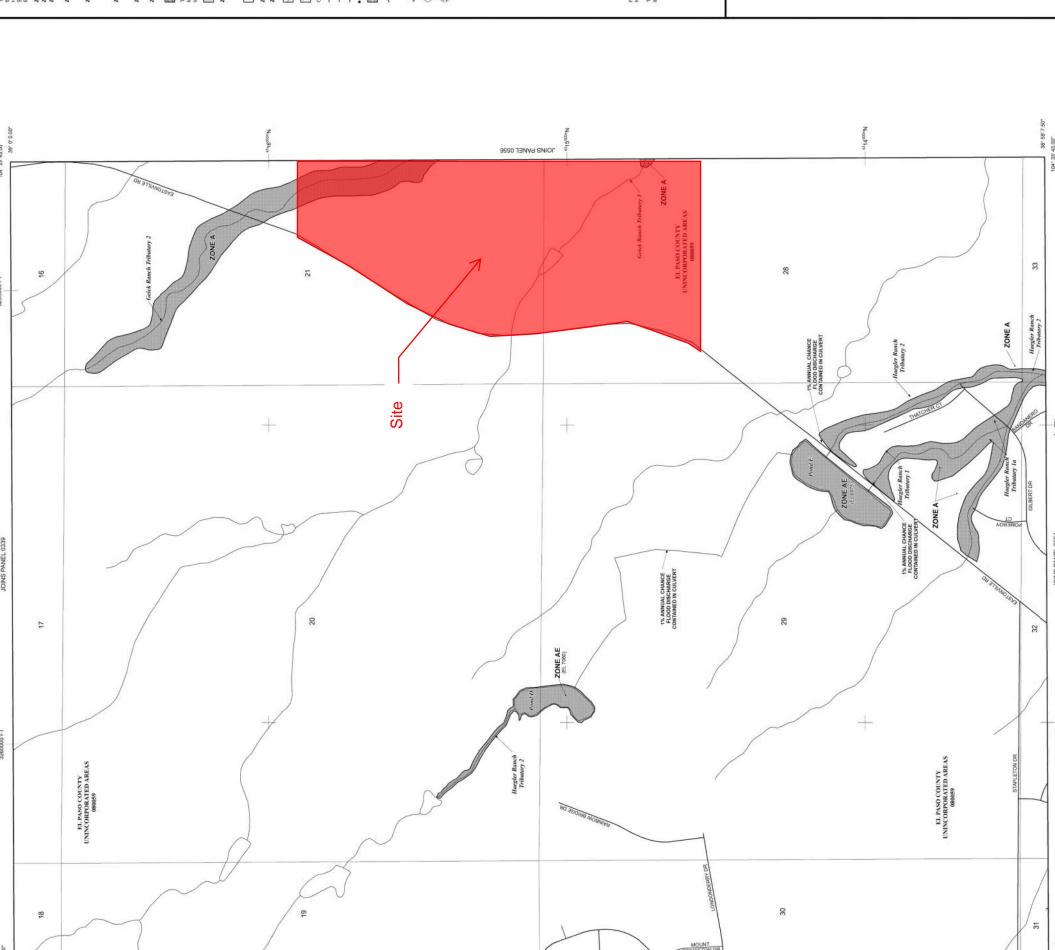
Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.

1415000 FT 38° 58° 7.50°

104 39" 0' 0.00"

101/02 PANEL 0552

1420000 FT



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Coastal Base Flood Elevations shown on this map apply only landward of 0.0 Nort that coastal Vertical State (NAU208). Users of this FIRM should be avail that coastal flood elevations are also provided in the Summary of Silwante Elevation table in the Flood iterations state apport for his straticitors. Teactions shown in the Summary of Silwater Elevations table should be used for construction and/of flood flood and an anotagement purposes when they are higher than the elevations shown of flood flood.

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NGS Information Services NOAA, NNGS12 National Geodetic Survey SSMC3, #9202 1315 East-West Highway Silver Spring, MD 20910-3282

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Base Map information shown on this FIRM was provided in digital format by EI Pasc County, Colorado Springs Utilities, City of Fourtian, Bureau of Land Management National Occasific and Atmospheric Administration, United States Geological Survey and Anterson Consulting Engineers, inc. These data are ourtient as of 2006.

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you have questions about this map or questions concerning the National Floc surance Program in greater) please call +4377-FBMA MAP (1-877-336-2627) ; the FEMA website at http://www.fema.gov/business/nfig.

REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION ical Datum Offset (ft) bsite at http://www.fema.gov/usenses. El Paso County Vertical Datum Offset Table Vertical Flooding Source

Panel Location Map

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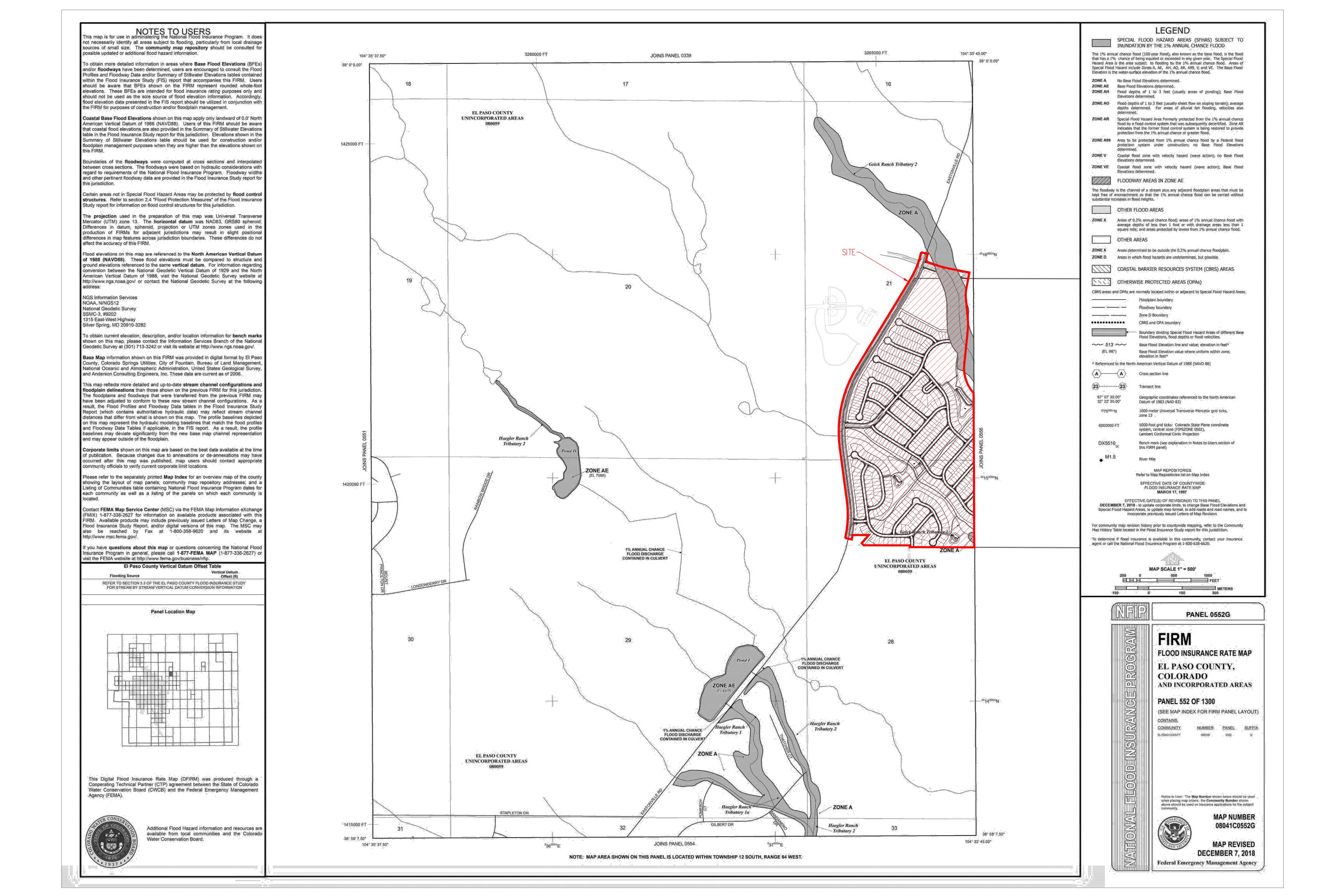
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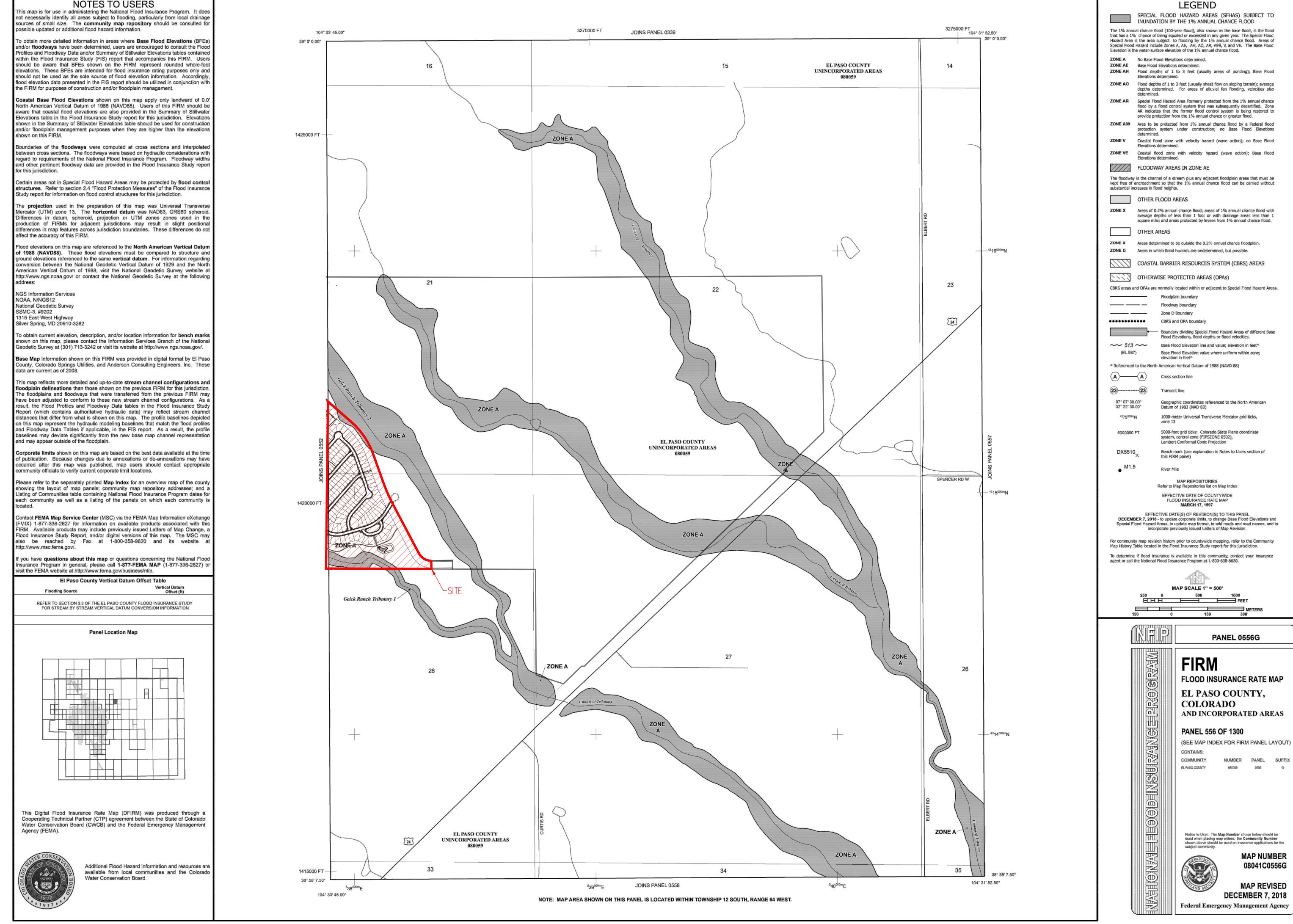
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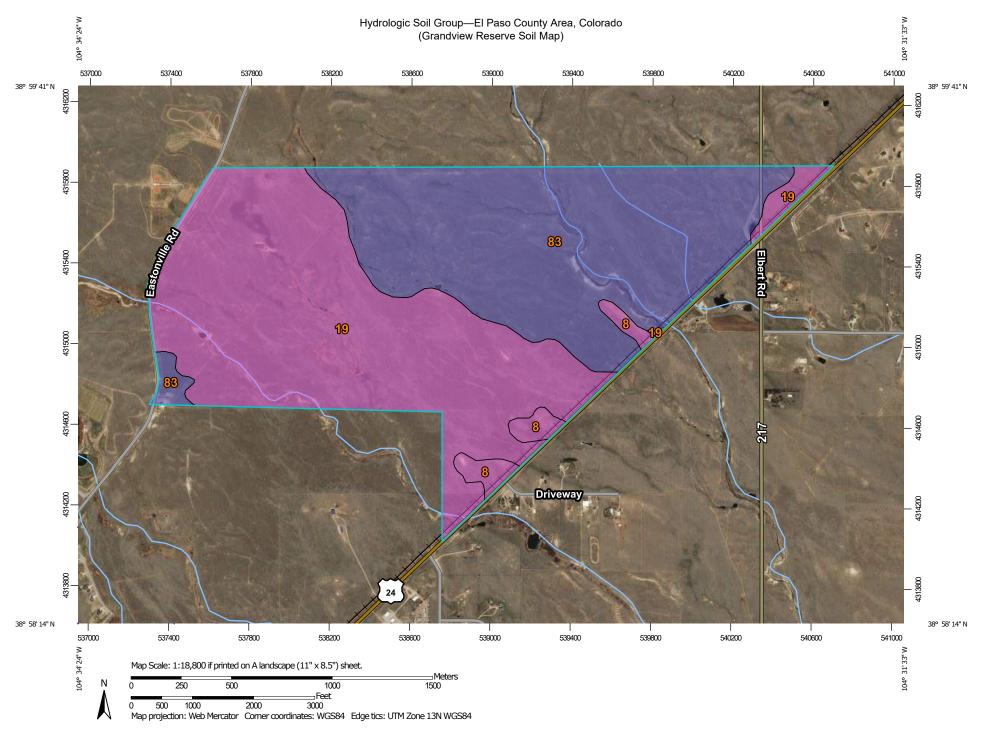
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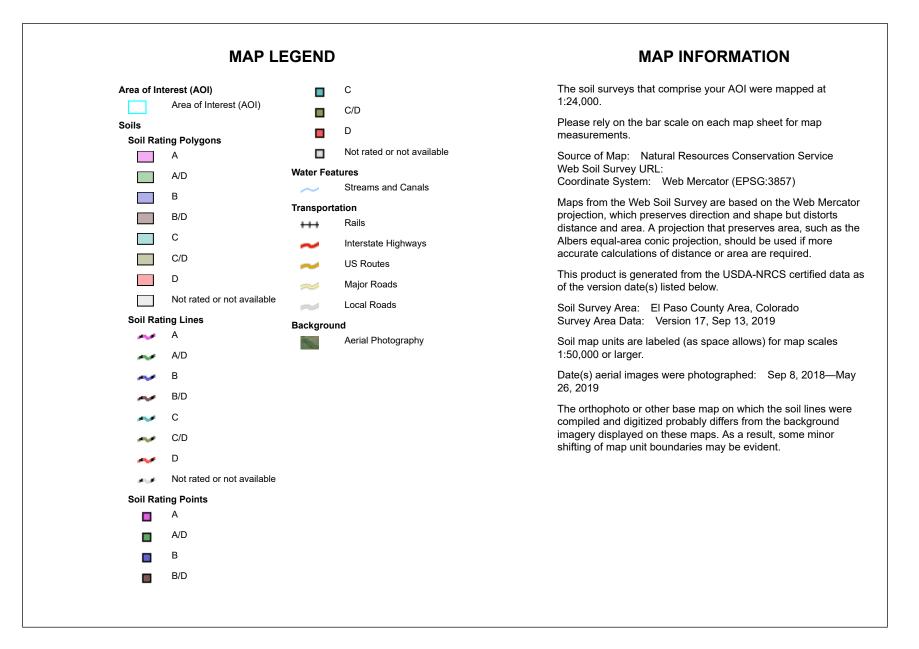
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USDA Natural Resources

Conservation Service

Web Soil Survey National Cooperative Soil Survey 4/6/2020 Page 1 of 4



Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|--------------------------|--|--------|--------------|----------------|
| 8 | Blakeland loamy sand, 1 to 9 percent slopes | A | 22.4 | 2.6% |
| 19 | Columbine gravelly sandy loam, 0 to 3 percent slopes | A | 450.7 | 52.5% |
| 83 | Stapleton sandy loam, 3 to 8 percent slopes | В | 385.4 | 44.9% |
| Totals for Area of Inter | rest | 858.5 | 100.0% | |

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition Component Percent Cutoff: None Specified Tie-break Rule: Higher



Precipitation Frequency Data Server



NOAA Atlas 14, Volume 8, Version 2 Location name: Peyton, Colorado, USA* Latitude: 38.985°, Longitude: -104.565° Elevation: 6975.71 ft** * source: ESRI Maps ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

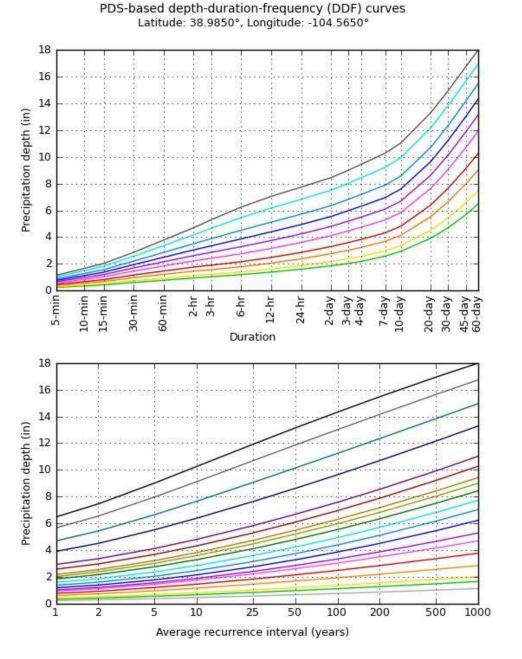
| 100 | -based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹ Average recurrence interval (years) | | | | | | | | | |
|----------|---|----------------------------|-------------------------|----------------------------|----------------------------|----------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Duration | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 0.239 | 0.291 | 0.381 | 0.461 | 0.576 | 0.671 | 0.770 | 0.875 | 1.02 | 1.14 |
| | (0.189-0.303) | (0.231-0.370) | (0.301-0.486) | (0.361-0.589) | (0.440-0.768) | (0.499-0.904) | (0.554-1.06) | (0.604-1.24) | (0.678-1.48) | (0.733-1.67) |
| 10-min | 0.350 | 0.426 | 0.558 | 0.674 | 0.844 | 0.982 | 1.13 | 1.28 | 1.49 | 1.66 |
| | (0.277-0.444) | (0.338-0.542) | (0.441-0.711) | (0.529-0.863) | (0.644-1.13) | (0.731-1.32) | (0.811-1.56) | (0.884-1.81) | (0.992-2.17) | (1.07-2.44) |
| 15-min | 0.426 | 0.520 | 0.681 | 0.823 | 1.03 | 1.20 | 1.37 | 1.56 | 1.82 | 2.03 |
| | (0.338-0.541) | (0.412-0.660) | (0.537-0.867) | (0.645-1.05) | (0.785-1.37) | (0.891-1.62) | (0.988-1.90) | (1.08-2.21) | (1.21-2.65) | (1.31-2.98) |
| 30-min | 0.608 | 0.740 | 0.968 | 1.17 | 1.46 | 1.70 | 1.94 | 2.21 | 2.57 | 2.86 |
| | (0.482-0.771) | (0.586-0.940) | (0.764-1.23) | (0.916-1.49) | (1.11-1.94) | (1.26-2.29) | (1.40-2.68) | (1.52-3.12) | (1 71-3 73) | (1.85-4.19) |
| 60-min | 0.775 | 0.933 | 1.21 | 1.46 | 1.84 | 2.16 | 2.49 | 2.85 | 3.37 | 3.78 |
| | (0.615-0.984) | (0 739-1 19) | (0.956-1.54) | (1.15-1.87) | (1.41-2.47) | (1.61-2.92) | (1.80-3.45) | (1.97-4.05) | (2.24-4.90) | (2.44-5.55) |
| 2-hr | 0.943 | 1.13 | 1.46 | 1.76 | 2.22 | 2.62 | 3.04 | 3.50 | 4.16 | 4.70 |
| | (0.754-1.19) | (0.898-1.42) | (1.16-1.84) | (1.39-2.23) | (1.72-2.97) | (1.97-3.52) | (2.21-4.19) | (2.45-4.95) | (2.80-6.03) | (3.06-6.85) |
| 3-hr | 1.03 | 1.22 | 1.57 | 1.90 | 2.41 | 2.86 | 3.35 | 3.88 | 4.66 | 5.29 |
| | (0.829-1.29) | (0.978-1.53) | (1.25-1.97) | (1.51-2.40) | (1.88-3.22) | (2.17-3.84) | (2.45-4.60) | (2.73-5.48) | (3.15-6.74) | (3.46-7.69) |
| 6-hr | 1.20 | 1.40 | 1.78 | 2.16 | 2.76 | 3.28 | 3.86 | 4.51 | 5.46 | 6.24 |
| | (0.968-1.49) | (1.13-1.74) | (1.44-2.22) | (1.73-2.70) | (2.18-3.66) | (2.52-4.39) | (2.86-5.29) | (3.21-6.34) | (3.73-7.86) | (4.12-9.01) |
| 12-hr | 1.38 | 1.61 | 2.05 | 2.48 | 3.15 | 3.74 | 4.39 | 5.12 | 6.17 | 7.04 |
| | (1.13-1.70) | (1.31-1.98) | (1.67-2.53) | (2.00-3.07) | (2.51-4.15) | (2.89-4.96) | (3.28-5.96) | (3.67-7.13) | (4.25-8.82) | (4.69-10.1) |
| 24-hr | 1.60 | 1.87 | 2.38 | 2.85 | 3.60 | 4.24 | 4.94 | 5.71 | 6.82 | 7.73 |
| | (1.31-1.95) | (1.54-2.28) | (1.94-2.91) | (2.32-3.51) | (2.88-4.67) | (3.29-5.56) | (3.71-6.63) | (4.12-7.87) | (4.73-9.66) | (5.20-11.0) |
| 2-day | 1.85 | 2.18 | 2.76 | 3.29 | 4.11 | 4.80 | 5.54 | 6.35 | 7.50 | 8.44 |
| | (1.54-2.24) | (1.80-2.63) | (2.28-3.35) | (2.70-4.01) | (3.30-5.27) | (3.76-6.22) | (4.19-7.36) | (4.62-8.68) | (5.25-10.5) | (5.73-11.9) |
| 3-day | 2.03 | 2.39 | 3.02 | 3.60 | 4.47 | 5.20 | 5.98 | 6.83 | 8.03 | 9.00 |
| | (1.69-2.44) | (1.98-2.87) | (2.50-3.64) | (2.97-4.36) | (3.60-5.69) | (4.09-6.70) | (4.55-7.90) | (4.99-9.28) | (5.65-11.2) | (6.15-12.7) |
| 4-day | 2.18 | 2.56 | 3.22 | 3.82 | 4.73 | 5.49 | 6.30 | 7.18 | 8.43 | 9.43 |
| | (1.82-2.61) | (2.13-3.06) | (2.68-3.87) | (3.16-4.62) | (3.83-6.00) | (4.33-7.04) | (4.81-8.30) | (5.26-9.72) | (5.95-11.7) | (6.46-13.3) |
| 7-day | 2.58 | 2.98 | 3.68 | 4.32 | 5.29 | 6.09 | 6.96 | 7.89 | 9.21 | 10.3 |
| | (2.17-3.07) | (2.50-3.54) | (3.08-4.39) | (3.60-5.18) | (4.31-6.65) | (4.84-7.76) | (5.34-9.09) | (5.82-10.6) | (6.55-12.8) | (7 10-14 4) |
| 10-day | 2.93 | 3.37 | 4.13 | 4.81 | 5.83 | 6.68 | 7.58 | 8.55 | 9.92 | 11.0 |
| | (2.48-3.47) | (2.84-3.98) | (3.47-4.90) | (4.02-5.74) | (4.76-7.29) | (5.32-8.45) | (5.85-9.86) | (6.34-11.4) | (7.09-13.7) | (7.65-15.4) |
| 20-day | 3.91 | 4.51 | 5.52 | 6.39 | 7.63 | 8.62 | 9.64 | 10.7 | 12.2 | 13.3 |
| | (3.33-4.58) | (3.84-5.29) | (4.68-6.50) | (5.39-7.55) | (6.25-9.37) | (6.90-10.8) | (7.47-12.4) | (7.98-14.1) | (8.74-16.6) | (9.31-18.4) |
| 30-day | 4.70 | 5.44 | 6.65 | 7.66 | 9.06 | 10.1 | 11.2 | 12.3 | 13.8 | 15.0 |
| | (4.02-5.47) | (4.65-6.34) | (5.66-7.78) | (6.49-9.00) | (7.44-11.0) | (8.15-12.5) | (8.74-14.3) | (9.24-16.2) | (9.98-18.7) | (10.5-20.6) |
| 45-day | 5.67 | 6.55 | 7.97 | 9.12 | 10.7 | 11.9 | 13.0 | 14.2 | 15.6 | 16.7 |
| | (4.88-6.57) | (5.63-7.60) | (6.82-9.27) | (7.77-10.7) | (8.79-12.9) | (9.56-14.5) | (10.2-16.4) | (10.6-18.4) | (11.3-21.0) | (11.9-23.0) |
| 60-day | 6.49 (5.60-7.48) | 7.46 (6.43-8.62) | 9.01 (7.74-10.4) | 10.3 (8.77-11.9) | 11.9 (9.82-14.3) | 13.1 (10.6-16.0) | 14.3 (11.2-18.0) | 15.5 (11.7-20.0) | 16.9 (12.3-22.6) | 18.0 (12.8-24.6) |

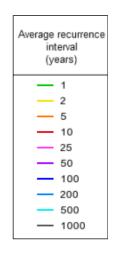
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

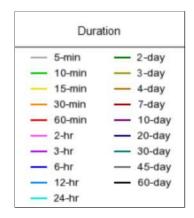
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical







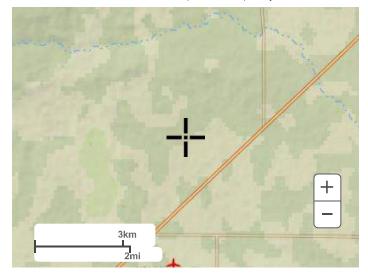
NOAA Atlas 14, Volume 8, Version 2

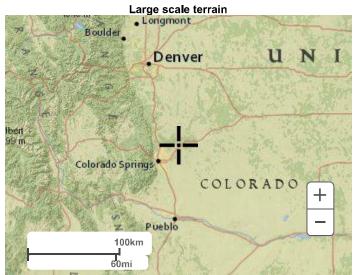
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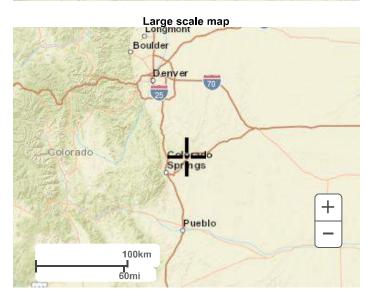
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Maps & aerials

Small scale terrain

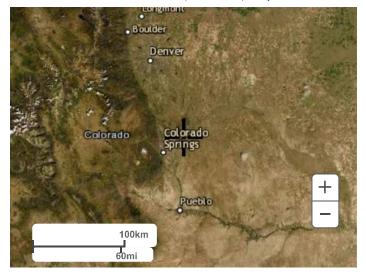






Large scale aerial

Precipitation Frequency Data Server



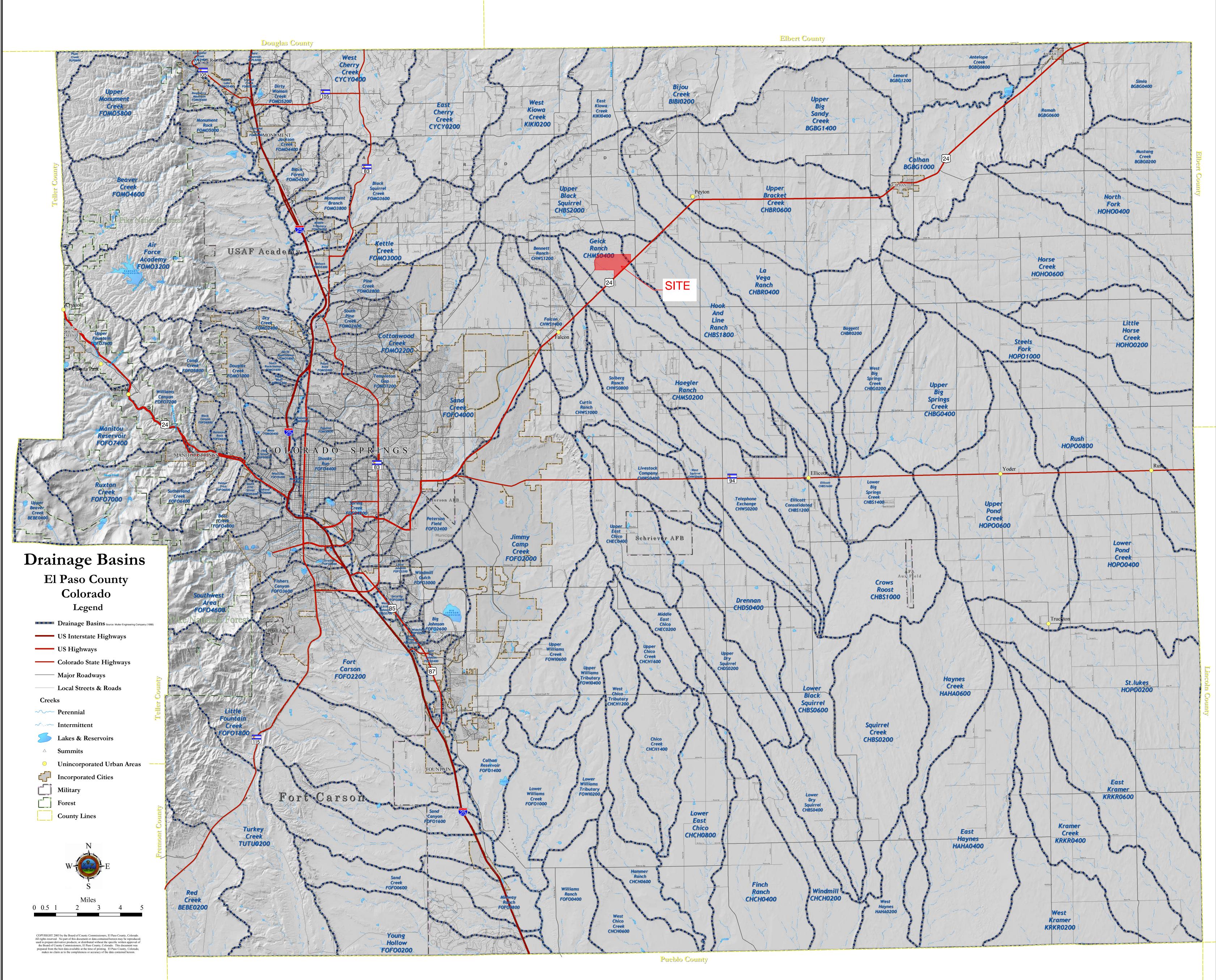
Back to Top

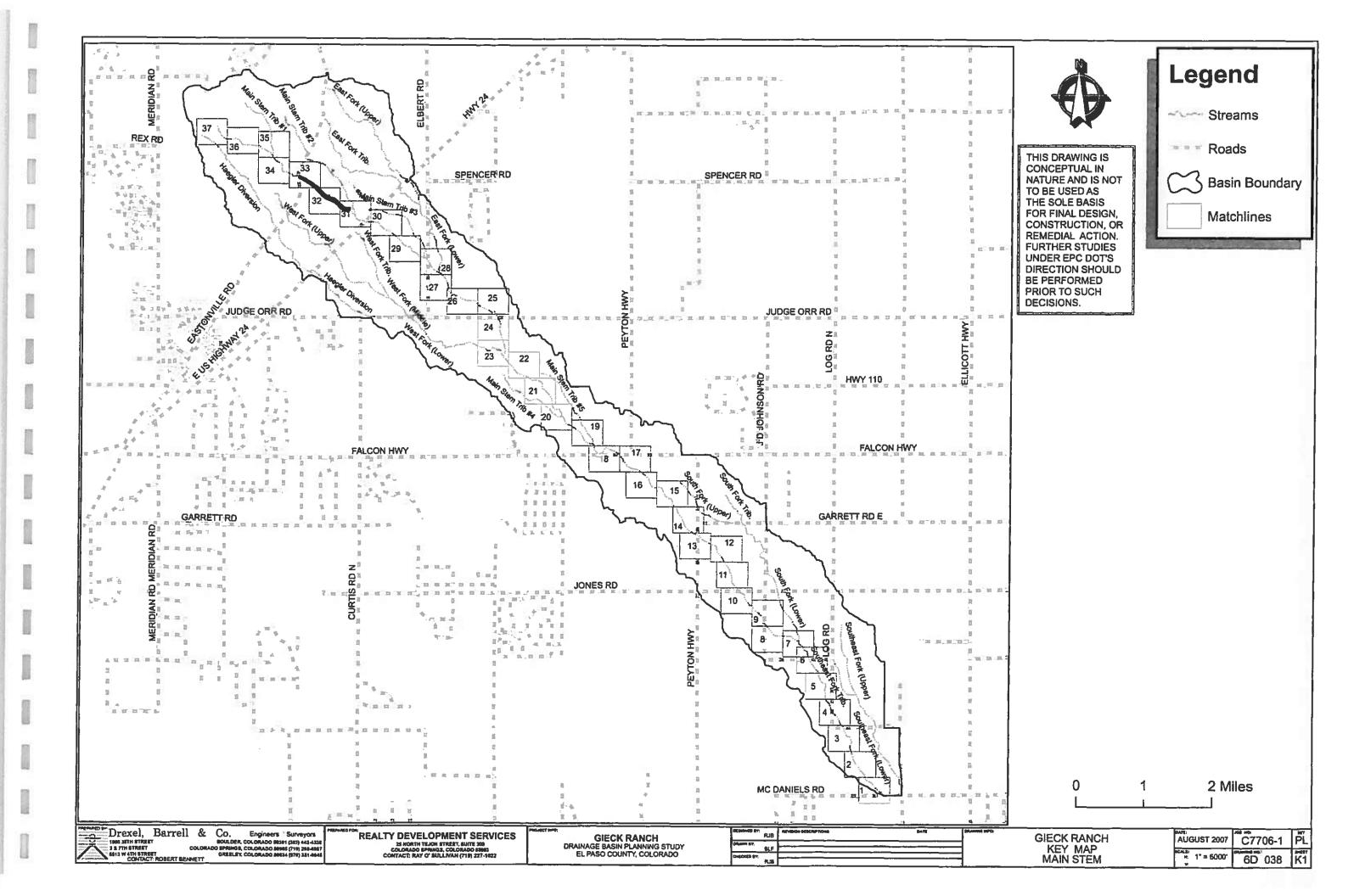
US Department of Commerce National Oceanic and Atmospheric Administration National Weather Service National Water Center 1325 East West Highway Silver Spring, MD 20910 Questions?: <u>HDSC.Questions@noaa.gov</u>

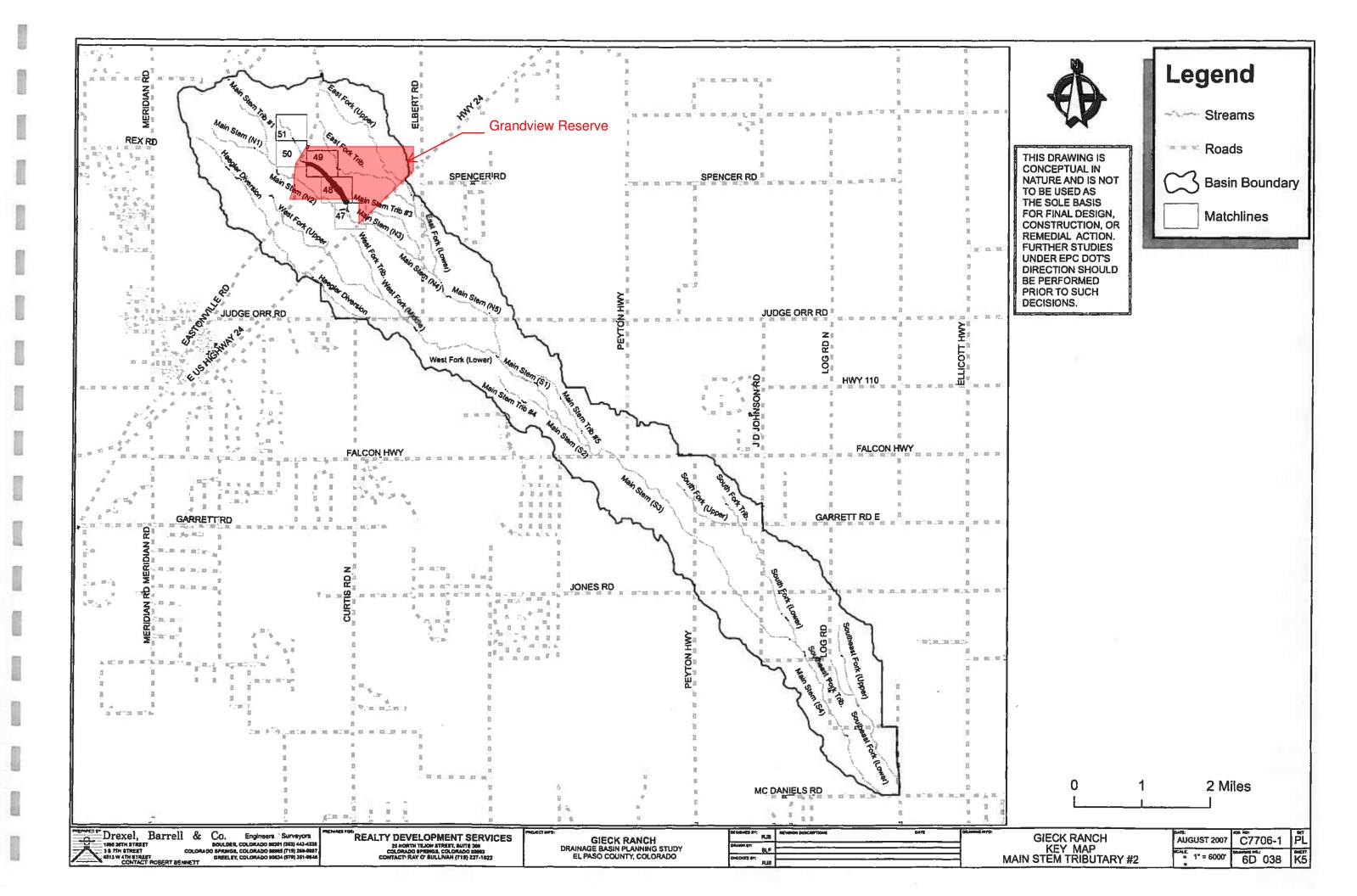
<u>Disclaimer</u>

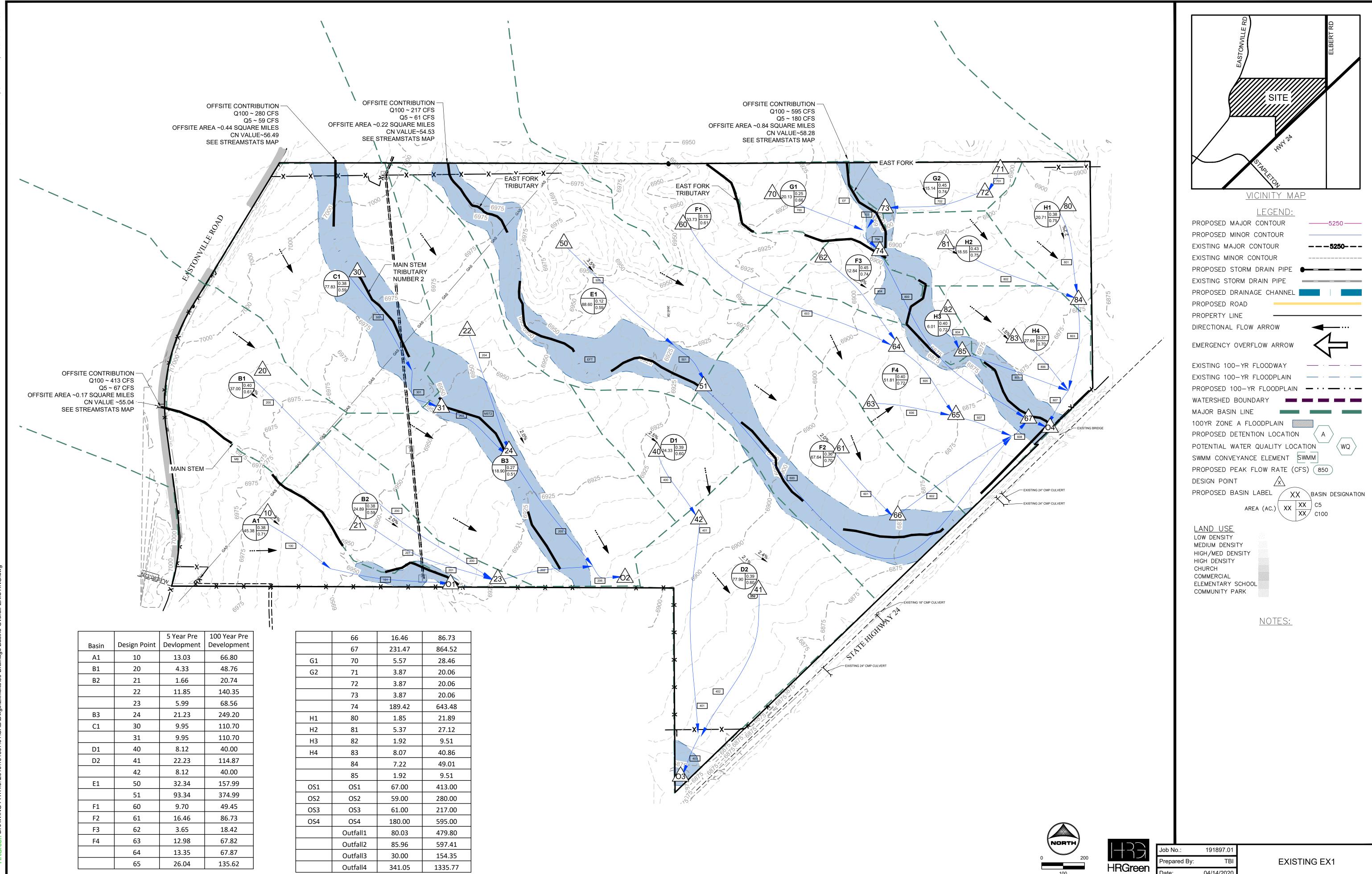
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APPENDIX B MDDP & DBPS Sheet References









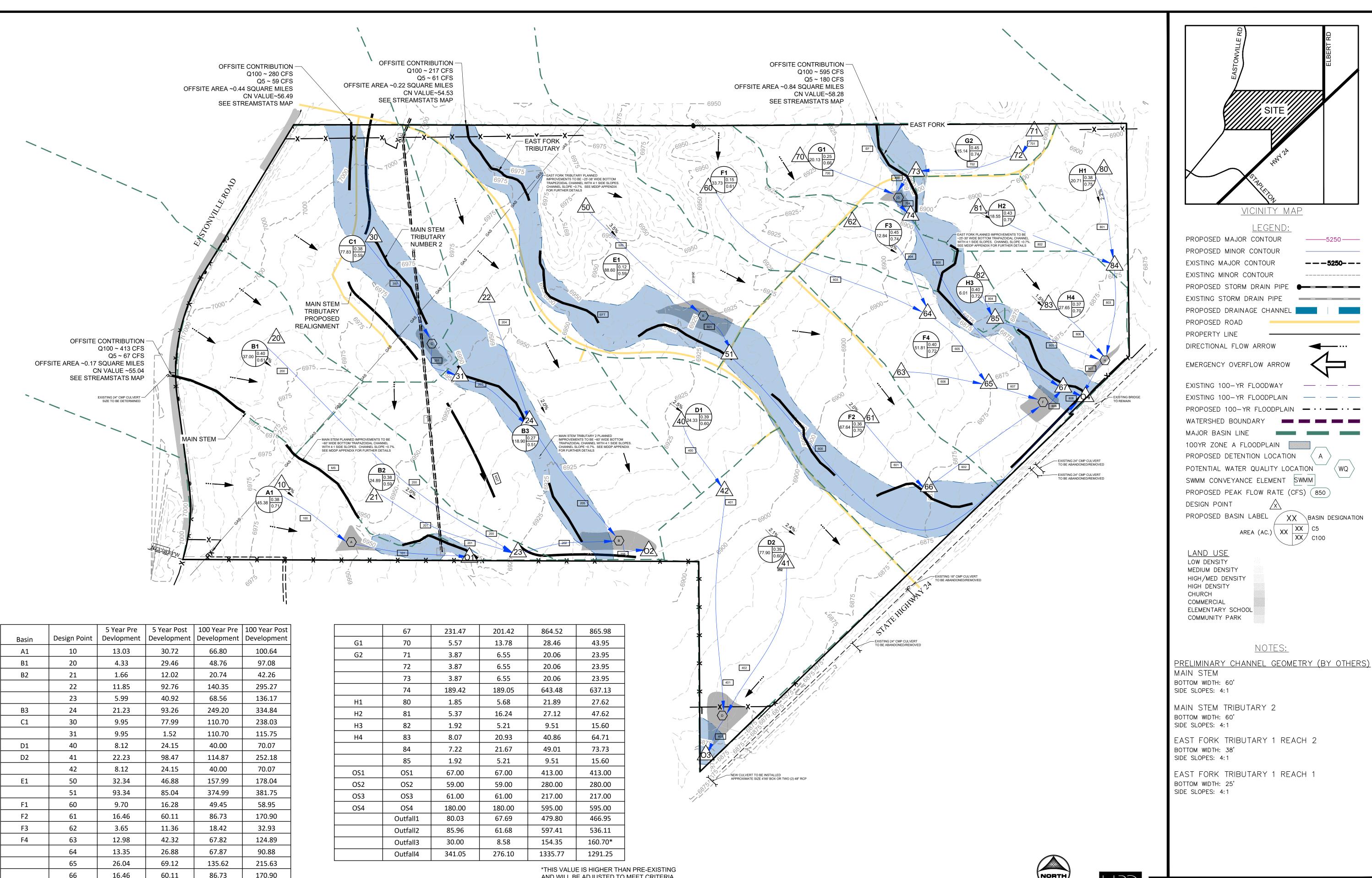
| | | 5 Year Pre | 100 Year Pre | | | | |
|-------|--------------|------------|--------------|--|--|--|--|
| Basin | Design Point | Devlopment | Development | | | | |
| A1 | 10 | 13.03 | 66.80 | | | | |
| B1 | 20 | 4.33 | 48.76 | | | | |
| B2 | 21 | 1.66 | 20.74 | | | | |
| | 22 | 11.85 | 140.35 | | | | |
| | 23 | 5.99 | 68.56 | | | | |
| B3 | 24 | 21.23 | 249.20 | | | | |
| C1 | 30 | 9.95 | 110.70 | | | | |
| | 31 | 9.95 | 110.70 | | | | |
| D1 | 40 | 8.12 | 40.00 | | | | |
| D2 | 41 | 22.23 | 114.87 | | | | |
| | 42 | 8.12 | 40.00 | | | | |
| E1 | 50 | 32.34 | 157.99 | | | | |
| | 51 | 93.34 | 374.99 | | | | |
| F1 | 60 | 9.70 | 49.45 | | | | |
| F2 | 61 | 16.46 | 86.73 | | | | |
| F3 | 62 | 3.65 | 18.42 | | | | |
| F4 | 63 | 12.98 | 67.82 | | | | |
| | 64 | 13.35 | 67.87 | | | | |
| | 65 | 26.04 | 135.62 | | | | |

| | 66 | 16.46 | 86.73 |
|-----|----------|--------|---------|
| | 67 | 231.47 | 864.52 |
| G1 | 70 | 5.57 | 28.46 |
| G2 | 71 | 3.87 | 20.06 |
| | 72 | 3.87 | 20.06 |
| | 73 | 3.87 | 20.06 |
| | 74 | 189.42 | 643.48 |
| H1 | 80 | 1.85 | 21.89 |
| H2 | 81 | 5.37 | 27.12 |
| H3 | 82 | 1.92 | 9.51 |
| H4 | 83 | 8.07 | 40.86 |
| | 84 | 7.22 | 49.01 |
| | 85 | 1.92 | 9.51 |
| OS1 | OS1 | 67.00 | 413.00 |
| OS2 | OS2 | 59.00 | 280.00 |
| OS3 | OS3 | 61.00 | 217.00 |
| OS4 | OS4 | 180.00 | 595.00 |
| | Outfall1 | 80.03 | 479.80 |
| | Outfall2 | 85.96 | 597.41 |
| | Outfall3 | 30.00 | 154.35 |
| | Outfall4 | 341.05 | 1335.77 |
| | | | |

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ate

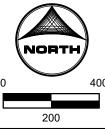




| Basin | Design Point | 5 Year Pre Devlopment | 5 Year Post Development | 100 Year Pre Development | 100 Year Post Development | |
|-------|--------------|--------------------------|----------------------------|-----------------------------|------------------------------|--|
| A1 | 10 | 13.03 | 30.72 | 66.80 | 100.64 | |
| B1 | 20 | 4.33 | 29.46 | 48.76 | 97.08 | |
| B2 | 21 | 1.66 | 12.02 | 20.74 | 42.26 | |
| | 22 | 11.85 | 92.76 | 140.35 | 295.27 | |
| | 23 | 5.99 | 40.92 | 68.56 | 136.17 | |
| B3 | 24 | 21.23 | 93.26 | 249.20 | 334.84 | |
| C1 | 30 | 9.95 | 77.99 | 110.70 | 238.03 | |
| | 31 | 9.95 | 1.52 | 110.70 | 115.75 | |
| D1 | 40 | 8.12 | 24.15 | 40.00 | 70.07 | |
| D2 | 41 | 22.23 | 98.47 | 114.87 | 252.18 | |
| | 42 | 8.12 | 24.15 | 40.00 | 70.07 | |
| E1 | 50 | 32.34 | 46.88 | 157.99 | 178.04 | |
| | 51 | 93.34 | 85.04 | 374.99 | 381.75 | |
| F1 | 60 | 9.70 | 16.28 | 49.45 | 58.95 | |
| F2 | 61 | 16.46 | 60.11 | 86.73 | 170.90 | |
| F3 | 62 | 3.65 | 11.36 | 18.42 | 32.93 | |
| F4 | 63 | 12.98 | 42.32 | 67.82 | 124.89 | |
| | 64 | 13.35 | 26.88 | 67.87 | 90.88 | |
| | 65 | 26.04 | 69.12 | 135.62 | 215.63 | |
| | 66 | 16.46 | 60.11 | 86.73 | 170.90 | |

| | 67 | 231.47 |
|-----|----------|--------|
| G1 | 70 | 5.57 |
| G2 | 71 | 3.87 |
| | 72 | 3.87 |
| | 73 | 3.87 |
| | 74 | 189.42 |
| H1 | 80 | 1.85 |
| H2 | 81 | 5.37 |
| Н3 | 82 | 1.92 |
| H4 | 83 | 8.07 |
| | 84 | 7.22 |
| | 85 | 1.92 |
| OS1 | OS1 | 67.00 |
| OS2 | OS2 | 59.00 |
| OS3 | OS3 | 61.00 |
| OS4 | OS4 | 180.00 |
| | Outfall1 | 80.03 |
| | Outfall2 | 85.96 |
| | Outfall3 | 30.00 |
| | Outfall4 | 341.05 |
| | | |

AND WILL BE ADJUSTED TO MEET CRITERIA WITH THE PRELIMINARY DRAINAGE REPORT



| +33 | |
|---------|--|
| HRGreen | |

| Job No.: | 191897.01 | |
|--------------|------------|--|
| Prepared By: | TBI | |
| Date: | 04/14/2020 | |

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APPENDIX C Hydrologic Computations

| | 2 Total Area (ac) 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | nty 3 | ed/Gravel Ro: Area (ac) 0 0 0 0 0 0 0 0 | Weighted % Imp. 0 0 0 0 0 0 0 | 6 | Provie existi basin ⁷ wns/Undevelo Area (ac) | 8 Ped Weighted % Imp. | site | 13 idential - 1/8 Area (ac) | 14 Acre Weighted % Imp. | 15 Res % Imp. | 16 idential - 1/4 . | 17 Acre | 18 | 19 | 20 | | P Calc Ch | roject No.: ulated By: lecked By: Date: | HRG01 TJE BAS | Subdivision | 26 | 27 |
|---|---|---|--|---|--|--|--------------------------------|--------------|-----------------------------------|----------------------------------|---------------------|------------------------|--------------------|----------|-----------------|---------------------|----------|-----------------|--|----------------------|-----------------|----------|---------------|
| I Basin ID OS-W OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-1 OS-2 | 2 Total Area (ac) 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 3 Por Imp. 100 100 100 100 100 100 100 100 | Area (ac) | Weighted % Imp. 0 0 0 0 0 0 0 | 6 Lav % Imp. | existi basin ⁷ wns/Undevelo Area (ac) | 8 Ped Weighted % Imp. | 12 Resi | idential - 1/8 | Acre Weighted | | | | | 19 | 20 | | Calc Ch | ulated By: lecked By: Date: | TJE BAS 3/1/22 | 25 | 20 | |
| EXISTING OS-NW OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 5% Imp. 100 100 100 100 100 100 100 | Area (ac) | Weighted % Imp. 0 0 0 0 0 0 0 | 6 Lav % Imp. | 7 wns/Undevelo Area (ac) | 8 ped Weighted % Imp. | 12 Resi | idential - 1/8 | Acre Weighted | | | | | 19 | 20 | | Ch | ecked By: Date: | BAS 3/1/22 | 25 | 20 | |
| EXISTING OS-NW OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 5% Imp. 100 100 100 100 100 100 100 | Area (ac) | Weighted % Imp. 0 0 0 0 0 0 0 | 6 Lav % Imp. | 7 wns/Undevelo Area (ac) | 8 ped Weighted % Imp. | 12 Resi | idential - 1/8 | Acre Weighted | | | | | 19 | 20 | | | Date: | 3/1/22 | 25 | 20 | 27 |
| EXISTING OS-NW OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 5% Imp. 100 100 100 100 100 100 100 | Area (ac) | Weighted % Imp. 0 0 0 0 0 0 0 | 6 Lav % Imp. 2 2 2 | 7 wns/Undevelo Area (ac) 16.18 | 8 Weighted % Imp. | Res | idential - 1/8 | Acre Weighted | | | | | 19 | 20 | | | | | 25 | 20 | 27 |
| EXISTING OS-NW OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 5% Imp. 100 100 100 100 100 100 100 | Area (ac) | Weighted % Imp. 0 0 0 0 0 0 0 | % Imp. | Area (ac) | Weighted % Imp. | Res | idential - 1/8 | Acre Weighted | | | | | 19 | 20 | | | | 24 | 25 | 20 | 27 |
| EXISTING OS-NW OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 5% Imp. 100 100 100 100 100 100 100 | Area (ac) | Weighted % Imp. 0 0 0 0 0 0 0 | % Imp. | Area (ac) | Weighted % Imp. | Res | idential - 1/8 | Acre Weighted | | idential - 1/4 | Acro | | | | 21 | 22 | 23 | 7.4 | | | |
| EXISTING OS-NW OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 108.8 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 100 100 100 | 0 0 0 0 0 0 0 | % Imp. 0 0 0 0 0 0 0 | 2 2 2 2 | 16.18 | % Imp. | % Imp. | Area (ac) | | % Imn | | un | Resi | dential - 1/3 A | cre | Res | idential - 1/2 | Acre | Re | sidential - 1 A | cre | Basins Total |
| OS-W OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-1 OS-2 | 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 100 100 | 0 0 0 0 0 | 0 0 0 0 0 0 | 2 | | | | | % Imp. | | Area (ac) | Weighted % Imp. | % Imp. | Area (ac) | Weighted % Imp. | % Imp. | Area (ac) | Weighted % Imp. | % Imp. | Area (ac) | Weighted | Weighted % |
| OS-W OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-1 OS-2 | 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 100 100 | 0 0 0 0 0 | 0 0 0 0 | 2 | | | | | - | | | 76 mp. | | | ⁷ 6 Imp. | | | 76 Imp. | | | % Imp. | Imp. |
| OS-NW EX-1 EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-1 OS-2 | 105.72 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 100 100 | 0 0 0 0 0 | 0 0 0 0 | 2 | | | | | | r | | | | | - I | | | | | | | 55* |
| EX-2 EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 16.18 46.06 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 100 100 | 0 0 0 0 0 | 0 0 0 0 | 2 | | | | | | | | | | | | | | | | | | 56* |
| EX-3 EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 64.34 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 100 | 0 0 0 0 | 0 0 0 0 | 2 | 46.06 | 2 | 65 | 0 | 0 | 40 | 0 | 0 | 30 | 0 | 0 | 25 | 0 | 0 | 20 | 0 | 0 | 2 |
| EX-4 EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 2.68 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 100 | 0 0 0 | 0 | | - | 2 | 65 | 0 | 0 | 40 | 0 | 0 | 30 | 0 | 0 | 25 | 0 | 0 | 20 | 0 | 0 | 2 |
| EX-5 EX-6 PROPOSED Basin-1 OS-1 OS-2 | 26.15 31.53 1.22 3.28 2.31 3.02 | 100 100 100 | 0 | 0 | 2 | 64.34 | 2 | 65 | 0 | 0 | 40 | 0 | 0 | 30 | 0 | 0 | 25 | 0 | 0 | 20 | 0 | 0 | 2 |
| EX-6 PROPOSED Basin-1 OS-1 OS-2 | 31.53 1.22 3.28 2.31 3.02 | 100 | 0 | | | 2.68 | 2 | 65 | 0 | 0 | 40 | 0 | 0 | 30 | 0 | 0 | 25 | 0 | 0 | 20 | 0 | 0 | 2 |
| Basin-1 OS-1 OS-2 | 1.22 3.28 2.31 3.02 | 100 | · · · | 0 | 2 | 26.15 31.53 | 2 | 65 65 | 0 | 0 | 40 40 | 0 | 0 | 30 30 | 0 | 0 | 25 25 | 0 | 0 | 20 20 | 0 | 0 | 2 2 |
| Basin-1 OS-1 OS-2 | 3.28 2.31 3.02 | | | U | 4 | 51.55 | 4 | 03 | 0 | 0 | 40 | 0 | U | 50 | 0 | U | 23 | 0 | U | 20 | 0 | U | 2 |
| OS-1 OS-2 | 3.28 2.31 3.02 | | 0.98 | 80.3 | 2 | 0.24 | 0.4 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 80.7 |
| | 3.02 | 100 | 2.35 | 71.6 | 2 | 0.93 | 0.6 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 72.2 |
| OS-3 | | 100 | 1.35 | 58.4 | 2 | 0.96 | 0.8 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 59.2 |
| | | 100 | 1.90 | 62.9 | 2 | 1.12 | 0.7 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 63.6 |
| OS-4 A-1 | 3.00 11.23 | 100 | 1.68 0.00 | 56.0 0.0 | 2 | 1.32 11.23 | 0.9 2.0 | 65.0 65.0 | 0.00 | 0.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 56.9 2.0 |
| A-1 A-2a | 4.21 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 4.21 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| A-2b | 2.75 | 100 | 1.80 | 65.5 | 2 | 0.00 | 0.0 | 65.0 | 0.95 | 22.5 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 88.0 |
| A-3 | 0.36 | 100 | 0.36 | 100.0 | 2 | 0.00 | 0.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 100.0 65.0 |
| A-4a A-4b | 6.05 3.81 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 6.05 3.81 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 |
| A-5 | 0.35 | 100 | 0.35 | 100.0 | 2 | 0.00 | 0.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 100.0 |
| A-6 A-7 | 2.76 0.23 | 100 | 0.00 0.23 | 0.0 100.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 2.76 0.00 | 65.0 0.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 100.0 |
| A-/ A-8 | 5.44 | 100 | 4.06 | 74.5 | 2 | 1.39 | 0.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 75.0 |
| A-9 | 4.91 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 4.91 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| A-10 A-11 | 1.02 3.56 | 100 | 0.00 | 0.0 | 2 | 0.00 2.77 | 0.0 | 65.0 65.0 | 1.02 0.79 | 65.0 14.4 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 16.0 |
| B-1 | 3.33 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 3.33 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| B-2 | 4.51 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 4.51 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| B-3 B-4 | 4.05 1.35 | 100 | 0.00 | 0.0 77.8 | 2 | 0.00 0.30 | 0.0 | 65.0 65.0 | 4.05 | 65.0 0.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 78.2 |
| B-5 | 5.12 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.4 | 65.0 | 5.12 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| B-6 | 2.28 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 2.28 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| B-7 B-8 | 0.89 3.23 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 0.89 3.23 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 65.0 |
| B-9 | 2.42 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 2.42 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| B-10 | 1.10 | 100 | 0.00 | 0.0 | 2 | 1.10 | 2.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 2.0 |
| C-1 C-2 | 4.12 2.71 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 4.12 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 65.0 |
| C-3 | 1.56 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 1.56 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| C-4 C-5 | 2.47 3.09 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 2.47 3.09 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 65.0 |
| C-6 | 2.1 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 2.10 | 65.0 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| C-7 | 6.72 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 6.72 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| C-8 C-9a | 5.11 3.5 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 5.11 3.50 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 65.0 |
| C-9a C-9b | 3.69 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 3.69 | 65.0 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 |
| C-10 | 3.51 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 3.51 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| C-11 C-12 | 0.46 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 0.46 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 65.0 |
| C-12 C-13 | 2.37 | 100 | 0.00 | 0.0 | 2 | 2.37 | 2.0 | 65.0 | 0.00 | 0.0 | 40 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 2.0 |
| C-14 | 1.53 | 100 | 0.00 | 0.0 | 2 | 1.53 | 2.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 2.0 |
| D-1 D-2 | 2.98 0.87 | 100 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 2.98 0.87 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 65.0 |
| D-2 D-3 | 3.66 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 3.66 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| D-4 | 2.00 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 2.00 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| D-5 D-6 | 1.53 0.83 | 100 | 0.00 | 0.0 | 2 | 0.71 0.83 | 0.9 | 65.0 | 0.82 | 34.8 | 40 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 35.7 2.0 |
| D-6 D-7 | 0.83 | 100 | 0.00 | 0.0 | 2 | 0.83 | 2.0 0.5 | 65.0 65.0 | 0.00 | 0.0 49.8 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 2.0 |
| E-1 | 5.13 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 5.13 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| E-2 E-3 | 5.42 3.20 | 100 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 65.0 | 5.42 3.20 | 65.0 65.0 | 40 40 | 0.00 | 0.0 | 30 30 | 0.00 | 0.0 | 25 25 | 0.00 | 0.0 | 20 20 | 0.00 | 0.0 | 65.0 65.0 |
| E-3 E-4 | 6.28 | 100 | 0.00 | 0.0 | 2 | 0.00 | 0.0 | 65.0 | 6.28 | 65.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 65.0 |
| E-5 | 1.13 | 100 | 0.00 | 0.0 | 2 | 1.13 | 2.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | 0.0 | 2.0 |
| E-6 | 0.74 | 100 | 0.00 | 0.0 | 2 | 0.74 | 2.0 | 65.0 | 0.00 | 0.0 | 40 | 0.00 | 0.0 | 30 | 0.00 | 0.0 | 25 | 0.00 | 0.0 | 20 | 0.00 | | 2.0 |

| Lot Type Ide | entification: |
|-----------------|-----------------|
| Lot Size (SF) | Lot Size (Acre) |
| 0 - 8,167 | 1/8 Acre |
| 8,168 - 12,704 | 1/4 Acre |
| 12,705 - 18,149 | 1/3 Acre |
| 18,150 - 32,670 | 1/2 Acre |
| 32,671 - 43,560 | 1 Acre |

NOTES: % Impervious values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001) *: Taken from NRCS Curve Numbers within HR Green MDDP

Subdivision:Grandview ReserveLocation:CO, El Paso County

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|------------------|-----------------|----------------|------------------|-----------|----------------|------------------|---------------|----------------|------------------|-----------|----------------|------------------|--------------|----------------|------------------|-----------|----------------|------------------|-----------|----------------|------------------|-----------|----------------|------------------|-----------|--------------------------|------------------|
| | | Pav | ed/Gravel R | oads | La | wns/Undevel | | | Roofs | | | idential - 1/8 | | Resi | dential - 1/4 | | | idential - 1/3 | | | idential - 1/2 | | | sidential - 1 A | | | Composite |
| Basin ID | Total Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | C ₅ | C ₁₀₀ | Area (ac) | Composite C ₅ | C ₁₀₀ |
| EXISTING | 100.0 | | 1 | 1 | | 1 | · · · · · · · | | | i | - | | 1 | | | 1 | | 1 | 1 | | 1 | . I | | 1 | 1 | | 55.044 |
| OS-W OS-NW | 108.8 105.72 | | | | | | | | | | | | | | | | | | | | | | | | | | 55.04* 56.49* |
| EX-1 | 16.18 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 16.18 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| EX-2 | 46.06 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 46.06 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| EX-3 EX-4 | 64.34 2.68 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 64.34 2.68 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| EX-5 | 26.15 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 26.15 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| EX-6 PROPOSED | 31.53 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 31.53 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| Basin-1 | 1.22 | 0.90 | 0.96 | 0.98 | 0.09 | 0.36 | 0.24 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.74 | 0.84 |
| OS-1 | 3.28 | 0.90 | 0.96 | 2.35 | 0.09 | 0.36 | 0.93 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.67 | 0.79 |
| OS-2 OS-3 | 2.31 3.02 | 0.90 | 0.96 | 1.35 | 0.09 | 0.36 | 0.96 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.56 | 0.71 0.74 |
| OS-4 | 3.00 | 0.90 | 0.96 | 1.68 | 0.09 | 0.36 | 1.32 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.54 | 0.74 |
| A-1 | 11.23 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 11.23 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| A-2a A-2b | 4.21 2.75 | 0.90 | 0.96 | 0.00 1.80 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 4.21 0.95 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 0.74 | 0.59 0.83 |
| A-3 | 0.36 | 0.90 | 0.96 | 0.36 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.90 | 0.96 |
| A-4a A-4b | 6.05 3.81 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 6.05 3.81 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 0.59 |
| A-4b A-5 | 0.35 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| A-6 | 2.76 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 2.76 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| A-7 A-8 | 0.23 | 0.90 | 0.96 | 0.23 4.06 | 0.09 | 0.36 | 0.00 1.39 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.90 | 0.96 |
| A-9 | 4.91 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 4.91 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| A-10 | 1.02 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 1.02 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| A-11 B-1 | 3.56 3.33 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 2.77 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.79 3.33 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 0.00 | 0.20 | 0.44 | 0.00 | 0.17 0.45 | 0.41 0.59 |
| B-2 | 4.51 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 4.51 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| B-3 B-4 | 4.05 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 0.30 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 4.05 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 0.72 | 0.59 0.83 |
| B-4 B-5 | 5.12 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 5.12 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.72 | 0.85 |
| B-6 | 2.28 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 2.28 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| B-7 B-8 | 0.89 3.23 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.89 3.23 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| B-9 | 2.42 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 2.42 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| B-10 | 1.10 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 1.10 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| C-1 C-2 | 4.12 2.71 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 4.12 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 0.59 |
| C-3 | 1.56 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 1.56 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| C-4 C-5 | 2.47 3.09 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 2.47 3.09 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 0.59 |
| C-6 | 2.10 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 2.10 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| C-7 | 6.72 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 6.72 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| C-8 C-9a | 5.11 3.50 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 0.73 | 0.81 | 0.00 | 0.45 | 0.59 0.59 | 5.11 3.50 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 0.59 |
| C-9b | 3.69 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 3.69 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| C-10 C-11 | 3.51 0.46 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 3.51 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 0.59 |
| C-11 C-12 | 1.79 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 1.79 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| C-13 | 2.37 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 2.37 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| C-14 D-1 | 1.53 2.98 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 1.53 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 2.98 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 0.00 | 0.20 | 0.44 | 0.00 | 0.09 0.45 | 0.36 0.59 |
| D-2 | 0.87 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.87 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| D-3 D-4 | 3.66 2.00 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 3.66 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 0.59 |
| D-4 D-5 | 1.53 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.82 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.43 | 0.39 |
| D-6 | 0.83 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.83 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |
| D-7 E-1 | 1.80 5.13 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.42 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 1.38 5.13 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.37 0.45 | 0.54 0.59 |
| E-2 | 5.42 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 5.42 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| E-3 | 3.20 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 3.20 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.45 | 0.59 |
| E-4 E-5 | 6.28 1.13 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.00 1.13 | 0.73 0.73 | 0.81 | 0.00 | 0.45 | 0.59 0.59 | 6.28 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 0.47 | 0.00 | 0.22 | 0.46 | 0.00 0.00 | 0.20 | 0.44 | 0.00 | 0.45 0.09 | 0.59 0.36 |
| E-6 | 0.74 | 0.90 | 0.96 | 0.00 | 0.09 | 0.36 | 0.74 | 0.73 | 0.81 | 0.00 | 0.45 | 0.59 | 0.00 | 0.30 | 0.50 | 0.00 | 0.25 | 0.47 | 0.00 | 0.22 | 0.46 | 0.00 | 0.20 | 0.44 | 0.00 | 0.09 | 0.36 |

| Lot Type Ide | entification: |
|-----------------|-----------------|
| Lot Size (SF) | Lot Size (Acre) |
| 0 - 8,167 | = 1/8 Acre</th |
| 8,168 - 12,704 | 1/4 Acre |
| 12,705 - 18,149 | 1/3 Acre |
| 18,150 - 32,670 | 1/2 Acre |
| 32,671 - 43,560 | 1 Acre |

NOTES:

C values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001) Coeffficients use HSG A&B soils - Refer to "Appendix A: Exhibits and Figures" for soil map *: SCS Curve Number from HR Green MDDP

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

STANDARD FORM SF-2: EXISTING & PROPOSED TIME OF CONCENTRATION

| Subc | ubdivision: Grandview Reserve Project Na | | | | | | | | | | Name: | e: Grandview Subdivision PDR | | | | | | |
|------------------|--|---------------------------|-------------------|----------------|------------------|------------|-------------------|-------------------------|--------------|------------|----------|------------------------------|-------------------------|-------------------------------|-------------------|------------------------------------|-------------------------|--|
| L | | | | | | | ect No.: | | | | | | | | | | | |
| | | | | | | | | | | | | Calcula | | TJE | | | | |
| | | | | | | | | | | | | Checl | ked By: | BAS | | | \frown | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | Date: | 3/1/22 | 16 | 17 | 18 | |
| | - | SUB-BA | | | | INITL | AL/OVER | LAND | | | RAVEL TI | | | | Te CHECK | | | |
| DAGIN | | DAT | | 6 | | | (T _i) | | | | (T,) | | | COMP | (T _c) | | FINAL | |
| BASIN ID | D.A. (AC) | Hydrologic Soils Group | Impervious (%) | C ₅ | C ₁₀₀ | L (FT) | S (%) | T _i (MIN) | L (FT) | S (%) | Cv | VEL. (FPS) | T _t (MIN) | COMP. T _c (MIN) | TOTAL LENGTHAT | Calculated T _c (MIN) | T _e (MIN) | |
| EXISTING | () | Toollo or only | (,-) | | | () | (,,,) | (| () | (, ;) | | () | (| (| | () | (| |
| OS-W OS-NW | | | | | | | | | | | | | | | \vee | | | |
| EX-1 | 16.18 | A | 2.0 | 0.09 | 0.36 | 300 | 3.3 | 21.6 | 1433 | 2.5 | 15 | 2.4 | 10.0 | 31.6 | 1732.7 | 19.6 | 19.6 | |
| EX-2 | 46.06 | A | 2.0 | 0.09 | 0.36 | 300 | 2.5 | 23.6 | 3127 | 2.0 | 15 | 2.1 | 24.7 | 48.3 | 3427.0 | 29.0 | 29.0 | |
| EX-3 EX-4 | 64.34 2.68 | A A | 2.0 2.0 | 0.09 | 0.36 | 300 300 | 3.2 2.5 | 21.7 23.8 | 3964 462 | 2.1 2.4 | 15 15 | 2.2 | 30.4 | 52.1 | 4263.6 762.3 | 33.7 | 33.7 | |
| EX-5 | 26.15 | A | 2.0 | 0.09 | 0.36 | 300 | 3.1 | 22.1 | 2121 | 2.3 | 15 | 2.3 | 15.6 | 37.7 | 2420.8 | 23.4 | 23.4 | |
| EX-6 PROPOSEI | 31.53 | A | 2.0 | 0.09 | 0.36 | 300 | 3.6 | 20.9 | 1488 | 2.1 | 15 | 2.2 | 11.4 | 32.3 | 1788.5 | 19.9 | 19.9 | |
| Basin-1 | 1.22 | A | 80.7 | 0.74 | 0.84 | 46 | 2.0 | 3.5 | 556 | 1.8 | 20 | 2.7 | 3.5 | 7.0 | 602.0 | 13.3 | 7.0 | |
| OS-1 | 3.28 | A | 72.2 | 0.67 | 0.79 | 48 | 3.0 | 3.8 | 1795 | 1.3 | 20 | 2.3 | 13.1 | 16.9 | 1843.0 | 20.2 | 16.9 | |
| OS-2 OS-3 | 2.31 3.02 | A | 59.2 63.6 | 0.56 | 0.71 0.74 | 45 | 4.0 | 4.2 | 1426 1050 | 1.4 | 20 20 | 2.4 | 10.0 | 14.2 | 1471.0 1084.0 | 18.2 | 14.2 | |
| OS-4 | 3.00 | А | 56.9 | 0.54 | 0.70 | 34 | 2.0 | 4.7 | 1020 | 1.4 | 20 | 2.4 | 7.2 | 11.9 | 1054.0 | 15.9 | 11.9 | |
| A-1 | 11.23 | A | 2.0 | 0.09 | 0.36 | 50 50 | 10.0 | 6.1 4.9 | 957 742 | 5.0 2.5 | 20 20 | 4.5 | 3.6 | 9.6 | 1007.0 | 15.6 14.4 | 9.6 | |
| A-2a A-2b | 4.21 2.75 | A A | 65.0 88.0 | 0.45 0.74 | 0.59 0.83 | 250 | 5.0 | 4.9 | 300 | 2.5 | 20 | 3.2 | 3.9 | 8.8 | 792.0 | 14.4 | 8.8 9.9 | |
| A-3 | 0.36 | A | 100.0 | 0.90 | 0.96 | 18 | 2.0 | 1.2 | 560 | 1.9 | 20 | 2.8 | 3.4 | 4.6 | 578.0 | 13.2 | 5.0 | |
| A-4a A-4b | 6.05 3.81 | A | 65.0 65.0 | 0.45 | 0.59 | 230 | 2.0 | 14.3 9.4 | 700 770 | 2.5 2.5 | 20 20 | 3.2 3.2 | 3.7 | 18.0 | 930.0 870.0 | 15.2 | 15.2 | |
| A-5 | 0.35 | A | 100.0 | 0.90 | 0.96 | 18 | 2.0 | 1.2 | 332 | 1.4 | 20 | 2.4 | 2.3 | 3.6 | 350.0 | 11.9 | 5.0 | |
| A-6 A-7 | 2.76 | A | 65.0 100.0 | 0.45 | 0.59 | 217 36 | 4.5 | 10.6 | 310 340 | 1.0 | 20 20 | 2.0 | 2.6 | 13.2 | 527.0 376.0 | 12.9 | 12.9 | |
| A-7 A-8 | 5.44 | A | 75.0 | 0.90 | 0.96 | 250 | 2.0 | 9.4 | 340 | 2.3 | 20 | 2.8 | 1.9 | 3.4 | 550.0 | 12.1 | 5.0 | |
| A-9 | 4.91 | А | 65.0 | 0.45 | 0.59 | 160 | 2.0 | 11.9 | 950 | 1.5 | 20 | 2.4 | 6.5 | 18.4 | 1110.0 | 16.2 | 16.2 | |
| A-10 A-11 | 1.02 3.56 | A A | 65.0 16.0 | 0.45 0.17 | 0.59 0.41 | 18 450 | 3.0 | 3.5 | 450 718 | 1.0 | 20 | 2.0 | 3.8 | 7.3 27.1 | 468.0 1168.0 | 12.6 | 7.3 | |
| B-1 | 3.33 | A | 65.0 | 0.45 | 0.41 | 210 | 3.5 | 11.4 | 560 | 1.0 | 20 | 2.6 | 3.6 | 14.9 | 770.0 | 14.3 | 14.3 | |
| B-2 | 4.51 | A | 65.0 | 0.45 | 0.59 | 230 | 3.0 | 12.5 | 611 | 2.5 | 20 | 3.2 | 3.2 | 15.7 | 841.0 | 14.7 | 14.7 | |
| B-3 B-4 | 4.05 | A | 65.0 78.2 | 0.45 0.72 | 0.59 0.83 | 34 10 | 2.0 | 5.5 | 680 700 | 2.7 | 20 20 | 3.3 | 3.4 5.8 | 9.0 7.0 | 714.0 710.0 | 14.0 | 9.0 7.0 | |
| B-5 | 5.12 | A | 65.0 | 0.45 | 0.59 | 60 | 1.0 | 9.2 | 946 | 1.7 | 20 | 2.6 | 6.0 | 15.3 | 1006.0 | 15.6 | 15.3 | |
| B-6 B-7 | 2.28 0.89 | A A | 65.0 65.0 | 0.45 | 0.59 | 186 62 | 3.0 | 11.3 6.5 | 480 509 | 1.0 | 20 20 | 2.0 | 4.0 4.2 | 15.3 | 666.0 571.0 | 13.7 | 13.7 | |
| B-8 | 3.23 | A | 65.0 | 0.45 | 0.59 | 177 | 5.0 | 9.3 | 700 | 2.0 | 20 | 2.8 | 4.2 | 13.4 | 877.0 | 13.2 | 13.4 | |
| B-9 | 2.42 | A | 65.0 | 0.45 | 0.59 | 152 | 3.0 | 10.2 | 800 | 2.4 | 20 | 3.1 | 4.3 | 14.5 | 952.0 | 15.3 | 14.5 | |
| B-10 C-1 | 1.10 4.12 | A | 2.0 65.0 | 0.09 | 0.36 | 66 65 | 25.0 | 5.1 | 187 1077 | 1.0 2.0 | 20 20 | 2.0 | 1.6 | 6.7 | 253.0 1142.0 | 11.4 | 6.7 | |
| C-2 | 2.71 | А | 65.0 | 0.45 | 0.59 | 55 | 2.0 | 7.0 | 620 | 1.9 | 20 | 2.8 | 3.7 | 10.8 | 675.0 | 13.8 | 10.8 | |
| C-3 C-4 | 1.56 2.47 | A | 65.0 65.0 | 0.45 | 0.59 | 77 194 | 4.0 | 6.6 13.2 | 0 345 | 0.0 | 20 20 | 0.0 | 0.0 | 6.6 | 77.0 539.0 | 10.4 | 6.6 13.0 | |
| C-4 C-5 | 3.09 | A | 65.0 | 0.45 | 0.59 | 38 | 4.0 | 4.6 | 761 | 1.5 | 20 | 2.0 | 6.3 | 13.7 | 799.0 | 13.0 | 13.0 | |
| C-6 | 2.10 | A | 65.0 | 0.45 | 0.59 | 61 | 3.0 | 6.4 | 1176 | 1.0 | 20 | 2.0 | 9.8 | 16.2 | 1236.5 | 16.9 | 16.2 | |
| C-7 C-8 | 6.72 5.11 | A | 65.0 65.0 | 0.45 | 0.59 | 35 58 | 4.0 | 4.4 | 1278 834 | 1.7 | 20 20 | 2.6 | 8.2 5.5 | 12.6 | 1313.0 892.0 | 17.3 | 12.6 | |
| C-9a | 3.50 | A | 65.0 | 0.45 | 0.59 | 193 | 2.0 | 13.1 | 570 | 0.7 | 20 | 1.7 | 5.7 | 18.8 | 763.0 | 14.2 | 14.2 | |
| C-9b C-10 | 3.69 | A | 65.0 65.0 | 0.45 | 0.59 | 160 | 3.0 | 10.4 | 665 1084 | 2.0 | 20 20 | 2.8 | 3.9 | 14.4 | 825.0 1206.0 | 14.6 | 14.4 | |
| C-10 C-11 | 0.46 | A | 65.0 | 0.45 | 0.59 | 26 | 2.0 | 4.8 | 1084 | 0.5 | 20 | 1.4 | 1.8 | 6.6 | 1208.0 | 10.7 | 6.6 | |
| C-12 | 1.79 | A | 65.0 | 0.45 | 0.59 | 160 | 4.0 | 9.5 | 200 | 0.5 | 20 | 1.4 | 2.4 | 11.8 | 360.0 | 12.0 | 11.8 | |
| C-13 C-14 | 2.37 | A | 2.0 | 0.09 | 0.36 | 225 300 | 15.0 | 11.3 18.7 | 352 | 1.0 | 20 10 | 2.0 | 2.9 | 14.2 | 577.0 300.0 | 13.2 | 13.2 | |
| D-1 | 2.98 | A | 65.0 | 0.45 | 0.59 | 170 | 1.0 | 15.5 | 715 | 1.0 | 20 | 2.0 | 6.0 | 21.5 | 885.0 | 14.9 | 14.9 | |
| D-2 | 0.87 | A | 65.0 | 0.45 | 0.59 | 10 140 | 2.0 | 3.0 | 700 | 1.3 | 20 20 | 2.3 | 5.1 | 8.1 | 710.0 | 13.9 | 8.1 | |
| D-3 D-4 | 3.66 | A | 65.0 65.0 | 0.45 | 0.59 | 50 | 3.0 | 9.8 5.8 | 660 750 | 2.2 | 20 | 2.8 | 4.4 | 13.5 | 800.0 800.0 | 14.4 | 13.5 | |
| D-5 | 1.53 | A | 35.7 | 0.28 | 0.48 | 110 | 25.0 | 5.4 | 201 | 1.0 | 20 | 2.0 | 1.7 | 7.1 | 311.0 | 11.7 | 7.1 | |
| D-6 D-7 | 0.83 | A | 2.0 | 0.09 | 0.36 | 300 | 5.0 | 18.7 | 0 855 | 0.0 | 10 | 0.0 | 0.0 | 18.7 | 300.0 930.0 | 11.7 | 11.7 | |
| E-1 | 5.13 | A | 65.0 | 0.45 | 0.59 | 25 | 4.0 | 3.7 | 1360 | 3.3 | 20 | 3.6 | 6.2 | 12.5 | 1385.0 | 17.7 | 10.0 | |
| E-2 | 5.42 | A | 65.0 | 0.45 | 0.59 | 20 | 2.0 | 4.2 | 1250 | 3.5 | 20 | 3.7 | 5.6 | 9.8 | 1270.0 975.0 | 17.1 | 9.8 | |
| E-3 E-4 | 3.20 6.28 | A A | 65.0 65.0 | 0.45 | 0.59 0.59 | 10 305 | 2.0 7.0 | 3.0 | 965 1125 | 1.5 | 20 20 | 2.4 | 6.6 7.4 | 9.6 | 975.0 | 15.4 | 9.6 17.9 | |
| E-5 | 1.13 | A | 2.0 | 0.09 | 0.36 | 127 | 25.0 | 7.1 | 315 | 1.0 | 20 | 2.0 | 2.6 | 9.8 | 442.0 | 12.5 | 9.8 | |
| E-6 | 0.74 | A | 2.0 | 0.09 | 0.36 | 350 | 2.0 | 27.5 | 113 | 2.0 | 10 | 1.4 | 1.3 | 28.8 | 463.0 | 12.6 | 12.6 | |

the computed value needs to be used for existing conditions if it's higher than the Tc check (the area isn't urbanized yet)

NOTES:

$$\begin{split} T_i &= (0.395^*(1.1-C_3)^*(L)^{0.5})/((S)^{0.33}), \ S \ in \ fi/ft \\ T_i &= L/60V \ (Velocity + Trom Fig. 501) \\ Velocity + V &= V^{0.5} \ S, \ S, \ S \ in \ fi/ft \\ T_c \ Check &= 10 + L/180 \\ For \ Urbanized basins a minimum \ T_e \ of 5.0 \ minutes is required. \\ For non-arbanized basins a minimum \ T_e \ of 1.0.0 \ minutes is required. \end{split}$$

Not checked on this review

STORM DRAINAGE SYSTEM DESIGN (RATIONAL METHOD PROCEDURE)

| Subdivision Location | | lview Rese | | | | | | | - | | | | | | Projec | | HRG(| | Subdivis | ion PE | R |
|-------------------------|-------------|------------|-----------|--------------|---------|---------|----------|-------|----------|---------|---------|-------|----------|------------------|------------------|----------|-------------------|------------|------------------|----------|--|
| Design Storm | | | | | | | | | - | | | | | | hecke | d By: | |) | | | |
| | _ | | | | | | | | | | | | | | - | | | | | | |
| | | | | DIRE | CT RUI | NOFF | | 1 | | FOTAL | RUNOF | F | STR | EET | | PIPE | - | TRA | VEL TI | ME | |
| STREET | esign Point | asin ID | Area (Ac) | unoff Coeff. | c (min) | *A (Ac) | (in/hr) | (cfs) | c (min) | *A (Ac) | (in/hr) | (cfs) | lope (%) | treet Flow (cfs) | esign Flow (cfs) | lope (%) | ipe Size (inches) | ength (ft) | elocity (fps) | Tt (min) | REMARKS |
| EXISTING | | <u> </u> | | ~ | н | | <u> </u> | | <u> </u> | | | | S | S | Ц | S | | | | Į. | |
| | | OS-W | 108.80 | | | | | | | | | 67.0 | | | | | | | | | Sheet flow to Main Stem Channel Total Flow - Q(5)=67 cfs (from MDDP) |
| | | OS-NW | 105.72 | | | | | | | | | | | | | | | | | | Sheet flow to Main Stem Tributary #2 Channel |
| | | EX-1 | 16.18 | 0.09 | 19.6 | 1.46 | 3.04 | 4.4 | | | | 59.0 | | | | | | | | | Total Flow - Q(5)=59 cfs (from MDDP) Sheet flow to Main Stem Channel |
| | 1 | EX-2 | 46.06 | 0.09 | 29.0 | 4.15 | 2.47 | 10.3 | | | | | | | | | | | $\left \right $ | | Total Flow - Incl. Offsite flow of Q(5)=67 cfs (from MDDP) Sheet flow to Main Stem Channel |
| | 2 | | | | | | | | | | | 77.3 | | | | | | | | | Total Flow - Incl. Offsite flow of Q(5)=67 cfs (from MDDP) |
| | 3 | EX-3 | 64.34 | 0.09 | 33.7 | 5.79 | 2.27 | 13.1 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 4 | EX-4 | 2.68 | 0.09 | 14.2 | 0.24 | 3.54 | 0.8 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 5 | EX-5 | 26.15 | 0.09 | 23.4 | 2.35 | 2.77 | 6.5 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | | EX-6 | 31.53 | 0.09 | 19.9 | 2.84 | 3.02 | 8.6 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 6 | | | | | | | | | | | | | | | | | | | | Total Existing Flow Leaving Property offsite - outfalls to Main Stem |
| | 7 | | | | | | | | 33.7 | 16.8 | 2.3 | 164.2 | | | | | | | | | Tributary #2 Channel |
| PROPOSED | - | • | | | | | | • | | • | | | | | | | | | | | |
| | 1 | Basin-1 | 1.22 | 0.74 | 7.0 | 0.90 | 4.64 | 4.2 | | | | | | | 1 | | | | | | East Leg of Rex Road Intersection |
| | 1 | A-1 | 11.23 | 0.09 | 9.6 | 1.01 | 4.16 | 4.2 | | | | | | | | | | | + | | Institutional Tract |
| | 2a | A-2a | 4.21 | 0.45 | 8.8 | 1.89 | 4.29 | 8.1 | | | | | | | | | | | | | Basin will have own water quality & detention pond On-Grade 15' CDOT Type R Inlet (0.4 cfs bypass to DP 2b) |
| | _ | A-2b | 2.75 | 0.74 | 9.9 | 2.04 | 4.13 | 8.4 | | | | | | | | | | | | | |
| | 2b | | | | | | | | | | | 8.8 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 0.4 cfs upstream bypass) |
| | 3 | A-3 | 0.36 | 0.90 | 5.0 | 0.32 | 5.10 | 1.6 | | | | | | | | | | | | | Sump 5' CDOT Type R Inlet |
| | 4a | A-4a | 6.05 | 0.45 | 15.2 | 2.72 | 3.44 | 9.4 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (2.9 cfs bypass to DP 2) |
| | 4b 4 | A-4b | 3.81 | 0.45 | 13.5 | 1.71 | 3.63 | 6.2 | | | | 4.2 | | | | | | | | | On-Grade 10' CDOT Type R Inlet (1.3 cfs bypass to DP 2) |
| | 5 | A-5 | 0.35 | 0.90 | 5.0 | 0.32 | 5.10 | 1.6 | | | | 4.2 | | | | | | | | | Sump 15' CDOT Type R Inlet (Receives 4.2 cfs upstream bypass) Sump 5' CDOT Type R Inlet |
| | 6 | A-6 | 2.76 | 0.45 | 12.9 | 1.24 | 3.70 | 4.6 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (0.4 cfs bypass to DP 7a) |
| | 7 | A-7 | 0.23 | 0.90 | 5.0 | 0.21 | 5.10 | 1.1 | | | | | | | | | | | | | On-Grade 5' CDOT Type R Inlet (0.1 cfs bypass to DP 7b) |
| | 8 | A-8 | 5.44 | 0.69 | 11.2 | 3.75 | 3.93 | 14.7 | | | | | | | | | | | | | Proposed Amenitity Center - Assumed 75% Imperviousness |
| | 0 | | | | | | | | | | | | | | | | | | | | Proposed Ameniaty Center - Assumed 7576 imperviousness |
| | 7a | A-9 | 4.91 | 0.45 | 16.2 | 2.21 | 3.34 | 7.4 | | | | 7.8 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 0.4 cfs upstream bypass) |
| | 7b | A-10 | 1.02 | 0.45 | 7.3 | 0.46 | 4.59 | 2.1 | | | | 2.2 | | | | | | | | | Sump 5' CDOT Type R Inlet (Receives 0.1 cfs upstream bypass) |
| | 8a | A-11 | 3.56 | 0.17 | 16.5 | 0.61 | 3.31 | 2.0 | 16.5 | 17.48 | 3.31 | 57.9 | | | | | | | | | Total of Flows to Pond A |
| | 9 | B-1 | 3.33 | 0.45 | 14.3 | 1.50 | 3.54 | 5.3 | 10.5 | 17.40 | 5.51 | 51.9 | | | | | | | | | Sump 10' CDOT Type R Inlet |
| | 10a | B-2 | 4.51 | 0.45 | 14.7 | 2.03 | 3.50 | 7.1 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (1.5 cfs bypass to DP 10b) |
| | | B-3 | 4.05 | 0.45 | 9.0 | 1.82 | 4.27 | 7.8 | | | | | | | | | | | $\left \right $ | | |
| | 10b 11 | B-4 | 1.35 | 0.72 | 7.0 | 0.97 | 4.63 | 4.5 | | | | 9.3 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 1.5 cfs of upstream bypass) Sump 10' CDOT Type R Inlet |
| | | | | | | | | | | | | | | | | | | | | | · · · · · |
| | 12a | B-5 | 5.12 | 0.45 | 15.3 | 2.30 | 3.43 | 7.9 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (2.0 cfs bypass to DP 12b) |
| | 14 | B-6 | 2.28 | 0.45 | 13.7 | 1.03 | 3.61 | 3.7 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (0.1 cfs bypass to DP 12b) |

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

 Subdivision:
 Grandview Reserve

 Location:
 CO, El Paso County
 Design Storm: 5-Year

| Project Name: | Grandview Subdivision PDR |
|----------------|---------------------------|
| Project No.: | HRG01 |
| Calculated By: | TJE |
| Checked By: | BAS |
| Date: | 3/1/22 |

| | | | | | | | | | Date: 3/1/22 | | | | | | | | | | | | |
|-------------------------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------|------------|--------------|----------|-----------|------------|-----------|-------------------|-------------------|-----------|--------------------|-------------|----------------|--|---|
| | | | | DIRI | ECT RUI | NOFF | | | , | FOTAL | RUNOF | F | STR | REET | | PIPE | | TRAV | /EL T | ME | |
| STREET | Design Point | Basin ID | Area (Ac) | Runoff Coeff. | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Slope (%) | Street Flow (cfs) | Design Flow (cfs) | Slope (%) | Pipe Size (inches) | Length (ft) | Velocity (fps) | Tt (min) | REMARKS |
| | 15 | B-7 | 0.89 | 0.45 | 10.7 | 0.40 | 3.99 | 1.6 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (0.0 cfs bypass to DP 12b) |
| | 12b | B-8 | 3.23 | 0.45 | 13.4 | 1.45 | 3.64 | 5.3 | | | | 7.4 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 2.1 cfs of upstream bypass) |
| | 13 | B-9 B-10 | 2.42 | 0.45 | 14.5 6.7 | 0.10 | 3.52 4.70 | 3.8 0.5 | | | | | | | | | | | | | Sump 10' CDOT Type R Inlet |
| | 16 17b | C-1 | 4.12 | 0.45 | 13.0 | 1.85 | 3.69 | 6.8 | 15.3 | 12.69 | 3.43 | 43.5 | | | | | | | | | Total of flows to Pond B On-Grade 15' CDOT Type R (0.1 cfs bypass to DP 17e) |
| | 17a | C-2 | 2.71 | 0.45 | 10.8 | 1.22 | 3.99 | 4.9 | | | | | | | | | | | | | On-Grade 15' CDOT Type R (1.7 cfs bypass to DP 17c) |
| | | C-3 | 1.56 | 0.45 | 6.6 | 0.70 | 4.73 | 3.3 | | | | | | | | | | | | | Sheet Flows off-site east |
| | 17c | C-4 C-5 | 2.47 | 0.45 | 13.0 | 1.11 | 3.69 | 4.1 | | | | 5.8 | | | | | | | | | Receives 1.7 cfs of Bypass from DP 17a On-Grade 15' CDOT Type R (0.0 cfs bypass to DP 17d) Receives 0.0 cfs of Bypass from DP 17c |
| | 17d | C-6 | 2.10 | 0.45 | 16.2 | 0.95 | 3.34 | 3.2 | | | | 5.5 | | | | | | | | | On-Grade 15' CDOT Type R (0.0 cfs bypass to DP 17h) Receives 0.1 cfs of Bypass from DP 17b |
| | 17e 17f | C-8 | 5.11 | 0.45 | 12.7 | 2.30 | 3.73 | 8.6 | | | | 3.3 | | | | | | | | | On-Grade 15' CDOT Type R (0.0 cfs bypass to DP 17h) On-Grade 15' CDOT Type R (0.6 cfs bypass to DP 17g) |
| | 17g | C-9a | 3.50 | 0.45 | 14.2 | 1.58 | 3.54 | 5.6 | | | | 6.2 | | | | | | | | | Receives 0.6 cfs of Bypass from DP 17f On-Grade 15' CDOT Type R (0.0 cfs bypass to DP 17h) |
| | 17h 18a | C-9b C-7 | 3.69 6.72 | 0.45 | 14.4 | 1.66 3.02 | 3.53 3.74 | 5.9 | | | | 5.9 | | | | | | | | | Sump 20' CDOT Type R (Receives 0.0 cfs of upstream bypass) |
| | _ | C-10 | 3.51 | 0.45 | 12.0 | 1.58 | 3.31 | 5.2 | | | | | | | | | | | | | On-Grade 15' CDOT Type R (1.7 cfs bypass to DP 18b) |
| | 18b 19 | C-11 | 0.46 | 0.45 | 6.6 | 0.21 | 4.72 | 1.0 | | | | 6.9 1.0 | | | | | | | | | Sump 15' CDOT Type R (Receives 1.7 cfs of upstream bypass) |
| | 20 | C-12 | 1.79 | 0.45 | 11.8 | 0.81 | 3.84 | 3.1 | | | | 3.1 | | | | | | | | | Sump 5' CDOT Type R (Receives 0.0 cfs of upstream bypass) Sump 5' CDOT Type R (Receives 0.0 cfs of upstream bypass) |
| | 21a 21b | C-13 C-14 | 2.37 | 0.09 | 13.2 | 0.21 | 3.66 | 0.8 | 16.5 | 18.59 | 3.31 | 61.5 | | | | | | | | | Total combined flows to Pond C |
| | 216 | D-1 | 2.98 | 0.09 | 11.7 14.9 | 0.14 | 3.47 | 4.6 | | | | | | | | | | | | | Un-developed area - Sheet flows to MS 2 On-Grade 10' CDOT Type R Inlet (0.4 cfs bypass to DP 24) |
| | 23 | D-2 | 0.87 | 0.45 | 8.1 | 0.39 | 4.42 | 1.7 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (0.0 cfs bypass to DP 24) |
| | 24 | D-3 | 3.66 | 0.45 | 13.5 | 1.65 | 3.63 | 6.0 | | | | 6.4 | | | | | | | | | Receives 0.4 cfs of upstream bypass Sump 15' CDOT Type R Inlet |
| | 25 | D-4 D-5 | 2.00 | 0.45 | 10.3 7.1 | 0.90 | 4.06 | 3.7 | | | | | | | | | | | | | Sump 10' CDOT Type R Inlet |
| | 26 | D-5 | 0.83 | 0.28 | 11.7 | 0.43 | 3.86 | 0.3 | 14.9 | 4.71 | 3.47 | 16.3 | | | | | | | | | Total of flows to Pond D Un-developed area - Sheet flows to MS |
| | 25a | D-7 | 1.80 | 0.37 | 12.5 | 0.67 | 3.75 | 2.5 | | | | | | | | - | | | | | Sheet flows to Channel and Conveyed to Pond D |
| | 27 | E-1 | 5.13 | 0.45 | 10.0 | 2.31 | 4.10 | 9.5 | | | | | | | | | | | | | On-Grade 15' CDOT Type R Inlet (0.9 cfs bypass to DP 29) |
| | 28 | E-2 | 5.42 | 0.45 | 9.8 | 2.44 | 4.13 4.17 | 10.1 | | | | | | | | | | | | On-Grade 15' CDOT Type R Inlet (1.2 cfs bypass to DP 29) | |
| | 29 | E-3 E-4 | 3.20 6.28 | 0.45 | 9.6 17.9 | 2.83 | 3.18 | 6.0 9.0 | | | | 8.1 | | | | | | | | | Receives 2.1 cfs of upstream bypass Sump 15' CDOT Type R Inlet Sump 20' CDOT Type R Inlet |
| HRG01 Pr. Drainage Cales xlsm | | | | | | | | | I | | | | 1 | | | | | | | | Page 2 of 3 - 3/3/2022 |

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

| | | | | | | | | | | | | | | Pro | ject N | ame: | Grand | view S | Subdivi | sion PD | R |
|---------------|----------|-----------|--------|------------|--------|--------|---------|-------|-------|---------|---------|-------|-----------|---------------|-----------------|--------|---------------|----------|------------|---------|--|
| Subdivision: | Grand | view Rese | erve | | | | | | | | | | | | Projec | t No.: | HRG(|)1 | | | |
| Location: | CO, E | l Paso Co | unty | | | | | | | | | | | Cal | culate | d By: | TJE | | | | |
| Design Storm: | 5-Yea | r | | | | | | | | | | | | 0 | hecke | d By: | BAS | | | | |
| | | | | | | | | | | | | | | | | Date: | 3/1/22 | 2 | | | |
| | - | | | DIDI | | NOFE | | | , | DOT 1 Y | DUNCE | - | OTT | - | | DIDE | | mn i i | CODE OF | | |
| | | | | DIRI | ECT RU | NOFF | | | | TOTAL | RUNOF | F. | STR | EET | - | PIPE | | TRA | VEL T | IME | |
| STREET | gn Point | n ID | t (Ac) | off Coeff. | (min) | . (Ac) | (in/hr) | (cfs) | (min) | . (Ac) | (in/hr) | (cfs) | Slope (%) | et Flow (cfs) | sign Flow (cfs) | e (%) | Size (inches) | gth (ft) | city (fps) | (min) | REMARKS |
| | Desi | Basi | Area | Run | Tc (i | C*A | I (in | 0 (c | Tc (i | C*A | I (in | Q (c | Slop | Stree | Desi | Slope | Pipe | Leng | Velc | Tt (1 | |
| | 31 | E-5 | 1.13 | 0.09 | 9.8 | 0.10 | 4.14 | 0.4 | 17.9 | 9.12 | 3.18 | 29.0 | | | | | | | | | Total of flows to Pond E |
| | | E-6 | 0.74 | 0.09 | 12.6 | 0.07 | 3.74 | 0.3 | | | | | | | | | | | | | Un-developed area - Sheet flows to MS |
| | 32 | OS-1 | 3.28 | 0.67 | 16.9 | 2.20 | 3.27 | 7.2 | | | | | | | | | | | | | Prelim Eastonvill Rd. Flows - NW Segment |
| | 33 34 | OS-2 | 2.31 | 0.56 | 14.2 | 1.29 | 3.55 | 4.6 | 16.9 | 3.49 | 3.27 | 11.4 | | | | | | | | | Prelim Eastonvill Rd. Flows - NE Segment Total Prelim Flows to North Eastonville Rd. Pond |
| | 35 | OS-3 | 3.02 | 0.60 | 11.6 | 1.81 | 3.86 | 7.0 | | | | | | | | | | | | | Prelim Eastonvill Rd. Flows - SW Segment |
| | 36 37 | OS-4 | 3.00 | 0.54 | 11.9 | 1.62 | 3.82 | 6.2 | 11.9 | 3.43 | 3.82 | 13.1 | | | | | | | | | Prelim Eastonvill Rd. Flows - SE Segment Total Prelim Flows to South Eastonville Rd. Pond |

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

| | | | | | | | | | | | | | | | | Name: | | | Subdivi | sion P | DR |
|----------------------------|---------------------|----------|-----------|---------------|----------|----------|---------|---------|---------|----------|---------|---------|----------|------------------|------------------|------------------|------------------|------------|----------------|----------|---|
| Subdivision | | | | | | | | | - | | | | | | | ct No.: | | 01 | | | |
| Location: Design Storm: | | | ounty | | | | | | - | | | | | | | ed By: ed By: | | | | | |
| Design Storm. | 100-1 | car | | | | | | | - | | | | | | | Date: | | 2 | | | |
| | 1 | r | | DID | FOT DU | NOFE | | | | TOTAL | DUNOE | F | GT | REET | 1 | | | | VEL T | ME | |
| | | | - | | ECT RU | NOFF | 1 | | | TOTAL | RUNOF | F | 51 | | | PIPE | \sim | IKA | VEL I | IVIE | |
| STREET | Design Point | 3asin ID | vrea (Ac) | tunoff Coeff. | Tc (min) | C*A (Ac) | (in/hr) | Q (cfs) | c (min) | C*A (Ac) | (in/hr) | Q (cfs) | lope (%) | treet Flow (cfs) | Jesign Flow (cfs | lope (%) | ipe Size (inches | ength (ft) | /elocity (fps) | ſt (min) | REMARKS |
| EXISTING | | <u> </u> | | | | 0 | | | | | | | 01 | | | 0 | | | | | |
| | | OS-W | 108.80 | | | | | | | | | 413.0 | | | | | | | | | Sheet flow to Main Stem Channel Total Flow - Q(100)=413 cfs (from MDDP) |
| | | OS-NW | 105.72 | | | | | | | | | | | | - | | | | | | Sheet flow to Main Stem Tributary #2 Channel |
| | | EX-1 | 16.18 | 0.36 | 19.6 | 5.82 | 5.42 | 31.5 | | | | 280.0 | | | | | | | | | Total Flow - Q(100)=280 cfs (from MDDP) Sheet flow to Main Stem Channel |
| | 1 | | | | | | | | | | | | | | | | | | | | Total Flow - Incl. Offsite flow of Q(100)=413 cfs (from MDDP) |
| | 2 | EX-2 | 46.06 | 0.36 | 29.0 | 16.58 | 4.39 | 72.8 | | | | 485.8 | | | | | | | | | Sheet flow to Main Stem Channel Total Flow - Incl. Offsite flow of Q(100)=413 cfs (from MDDP) |
| | 3 | EX-3 | 64.34 | 0.36 | 33.7 | 23.16 | 4.03 | 93.3 | - | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 4 | EX-4 | 2.68 | 0.36 | 14.2 | 0.96 | 6.31 | 6.1 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 5 | EX-5 | 26.15 | 0.36 | 23.4 | 9.41 | 4.94 | 46.5 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 6 | EX-6 | 31.53 | 0.36 | 19.9 | 11.35 | 5.37 | 60.9 | | | | | | | | | | | | | Sheet flow offiste - outfalls to Main Stem Tributary #2 Channel |
| | 7 | | | | | | | | 33.7 | 67.28 | 4.03 | 964.1 | | | | | | | | | Total Existing Flow Leaving Property offsite - outfalls to Main Stem Tributary #2 Channel |
| PROPOSED | | • | | • | | | | | • | | | | | | • | · | | • | | | |
| | 1 | Basin-1 | 1.22 | 0.84 | 7.0 | 1.02 | 8.26 | 8.4 | 1 | 1 | | | 1 | | 1 | 1 | | 1 | | | East Leg of Rex Road Intersection |
| | 1 | A-1 | 11.23 | 0.36 | 9.6 | 4.04 | 7.40 | 29.9 | | | | | | | <u> </u> | | | | | | Institutional Tract |
| | · | | | | | | | | | | | | | | | | | | | | Basin will have own water quality & detention pond |
| | 2a | A-2a | 4.21 | 0.59 | 8.8 | 2.48 | 7.64 | 18.9 | | | | | | | | | | | | | On-Grade 15' CDOT Type R Inlet (6.1 cfs bypass to DP 2b) |
| | 2b | A-2b | 2.75 | 0.83 | 9.9 | 2.28 | 7.34 | 16.7 | | | | 22.8 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 6.1 cfs upstream bypass) |
| | 3 | A-3 | 0.36 | 0.96 | 5.0 | 0.35 | 9.09 | 3.2 | | | | | | | | | | | | | Sump 5' CDOT Type R Inlet |
| | 4a | A-4a | 6.05 | 0.59 | 15.2 | 3.57 | 6.13 | 21.9 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (12.2 cfs bypass to DP 2) |
| | 4b 4 | A-4b | 3.81 | 0.59 | 13.5 | 2.25 | 6.46 | 14.5 | | | | 19.6 | | | | | | | | | On-Grade 10' CDOT Type R Inlet (7.4 cfs bypass to DP 2) Sump 15' CDOT Type R Inlet (Receives 19.6 cfs upstream bypass) |
| | 5 | A-5 | 0.35 | 0.96 | 5.0 | 0.34 | 9.09 | 3.1 | | | | | | | | | | | | | Sump 5' CDOT Type R Inlet |
| | 6 | A-6 | 2.76 | 0.59 | 12.9 | 1.63 | 6.58 | 10.7 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (3.8 cfs bypass to DP 7a) |
| | 7 | A-7 | 0.23 | 0.96 | 5.0 | 0.22 | 9.09 | 2.0 | | | | | | | | | | | | | On-Grade 5' CDOT Type R Inlet (0.4 cfs bypass to DP 7b) |
| | 8 | A-8 | 5.44 | 0.81 | 11.2 | 4.41 | 6.99 | 30.8 | | | | | | | | | | | | | Proposed Amenitity Center - Assumed 75% Imperviousness |
| | 7a | A-9 | 4.91 | 0.59 | 16.2 | 2.90 | 5.95 | 17.3 | | | | 21.1 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 3.8 cfs upstream bypass) |
| | 7b | A-10 | 1.02 | 0.59 | 7.3 | 0.60 | 8.17 | 4.9 | | | | 5.3 | | | | | | | | | Sump 5' CDOT Type R Inlet (Receives 0.4 cfs upstream bypass) |
| | 8a | A-11 | 3.56 | 0.41 | 16.5 | 1.46 | 5.90 | 8.6 | 16.5 | 22.49 | 5.90 | 132.7 | | | | | | | | | Total of Flows to Pond A |
| | 9 | B-1 | 3.33 | 0.59 | 14.3 | 1.96 | 6.30 | 12.3 | | | | | | | | | | | | | Sump 10' CDOT Type R Inlet |
| | 10a | B-2 | 4.51 | 0.59 | 14.7 | 2.66 | 6.22 | 16.5 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (8.0 cfs bypass to DP 10b) |
| | 10b | B-3 | 4.05 | 0.59 | 9.0 | 2.39 | 7.61 | 18.2 | | | | 26.2 | | | | | | | | | Sump 15' CDOT Type R Inlet (Receives 8.0 cfs of upstream bypass) |
| | 11 | B-4 | 1.35 | 0.83 | 7.0 | 1.12 | 8.25 | 9.2 | | | | | | | 1 | | | | | | Sump 10' CDOT Type R Inlet |
| | 12a | B-5 | 5.12 | 0.59 | 15.3 | 3.02 | 6.11 | 18.5 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (9.5 cfs bypass to DP 12b) |
| | 14 | B-6 | 2.28 | 0.59 | 13.7 | 1.35 | 6.42 | 8.7 | 1 | 1 | l | | 1 | | | | | 1 | | | On-Grade 10' CDOT Type R Inlet (2.5 cfs bypass to DP 12b) |

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

 Subdivision:
 Grandview Reserve

 Location:
 CO, El Paso County
 Design Storm: 100-Year

| Project Name: | Grandview Subdivision PDR |
|----------------|---------------------------|
| Project No.: | HRG01 |
| Calculated By: | TJE |
| Checked By: | BAS |
| Date: | 3/1/22 |

| | | DIRECT RUNOFF | | | | | | TOTAL RUNOFF | | | | | | | TRA | VEL T | | | | | |
|--------|--------------|---------------|--------------|---------------|-------------|--------------|--------------|--------------|----------|----------|-----------|--------------|-----------|-------------------|-------------------|-----------|--------------------|-------------|----------------|--|---|
| STREET | Design Point | Basin ID | Area (Ac) | Runoff Coeff. | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Slope (%) | Street Flow (cfs) | Design Flow (cfs) | Slope (%) | Pipe Size (inches) | Length (ft) | Velocity (fps) | Tt (min) | REMARKS |
| | 15 | B-7 | 0.89 | 0.59 | 10.7 | 0.53 | 7.10 | 3.8 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (0.1 cfs bypass to DP 12b) |
| | 12b | B-8 | 3.23 | 0.59 | 13.4 | 1.91 | 6.48 | 12.4 | | | | 24.5 | | | | | | | | | Sump 20' CDOT Type R Inlet (Receives 12.1 cfs of upstream bypass) |
| | 13 | B-9 | 2.42 | 0.59 | 14.5 | 1.43 | 6.26 | 9.0 | | | | | | | | | | | | | Sump 10' CDOT Type R Inlet |
| | 16 17b | B-10 C-1 | 1.10 4.12 | 0.36 | 6.7 | 0.40 2.43 | 8.37 6.57 | 3.3 | 15.3 | 16.77 | 6.11 | 102.5 | | | | | | | | | Total of flows to Pond B On-Grade 15' CDOT Type R (4.3 cfs bypass to DP 17e) |
| | 17a | C-2 | 2.71 | 0.59 | 10.8 | 1.60 | 7.10 | 11.4 | | | | | | | | | | | | | On-Grade 15' CDOT Type R (11.2 cfs bypass to DP 17c) |
| | | C-3 | 1.56 | 0.59 | 6.6 | 0.92 | 8.42 | 7.7 | | | | | | | | | | | | | Sheet Flows off-site east |
| | 17c | C-4 | 2.47 | 0.59 | 13.0 | 1.46 | 6.57 | 9.6 | | | | 13.9 | | | | | | | | | Receives 4.3 cfs of Bypass from DP 17a On-Grade 15' CDOT Type R (7.4 cfs bypass to DP 17d) |
| | 17d | C-5 C-6 | 3.09 2.10 | 0.59 | 11.0 | 1.82 | 7.04 5.94 | 7.4 | | | | 20.2 | | | | | | | | | Receives 7.4 cfs of Bypass from DP 17c On-Grade 15' CDOT Type R (7.0 cfs bypass to DP 17h) Receives 4.3 cfs of Bypass from DP 17b |
| | 17e 17f | C-0 | 5.11 | 0.59 | 12.7 | 3.01 | 6.63 | 20.0 | | | | 11.7 | | | | | | | | | On-Grade 15' CDOT Type R (2.0 cfs bypass to DP 17h) On-Grade 15' CDOT Type R (6.9 cfs bypass to DP 17h) |
| | 17 | C-9a | 3.50 | 0.59 | 14.2 | 2.07 | 6.31 | 13.1 | | | | 20.0 | | | | | | | | | Receives 6.9 cfs of Bypass from DP 17f |
| | 17g 17h | C-9b | 3.69 | 0.59 | 14.4 | 2.18 | 6.29 | 13.7 | | | | 20.0 29.5 | | | | | | | | | On-Grade 15' CDOT Type R (6.8 cfs bypass to DP 17h) Sump 20' CDOT Type R (Receives 15.8 cfs of upstream bypass) |
| | 18a | C-7 | 6.72 | 0.59 | 12.6 | 3.96 | 6.65 | 26.3 | | | | | | | | | | | | | On-Grade 15' CDOT Type R (11.2 cfs bypass to DP 18b) |
| | 18b | C-10 C-11 | 3.51 0.46 | 0.59 | 16.5 6.6 | 2.07 0.27 | 5.90 8.41 | 12.2 2.3 | | | | 23.4 | | | | | | | | | Sump 15' CDOT Type R (Receives 11.2 cfs of upstream bypass) |
| | 19 | C-12 | 1.79 | 0.59 | 11.8 | 1.06 | 6.83 | 7.2 | | | | 2.3 | | | | | | | | | Sump 5' CDOT Type R (Receives 0.0 cfs of upstream bypass) |
| | 20 | C-13 | 2.37 | 0.36 | 13.2 | 0.85 | 6.52 | 5.5 | | | | 7.2 | | | | | | | | | Sump 5' CDOT Type R (Receives 0.0 cfs of upstream bypass) |
| | 21a 21b | C-14 | 1.53 | 0.36 | 11.7 | 0.55 | 6.87 | 3.8 | 16.5 | 24.94 | 5.90 | 147.1 | | | | | | | | | Total combined flows to Pond C Un-developed area - Sheet flows to MS 2 |
| | 22 | D-1 | 2.98 | 0.59 | 14.9 | 1.76 | 6.18 | 10.9 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (4.0 cfs bypass to DP 24) |
| | 23 | D-2 D-3 | 0.87 | 0.59 | 8.1 | 0.51 | 7.88 6.46 | 4.0 | | | | | | | | | | | | | On-Grade 10' CDOT Type R Inlet (0.2 cfs bypass to DP 24) Receives 4.2 cfs of upstream bypass |
| | 24 25 | D-3 | 2.00 | 0.59 | 10.3 | 1.18 | 7.23 | 8.5 | | | | 18.2 | | | | | | | | | Sump 15' CDOT Type R Inlet |
| | _ | D-5 | 1.53 | 0.48 | 7.1 | 0.73 | 8.24 | 6.0 | 14.0 | 6.24 | 6 10 | 20.2 | | | | | | | | | |
| | 26 | D-6 | 0.83 | 0.36 | 11.7 | 0.30 | 6.87 | 2.1 | 14.9 | 6.34 | 6.18 | 39.2 | | | | | | | | | Total of flows to Pond D Un-developed area - Sheet flows to MS |
| | 25a | D-7 | 1.80 | 0.54 | 12.5 | 0.97 | 6.67 | 6.5 | | | | | | | | | | | | | Sheet flows to Channel and Conveyed to Pond D |
| | 27 | E-1 E-2 | 5.13 | 0.59 | 9.8 | 3.03 | 7.30 | 22.1 | | | | | | | | | | | | On-Grade 15' CDOT Type R Inlet (8.3 cfs bypass to DP 29) On-Grade 15' CDOT Type R Inlet (9.3 cfs bypass to DP 29) | |
| | - | E-2 E-3 | 3.20 | 0.59 | 9.6 | 1.89 | 7.43 | 14.0 | | | | | | | | | | | | | Receives 17.6 cfs of upstream bypass |
| | 29 30 | E-4 | 6.28 | 0.59 | 17.9 | 3.71 | 5.66 | 21.0 | | | | 31.6 | | | | | | | | | Sump 15' CDOT Type R Inlet Sump 20' CDOT Type R Inlet |

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

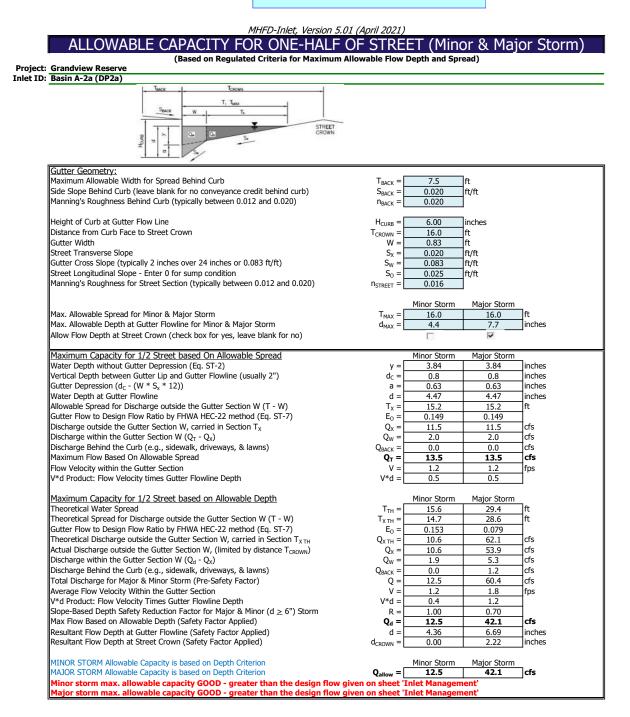
| | | | | | | | | | | | | | | Pro | oject N | ame: | Grand | view S | ubdivi | sion P. | DR |
|---------------|---------------|-----------|-----------|---------------|----------|----------|-----------|---------|----------|----------|-----------|---------|-----------|-------------------|-------------------|-----------|--------------------|-------------|----------------|----------|--|
| Subdivision: | Grand | view Res | serve | | | | | | | | | | | | Projec | t No.: | HRG |)1 | | | |
| Location: | CO, E | l Paso Co | ounty | | | | | | | | | | | Cal | culate | d By: | TJE | | | | |
| Design Storm: | 100-Y | ear | | | | | | | • | | | | | 0 | hecke | d By: | BAS | | | | |
| | | | | | | | | | | | | | | |] | Date: | 3/1/22 | 2 | | | |
| | DIRECT RUNOFF | | | | | | | | | | | | | | | | | | | | |
| | | | | DIR | ECT RU | NOFF | | | 1 | TOTAL | RUNOF | F | ST | REET | | PIPE | | TRAV | VEL T | IME | |
| STREET | Design Point | Basin ID | Area (Ac) | Runoff Coeff. | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Tc (min) | C*A (Ac) | I (in/hr) | Q (cfs) | Slope (%) | Street Flow (cfs) | Design Flow (cfs) | Slope (%) | Pipe Size (inches) | Length (ft) | Velocity (fps) | Tt (min) | REMARKS |
| | 31 | E-5 | 1.13 | 0.36 | 9.8 | 0.41 | 7.37 | 3.0 | 17.9 | 12.24 | 5.66 | 69.3 | | | | | | | | | Total of flows to Pond E |
| | | E-6 | 0.74 | 0.36 | 12.6 | 0.27 | 6.66 | 1.8 | | | | | | | | | | | | | Un-developed area - Sheet flows to MS |
| | 32 | OS-1 | 3.28 | 0.79 | 16.9 | 2.59 | 5.83 | 15.1 | | | | | | | | | | | | | Prelim Eastonvill Rd. Flows - NW Segment |
| | 33 34 | OS-2 | 2.31 | 0.71 | 14.2 | 1.64 | 6.31 | 10.3 | 16.9 | 4.23 | 5.83 | 24.7 | | | | | | | | | Prelim Eastonvill Rd. Flows - NE Segment Total Prelim Flows to North Eastonville Rd. Pond |
| | 35 | OS-3 | 3.02 | 0.74 | 11.6 | 2.23 | 6.88 | 15.3 | | | | | | | | | | | | | Prelim Eastonvill Rd. Flows - SW Segment |
| | 36 37 | OS-4 | 3.00 | 0.70 | 11.9 | 2.10 | 6.81 | 14.3 | 11.9 | 4.33 | 6.81 | 29.5 | | | | | | | | | Prelim Eastonvill Rd. Flows - SE Segment Total Prelim Flows to South Eastonville Rd. Pond |

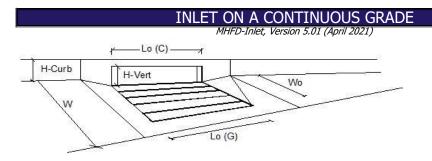
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APPENDIX D

Hydraulic Computations

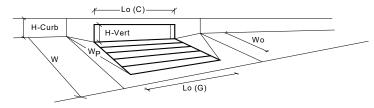
Inlets not checked in detail with this review.





| Design Information (Input) | | MINOR | MAJOR | |
|---|-------------------------|-------|--------------|-----------------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | linches |
| 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 | 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 = 0.3) | C _f -C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | ц г с = | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | Q ₀ = | 8.1 | 18.9 | lcfs |
| Water Spread Width | Q₀ = T = | 13.2 | 16.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 3.8 | 5.0 | linches |
| | | 0.0 | 0.5 | linches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | | | Inches |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.183 | 0.130 | 4, |
| 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 = | 0.23 | 0.32 | sq ft |
| Velocity within the Gutter Section W | V _W = | 6.3 | 7.8 | fps |
| 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 | 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 | 7 |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 7 |
| 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 | 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 | $V_0^{-e} =$ | 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) | ₹B | MINOR | MAJOR | |
| Equivalent Slope S_{ρ} (based on grate carry-over) | S _e = | 0.087 | 0.068 |]ft/ft |
| Required Length L_T to Have 100% Interception | L _T = | 18.41 | 31.80 | T _{ft} |
| Under No-Clogging Condition | -1 - I | MINOR | MAJOR | ⊣ |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 15.00 | 15.00 | Πft |
| Interception Capacity | Q _i = | 7.7 | 12.9 | cfs |
| Under Clogging Condition | Qi = | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.31 | 1.31 | 7 |
| 55 5 | | | | - |
| 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 | ft |
| Actual Interception Capacity | Qa = | 7.7 | 12.8 | cfs |
| Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a | Q _b = | 0.4 | 6.1 | cfs |
| <u>Summary</u> | - 1 | MINOR | MAJOR | ٦. |
| Total Inlet Interception Capacity | Q = | 7.7 | 12.8 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.4 | 6.1 | cfs |
| Capture Percentage = Q_a/Q_o = | C% = | 95 | 68 | % |

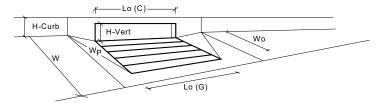
| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | |
|--|-------------------------------------|-------------|---------------------|----------|
| Grandview Reserve | | | , | |
| Basin A-2b (DP2b) | | | | |
| | | | | |
| SBACK T, TMAX | | | | |
| | | | | |
| STREET CROWN | | | | |
| B D S CHOWN | | | | |
| I O S | | | | |
| V | | | | |
| Gutter Geometry: | | | 1. | |
| Maximum Allowable Width for Spread Behind Curb | T _{BACK} = | 7.5 | ft | |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | ft/ft | |
| Manning's Roughness Benind 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 | V = | 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 | 1 | |
| | | | - | |
| | - | Minor Storm | Major Storn | |
| 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 | Majar Charm | |
| Water Depth without Gutter Depression (Eq. ST-2) | y =[| 3.84 | Major Storm 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) | т _х = | 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 = | 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 | 2 |
| Theoretical Water Spread | т _{тн} =Г | 15.6 | 29.4 | |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | т _н = Т _{хтн} = | 15.0 | 29.4 | - |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $E_0 =$ | 0.153 | 0.079 | \dashv |
| 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 ($Q_d - Q_x$) | $\tilde{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 Capacity is based on Depth Criterion | | Minor Storm | Major Storm | _ |
| | | | | |



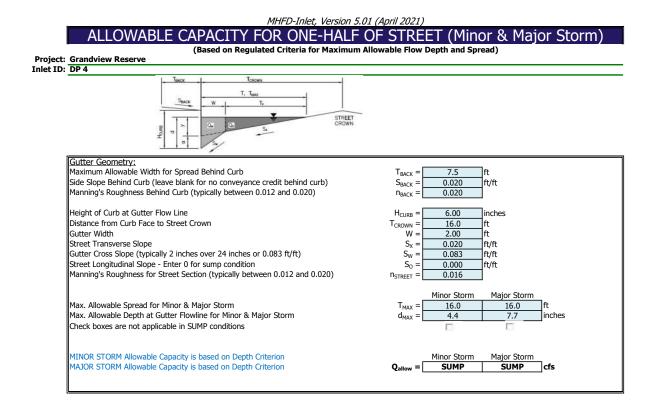
| | <u>mation (Input)</u> | CDOT Type R Curb Opening | - | MINOR | MAJOR | - |
|----------------|-----------------------|--|----------------------------------|--------------|---------------|----------------|
| Type of Inlet | | <i>"</i> | Type = | | Curb Opening | |
| | | continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of U | nit Inlets (Grate o | r Curb Opening) | No = | 4 | 4 | |
| Water Depth | at Flowline (outsi | de of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Inform | nation | | _ | MINOR | MAJOR | Verride Depths |
| Length of a L | Init Grate | | $L_{0}(G) =$ | N/A | N/A | feet |
| Width of a Ur | nit Grate | | W ₀ = | N/A | N/A | feet |
| | | (typical values 0.15-0.90) | A _{ratio} = | N/A | N/A | 1 |
| | | ate (typical value 0.50 - 0.70) | $C_f(G) =$ | N/A | N/A | |
| | | value 2.15 - 3.60) | $C_{w}(G) =$ | N/A | N/A | - |
| | | al value 0.60 - 0.80) | $C_{0}(G) = C_{0}(G) = C_{0}(G)$ | N/A | N/A | - |
| | g Information | | | MINOR | MAJOR | |
| | Init Curb Opening | | $L_{0}(C) = [$ | 5.00 | 5.00 | feet |
| | tical Curb Opening | a in Inchos | | 6.00 | 6.00 | linches |
| | b Orifice Throat i | | H _{vert} = | 6.00 | 6.00 | linches |
| | | | H _{throat} = | | | |
| | at (see USDCM F | | Theta = | 63.40 | 63.40 | degrees |
| | | (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | feet |
| | | rb Opening (typical value 0.10) | $C_{f}(C) =$ | 0.10 | 0.10 | _ |
| | | (typical value 2.3-3.7) | $C_w(C) =$ | 3.60 | 3.60 | _ |
| | | nt (typical value 0.60 - 0.70) | $C_{o}(C) =$ | 0.67 | 0.67 | |
| Grate Flow | Analysis (Calcula | ted) | _ | MINOR | MAJOR | _ |
| Clogging Coe | fficient for Multipl | e Units | Coef = | N/A | N/A | |
| Clogging Fac | or for Multiple Ur | its | Clog = | N/A | N/A | 1 |
| Grate Capac | ity as a Weir (b | ased on Modified HEC22 Method) | | MINOR | MAJOR | - |
| | without Clogging | | Q _{wi} = | N/A | N/A | lcfs |
| | with Clogging | | Q _{wa} = | Ń/A | N/A | cfs |
| | | based on Modified HEC22 Method) | | MINOR | MAJOR | |
| | without Clogging | | Q _{oi} = | N/A | N/A | lcfs |
| Interception | | | $Q_{oa} =$ | N/A | N/A | cfs |
| | ity as Mixed Flo | | Qoa - L | MINOR | MAJOR | |
| | without Clogging | <u>vv</u> | o – [| N/A | N/A | lcfs |
| | | | Q _{mi} = | | | |
| Interception | | | $Q_{ma} =$ | N/A N/A | N/A N/A | cfs cfs |
| | | mes clogged condition) | Q _{Grate} = | MINOR | MAJOR | LIS |
| | ng Flow Analysis | | а с Г | | | 7 |
| | fficient for Multipl | | Coef = | 1.33 | 1.33 | 4 |
| | or for Multiple Ur | | Clog = | 0.03 | 0.03 | |
| | | sed on Modified HEC22 Method) | - | MINOR | MAJOR | - |
| | without Clogging | | Q _{wi} = | 10.0 | 35.4 | cfs |
| Interception | | | Q _{wa} = | 9.7 | 34.3 | cfs |
| Curb Openir | ng as an Orifice | (based on Modified HEC22 Method) | _ | MINOR | MAJOR | _ |
| Interception | without Clogging | | Q _{oi} = | 33.6 | 43.9 | cfs |
| Interception | | | Q _{oa} = | 32.5 | 42.4 | cfs |
| | ng Capacity as M | lixed Flow | | MINOR | MAJOR | - |
| | without Clogging | | Q _{mi} = | 17.0 | 36.7 | cfs |
| | with Clogging | | Q _{ma} = | 16.5 | 35.5 | lcfs |
| | | ty (assumes clogged condition) | Q _{curb} = | 9.7 | 34.3 | cfs |
| | reet Conditions | cy (assumes dogged condition) | Cuib | MINOR | MAJOR | 1 |
| Total Inlet Le | | | L = [| 20.00 | 20.00 | lfeet |
| | | bacad an atract geometry from shours) | | | | ft.>T-Crown |
| | | based on street geometry from above) | · - | 15.6 | 29.4 | |
| Resultant Flo | w Depth at Street | Crown | d _{CROWN} = | 0.0 | 3.2 | inches |
| | | (Colordoted) | | | | |
| | | uction (Calculated) | | MINOR | MAJOR | ٦. |
| Depth for Gra | | | d _{Grate} = | N/A | N/A | ft |
| | rb Opening Weir I | | d _{Curb} = | 0.29 | 0.57 | ft |
| Combination | Inlet Performance | e Reduction Factor for Long Inlets | RF _{Combination} = | 0.41 | 0.72 | |
| Curb Opening | Performance Re | duction Factor for Long Inlets | RF _{Curb} = | 0.67 | 0.88 | 1 |
| | | iction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | 7 |
| | | 5 | c.ate | | | - |
| Grated Inice | | | | | | |
| | | | | MINOR | MAJOR | |
| | tercention Canaci | y (assumes clogged condition) | Q _a = [| MINOR 9.7 | MAJOR 34.3 | cfs |

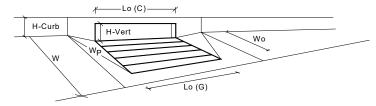
Warning 1: Dimension entered is not a typical dimension for inlet type specified.

| (Based on Regulated Criteria for Maximum Allo | | | or & Ma ead) | , |
|---|---|---------------------|---------------------|----------|
| Grandview Reserve | | | | |
| Basin A-3 (DP3) | | | | |
| | | | | |
| Seace W I T. | | | | |
| | | | | |
| STREET CROWN | | | | |
| S S | | | | |
| I O Sa | | | | |
| | | | | |
| Gutter Geometry: Maximum Allowable Width for Savard Babind Curb | т _Г | 7.5 | ام | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | π/π | |
| Manning's Roughness benind carb (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 = | 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 | 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 |
| Check boxes are not applicable in SUMP conditions | | | | |
| Maximum Canadity for 1/2 Streat based On Allowable Canad | | Min en Chauma | Maiau Chauna | |
| Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) | y =[| Minor Storm 3.84 | Major Storm 3.84 | linches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y – d _C = | 2.0 | 2.0 | inches |
| Gutter Depression (d _c - (W * S_x * 12)) | a = | 1.51 | 1.51 | linches |
| Water Depth at Gutter Flowline | d = | 5.35 | 5.35 | linches |
| 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) | $E_0 = 1$ | 0.372 | 0.372 | - |
| Discharge outside the Gutter Section W, carried in Section T_{χ} | 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 Streat bacad on Allowable Danth | | Minor Cham | Maio: Ch- | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | т Г | Minor Storm | Major Storm | |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | T _{TH} = | <u>11.9</u> 9.9 | 25.7 23.7 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | Т _{х тн} = Е ₀ = | 0.497 | 0.228 | |
| Theoretical Discharge outside the Gutter Section W, carried in Section $T_{x TH}$ | с _о = Q _{х тн} = | 0.497 | 0.228 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | $Q_{X TH} = Q_X =$ | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_{\rm X} = Q_{\rm W} = 1$ | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 0.0 | |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | QBACK - | 0.0 | 0.0 | cfs |
| Average Flow Velocity Within the Gutter Section | v = | 0.0 | 0.0 | |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | v*d = | 0.0 | 0.0 | 1.62 |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | SUMP | SUMP | 1 |
| 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 |
| | L | | | — |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storm | <u> </u> |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | | SUMP | SUMP | cfs |



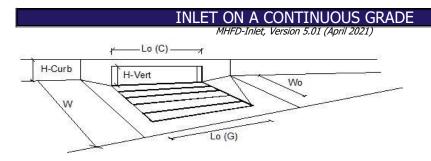
| Design Information (Input) | | MINOR | MAJOR | |
|--|----------------------------------|-------|--------------|----------------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | MINOR | MAJOR | Verride Depths |
| Length of a Unit Grate | L ₀ (G) = | N/A | N/A | lfeet |
| 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 | |
| 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 | - |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{0}(G) = C_{0}(G) = C_{0}(G)$ | N/A | N/A | - |
| Curb Opening Information | | MINOR | MAJOR | _ |
| Length of a Unit Curb Opening | L _o (C) = | 5.00 | 5.00 | feet |
| 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 |
| 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 | 1 |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_{0}(C) =$ | 0.67 | 0.67 | 1 |
| Grate Flow Analysis (Calculated) | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | 7 |
| 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 | 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 | $Q_{oi} = [$ | 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 | 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) | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | 7 |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| Curb Opening as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | _ |
| Interception without Clogging | Q _{wi} = | 2.7 | 10.1 | cfs |
| 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 | Q _{oi} = | 8.4 | 11.0 | cfs |
| Interception with Clogging | Q _{oa} = | 7.6 | 9.9 | 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 | 8.8 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{Curb} = | 2.4 | 8.8 | cfs |
| Resultant Street Conditions | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | 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 _{Grate} = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | d _{Curb} = | 0.20 | 0.47 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | RF _{Combination} = | 0.56 | 0.98 | _ |
| Curb Opening Performance Reduction Factor for Long Inlets | RF _{Curb} = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | |
| | | | | |
| | - | MINOR | MAJOR | - - |
| Total Inlet Interception Capacity (assumes clogged condition) | Q _a = | 2.4 | 8.8 | cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | 1.6 | 3.0 | cfs |





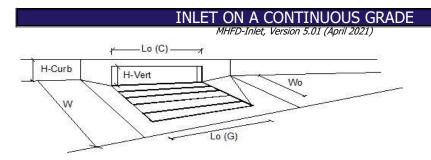
| Design Information (Input) | | MINOR | MAJOR | |
|--|--|-------|--------------|----------------|
| Type of Inlet | Type = | | Curb Opening | 1 |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | linches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 3 | 3 | - |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | MINOR | MAJOR | Verride Depths |
| Length of a Unit Grate | L ₀ (G) = | N/A | N/A | lfeet |
| 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) | $C_f(G) =$ | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | C _w (G) = | N/A | N/A | 1 |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{0}(G) =$ | N/A | N/A | 1 |
| Curb Opening Information | -0(-) | MINOR | MAJOR | 4 |
| Length of a Unit Curb Opening | L _o (C) = | 5.00 | 5.00 | lfeet |
| 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 | 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 _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 | 1 |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_{0}(C) = C_{0}(C) = C_{0}(C)$ | 0.67 | 0.67 | 1 |
| Grate Flow Analysis (Calculated) | 0() | MINOR | MAJOR | 1 |
| 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) | ciug – L | MINOR | MAJOR | 1 |
| Interception without Clogging | Q _{wi} = | N/A | N/A | lcfs |
| Interception with Clogging | $Q_{wa} =$ | N/A | N/A | cfs |
| Grate Capacity as a Orifice (based on Modified HEC22 Method) | Rwa | MINOR | MAJOR | |
| Interception without Clogging | Q _{oi} = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa} =$ | N/A | N/A | lcfs |
| Grate Capacity as Mixed Flow | Q _{0a} – [| MINOR | MAJOR | |
| Interception without Clogging | Q _{mi} = | N/A | N/A | lcfs |
| Interception with Clogging | $Q_{ma} = $ | N/A | N/A | cfs |
| Resulting Grate Capacity (assumes clogged condition) | Q _{ma} = | N/A | N/A | cfs |
| Curb Opening Flow Analysis (Calculated) | Colate | MINOR | MAJOR | 10.0 |
| Clogging Coefficient for Multiple Units | Coef = | 1.31 | 1.31 | 7 |
| Clogging Factor for Multiple Units | Clog = | 0.04 | 0.04 | - |
| Curb Opening as a Weir (based on Modified HEC22 Method) | ciog – L | MINOR | MAJOR | 4 |
| Interception without Clogging | Q _{wi} = | 5.4 | 26.6 | lcfs |
| Interception with Clogging | | 5.2 | 25.5 | lcfs |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | Q _{wa} – L | MINOR | MAJOR | |
| Interception without Clogging | Q _{oi} = | 25.2 | 32.9 | lcfs |
| Interception without clogging | $Q_{oa} = $ | 24.1 | 31.5 | cfs |
| Curb Opening Capacity as Mixed Flow | Q _{0a} – [| MINOR | MAJOR | |
| Interception without Clogging | o - [| 10.9 | 27.5 | cfs |
| Interception with Clogging | Q _{mi} = Q _{ma} = | 10.9 | 27.3 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{ma} = Q _{curb} = | 5.2 | 20.3 25.5 | cfs |
| Resultant Street Conditions | Curb - | MINOR | MAJOR | 10.0 |
| Total Inlet Length | L = [| 15.00 | 15.00 | lfeet |
| | | 15.00 | 25.7 | ft.>T-Crown |
| Resultant Street Flow Spread (based on street geometry from above) Resultant Flow Depth at Street Crown | · - | 0.0 | 25.7 | linches |
| | d _{CROWN} = | 0.0 | 2.3 | |
| 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} = | 0.20 | 0.47 | 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 | |
| | | | | - |
| | - | MINOR | MAJOR | - - |
| Total Inlet Interception Capacity (assumes clogged condition) | Q _a = | 5.2 | 25.5 | cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | 4.2 | 19.6 | cfs |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | |
|--|--|----------------------|---------------------|------------|
| Grandview Reserve | | | , | |
| Basin A-4a (DP4a) | | | | |
| | | | | |
| the second secon | | | | |
| Gutter Geometry: | т _Г | 75 | ام | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = S _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | n _{BACK} = | 0.020 | | |
| ······································ | BACK | 01020 | 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 Manning's Roughness for Street Section (typically between 0.012 and 0.020) | S ₀ = | 0.025 | ft/ft | |
| ויישראוויו איז איזענערוובאז וטר שניכנ שכנוטרו (נאווינשוע שנושפרו 10.012 מום 0.020) | n _{street} = | 0.010 | 1 | |
| | | Minor Storm | Major Storn | า |
| 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) | | | 4 | |
| Maximum Canacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storn | |
| Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) | y =[| 3.84 | Major Storn 3.84 | linches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y – 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 = | 11.5 | 11.5 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | Q _w = | 2.0 | 2.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread | $Q_{BACK} =$ | 0.0 13.5 | 0.0 13.5 | cfs cfs |
| Flow Velocity within the Gutter Section | Q _T = V = | 1.2 | 1.2 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | v = V*d = | 0.5 | 0.5 | |
| | - | | | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | - r | Minor Storm | Major Storn | |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | | 15.6 | 29.4 | ft ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | Т _{х тн} = E ₀ = | <u>14.7</u> 0.153 | 28.6 0.079 | |
| Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | ⊂ ₀ = Q _{X TH} = | 10.6 | 62.1 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) | $Q_X = Q_X = Q_X$ | 10.0 | 53.9 | |
| 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 |
| 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 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | 1.00 | 0.70 | ⊣ . |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | 12.5 | 42.1 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | 4.36 | 6.69 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 2.22 | inches |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | า |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = [| 12.5 | 42.1 | cfs |



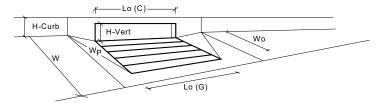
| Design Information (Input) | | MINOR | MAJOR | |
|---|-------------------------|-------|--------------|---------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | linches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 2 | 2 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_0 =$ | 5.00 | 5.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W ₀ = | N/A | N/A | - Ift |
| 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) | Cr-C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | UFC = | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | Q ₀ = | 9.4 | 21.9 | lcfs |
| Water Spread Width | Q₀ = T = | 9.4 | 16.0 | ft |
| • | · · · | | | -1·* |
| Water Depth at Flowline (outside of local depression) | d = | 4.0 | 5.3 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.8 | inches |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.172 | 0.123 | 4. |
| Discharge outside the Gutter Section W, carried in Section T_x | Q _x = | 7.8 | 19.2 | cfs |
| Discharge within the Gutter Section W | Q _w = | 1.6 | 2.7 | cfs |
| Discharge Behind the Curb Face | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | A _W = | 0.25 | 0.34 | sq ft |
| Velocity within the Gutter Section W | V _W = | 6.6 | 8.1 | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 7.0 | 8.3 | 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 | N/A | 7 |
| Under No-Clogging Condition | · · · · · · | MINOR | MAJOR | - |
| Minimum Velocity Where Grate Splash-Over Begins | V ₀ = | 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 |
| Under Clogging Condition | - L | MINOR | MAJOR | |
| Clogging Coefficient for Multiple-unit Grate Inlet | 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 | | N/A | N/A | ft |
| Minimum Velocity Where Grate Splash-Over Begins | V _o = | N/A | N/A N/A | fps |
| Interception Rate of Frontal Flow | | / | N/A N/A | |
| | R _f = | 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) | - T | MINOR | MAJOR | |
| Equivalent Slope S_e (based on grate carry-over) | S _e = | 0.083 | 0.065 | ft/ft |
| Required Length L_T to Have 100% Interception | L _T = [| 20.29 | 34.90 | _ft |
| Under No-Clogging Condition | | MINOR | MAJOR | - |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i =$ | 6.6 | 10.0 | 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 | |
| Effective (Unclogged) Length | L _e = | 9.37 | 9.37 | ft |
| Actual Interception Capacity | Q _a = | 6.5 | 9.7 | cfs |
| Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a | $Q_{\rm b} =$ | 2.9 | 12.2 | cfs |
| Summary | <u></u> | MINOR | MAJOR | • |
| Total Inlet Interception Capacity | Q =[| 6.5 | 9.7 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | $Q_b =$ | 2.9 | 12.2 | cfs |
| Capture Percentage = Q_a/Q_a = | Qь – С% = | 69 | 44 | |
| $Cupture + creentage = Q_2/Q_0 =$ | C /0 - | | | 1 / 9 |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum Al | | | | |
|--|--|---------------|-------------|------------------|
| Grandview Reserve | | bepen und opi | cuu) | |
| Basin A-4b (DP4b) | | | | |
| | | | | |
| A C C C C C C C C C C C C C C C C C C C | | | | |
| Gutter Geometry: | - F | 7.5 | 10 | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = n _{BACK} = | 0.020 | | |
| | HBACK - | 0.020 | J | |
| 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 = | 0.025 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{street} = | 0.016 |] | |
| | | Minor Storm | Major Storn | h |
| 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) | | | 2 | |
| | | | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storn | |
| Water Depth without Gutter Depression (Eq. ST-2) | y = | 3.84 | 3.84 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) | d _c = a = | 0.8 | 0.8 | inches inches |
| Water Depth at Gutter Flowline | d = | 4.47 | 4.47 | inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | u = 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 | $\overline{Q}_{x} = $ | 11.5 | 11.5 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_W = $ | 2.0 | 2.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | $\mathbf{Q}_{\mathrm{T}} =$ | 13.5 | 13.5 | cfs |
| Flow Velocity within the Gutter Section | V = | 1.2 | 1.2 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.5 | 0.5 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storn | 2 |
| Theoretical Water Spread | т _{тн} =Г | 15.6 | 29.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | т _{х тн} = | 14.7 | 29.4 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | E ₀ = | 0.153 | 0.079 | -1" |
| 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 | 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 |
| 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 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | 1.00 | 0.70 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $Q_d =$ | 12.5 | 42.1 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | 4.36 | 6.69 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 2.22 | inches |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | า |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 12.5 | 42.1 | cfs |



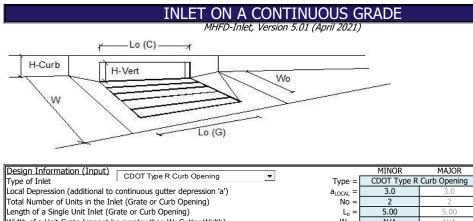
| Design Information (Input) | | MINOR | MAJOR | |
|---|--------------------------------------|---------------|--------------|------------------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total 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 - |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | $W_0 =$ | | N/A | |
| | ₩₀ = Cr-G = | N/A | N/A N/A | - ^{III} |
| 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 -C = | 0.10 MINOR | 0.10 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | 0 | - | MAJOR | lcfs |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | $Q_0 =$ | 6.7 | 15.7 | |
| Water Spread Width | T = | 12.3 | 16.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 3.6 | 4.7 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.2 | inches |
| Ratio of Gutter Flow to Design Flow | E _o = | 0.198 | 0.140 | _ |
| Discharge outside the Gutter Section W, carried in Section T_x | Q _x = | 5.4 | 13.5 | 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 |
| Flow Area within the Gutter Section W | A _W = | 0.22 | 0.30 | sq ft |
| Velocity within the Gutter Section W | V _W = | 6.1 | 7.4 | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 6.6 | 7.7 | 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 | N/A | 7 |
| Under No-Clogging Condition | | MINOR | MAJOR | _ |
| Minimum Velocity Where Grate Splash-Over Begins | V ₀ = | 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 |
| Under Clogging Condition | ×⊔ [| MINOR | MAJOR | |
| Clogging Coefficient for Multiple-unit Grate Inlet | 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 | |
| Minimum Velocity Where Grate Splash-Over Begins | V _o = | N/A | N/A N/A | fps |
| Interception Rate of Frontal Flow | v _o – R _f = | N/A | N/A N/A | |
| Interception Rate of Side Flow | $R_{f} = R_{x}$ | 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) | c | MINOR | MAJOR | |
| Equivalent Slope S _e (based on grate carry-over) | S _e = | 0.092 | 0.071 | ft/ft |
| Required Length L_T to Have 100% Interception | L _T = | 16.26 | 28.26 | _ft |
| Under No-Clogging Condition | . 1 | MINOR | MAJOR | ٦. |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i = [$ | 5.5 | 8.5 | 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 | _ |
| Effective (Unclogged) Length | L _e = | 9.37 | 9.37 | ft |
| Actual Interception Capacity | Q _a = | 5.4 | 8.3 | cfs |
| Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a | Q _b = | 1.3 | 7.4 | cfs |
| Summary | | MINOR | MAJOR | _ |
| Total Inlet Interception Capacity | Q = | 5.4 | 8.3 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 1.3 | 7.4 | cfs |
| Capture Percentage = Q_a/Q_a = | C% = | 80 | 53 | % |
| | | | | |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | |
|---|-------------------------|-------------|-------------|----------|
| Grandview Reserve | | | | |
| Basin A-5 (DP5) | | | | |
| | | | | |
| Seace W 1 To | | | | |
| | | | | |
| STREET CROWN | | | | |
| P S | | | | |
| ± 0 5. | | | | |
| / | | | | |
| Gutter Geometry: Maximum Allounda Width for Savard Babind Curb | т _Г | 7.5 | ٦ | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | | |
| naming's Roughness berning 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 = | 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 | 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 | |
| Nater Depth without Gutter Depression (Eq. ST-2) | y =[| 3.84 | 3.84 | linches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | d _C = | 2.0 | 2.0 | linches |
| Gutter Depression (d_c - (W * S _x * 12)) | a = | 1.51 | 1.51 | linches |
| Nater 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 _O = | 0.372 | 0.372 | |
| Discharge outside the Gutter Section W, carried in Section T_{χ} | 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 |
| /*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} = [| 11.9 | 25.7 | |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | т _{и =} | 9.9 | 23.7 | |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $E_0 =$ | 0.497 | 0.228 | \dashv |
| 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) | $Q_W = 1$ | 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 |
| /*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 | Major Storm | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | | | |



| Design Information (Input) | | MINOR | MAJOR | |
|--|---|------------|----------------|----------------|
| Type of Inlet | Type = | | R Curb Opening | 1 |
| 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 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.3 | 5.6 | inches |
| Grate Information | ronding Deptit = L | MINOR | MAJOR | Verride Depths |
| Length of a Unit Grate | L ₀ (G) = | N/A | N/A | lfeet |
| 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 | |
| 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 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{0}(G) =$ | N/A | N/A | - |
| Curb Opening Information | | MINOR | MAJOR | 4 |
| Length of a Unit Curb Opening | $L_0(C) = $ | 5.00 | 5.00 | lfeet |
| 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 |
| 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) | $C_{w}(C) = C_{w}(C) = C_{w}(C)$ | 3.60 | 3.60 | 1 |
| Curb Opening Orifice Coefficient (typical value 2.5 5.7) | $C_{0}(C) = C_{0}(C) = C_{0}(C)$ | 0.67 | 0.67 | - |
| Grate Flow Analysis (Calculated) | -0 (-/ | MINOR | MAJOR | 1 |
| 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) | ciug – L | MINOR | MAJOR | |
| Interception without Clogging | Q _{wi} = | N/A | N/A | lcfs |
| Interception with load clogging | | N/A | N/A | cfs |
| Grate Capacity as a Orifice (based on Modified HEC22 Method) | Qwa - L | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi} = \int$ | N/A | N/A | lcfs |
| Interception with Clogging | $Q_{oa} = $ | N/A | N/A | cfs |
| Grate Capacity as Mixed Flow | Q _{0a} – [| MINOR | MAJOR | |
| Interception without Clogging | Q _{mi} = [| N/A | N/A | lcfs |
| Interception with load clogging | $Q_{ma} =$ | N/A | N/A | cfs |
| Resulting Grate Capacity (assumes clogged condition) | Q _{ma} = | N/A | N/A | cfs |
| Curb Opening Flow Analysis (Calculated) | Colate | MINOR | MAJOR | 10.0 |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | 7 |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | - |
| Curb Opening as a Weir (based on Modified HEC22 Method) | ciug – L | MINOR | MAJOR | 4 |
| Interception without Clogging | Q _{wi} = | 2.6 | 5.1 | lcfs |
| Interception with Clogging | Q _{wa} = | 2.3 | 4.6 | lcfs |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | Qwa - L | MINOR | MAJOR | |
| Interception without Clogging | Q _{oi} = | 8.3 | 9.4 | lcfs |
| Interception with Ologging | $Q_{01} = Q_{02} = $ | 7.5 | 8.5 | cfs |
| Curb Opening Capacity as Mixed Flow | - Coa - C | MINOR | MAJOR | 1 |
| Interception without Clogging | Q _{mi} = [| 4.3 | 6.4 | lcfs |
| Interception without clogging | Q _{mi} = Q _{ma} = | 3.9 | 5.8 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{ma} = | 2.3 | 4.6 | cfs |
| Resultant Street Conditions | -Curb | MINOR | MAJOR | |
| Total Inlet Length | L = [| 5.00 | 5.00 | Ifeet |
| Resultant Street Flow Spread (based on street geometry from above) | | 11.5 | 17.0 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | · - | 0.0 | 0.2 | linches |
| | d _{CROWN} = | 0.0 | 1 0.2 | |
| Low Head Performance Reduction (Calculated) | | MINOR | MAJOR | |
| Depth for Grate Midwidth | a _ F | N/A | MAJOR N/A | Πft |
| Depth for Curb Opening Weir Equation | d _{Grate} = d _{Curb} = | 0.19 | 0.30 | Ift |
| | | | | - "· |
| Combination Inlet Performance Reduction Factor for Long Inlets | RF _{Combination} = | 0.55 | 0.72 | - |
| Curb Opening Performance Reduction Factor for Long Inlets | RF _{Curb} = | 1.00 | 1.00 | - |
| Grated Inlet Performance Reduction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | |
| | | MINOD | MAJOD | |
| | • 「 | MINOR | MAJOR | 7.50 |
| Total Inlet Interception Capacity (assumes clogged condition) | Q _a = | 2.3 1.6 | 4.6 3.1 | cfs cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | Q PEAK REQUIRED = | 1.0 | J 3.1 | lu s |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | iju stor |
|---|---|---------------|--------------|----------|
| Grandview Reserve | owable Flow | Sepur and Spr | eauj | |
| Basin A-6 (DP6) | | | | |
| | | | | |
| Gutter Geometry: | | | 1. | |
| 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 = | 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 = | 0.020 | ft/ft | |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_0 =$ | 0.005 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{STREET} = | 0.010 | 1.910 | |
| | SINCE | | - | |
| | _ | Minor Storm | Major Storr | <u>n</u> |
| 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} = | 4.6 | 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 Storr | ~ |
| 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 | linches |
| Gutter Depression (d_c - (W * S _x * 12)) | a = | 0.63 | 0.63 | linches |
| Water Depth at Gutter Flowline | d = | 4.47 | 4.47 | linches |
| 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 | $Q_x = [$ | 7.3 | 7.3 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_W = $ | 1.3 | 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 | cfs |
| Flow Velocity within the Gutter Section | V = | 0.8 | 0.8 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.3 | 0.3 | |
| Maximum Canacity for 1/2 Street based on Allowable Donth | | Minor Charm | Major Charm | n |
| Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread | т. — Г | Minor Storm | Major Storr | n Ift |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = т | 16.7 15.8 | 29.4 28.6 | |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | Т _{х тн} = 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 in Section T_{XTH} | $Q_X TH = Q_X = Q_X TH$ | 8.2 | 39.5 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_{W} = $ | 1.4 | 3.4 | |
| Discharge Behind the Cutte Section $W(Q_d = Q_X)$ | Q _{BACK} = | 0.0 | 0.7 | |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | | 9.5 | 38.2 | |
| 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 ($d \ge 6$ ") Storm | | 1.00 | 1.00 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | 9.5 | 38.2 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | | 4.63 | 7.68 | |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.17 | 3.22 | inches |
| | | | | |
| MINOR STORM Allowable Capacity is based on Spread Criterion | _ | Minor Storm | Major Storr | |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 8.5 | 38.2 | cfs |

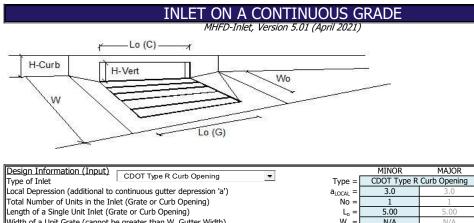


| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W _o = | N/A | N/A | ft | |
|---|---------------------|-------|-------|-----------|--|
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | C _f -G = | N/A | N/A | | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | C _f -C = | 0.10 | 0.10 | | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | | MINOR | MAJOR | | |
| Total Inlet Interception Capacity | Q = | 4.2 | 6.9 | cfs | |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.4 | 3.8 | cfs | |
| Capture Percentage = O_a/O_a = | C% = | 92 | 64 | ∃% | |

inches

ft

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | Joi - 0001 |
|---|--|--------------------|----------------|------------------|
| Grandview Reserve | | | , | |
| Basin A-7 (DP7) | | | | |
| | | | | |
| Stack W I T. | | | | |
| | | | | |
| STREET | | | | |
| P T T 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 | 1,1,1 | |
| | | | - | |
| 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 = | 2.00 | ft | |
| Street Transverse Slope Gutter Cross Slope (hupically 2 inches over 24 inches or 0.083 ft/ft) | S _X = | 0.020 | ft/ft | |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) Street Longitudinal Slope - Enter 0 for sump condition | S _W = S ₀ = | 0.083 | ft/ft ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{street} = | 0.016 | | |
| | ··SIREEI - | 0.010 | - | |
| | | Minor Storm | Major Storn | <u>1</u> |
| 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 Storn | า |
| 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 =[| 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 | cfs |
| Discharge outside the Gutter Section W, carried in Section T_x Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_X = Q_W = $ | 58.7 34.8 | 58.7 34.8 | crs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _W = Q _{BACK} = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | $\mathbf{Q}_{T} = \mathbf{I}$ | 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 | <u> </u> |
| Maximum Canadity for 1/2 Chroat based on Allowable Double | | Minor Ci | Mail Ci | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | т _Г | Minor Storm | Major Storn | |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = Т _{х тн} = | <u>11.9</u> 9.9 | 25.7 | ft 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 _{XTH} = | 23.1 | 239.0 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) | Q _X = | 23.1 | 217.0 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_x$) | $Q_W =$ | 22.8 | 70.7 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 7.4 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | 45.9 | 295.0 | cfs |
| Average Flow 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 | _ |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | 0.13 | 0.04 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | 6.2 | 10.8 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) | d = | 2.43 | 2.89 | inches inches |
| עלטונערוג דוטאי שבארון מו סורבנ גוטאיו (סמוכנץ Factor Applieu) | d _{CROWN} = | 0.00 | 0.00 | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | า |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 6.2 | 10.8 | cfs |

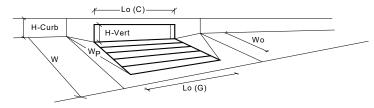


| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W _o = | N/A | N/A | ft | |
|---|---------------------|-------|-------|------------|--|
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_{f}-G =$ | N/A | N/A | | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | C _f -C = | 0.10 | 0.10 | | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | | 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 | |
| Capture Percentage = Ω_{1}/Ω_{2} = | C% - | 95 | 81 | 0 % | |

inches

ft

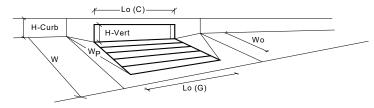
| (Based on Regulated Criteria for Maximum All | | | | jor Stor |
|--|--|---------------|---------------------|------------------|
| Grandview Reserve | Swable How | Depth and Spi | eau) | |
| Basin A-9(DP7a) | | | | |
| TBACK TCROWN - | | | | |
| SBACK W I T, | | | | |
| | | | | |
| TREET CROWN | | | | |
| Htte | | | | |
| | | | | |
| 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) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | ft/ft | |
| vianning's Roughness Benind 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 Sutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | S _X = | 0.020 | ft/ft | |
| Street Longitudinal Slope - Enter 0 for sump condition | S _W = S ₀ = | 0.083 | ft/ft ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{STREET} = | 0.000 | | |
| | | | 1 | |
| | | Minor Storm | Major Storm | |
| Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | T _{MAX} = | 16.0 | 16.0 | ft |
| Check boxes are not applicable in SUMP conditions | d _{MAX} = | 4.4 | 7.7 | inches |
| | | 1 | A-1. | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | г | Minor Storm | Major Storm | |
| Nater Depth without Gutter Depression (Eq. ST-2) | y = | 3.84 | 3.84 | inches |
| /ertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) | d _C = a = | 0.8 | 0.8 | inches inches |
| Nater Depth at Gutter Flowline | d = | 4.47 | 4.47 | linches |
| 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 ($Q_T - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _W = | 0.0 | 0.0 | cfs cfs |
| Maximum Flow Based On Allowable Spread | $Q_{BACK} = \mathbf{Q}_T = \mathbf{Q}_T$ | 0.0 SUMP | 0.0 SUMP | |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| /*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 Starm | |
| Theoretical Water Spread | Т _{тн} = [| 15.6 | Major Storm 29.4 | l Ift |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | $T_{XTH} =$ | 14.7 | 29.4 | 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) Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q _{BACK} = Q = | 0.0 | 0.0 | cfs cfs |
| Average Flow Velocity Within the Gutter Section | Q - V = | 0.0 | 0.0 | fps |
| /*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 Capacity is based on Depth Criterion | | Minor Storm | Major Storm | ı |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | SUMP | SUMP | cfs |



| Design Information (Input) | CDOT Type R Curb Opening | - | MINOR | MAJOR | _ |
|------------------------------------|--|--|-------------|---------------------|----------------|
| Type of Inlet | | Type = | CDOT Type R | 1 3 | |
| | continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate o | r Curb Opening) | No = | 4 | 4 | |
| Water Depth at Flowline (outsi | de of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | _ | MINOR | MAJOR | Verride 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 Gr | | $C_f(G) =$ | N/A | N/A | - |
| Grate Weir Coefficient (typical | | $C_{w}^{-}(G) =$ | N/A | N/A | - |
| Grate Orifice Coefficient (typical | | $C_{0}(G) = C_{0}(G) = C_{0}(G)$ | N/A | N/A | - |
| Curb Opening Information | | C ₀ (C) = [| MINOR | MAJOR | |
| Length of a Unit Curb Opening | | $L_{0}(C) = [$ | 5.00 | 5.00 | feet |
| Height of Vertical Curb Openin | | $H_{vert} =$ | 6.00 | 6.00 | linches |
| Height of Curb Orifice Throat i | | | 6.00 | 6.00 | linches |
| | | H _{throat} = | | | |
| Angle of Throat (see USDCM F | | Theta = | 63.40 | 63.40 | degrees |
| | (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | feet |
| | rb Opening (typical value 0.10) | $C_{f}(C) =$ | 0.10 | 0.10 | _ |
| Curb Opening Weir Coefficient | | C _w (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficien | | $C_{o}(C) =$ | 0.67 | 0.67 | |
| Grate Flow Analysis (Calcula | ited) | | MINOR | MAJOR | |
| Clogging Coefficient for Multipl | e Units | Coef = | N/A | N/A | 7 |
| Clogging Factor for Multiple Ur | nits | Clog = | N/A | N/A | 1 |
| | ased on Modified HEC22 Method) | | MINOR | MAJOR | _ |
| Interception without Clogging | ······ | Q _{wi} = | N/A | N/A | lcfs |
| Interception with Clogging | | Q _{wa} = | N/A | N/A | cfs |
| | based on Modified HEC22 Method) | Rwa | MINOR | MAJOR | |
| Interception without Clogging | bused on Modified Theezz Methody | Q _{oi} = | N/A | N/A | lcfs |
| Interception with Clogging | | | N/A N/A | N/A N/A | cfs |
| | | Q _{oa} = | | | |
| Grate Capacity as Mixed Flo | W | о Г | MINOR | MAJOR | 7.6 |
| Interception without Clogging | | Q _{mi} = | N/A | N/A | cfs |
| Interception with Clogging | | Q _{ma} = | N/A | N/A | cfs |
| Resulting Grate Capacity (assu | | Q _{Grate} = | N/A | N/A | cfs |
| Curb Opening Flow Analysis | | - | MINOR | MAJOR | _ |
| Clogging Coefficient for Multipl | | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Ur | | Clog = | 0.03 | 0.03 | |
| Curb Opening as a Weir (ba | sed 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 |
| | (based on Modified HEC22 Method) | | MINOR | MAJOR | |
| Interception without Clogging | · | $Q_{oi} = [$ | 33.6 | 43.9 | lcfs |
| Interception with Clogging | | $Q_{oa} =$ | 32.5 | 42.4 | cfs |
| Curb Opening Capacity as M | lived Flow | | MINOR | MAJOR | _ ∽ |
| Interception without Clogging | | Q _{mi} = [| 17.0 | 36.7 | cfs |
| | | | 17.0 | 35.5 | cfs |
| Interception with Clogging | ity (new man along and sen this) | Q _{ma} = Q_{curb} = | 9.7 | 35.5 34.3 | |
| | ity (assumes clogged condition) | Curb - | _ | | LIS |
| Resultant Street Conditions | | | MINOR | MAJOR | ٦. |
| Total Inlet Length | | L = | 20.00 | 20.00 | feet |
| | 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 Red | uction (Calculated) | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | d _{Grate} = | N/A | N/A |]ft |
| Depth for Curb Opening Weir B | Equation | d _{Curb} = | 0.29 | 0.57 | lft l |
| | e Reduction Factor for Long Inlets | RF _{Combination} = | 0.41 | 0.72 | 1 |
| Curb Opening Performance Re | | RF _{Curb} = | 0.67 | 0.72 | 1 |
| Grated Inlet Performance Redu | | | N/A | N/A | 4 |
| Grateu Iniet Performance Reut | | RF _{Grate} = | IN/A | IN/A | _ |
| | | | MINOD | MAJOR | |
| . | | • 「 | MINOR | MAJOR | 7-6- |
| ILLOTAL Inlet Interception Capaci | ty (assumes clogged condition) | Q _a = | 9.7 | 34.3 | cfs |
| | Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | 7.8 | 21.1 | cfs |

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

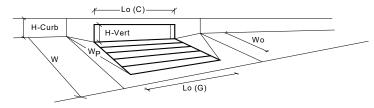
| (Based on Regulated Criteria for Maximum Al | lowable Flow | Depth and Spr | ead) | - |
|--|--------------------------------|---------------------|---------------------|------------|
| Grandview Reserve | | | - | |
| Basin A-10(DP7b) | | | | |
| - DAVE | | | | |
| Stack W I Tr | | | | |
| | | | | |
| STREET CROWN | | | | |
| BE D S | | | | |
| S- | | | | |
| | | | | |
| 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 | | |
| | BACK L | 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 Manning's Roughness for Street Section (typically between 0.012 and 0.020) | S ₀ = | 0.000 | ft/ft | |
| Maining's Roughness for Suleet Section (typically between 0.012 and 0.020) | $n_{\text{STREET}} = $ | 0.016 | 1 | |
| | | Minor Storm | Major Storm | ı |
| 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 Water Depth without Gutter Depression (Eq. ST-2) | v – ľ | Minor Storm 3.84 | Major Storm 3.84 | inches |
| Varial Depth between Gutter Lip and Gutter Flowline (usually 2") | y = 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_{χ} | 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) Maximum Flow Based On Allowable Spread | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section | Q _T = V = | SUMP 0.0 | SUMP 0.0 | cfs |
| V*d Product: Flow Velocity times Gutter Flowline Depth | v = V*d = | 0.0 | 0.0 | fps |
| a model now velocity times outer nowine beptin | • u - [| 0.0 | 0.0 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | ı |
| 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 | <u> </u> |
| 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 _X = | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | Q _w = | 0.0 | 0.0 | cfs cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Average Flow Velocity Within the Gutter Section | Q = V = | 0.0 | 0.0 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | v = 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) | $\mathbf{Q}_{d} = \mathbf{I}$ | 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 | |



| Design Information (Input) CDOT Type R Curb Opening | | MINOR | MAJOR | 7 |
|---|--|-------|--------------|----------------|
| Type of Inlet | Type = | | Curb Opening | 4 |
| 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 | 4 |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.3 | 8.0 | inches |
| Grate Information | - | MINOR | MAJOR | Verride Depths |
| Length of a Unit Grate | $L_{0}(G) =$ | N/A | 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 | N/A | 1 |
| 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) | $C_{o}(G) =$ | N/A | N/A | - |
| Curb Opening Information | 00(0) L | MINOR | MAJOR | _ |
| Length of a Unit Curb Opening | $L_{0}(C) = $ | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | | 6.00 | 6.00 | linches |
| | H _{vert} = | | | |
| 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 |
| 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 | 1 |
| Grate Flow Analysis (Calculated) | | MINOR | MAJOR | |
| 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) | clog – L | MINOR | MAJOR | |
| Interception without Clogging | o _[| N/A | N/A | cfs |
| | Q _{wi} = | | | |
| Interception with Clogging | Q _{wa} = | N/A | N/A | cfs |
| Grate Capacity as a Orifice (based on Modified HEC22 Method) | - T | 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 | | 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) | | MINOR | MAJOR | • |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | 7 |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | - |
| Curb Opening as a Weir (based on Modified HEC22 Method) | clog – L | MINOR | MAJOR | _ |
| Interception without Clogging | Q _{wi} = | 3.6 | 10.8 | lcfs |
| | | | | cfs |
| Interception with Clogging | Q _{wa} = | 3.2 | 9.7 | CTS |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | | MINOR | MAJOR | ٦. |
| Interception without Clogging | Q _{oi} = | 8.3 | 11.2 | cfs |
| Interception with Clogging | Q _{oa} = | 7.5 | 10.1 | cfs |
| Curb Opening Capacity as Mixed Flow | _ | MINOR | MAJOR | _ |
| Interception without Clogging | Q _{mi} = | 5.1 | 10.2 | cfs |
| Interception with Clogging | Q _{ma} = | 4.6 | 9.2 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{Curb} = | 3.2 | 9.2 | cfs |
| Resultant Street Conditions | | MINOR | MAJOR | • |
| Total Inlet Length | L = [| 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on street geometry from above) | T = | 15.2 | 30.7 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | | 0.0 | 3.5 | linches |
| | d _{CROWN} = | 0.0 | 3.5 | |
| Level Land Developmenter Deduction (C-to-to-to-to-to-to-to-to-to-to-to-to-to- | | MINOD | MARCO | |
| Low Head Performance Reduction (Calculated) | | MINOR | MAJOR | 7. |
| Depth for Grate Midwidth | d _{Grate} = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | d _{Curb} = | 0.29 | 0.60 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | RF _{Combination} = | 0.55 | 1.00 | |
| Curb Opening Performance Reduction Factor for Long Inlets | RF _{Curb} = | 1.00 | 1.00 | 1 |
| Grated Inlet Performance Reduction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | 1 |
| | ··· Grate – | , | ,,,. | _ |
| | | MINOR | MAJOR | |
| Total Inlet Interception Capacity (accuracy closed condition) | 0 – [[] | 3.2 | 9.2 | cfs |
| Total Inlet Interception Capacity (assumes clogged condition) Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | $\mathbf{Q}_{\mathbf{a}} = \mathbf{Q}_{\mathbf{p} \in \mathbf{A} \times \mathbf{R} \in \mathbf{Q} \cup \mathbf{R} \in \mathbf{Q}}$ | 2.2 | 5.3 | cfs |
| | | ,, | . 53 | |

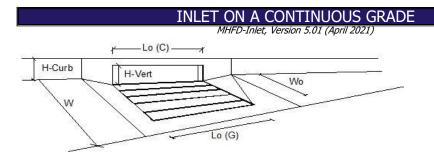
Warning 1: Dimension entered is not a typical dimension for inlet type specified.

| (Based on Regulated Criteria for Maximum Allo | | ET (Min Depth and Spi | | |
|--|---|--------------------------|--------------|------------------|
| Grandview Reserve | | | | |
| Basin B-1 (DP 9) | | | | |
| | | | | |
| T. T | | | | |
| Succe W T, | | | | |
| STREET CROWN | | | | |
| B P CROWN | | | | |
| f a s | | | | |
| 111 19 | | | | |
| Gutter Geometry: | - | | | |
| Aaximum Allowable Width for Spread Behind Curb | T _{BACK} = | 7.5 | ft | |
| ide Slope Behind Curb (leave blank for no conveyance credit behind curb) | S _{BACK} = | 0.020 | ft/ft | |
| Ianning's Roughness Behind Curb (typically between 0.012 and 0.020) | n _{BACK} = | 0.020 | | |
| leight of Curb at Gutter Flow Line | u _[| 6.00 | linches | |
| Distance from Curb Face to Street Crown | H _{CURB} = | | ft | |
| Sutter Width | T _{CROWN} = W = | <u>16.0</u> 0.83 | ft | |
| itreet Transverse Slope | vv = S _x = | 0.83 | ft/ft | |
| Sutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | $S_X = S_W = 1$ | 0.020 | ft/ft | |
| treet Longitudinal Slope - Enter 0 for sump condition | S ₀ = | 0.000 | ft/ft | |
| Ianning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{STREET} = | 0.016 | 1.7.10 | |
| | JINEEL | | - | |
| | | Minor Storm | Major Storm | 1 |
| 1ax. Allowable Spread for Minor & Major Storm | T _{MAX} = | 16.0 | 16.0 | ft |
| Iax. Allowable Depth at Gutter Flowline for Minor & Major Storm | d _{MAX} = | 4.4 | 7.7 | inches |
| heck boxes are not applicable in SUMP conditions | | | | |
| | | | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
| Vater Depth without Gutter Depression (Eq. ST-2) 'ertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y = d _C = | <u>3.84</u> 0.8 | 3.84 | inches inches |
| Sutter Depression (d_c - (W * S _x * 12)) | a = | 0.63 | 0.63 | inches |
| Vater Depth at Gutter Flowline | d = | 4.47 | 4.47 | linches |
| Nowable Spread for Discharge outside the Gutter Section W (T - W) | T _x = | 15.2 | 15.2 | ft |
| Sutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $E_0 = 1$ | 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 |
| Iaximum Flow Based On Allowable Spread | Q _T = | SUMP | SUMP | cfs |
| low Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| *d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| lavimum Canacity for 1/2 Street based on Allowable Denth | | Minor Charry | Major Charm | |
| <u>Iaximum Capacity for 1/2 Street based on Allowable Depth</u> heoretical Water Spread | т _Г | Minor Storm | Major Storm | ı Tft |
| heoretical water Spread 'heoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = т – | 15.6 14.7 | 29.4 28.6 | -ft |
| Sutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | Т _{х тн} = E ₀ = | 0.153 | 0.079 | '' |
| heoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | $Q_{XTH} =$ | 0.155 | 0.079 | cfs |
| ctual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) | $Q_{XTH} = Q_{X} =$ | 0.0 | 0.0 | cfs |
| vischarge within the Gutter Section W ($Q_d - Q_x$) | $Q_{\rm W} =$ | 0.0 | 0.0 | cfs |
| vischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 0.0 | |
| otal Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | 0.0 | 0.0 | cfs |
| verage Flow Velocity Within the Gutter Section | V = | 0.0 | 0.0 | fps |
| *d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| lope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | SUMP | SUMP | 1 |
| lax Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} = \begin{bmatrix} \\ \\ \\ \end{bmatrix}$ | SUMP | SUMP | cfs |
| tesultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | | | inches |
| esultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | | | inches |
| | - | | | |
| INOR STORM Allowable Capacity is based on Depth Criterion | - | Minor Storm | Major Storm | |
| IAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | SUMP | SUMP | cfs |



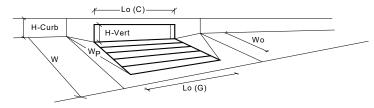
| Design Information (Input) CDOT Type R Curb Opening | т Г | MINOR | MAJOR | 7 |
|---|--|-------|--------------|-----------------|
| Type of Inlet | Type = | | Curb Opening | inches |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | 4 |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | _ | MINOR | MAJOR | Verride Depthe |
| Length of a Unit Grate | $L_{o}(G) =$ | N/A | 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 | 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 | 1 |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{o}(G) =$ | N/A | N/A | 1 |
| Curb Opening Information | -0(-) | MINOR | MAJOR | _ |
| Length of a Unit Curb Opening | $L_{0}(C) =$ | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert} =$ | 6.00 | 6.00 | linches |
| Height of Curb Orifice Throat in Inches | | 6.00 | 6.00 | linches |
| 5 | H _{throat} = | 63.40 | 63.40 | - |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | | | degrees feet |
| 1 Side Width for Depression Pan (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | reet |
| 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 | |
| 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 | Q _{oi} = | N/A | N/A | Cfs |
| Interception with Clogging | | N/A | N/A | lcfs |
| Grate Capacity as Mixed Flow | Q _{oa} = | MINOR | MAJOR | |
| | о Г | | | 7-6- |
| 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) | - | MINOR | MAJOR | - |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | _ |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| Curb Opening as a Weir (based on Modified HEC22 Method) | _ | MINOR | MAJOR | _ |
| Interception without Clogging | Q _{wi} = | 6.1 | 20.2 | cfs |
| Interception with Clogging | Q _{wa} = | 5.7 | 18.9 | cfs |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | | MINOR | MAJOR | - |
| Interception without Clogging | Q _{oi} = | 16.8 | 21.9 | cfs |
| Interception with Clogging | $Q_{oa} =$ | 15.7 | 20.6 | cfs |
| Curb Opening Capacity as Mixed Flow | -coa - | MINOR | MAJOR | · - |
| Interception without Clogging | Q _{mi} = | 9.4 | 19.6 | lcfs |
| Interception with Clogging | Q _{mi} = Q _{ma} = | 8.8 | 19.0 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{ma} = Q _{Curb} = | 5.7 | 18.3 | cfs |
| | Curb - | | | C13 |
| Resultant Street Conditions | | MINOR | MAJOR | 74. |
| Total Inlet Length | L = | 10.00 | 10.00 | 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} = | 0.82 | 1.00 | 1 |
| Grated Inlet Performance Reduction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | 1 |
| | Grate - | in/A | 11/7 | _ |
| | | MINOR | MAJOR | |
| Total Inlat Intercontian Connects (accurate days days days | ~ 「 | | | |
| Total Inlet Interception Capacity (assumes clogged condition) | Q _a = | 5.7 | 18.3 | cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | 5.3 | 12.3 | cfs |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | |
|--|--------------------------------|--------------------|-------------|------------------|
| Grandview Reserve | | | | |
| Basin B-2 (DP 10a) | | | | |
| | | | | |
| Stack W T. | | | | |
| | | | | |
| STREET CROWN | | | | |
| BENT DI CALL | | | | |
| ± o Sa | | | | |
| | | | | |
| Gutter Geometry: | - r | | 7.0 | |
| 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 = | 0.020 | 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 | 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 | ı |
| 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 | <u> </u> |
| 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 cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread | Q _{BACK} = | 0.0 12.1 | 0.0 | |
| Flow Velocity within the Gutter Section | Q _T = V = | 1.1 | 1.1 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.4 | 0.4 | |
| a riodael riow velocity times dater riowine bepar | • • • -[| 0.1 | 0.1 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | 1 |
| 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} = | 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 = | 1.1 | 1.6 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.4 | 1.0 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) | R = | 1.00 | 0.83 | cfs |
| | $Q_d =$ | 11.2 | 45.0 | |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) | d = | 4.36 | 7.17 | inches inches |
| Container i low Deput at Succe Crown (Sarety Factor Applieu) | d _{CROWN} = | 0.00 | 2.70 | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | ı |
| | | 11.2 | 45.0 | |



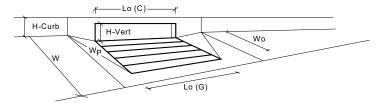
| Design Information (Input) | | MINOR | MAJOR | |
|--|--|-------------------|--------------|------------|
| Type of Inlet | Type = | - | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 2 | 2 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | L ₀ = | 5.00 | 5.00 | |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W _o = | N/A | N/A | -lft - |
| 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 = 0.3) | C _f -C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | 4 C - I | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | $Q_0 = \int$ | 7.1 | 16.5 | lcfs |
| Water Spread Width | τ= | 13.1 | 16.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 3.8 | 5.0 | linches |
| Water Depth at Flowing (outside of local depression) Water Depth at Street Crown (or at T_{MAX}) | · · · | 0.0 | 0.5 | linches |
| Ratio of Gutter Flow to Design Flow | d _{CROWN} = E ₀ = | 0.184 | 0.132 | |
| Discharge outside the Gutter Section W, carried in Section T_x | | 5.8 | 14.3 | cfs |
| | Q _x = | | 2.2 | |
| Discharge within the Gutter Section W | Q _w = | <u>1.3</u> 0.0 | 0.0 | cfs cfs |
| Discharge Behind the Curb Face | $Q_{BACK} =$ | | | |
| Flow Area within the Gutter Section W | A _W = | 0.23 5.7 | 0.31 6.9 | sq ft |
| Velocity within the Gutter Section W | V_w = | | | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 6.8 | 8.0 | inches |
| Grate Analysis (Calculated) | F | MINOR | MAJOR | ۹. |
| 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 | ., г | MINOR | MAJOR | ٦, |
| 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 | - |
| 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 | _ |
| 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 | |
| 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 = | 0.087 | 0.068 | _ft/ft |
| Required Length L_T to Have 100% Interception | L _T = [| 16.94 | 29.21 | _ft |
| Under No-Clogging Condition | - | MINOR | MAJOR | _ |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i =$ | 5.7 | 8.7 | 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 | |
| Effective (Unclogged) Length | L _e = | 9.37 | 9.37 | ft |
| Actual Interception Capacity | Q _a = | 5.6 | 8.5 | cfs |
| Carry-Over Flow = $Q_{h(GRATE)}$ - Q_a | Q _b = | 1.5 | 8.0 | cfs |
| Summary | | MINOR | MAJOR | |
| Total Inlet Interception Capacity | Q =[| 5.6 | 8.5 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 1.5 | 8.0 | cfs |
| Capture Percentage = Q_a/Q_0 = | C% = | 78 | 52 | % |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum Allo | | | | |
|---|--------------------------------------|---------------|---------------|------------------|
| Grandview Reserve | wable now | Depth and Spi | eau) | |
| Basin B-3 (DP 10b) | | | | |
| - TBACK TCHOWN | | | | |
| Stack W I T. | | | | |
| | | | | |
| STREET CROWN | | | | |
| P 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 | 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 = | 0.000 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{\text{STREET}} = L$ | 0.016 | J | |
| | | 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 | | 4.47 | 4.47 | inches ft |
| 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) | T _X = E ₀ = | 15.2 0.149 | 15.2 0.149 | - '' |
| 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 ($Q_T - Q_X$) | $\vec{Q}_{W} = \vec{Q}_{W}$ | 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} = | 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 (Eq. ST-7) | $E_0 =$ | 0.153 | 0.079 | - |
| 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 TH} = | 0.0 | 0.0 | cfs cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_X = Q_W = $ | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Qw = 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 | 4. |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $Q_d =$ | SUMP | SUMP | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) | d = | | | inches inches |
| Acounter now peper at succe crowin (sarcey ractor Applica) | d _{CROWN} = | | 1 | |
| 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 |



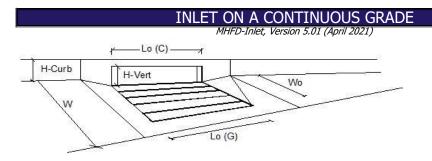
| Design Information (Input) CDOT Type R Curb Opening | | MINOR | MAJOR | - |
|---|-----------------------------|-------|--------------|--------------|
| Type of Inlet | Type = | | Curb Opening | 4 |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 4 | 4 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | - | MINOR | MAJOR | Verride Dept |
| Length of a Unit Grate | $L_{o}(G) =$ | N/A | 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 | 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 | 7 |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{o}(G) =$ | N/A | N/A | 1 |
| Curb Opening Information | | MINOR | MAJOR | - |
| Length of a Unit Curb Opening | $L_{0}(C) = [$ | 5.00 | 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 |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| 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) | | 0.10 | 0.10 | |
| | $C_{f}(C) =$ | | | - |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w(C) =$ | 3.60 | 3.60 | 4 |
| 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 | 4 |
| 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 | Q _{oi} = | N/A | N/A | cfs |
| Interception with Clogging | Q _{oa} = | N/A | , N/A | lcfs |
| Grate Capacity as Mixed Flow | -cua _ | MINOR | MAJOR | 7 |
| Interception without Clogging | Q _{mi} = | N/A | N/A | lcfs |
| Interception with Clogging | $Q_{ma} = $ | N/A | N/A | |
| Resulting Grate Capacity (assumes clogged condition) | Q _{Grate} = | N/A | N/A | cfs |
| 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) | ciug – L | MINOR | MAJOR | |
| | o _ [| 10.0 | | lcfs |
| Interception without Clogging | Q _{wi} = | | 35.4 | |
| Interception with Clogging | Q _{wa} = | 9.7 | 34.3 | cfs |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | | MINOR | MAJOR | ٦. |
| 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 |
| Interception with Clogging | Q _{ma} = | 16.5 | 35.5 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{Curb} = | 9.7 | 34.3 | cfs |
| Resultant Street Conditions | • | MINOR | MAJOR | |
| Total Inlet Length | L = [| 20.00 | 20.00 | feet |
| Resultant Street Flow Spread (based on street geometry from above) | т=Г | 15.6 | 29.4 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | d _{CROWN} = | 0.0 | 3.2 | linches |
| | CROWN - | 0.0 | J.2 | |
| Low Head Performance Reduction (Calculated) | | MINOR | MAJOR | |
| Depth for Grate Midwidth | d _ [| N/A | N/A | ٦ft |
| | d _{Grate} = | | | |
| 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 | N/A | |
| | | | | |
| | | MINOR | MAJOR | _ |
| Total Inlet Interception Capacity (assumes clogged condition) | Q _a = [| 9.7 | 34.3 | cfs |
| | Q PEAK REQUIRED = | 9.3 | 26.2 | cfs |

| (Based on Regulated Criteria for Maximum Alle | | | | jor Stor |
|---|--|--------------|---------------------|--------------|
| Grandview Reserve | | | | |
| Basin B-4 (DP 11) | | | | |
| | | | | |
| Seace W I T | | | | |
| | | | | |
| STREET CROWN | | | | |
| P P S | | | | |
| I of Sal | | | | |
| v/ | | | | |
| Gutter Geometry: Maximum Alloughla Width for Sarand Bakind Curb | [| 0.0 | ام | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 8.0 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | π/π | |
| daming's Roughness benniti curb (typically between 0.012 and 0.020) | n _{BACK} = | 0.015 | 1 | |
| Height of Curb at Gutter Flow Line | H _{CURB} = | 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_{\text{STREET}} = $ | 0.016 | 1 | |
| | | Minor Storm | Major Storm | |
| Max. Allowable Spread for Minor & Major Storm | T _{MAX} = | 11.5 | 17.0 | l Tft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | d _{MAX} = | 6.0 | 8.0 | inches |
| Check boxes are not applicable in SUMP conditions | -MAX L | | | |
| | | A | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | |
| Nater Depth without Gutter Depression (Eq. ST-2) | y = | 2.76 | 4.08 | inches |
| /ertical Depth between Gutter Lip and Gutter Flowline (usually 2") | d _C = | 2.0 | 2.0 | inches |
| Sutter Depression (d_c - (W * S_x * 12)) | a = | 1.51 | 1.51 | inches |
| Nater Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) | d = T _X = | 4.27 9.5 | 5.59 15.0 | inches 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 | $Q_{\rm X} =$ | 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 |
| Naximum Flow Based On Allowable Spread | $Q_T =$ | SUMP | SUMP | cfs |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Anvinum Connaite for 1/2 Church based or Allowable Double | | Min en Ci | Maia Ci | |
| Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread | т.,_Г | Minor Storm | Major Storm 27.0 | ı Tft |
| Preoretical water Spread Fheoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = Т _{х тн} = | 18.7 16.7 | 27.0 | |
| Sutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | E _O = | 0.318 | 0.216 | |
| Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | Q _{X TH} = | 0.0 | 0.210 | 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 ($Q_d - Q_X$) | $Q_W^{q_X} =$ | 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 |
| /*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 | <u> </u> |
| 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) | $d_{CROWN} = L$ | | | inches |
| INOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storm | |
| | | | | |



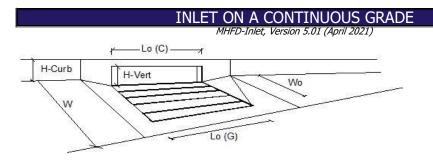
| Design Information (Input) | | MINOR | MAJOR | |
|---|-----------------------------|----------|--------------|-----------------|
| Type of Inlet | Type = | | Curb Opening | - I |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.3 | 5.6 | inches |
| Grate Information | ronding bepar = | MINOR | MAJOR | Override Depths |
| Length of a Unit Grate | L ₀ (G) = | N/A | N/A | lfeet |
| 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 | I |
| Clogging Factor for a Single Grate (typical values 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 | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_0(G) =$ | N/A | N/A | ┥ ║ |
| Curb Opening Information | -0(-) | MINOR | MAJOR | - |
| Length of a Unit Curb Opening | $L_{0}(C) = [$ | 5.00 | 5.00 | lfeet |
| 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 _n = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f(C) =$ | 0.10 | 0.10 | - 1 |
| 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 | <u> </u> |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | ן ר |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | ╡ ║ |
| Grate Capacity as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | - 1 |
| Interception without Clogging | Q _{wi} = | N/A | N/A | lcfs |
| Interception with Clogging | $Q_{wa} = $ | N/A | N/A | lcfs |
| Grate Capacity as a Orifice (based on Modified HEC22 Method) | Civia L | MINOR | MAJOR | |
| Interception without Clogging | Q _{oi} = | N/A | N/A | lcfs |
| Interception with Clogging | $Q_{oa} =$ | , N/A | N/A | lcfs |
| Grate Capacity as Mixed Flow | coa L | MINOR | MAJOR | |
| Interception without Clogging | Q _{mi} = | N/A | N/A | lcfs |
| 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) | • | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | ן ר |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | 1 |
| Curb Opening as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | - |
| Interception without Clogging | Q _{wi} = | 4.2 | 9.3 | cfs |
| Interception with Clogging | Q _{wa} = | 3.9 | 8.7 | cfs |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | | MINOR | MAJOR | - |
| Interception without Clogging | Q _{oi} = | 16.6 | 18.9 | Cfs |
| Interception with Clogging | $Q_{oa} =$ | 15.6 | 17.7 | cfs |
| Curb Opening Capacity as Mixed Flow | | MINOR | MAJOR | - |
| Interception without Clogging | Q _{mi} = | 7.7 | 12.3 | cfs |
| Interception with Clogging | Q _{ma} = | 7.3 | 11.5 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{Curb} = | 3.9 | 8.7 | cfs |
| Resultant Street Conditions | • | MINOR | MAJOR | |
| Total Inlet Length | L = [| 10.00 | 10.00 | feet |
| Resultant Street Flow Spread (based on street geometry from above) | т = | 11.5 | 17.0 | ft |
| Resultant Flow Depth at Street Crown | d _{CROWN} = | 0.0 | 0.0 | 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} = | 0.19 | 0.30 | ft l |
| Combination Inlet Performance Reduction Factor for Long Inlets | RF _{Combination} = | 0.40 | 0.53 | 1 |
| Curb Opening Performance Reduction Factor for Long Inlets | RF _{Curb} = | 0.81 | 0.91 | ן ו |
| | RF _{Grate} = | N/A | N/A | 1 1 |
| | NI Grate = I | | | |
| | Ki Grate – | , | | |
| | Ki Grate – L | MINOR | MAJOR | |
| Grated Inlet Performance Reduction Factor for Long Inlets Total Inlet Interception Capacity (assumes clogged condition) | Q _a = | , | MAJOR 8.7 | cfs |

| ALLOWABLE CAPACITY FOR ONE-HALF ((Based on Regulated Criteria for Maximum Al | | | | , |
|--|--|--------------|----------------|------------------|
| Grandview Reserve | | | - | |
| Basin B-5 (DP 12a) | | | | |
| T, Tuxx I | | | | |
| SBACK W T | | | | |
| STREET | | | | |
| 2 > Qu Qu S STREET CROWN | | | | |
| 2 1 + | | | | |
| 11-1 1 | | | | |
| Gutter Geometry: Maximum Allowable Width for Ground Babind Curb | т _Г | 7 5 | ٦ | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = n _{BACK} = | 0.020 | | |
| | HBACK - | 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) Street Longitudinal Slope - Enter 0 for sump condition | S _W = S ₀ = | 0.083 | ft/ft ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{street} = | 0.020 | | |
| | JINEEL | | - | |
| | - | Minor Storm | Major Storm | n |
| 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 Storn | n |
| 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)) Water Depth at Gutter Flowline | a = d = | 0.63 4.47 | 0.63 | inches inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | и – Т _х = | 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 Flow Velocity within the Gutter Section | Q _T = V = | 12.1 1.1 | 12.1 1.1 | cfs fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | v = V*d = | 0.4 | 0.4 | |
| | | | • | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | - | Minor Storm | Major Storn | |
| Theoretical Water Spread | T _{TH} = | 15.6 | 29.4 | ft |
| 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) | T _{X TH} = | 14.7 | 28.6 | ft |
| Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | Е ₀ = Q _{X TH} = | 0.153 9.5 | 0.079 55.6 | cfs |
| Actual Discharge outside the Gutter Section W, (limited in Section T_{XTH} | $Q_X TH = Q_X =$ | 9.5 | 48.2 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_W^{2x} =$ | 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 = | 1.1 | 1.6 | fps |
| 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 = | 0.4 | 1.0 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{-}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) | R = $Q_d = $ | 1.00 11.2 | 0.83 45.0 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | • v a − d = | 4.36 | 7.17 | linches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 2.70 | inches |
| | | | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | n |



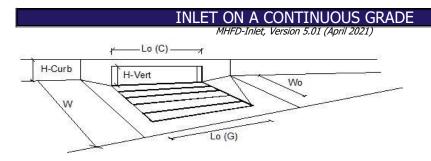
| $\begin{split} & Type f last control (Control Control Con$ | Design Information (Input) | | MINOR | MAJOR | |
|--|--|------------------------|-------|-------|---------|
| Lical Depression (additional to continuous gutter depression 'a) Total Number of Units in the Intel (Grate or Curb Opening) Length of a Single Unit Intel (Grate or Curb Opening) We of a Vinit Grate (Grate or Curb Opening) U, = Street Numa (Carbo Opening) V, = Street Numa (Carbo Opening) V, = Street Numa (Carbo Opening) V, = Street Numa (Carbo Opening) V, = Nin A NUA Street Numa (Cirb Opening (Nyma in Value = 0.1) C-C = V, A NUA NUA Street Numine (Outside of local depression) Viater Depth at Street (Carbo Opening (Nyma in Value = 0.1) C-C = Street Numa (Nyma in Value = 0.1) C-C = V, A NUA Numa (Nyma in Value = 0.1) C-C = Numa (Nyma in Value = 0.1) C-C | | Type = | | | |
| Total Number of Units in the Inite (Grate or Curb Opening) With of a Unit Number of Curb Opening) With or a Single Unit Curb Queening (typical min, value = 0.5) Street Hydraulitics (S. 4. 2. 4. Allowable Street Charactive) With or a Single Unit Curb Opening (typical min, value = 0.5) Street Hydraulitics (S. 4. 2. 4. Allowable Street Charactive) Design Discharge for Half of Street (from <i>Inlet Management</i>) Water Spread With Water Spread With Water Spread With Water Depth at Flowline (outside of local depression) Water Depth at Flowline (outside of local depth at Plot (Intervation) Minitory Mator (| | | | | linches |
| Length of a Single Unit Intel (Grate or Curb Opening) $\begin{tabular}{ c c c c c c } L_{q} = \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$ | | | | | |
| With of unit Grate (cannot be greater than W, Gutter With) W, = N/A N/A N/A Clogging Factor for a Single Unit Grate (typical min, value = 0.1) C-C = 0.10 0.10 Street Mydraulics: OK - O < Allowable Street Capacity' | | - | | | ff |
| Clogging Factor, for a Single Unit Grate (typical min, value = 0.1) C-C = N/A NA Cargoning Factor, for a Single Unit Grate (typical min, value = 0.1) C-C = 0.10 0.10 Street, Hydraulics; OK 0. < Allowable Street Capacity; | | | | | |
| Clocing Factor for a Single Unit Curb Dening (typical min, value = 0.1) C-C = 0.10 0.10 Street Hubral Units: SK 0-C - Klowable Street Canacity: Design Discharge for Half of Street (from Inlet Management) Water Depth at Street (from Inlet Management) Water Depth at Street (from Inlet Management) Water Depth at Street (rown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Water Depth at Street Cown (or at T _{NN}) Discharge outside the Gutter Section W Care = 0.177 0.126 Discharge thin the Gutter Section W Water Depth for Design Condition Water Depth for Design Condition Water Depth for Design Condition Grate Analysis Claiculated) Total Length of Design Condition Winnum Velocity Where Grate Splash-Over Begins Minnum Velocity Mere Grate Splash-Over Begins Mi | | | | | |
| Street Hvdraulics: OK - 0 < Allowable Street Canacity MINOR MAIOR Design Discharge for Half of Street (from Inlet Management) $Q_1 =$ 7.9 18.5 6's Water Spread Width T = 13.6 16.0 ft Water Depth at Street Crown (or at Tww) $Q_2 =$ 0.0 0.7 11.6 5 Discharge outside the Gutter Section W, Carrel in Section Tx $Q_2 =$ 6.5 16.2 cfs Discharge within the Gutter Section W $Q_4 =$ 0.0 0.0 cfs Discharge within the Gutter Section W $Q_{acc} =$ 0.2 0.33 sq t Velocity within the Gutter Section W $Q_{acc} =$ 0.8 2.1 inches Total Length of Talet Grate Opening HINOR MAIOR MAIOR Velocity within the Gutter Section W $Q_a =$ N/A N/A MAIOR Total Length of Talet Grate Opening L HINOR MAIOR MAIOR Total Length of Talet Grate Opening R N/A N/A M/A M/A Minimum Velocity Where Grate Splash-Over Begins V_a = N/A N/A N/A MAIOR <td></td> <td></td> <td></td> <td></td> <td>-</td> | | | | | - |
| Design Discharge for Half of Street (from Inlet Management) Water Spread Width $T = \frac{79}{13.6} \frac{116.0}{16.0} \text{ ft}$ Water Depth at Street Crown (or at T _{NKN}) Water Depth at Street Crown (or at T _{NKN}) Water Depth at Street Crown (or at T _{NKN}) Water Depth at Street Crown (or at T _{NKN}) Ratio of Gutter Flow to Design Flow Discharge within the Gutter Section W, Carried in Section T _x Discharge behind the Cuther Section W Water Depth at Street Crown (or at T _{NKN}) Discharge within the Gutter Section W Water Depth or Design Condition Mater Depth Crown (or at T _{NKN}) Water Depth for Design Condition Mater Depth for U Design Flow Under ChoCogging Condition Minum Velocity Where Grate Splash-Over Begins Vieter Capt for Water Grate Splash-Over Begins Vieter Capt for Multiple-unit Grate Inlet Grate Condition Minore Kalf for Multiple-unit Grate Inlet Grate Grate Grate for Multiple-unit Grate Inlet Grate Grate Grate for Multiple-unit Grate Inlet Grate Grate Grate Splash-Over Begins Vieter Winker Grate Splash-Over Begins Vieter Winker Grate Splash-Over Begins Vieter Winker Grate Splash-Over Begins Vieter Depth for Multiple-unit Grate Inlet GrateCoef = N/A N/A Minore MAJOR Minore MAJOR MAJOR Minore MAJOR | | 6 6 - | | | |
| Wate Spend WidthT =13.616.0ftWater Depth at Street Crown (or at Twa) 3.9 5.2inchesRatio of Gutter Flow to Design Flow $B_{claware}$ 0.0 0.7 inchesDischarge within the Guter Section W, carried in Section T, Q_{e} 0.0 0.7 inchesDischarge within the Guter Section W Q_{a} 0.0 0.0 0.7 inchesDischarge within the Guter Section W Q_{a} 0.0 0.0 0.0 drs Stockarge Point Me Curb Section W Q_{a} 0.24 0.33 sq ftVelocity within the Guter Section W Q_{a} 0.0 0.0 drs Water Depth for Design Condition d_{oral} 0.7 0.82 0.33 sq ftTotal Length of Inlet Grate Dopping $L =$ NIA N/A N/A N/A Minore Robust Design Flow $R_{carried}$ N/A N/A N/A N/A Under No-Clogging Condition $R_{carried}$ N/A N/A N/A N/A Interception Rate of Frontal Flow $R_{carried}$ N/A N/A N/A N/A Interception Rate of Stock Flow $R_{carried}$ N/A N/A N/A N/A Interception Rate of Frontal Flow $R_{carried}$ N/A N/A N/A Interception Rate of Frontal Flow $R_{carried}$ N/A N/A N/A Interception Rate of Frontal Flow $R_{carried}$ N/A N/A N/A Interception Rate of Sto | | 0. = | | 1 | lcfs |
| Water Depth at Flowline (outside of local depression)d = 3.9 5.2 inchesWater Depth at Street Crown (or at T_{NAC}) G_{DOW} G_{DOW} G_{DOW} G_{DO} $D.7$ inchesDischarge within the Gutter Section W, carried in Section T, Q_x G_x | | | | | |
| Water Depth at Street Covin (or at Two) $d_{CROWN} =$ 0.0 0.7 InchesRatio of Gutter Flow to Design Flow $E_{0} =$ 0.177 0.126 0.177 0.126 Discharge within the Gutter Section W $Q_{u} =$ 1.4 2.3 cfs Discharge within the Gutter Section W $Q_{u} =$ 0.0 0.0 cfs Sicharge outside the Gutter Section W $Q_{u} =$ 0.0 0.0 cfs Sicharge Delining Condition 0.224 0.33 sq ftWater Depth for Design Condition $d_{IOCM} =$ 5.9 8.2 inchesGrate Analysis (Calculated) $d_{IOCM} =$ N/A N/A ftNater Obeging Condition $d_{IOCM} =$ N/A N/A ftMinimum Velocity Where Grate Splash-Over Begins $V_{0} =$ N/A N/A N/A Interception Rate of Frontal Flow $R_{e} =$ N/A N/A N/A Interception Rate of Side Flow $R_{e} =$ N/A N/A N/A Interception Rate of Side Flow $R_{e} =$ N/A N/A N/A Interception Rate of Side Flow $R_{e} =$ N/A N/A N/A Interception Rate of Side Flow $R_{e} =$ N/A N/A N/A Interception Rate of Frontal Flow $R_{e} =$ N/A N/A N/A Interception Capacity $Q_{e} =$ N/A N/A N/A Interception Rate of Side Flow $R_{e} =$ N/A N/A N/A Interception Rate of Frontal | | | | | -1·* |
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| Discharge within the Gutter Section W $Q_{MCR} = 1.4$ 2.3 cfs Discharge Behind the Curb Face $Q_{MCR} = 0.0$ 0.0 cfs Flow Area within the Gutter Section W $A_W = 0.24$ 0.33 sq ft Velocity within the Gutter Section W $W = 5.8$ 7.1 fps Mater Depth for Design Condition $d_{OCM} = 5.9$ 8.2 inches Grate Analysis (Calculated) $MINOR$ MAIOR Total Length of Inlet Grate Opening Total Length of Inlet Grate Opening Rate of Grate Flow to Design Flow $B_{OCM} = N/A$ N/A N/A ft Interception Rate of Stole Flow Interception Rate of Stole Flow Interception Rate of Stole Flow Clogging Condition Grate Analysis (Calculated) $MINOR$ MAIOR Interception Rate of Stole Flow Interception Rate of Flortal Flow Interception Rate of Stole Flow Interception Rate of Stole Flow Interception Rate of Stole Flow Interception Rate of Flortal Flow Interception Rate of Stole Flow Re = N/A N/A N/A Interception Rate of Stole Flow Curb Cogging Condition Curb Cogging Condition Cur | | - | | | fc |
| Discharge Behind the Curb Face $Q_{DACC} = 0.0$ 0.0 cfs Flow Area within the Gutter Section W $A_W = 0.24$ 0.33 sq ft Value Depth for Design Condition $d_{DCM} = 6.9$ 8.2 inches Grate Analysis (Calculated) Total Length of Inlet Grate Opening $L = N/A N/A$ ft Total Length of Inlet Grate Opening $L = N/A N/A$ ft Inder No-Clogging Condition $N/A = N/A N/A$ ft Interception Rate of Frontal Flow $N/A = N/A N/A$ ft Interception Rate of Frontal Flow $R_c = N/A N/A N/A$ ft Interception Rate of Frontal Flow $R_c = N/A N/A N/A$ ft Interception Rate of Frontal Flow $R_c = N/A N/A N/A$ ft Interception Rate of Frontal Flow $R_c = N/A N/A N/A$ ft Interception Rate of Frontal Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A$ ft Interception Rate of Side Flow $R_c = N/A N/A N/A $ ft Interception Rate of Side Flow $R_c = N/A N/A N/A $ ft Interception Rate of Side Flow $R_c = N/A N/A N/A $ ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ N/A ft Interception Rate of Side Flow $R_c = N/A N/A $ A MAC Curb Cogging Condition $Rate Side Flow RACE = 0.068 0.066 ft ft ft Under NoClogging Condition Rate Side Flow RACE = 0.068 0.066 ft ft ft Under NoClogging Condition Rate Side Flow RACE = 0.068 0.066 ft ft ft Under NoClogging Condition Rate Side Flow RACE = 0.068 0.066 ft ft ft Curb Cog Sign Factor for Multiple-unit Curb Opening$ | 5 | | | | |
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| Interception Rate of Frontal Flow $R_r =$ N/A N/A Interception Rate of Side Flow $R_r =$ N/A N/A Interception Capacity $Q_r =$ N/A N/A Under Clogging Condition $MNOR$ $MAOR$ Clogging Coefficient for Multiple-unit Grate Inlet $GrateCoef =$ N/A N/A Clogging Factor for Multiple-unit Grate Inlet $U_r =$ N/A N/A Effective (unclogged) Length of Multiple-unit Grate Inlet $U_r =$ N/A N/A Interception Rate of Side Flow $R_r =$ N/A N/A ftInterception Rate of Side Flow $R_r =$ N/A N/A fpsInterception Capacity $Q_a =$ N/A N/A ffsCurb or Slotted Inlet Opening or next d/s inlet) $Q_b =$ N/A N/A ffEquivalent Slope Se, (based on grate carry-over) $S_c =$ 0.084 0.066 ft/ftEffective Length of Curb Opening or Slotted Inlet (minimum of $L_r L_T$) $L_T =$ $MINOR$ $MAOR$ Effective Length of Curb Opening or Slotted Inlet (minimum of $L_r L_T$) $L_r =$ 0.066 0.066 Interception Capacity $Q_a =$ 0.066 0.066 0.066 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 0.20 0.5 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 0.20 0.5 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 0.066 0.06 Clogging Coefficient | | | | | ٦. |
| Interception Rate of Side Flow $R_{c} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ Interception Capacity $Q_{c} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ of s MINOR MAJOR Clogging Coefficient for Multiple-unit Grate Inlet $GrateCoef = N/A N/A$ Clogging Coefficient for Multiple-unit Grate Inlet $C_{c} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ ft Minimum Velocity Where Grate Splash-Over Begins $V_{o} = N/A N/A$ ft Interception Rate of Fortal Flow $R_{c} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ ft Interception Rate of Side Flow $R_{c} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ Interception Rate of Side Flow $R_{c} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ Interception Capacity $Q_{a} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ ft Garry-Over Flow Q_{c}, Q_{c} (to be applied to curb opening or next d/s inlet) $Q_{b} = \frac{N/A}{N/A} \frac{N/A}{N/A}$ ft Equivalent Slope S_{c} (based on grate carry-over) $S_{c} = \frac{0.084}{0.084} \frac{0.066}{0.066}$ ft/ft Equivalent Slope S_{c} (based on grate carry-over) $S_{c} = \frac{0.084}{0.066} \frac{0.066}{0.06}$ ft/ft Equivalent Lpt on Have 100% Interception $L_{T} = \frac{10.00}{10.00} \frac{10.00}{10.00}$ ft Interception Capacity $Q_{c} = \frac{0.937}{9.37} \frac{9.37}{9.37}$ ft Curb or Slotted Inlet Opening or Slotted Inlet (minimum of L, L _T) $L_{c} = \frac{9.37}{9.37} \frac{9.37}{9.37}$ ft Actual Interception Capacity $Q_{a} = \frac{5.9}{9.0.0}$ cfs Summary MINOR MAJOR | | | | | fps |
| Interception Capacity $Q_i = \frac{N/A}{N/A}$ N/A cfsUnder Clogging ConditionMINORMAJORClogging Coefficient for Multiple-unit Grate InletGrateCoef = N/A N/A Clogging Factor for Multiple-unit Grate InletGrateCoef = N/A N/A Effective (unclogged) Length of Multiple-unit Grate Inlet $L_e =$ N/A N/A Minimum Velocity Where Grate Splash-Over Begins $V_o =$ N/A N/A N/A Interception Rate of Frontal Flow $R_r =$ N/A N/A N/A Interception Rate of Side Flow $R_r =$ N/A N/A N/A Actual Interception Capacity $Q_a =$ N/A N/A N/A Carry-Over Flow = Q_a, Q_a (to be applied to curb opening or next d/s inlet) $Q_h =$ N/A N/A Equivalent Slope Se, (based on grate carry-over) $S_e =$ 0.084 0.066 ft/ftEquivalent Slope Se, (based on grate carry-over) $S_e =$ 0.084 0.066 ft/ftUnder No-Clogging Condition $MINOR$ MAJORftEffective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) $L =$ 10.00 10.00 ftInterception Capacity $Q_a =$ 5.0 9.0 cfsClogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 1.25 1.25 Clogging CoefficientCurbCoef = 1.25 1.25 1.25 Clogging CoefficientCurbCoef = 1.25 1.25 1.25 Clogging Coefficient <td></td> <td></td> <td></td> <td></td> <td>_</td> | | | | | _ |
| Under Clogging ConditionMINORMAJORClogging Coefficient for Multiple-unit Grate InletGrateCoef =N/AN/AClogging Factor for Multiple-unit Grate InletGrateClog =N/AN/AEffective (unclogged) Length of Multiple-unit Grate InletLe =N/AN/AMinimum Velocity Where Grate Splash-Over BeginsVo =N/AN/AInterception Rate of Frontal FlowRr =N/AN/AInterception Rate of Side FlowRr =N/AN/AActual Interception CapacityQa =N/AN/ACurb or Slotted Inlet Opening Analysis (Calculated)MINORMAJOREquivalent Slope Se (based on grate carry-over)Se =0.0840.066Required Length L ₁ to Have 100% InterceptionL ₇ =10.0010.00Interception CapacityQi =6.09.2cfsUnder No-Clogging ConditionMINORMAJORCfsEffective Length G Curb Opening or Slotted Inlet (minimum of L, L ₇)L =10.0010.00Interception CapacityQi =6.09.2cfsUnder Clogging CoefficientCurbCoef =1.251.25Clogging GoefficientCurbCoef =1.251.25Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef =1.25Clogging GoefficientCurbCoef =1.251.25Clogging GoefficientCurbCoef =1.251.25Clogging GoefficientCurbCoef =2.09.0Carry-Over Flow = Q _{MCBATE} -QaQ | | | | | 4. |
| Clogging Coefficient for Multiple-unit Grate InletGrateCoef =N/AN/AClogging Factor for Multiple-unit Grate InletGrateClog =N/AN/AEffective (unclogged) Length of Multiple-unit Grate Inlet $L_e =$ N/AN/AInterception Rate of Frontal Flow $V_o =$ N/AN/AftInterception Rate of Side Flow $R_r =$ N/AN/AN/AActual Interception Capacity $Q_a =$ N/AN/AKCarry-Over Flow = $Q_a - Q_a$ (to be applied to curb opening or next d/s inlet) $\mathbf{O}_h =$ N/AN/AcfsCurb or Slotted Inlet Opening Analysis (Calculated)MINORMAIORFt/ftEquivalent Slope Se (based on grate carry-over)Se =0.0840.066ft/ftUnder No-Clogging Condition $L_T =$ 10.0010.00ftInterception CapacityQa =0.060.060.06Under Cloaging ConditionCurbCoef =1.251.25Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef =1.251.25Clogging GoefficientCurbCoef =1.251.251.25Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef =1.251.25Clogging GoefficientCurbCoef =1.251.251.25Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef =1.251.25Clogging GoefficientCurbCoef =1.251.251.25Clogging GoefficientCurbCoef =1.251.25 | | $Q_i =$ | , | , | _cfs |
| Clogging Factor for Multiple-unit Grate Inlet Effective (unclogged) Length of Multiple-unit Grate Inlet Minimum Velocity Where Grate Splash-Over Begins Interception Rate of Frontal Flow Interception Rate of Frontal Flow Interception Capacity Carry-Over Flow = $Q_n - Q_n$ (to be applied to curb opening or next d/s inlet) Curb or Slotted Inlet Opening Analysis (Calculated) Equivalent Slope S _e (based on grate carry-over) Required Length L _T to Have 100% Interception Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet (minimum of L, L _T) Interception Capacity Q ₁ = $\frac{10.00}{10.00}$ ft Interception Capacity Q ₂ = $\frac{10.00}{10.00}$ ft Interception Capacity Q ₁ = $\frac{10.00}{10.00}$ ft Interception Capacity Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet (minimum of L, L _T) Interception Capacity Q ₁ = $\frac{10.25}{1.25}$ $\frac{1.25}{1.25}$ Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbCoef = $\frac{1.25}{1.25}$ $\frac{1.25}{1.25}$ Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbCoef = $\frac{1.25}{1.25}$ $\frac{1.25}{1.25}$ Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbCoef = $\frac{1.25}{1.25}$ $\frac{1.25}{1.25}$ Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbCoef = $\frac{1.25}{1.25}$ $\frac{1.25}{1.25}$ Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbCoef = $\frac{1.25}{1.25}$ $\frac{1.25}{1.25}$ Clog = $\frac{1.20}{1.25}$ $\frac{9.9}{1.25}$ $\frac{1.5}{1.5}$ Carry-Over Flow = $\frac{0.06}{0.06}$ $\frac{10.66}{0.06}$ Fifective (Unclogged) Length Actual Interception Capacity Q ₀ = $\frac{5.9}{1.0}$ $\frac{9.0}{1.00}$ $\frac{10.00}{1.00}$ $\frac{10.00}{1.$ | | | | | - |
| Effective (unclogged) Length of Multiple-unit Grate Inlet $L_e =$ N/A N/A N/A ftMinimum Velocity Where Grate Splash-Over Begins $V_o =$ N/A N/A N/A fpsInterception Rate of Frontal Flow $R_f =$ N/A N/A N/A fpsInterception Rate of Side Flow $R_f =$ N/A N/A N/A fdsActual Interception Capacity $Q_a =$ N/A N/A N/A fdsCarry-Over Flow = $Q_{-}Q_a$ (to be applied to curb opening or next d/s inlet) $Q_h =$ N/A N/A fdsCurb or Slotted Inlet Opening Analysis (Calculated)MINORMAIORfdftEquivalent Slope S _e (based on grate carry-over) $S_e =$ 0.084 0.066 ft/ftRequired Length L _T to Have 100% Interception $L_T =$ 18.17 31.40 ftUnder No-Clogging Condition $MINOR$ MAIORftEffective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)L = 10.00 10.00 ftInterception Capacity $Q_i =$ 6.0 9.2 cfsUnder Cloaging CoefficientCurbCoef = 1.25 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 1.25 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 0.06 0.06 0.06 Carry-Over Flow = $Q_{hr(GATF)} \cdot Q_h$ $Q_h =$ 5.9 9.0 cfsCarry-Over Flow = $Q_{hr(GATF)} \cdot Q_h$ | | | | | _ |
| Minimum Velocity Where Grate Splash-Over Begins V_o N/A N/A N/A N/A N/A Interception Rate of Frontal Flow R_r N/A N/A N/A N/A Interception Rate of Side Flow R_x N/A N/A N/A N/A Actual Interception Capacity Q_b N/A N/A N/A K Carry-Over Flow = Q_0 - Q_a (to be applied to curb opening or next d/s inlet) Q_b N/A N/A N/A Equivalent Slope Se (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 MAOR MAOR Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T) L = 10.00 10.00 ft Interception Capacity Qi = 6.0 9.2 cfs Under Cloaging Condition MINOR MAOR MAOR Effective Length of Curb Opening or Slotted Inlet CurbCoEf = 1.25 1.25 Cloaging Coefficient Curb Coef = 9.37 9.37 | | | | | |
| Interception Rate of Frontal Flow $R_r =$ N/A N/A Interception Rate of Side Flow $R_v =$ N/A N/A Actual Interception Capacity $Q_a =$ N/A N/A Actual Interception Capacity $Q_a =$ N/A N/A Curb or Slotted Inlet Opening Analysis (Calculated) $MINOR$ MIA N/A Equivalent Slope S _c (based on grate carry-over) $S_e =$ 0.084 0.066 Required Length L _T to Have 100% Interception $L_T =$ 18.17 31.40 Inder No-Clogging ConditionMINORMAJOREffective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) $L =$ 10.00 10.00 Interception Capacity $Q_i =$ 6.0 9.2 cfs Under No-Clogging ConditionMINORMAJOR $MINOR$ MAJORClogging CoefficientCurbCoef = 1.25 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 1.25 1.25 Clogging Gapacity $Q_a =$ 5.9 9.0 cfs Carry-Over Flow = $Q_{hrCeATT} Q_a$ $Q_b =$ 2.0 9.5 cfs SummaryTotal Inlet Interception Capacity $Q_a =$ 5.9 9.0 cfs Cotal Inlet Carry-Over Flow (flow bypassing inlet) $Q_b =$ 2.0 9.5 cfs | | | , | | - · |
| Interception Rate of Side Flow $R_x =$ N/A N/A Actual Interception Capacity $Q_a =$ N/A N/A N/A Carry-Over Flow = $Q_a \cdot Q_a$ (to be applied to curb opening or next d/s inlet) $Q_b =$ N/A N/A Curb or Slotted Inlet Opening Analysis (Calculated)MINORMAJOREquivalent Slope S _e (based on grate carry-over) $S_e =$ 0.084 0.066 Required Length L _T to Have 100% Interception $L_T =$ 18.17 31.40 Interception Capacity $Q_i =$ 6.0 9.2 cfs Under Clogging Condition $MINOR$ MAJOREffective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) $L =$ 10.00 10.00 Interception Capacity $Q_i =$ 6.0 9.2 cfs Under Clogging CoefficientCurbCoef = 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 1.25 1.25 Clogging 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 $Q_a =$ 5.9 9.0 cfs SummaryMINORMAJOR $MAJOR$ $MAJOR$ Total Inlet Interception Capacity $Q_e =$ 5.9 9.0 cfs Cutal Interception Capacity $Q_e =$ 5.9 9.0 cfs Cotal Inter Carry-Over Flow (flow bypassing inlet) $Q_b =$ 2.0 9.5 cfs | | | | | fps |
| Actual Interception Capacity $Q_a =$ N/A N/A N/A cfs Carry-Over Flow = Q_a, Q_a (to be applied to curb opening or next d/s inlet) $Q_b =$ N/A N/A N/A cfs Curb or Slotted Inlet Opening Analysis (Calculated)MINORMAJORGuivalent Slope S _e (based on grate carry-over)S _e = 0.084 0.066 ft/ftRequired Length L _T to Have 100% InterceptionL _T = 18.17 31.40 ftUnder No-Clogging ConditionL _T = 10.00 10.00 ftEffective Length of Curb Opening or Slotted Inlet (minimum of L, L _T)L = 10.00 10.00 ftInterception CapacityQ _i = 6.0 9.2 cfsUnder Cloaging ConditionMINORMAJORFtClogging CoefficientCurbCoef = 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef = 0.06 0.06 Carry-Over Flow = $Q_{hr(GATF)} \cdot Q_a$ Q _a = 5.9 9.0 cfsSummaryCarry-Over Flow = $Q_{hr(GATF)} \cdot Q_a$ Q_b = 2.0 9.5 cfsSummaryTotal Inlet Carry-Over Flow (flow bypassing inlet) Q_b = 2.0 9.5 cfs | Interception Rate of Frontal Flow | $R_{f} =$ | N/A | | |
| Carry-Over Flow = $Q_n - Q_n$ (to be applied to curb opening or next d/s inlet) Q_h = N/A N/A cfs Curb or Slotted Inlet Opening Analysis (Calculated) MINOR MAJOR Equivalent Slope Se (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 or Slotted Inlet (minimum of L, L _T) L = 10.00 10.00 ft Interception Capacity Qi = 6.0 9.2 cfs Under Cloaging 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 Effective (Unclogged) Length Le = 9.37 9.37 ft Actual Interception Capacity Qa = 5.9 9.0 cfs Carry-Over Flow = $Q_{htGRATP} \cdot Q_n$ Qh = 2.0 9.5 cfs Summary Total Inlet Interception Capacity Qe = 5.9 9.0 < | Interception Rate of Side Flow | R _x = | N/A | N/A | |
| Curb or Slotted Inlet Opening Analysis (Calculated) MINOR MAJOR Equivalent Slope S _e (based on grate carry-over) S _e = 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 or Slotted Inlet (minimum of L, L _T) L = 10.00 10.00 ft Interception Capacity Q _i = 6.0 9.2 cfs Under Cloaging 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 Effective (Unclogged) Length L _e = 9.37 9.37 ft Actual Interception Capacity Q _a = 5.9 9.0 cfs Summary Total Inlet Interception Capacity Q_a = 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) Q_b = 5.9 9.0 cfs | Actual Interception Capacity | Q _a = | N/A | | cfs |
| Equivalent Slope Se (based on grate carry-over)Se = 0.084 0.066ft/ftRequired Length L _T to Have 100% Interception $L_T = 18.17 31.40$ ftUnder No-Clogging Condition $MINOR$ MAIOREffective Length of Curb Opening or Slotted Inlet (minimum of L, L _T)L = 10.00 10.00ftInterception CapacityQi = 6.0 9.2cfsUnder Clogging ConditionMINORMAIORClogging CoefficientCurbCoef = 1.25 1.25crsClogging Factor for Multiple-unit Curb Opening or Slotted InletCurbClog = 0.06 0.06cfsEffective (Unclogged) LengthLe 9.37 9.37ftActual Interception CapacityQa = 5.9 9.0cfsCarry-Over Flow = $Q_{hrGRATE}$ - Q_a Qh = 2.0 9.5cfsSummaryMINORMAIORTotal Inlet Carry-Over Flow (flow bypassing inlet)Qb = 2.09.5cfs | | Q _b = | | | cfs |
| Required Length L _T to Have 100% Interception $L_T =$ 18.1731.40ftUnder No-Clogging ConditionEffective Length of Curb Opening or Slotted Inlet (minimum of L, L _T)L =10.0010.00ftInterception CapacityQi =6.09.2cfscfsUnder Clogging CoefficientCurbCoef =1.251.251.25Clogging Factor for Multiple-unit Curb Opening or Slotted InletCurbCoef =0.060.060.06Effective (Unclogged) LengthLe =9.379.37ftActual Interception CapacityQa =5.99.0cfsCarry-Over Flow = $Q_{hrGRATE} \cdot Q_a$ Qb =2.09.5cfsSummaryMINORMAIORMAIORCost fieldCarry-Over Flow (flow bypassing inlet)Cp =Total Inlet Carry-Over Flow (flow bypassing inlet)Qb =2.09.5cfs | | | | | _ |
| Under No-Clogging Condition MINOR MAJOR Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T) L = 10.00 10.00 ft Interception Capacity Q ₁ = 6.0 9.2 cfs Under Cloaging 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 Effective (Unclogged) Length L _e = 9.37 9.37 ft Actual Interception Capacity Q _a = 5.9 9.0 cfs Carry-Over Flow = Q _{bricgarre} -Q _n Q _h = 2.0 9.5 cfs Summary Total Inlet Interception Capacity Q = 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) Q b 2.0 9.5 cfs | Equivalent Slope S _e (based on grate carry-over) | S _e = | 0.084 | 0.066 | _ft/ft |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T) L = 10.00 10.00 ft Interception Capacity $Q_i =$ 6.0 9.2 cfs Under Cloaging Coefficient CurbCoef = 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbCoef = 9.37 9.37 Carry-Over Flow = Q _{NCRATE} -Q _a Qa = 5.9 9.0 cfs Summary MINOR MAJOR MAJOR Total Inlet Interception Capacity Q = 5.9 9.0 cfs Cotal Inlet Carry-Over Flow (flow bypassing inlet) Qb = 2.0 9.5 cfs | Required Length L _T to Have 100% Interception | L _T = | 18.17 | 31.40 | ft |
| Interception Capacity $Q_i = 6.0$ 9.2 cfs Under Cloaging ConditionMINORMAJORClogging CoefficientCurbCoef = 1.25 1.25 Cloaging Factor for Multiple-unit Curb Opening or Slotted InletCurbClog = 0.06 0.06 Effective (Uncloaged) Length $L_e =$ 9.37 9.37 ftActual Interception Capacity $Q_a =$ 5.9 9.0 cfsSummary $Q_h =$ 2.0 9.5 cfsTotal Inlet Interception Capacity $Q_e =$ 5.9 9.0 cfsCotal Inlet Carry-Over Flow (flow bypassing inlet) $Q_b =$ 2.0 9.5 cfs | Under No-Clogging Condition | | | MAJOR | _ |
| Under Clogging Coefficient MINOR MAJOR Clogging Coefficient CurbCoef = 1.25 1.25 Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet CurbColog = 0.06 0.06 Effective (Unclogged) Length L_e = 9.37 9.37 ft Actual Interception Capacity Q_a = 5.9 9.0 cfs Carry-Over Flow = $Q_{hrGRATE} \cdot Q_a$ Q_b = 2.0 9.5 cfs Summary MINOR MAIOR MAIOR Total Inlet Interception Capacity Q_a = 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) Q_b = 2.0 9.5 cfs | Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 10.00 | 10.00 | ft |
| Clogging Coefficient CurbCoef = 1.25 1.25 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 Qa = 5.9 9.0 cfs Summary Qb = 2.0 9.5 cfs Total Inlet Interception Capacity Q = 5.9 9.0 cfs Control Inlet Carry-Over Flow (flow bypassing inlet) Qb = 2.0 9.5 cfs | Interception Capacity | $Q_i =$ | 6.0 | 9.2 | cfs |
| 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 Carry-Over Flow = $Q_{hrGPATF1}$ - Q_a Q_h = 2.0 9.5 cfs Summary MINOR MAJOR Total Inlet Interception Capacity Q_e = 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) Q_b = 2.0 9.5 cfs | Under Clogging Condition | | MINOR | MAJOR | |
| Effective (Unclogged) Length $L_e =$ 9.37 9.37 ftActual Interception Capacity $Q_a =$ 5.9 9.0 cfs Carry-Over Flow = $Q_{hrGRATE} \cdot Q_a$ $Q_b =$ 2.0 9.5 cfs SummaryMINORMAJORTotal Inlet Interception Capacity $Q =$ 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) $Q_b =$ 2.0 9.5 cfs | Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | 7 |
| Actual Interception Capacity $Q_a =$ 5.9 9.0 cfs Carry-Over Flow = $Q_{hIGRATE} \cdot Q_a$ $Q_b =$ 2.0 9.5 cfs Summary MINOR MAJOR Total Inlet Interception Capacity $Q =$ 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) $Q_b =$ 2.0 9.5 cfs | Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Actual Interception Capacity $Q_a =$ 5.9 9.0 cfs Carry-Over Flow = $Q_{hIGRATE} \cdot Q_a$ $Q_h =$ 2.0 9.5 cfs Summary MINOR MAJOR Total Inlet Interception Capacity $Q =$ 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) $Q_b =$ 2.0 9.5 cfs | Effective (Unclogged) Length | L, = | 9.37 | 9.37 | ft |
| Carry-Over Flow = $Q_{brGRATE1}$ - Q_a Q_b = 2.0 9.5 cfs SummaryMINORMAJORTotal Inlet Interception Capacity Q = 5.9 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) Q_b = 2.0 9.5 cfs | Actual Interception Capacity | | 5.9 | 9.0 | cfs |
| SummaryMINORMAJORTotal Inlet Interception CapacityQ = 5.99.0cfsTotal Inlet Carry-Over Flow (flow bypassing inlet)Qb = 2.09.5cfs | Carry-Over Flow = $Q_{h(GRATE)}$ - Q_a | | | | cfs |
| Total Inlet Interception Capacity $Q = 5.9$ 9.0 cfs Total Inlet Carry-Over Flow (flow bypassing inlet) $Q_b = 2.0$ 9.5 cfs | | | MINOR | MAJOR | |
| Total Inlet Carry-Over Flow (flow bypassing inlet) $Q_b = 2.0 9.5$ cfs | | 0 = | 5.9 | 9.0 | cfs |
| | Total Inlet Carry-Over Flow (flow bypassing inlet) | - | | | |
| | | | | | |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | Joi 3001 |
|--|--|---------------|---------------------|------------------|
| Grandview Reserve | owable now | Depth and Spi | eau) | |
| Basin B-6 (DP 14) | | | | |
| - TBACK - TCROWN | | | | |
| T, Taxx | | | | |
| Suck W T, | | | | |
| STREET | | | | |
| | | | | |
| I I I S | | | | |
| / | | | | |
| Gutter Geometry: Maximum Allounda Width for Savard Babind Curb | т _Г | 7.5 | ٦ | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = n _{BACK} = | 0.020 | | |
| | HBACK - | 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 = | 0.020 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{street} = | 0.016 | J | |
| | | Minor Storm | Major Storn | h |
| 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) | | | 2 | |
| | | | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storn | |
| 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 inches |
| Gutter Depression (d _c - (W * S _x * 12)) Water Depth at Gutter Flowline | a = d = | 0.63 | 0.63 | inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | u = 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 | \dashv |
| 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 | | Minor Storm | Major Storn | n |
| Theoretical Water Spread | Т _{тн} = [| 15.6 | 29.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{х тн} = | 14.7 | 28.6 | |
| 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 _{х 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 | 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 | _ |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) | R = | 1.00 11.2 | 0.83 | cfs |
| Max Flow Based on Allowable Depth (Sarety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | Q _d = | 4.36 | 45.0 7.17 | inches |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) | d = d _{CROWN} = | 4.36 | 2.70 | inches |
| | ACROWN - | 0.00 | 2.70 | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | า |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = [| 11.2 | 45.0 | cfs |



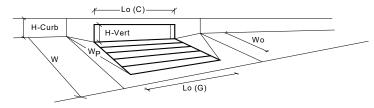
| 1 | | | | |
|---|-------------------------|-------|--------------|-----------------|
| CDOT Type R Curb Opening | | MINOR | MAJOR | _ |
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 2 | 2 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | L _o = | 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 | |
| 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) | $Q_o =$ | 3.7 | 8.7 | cfs |
| Water Spread Width | T =[| 10.2 | 14.1 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 3.1 | 4.0 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.0 | inches |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.240 | 0.170 | 7 |
| Discharge outside the Gutter Section W, carried in Section T, | $Q_x =$ | 2.8 | 7.2 | cfs |
| Discharge within the Gutter Section W | $Q_w = 1$ | 0.9 | 1.5 | cfs |
| Discharge Behind the Curb Face | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $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 | linches |
| Grate Analysis (Calculated) | $u_{IOCAI} = I$ | MINOR | MAJOR | linches |
| Total Length of Inlet Grate Opening | L =[| N/A | N/A | ∃ft |
| | | | N/A N/A | |
| Ratio of Grate Flow to Design Flow | $E_{o-GRATE} = [$ | N/A | | |
| Under No-Clogging Condition | r | MINOR | MAJOR | ٦. |
| 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 | |
| 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 | |
| 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 | 7 |
| 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 Se (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 | T _{ft} |
| Under No-Clogging Condition | -, [| MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L =[| 10.00 | 10.00 | Tft |
| Interception Capacity | Q _i = | 3.6 | 6.4 | lcfs |
| Under Clogging Condition | Qi - [| MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | - |
| | | 0.06 | | - |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | | 0.06 9.37 | -L |
| Effective (Unclogged) Length | L _e = | 9.37 | | ft |
| Actual Interception Capacity | Q _a = | 3.6 | 6.2 | cfs |
| Carry-Over Flow = $Q_{h(GRATE)}$ - Q_a | Q _b = | 0.1 | 2.5 | cfs |
| Summary | _ r | MINOR | MAJOR | ٦. |
| 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 |
| Capture Percentage = Q_a/Q_o = | C% = | 98 | 71 | % |

| $ \frac{1}{12} \frac{1}{1} $ | ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | or & Ma | Joi 3001 |
|--|---|-----------------------|--------------|-------------|----------|
| Two: </th <th>Grandview Reserve</th> <th>owable How</th> <th>Depth and Sp</th> <th>leady</th> <th></th> | Grandview Reserve | owable How | Depth and Sp | leady | |
| $ \frac{1}{12} + \frac{1}{12}$ | Basin B-7 (DP 15) | | | | |
| $ \begin{array}{c} \hline \\ \hline $ | - IBACK - ICROWN - | | | | |
| Image: The second seco | | | | | |
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| leight of Curb at Gutter Flow Line bistance from Curb Face to Street Crown utter With treet Transverse Slope (wither Corss Slope (typically 2 inches over 24 inches or 0.083 ft/ft) treet constructional Slope - Enter of or sump condition faming's Roughness for Street Section (typically between 0.012 and 0.020) tax. Allowable Spread for Minor & Major Storm tax. Allowable Spread for Minor & Major Storm tax. Allowable Depth at Gutter Flowline for Minor & Major Storm tax. Allowable Depth at Gutter Flowline for Minor & Major Storm tax. Allowable Depth at Gutter Flowline for Minor & Major Storm tax. Allowable Depth at Gutter Flowline (usually 2") where Depth whoth Gutter Depression (Eq. 51-2) tertical Depth between Gutter Lip and Gutter Flowline (usually 2") where Depth whoth Gutter Depression (Eq. 51-2) tertical Depth at Gutter Flowline (usually 2") where Depth whoth Gutter Depression (Eq. 51-2) tertical Depth at Gutter Flowline (usually 2") where Depth whoth Gutter Depression (Eq. 51-2) tertical Depth at Gutter Section W (T - W) subter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. 51-7) tischarge outside the Gutter Section W (Qr - Q ₂) Norther Section V, Carriel in Section T _X = 1 1 1 1 1 1 1 1 1 1 | | | | | |
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| uitter With treet Transverse Slope uitter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) treet Longitudinal Slope - Enter 0 for sump condition naming's Roughness for Street Section (typically between 0.012 and 0.020)ft S _x = 0.020 0.020 ft/ftIannig's Roughness for Street Section (typically between 0.012 and 0.020)ftS _x = 0.020 0.016Iax. Allowable Spread for Minor & Major Storm Iaw. Allowable Depth at Street Fowline for Minor & Major Storm law. Allowable Depth at Street Crown (check box for yes, leave blank for no)Twice To Storm Major Storm Major StormIax. Allowable Spread for Discharge outside the Gutter Section W (T - W) uitter Depression (d _c - (W * S _x * 12)) totare Depth A Cutter Flowline lowable Spread for Discharge outside the Gutter Section W (T - W) uitter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) tscharge outside the Gutter Section W (T - W) takiter How to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) tscharge outside the Gutter Section W (C ₁ - Q ₂) ischarge outside the Gutter Section W (T - W) takiter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) tscharge outside the Gutter Section W (C ₁ - Q ₂) ischarge outside the Gutter Section W (C ₁ - Q ₂) ischarge outside the Gutter Section W (C ₁ - Q ₂) ischarge outside the Gutter Section W (C ₁ - Q ₂) ischarge outside the Gutter Section W (Q ₁ - Q ₂) ischarge outside the Gutter Section W (C ₁ - W) ischarge outside the Gutter Section W (Q ₁ - Q ₂) ischarge outside the Gutter Section W (Q ₁ - Q ₂) ischarge outside the Gutter Section W (Q ₁ - Q ₂) ischarge outside the Gutter Section W (Q ₁ - Q ₂) ischarge outside the Gutter Section W (M ₁ - Q ₂) ischarge outside the Gutter Section W (G ₁ - Q ₂) ischarge outside the Gutter Section W (M ₁ | | | | | |
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| werage Flow Velocity Within the Gutter Section $V = 1.1$ 1.6fps**d Product: Flow Velocity Times Gutter Flowline Depth $V = 1.1$ 1.6fpslope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{"}$) Storm $V = 0.4$ 1.0fpslax Flow Based Depth at Gutter Flowline (Safety Factor Applied) $Q_d = 11.2$ 45.0cfslesultant Flow Depth at Street Crown (Safety Factor Applied) $d = 4.36$ 7.17incheslesultant Flow Depth at Street Crown (Safety Factor Applied) $d = 0.00$ 2.70incheslINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm | | | | - | |
| t^*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d = 0.4$ 1.0 lope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{\circ}$) Storm $R =$ 1.00 0.83 fax Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 11.2 45.0 cfs desultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d =$ 4.36 7.17 inchesdesultant Flow Depth at Street Crown (Safety Factor Applied) $d =$ 0.00 2.70 inches1INOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm | | | | | |
| R =1.000.83Iax Flow Based on Allowable Depth (Safety Factor Applied) \mathbf{Q}_{d} =1.1.245.0cfsIax Flow Depth at Gutter Flowline (Safety Factor Applied) \mathbf{d} =4.367.17inchesItesultant Flow Depth at Street Crown (Safety Factor Applied) \mathbf{d} =0.002.70inchesIINOR STORM Allowable Capacity is based on Depth CriterionMinor StormMajor Storm | | | | | |
| Tax Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 11.2$ 45.0 cfs Lesultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = 4.36$ 7.17 inches Lesultant Flow Depth at Street Crown (Safety Factor Applied) $d = 0.00$ 2.70 inches MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm | Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | | | | - |
| tesultant Flow Depth at Gutter Flowline (Safety Factor Applied) $d = \frac{4.36}{0.00}$ 7.17 inches tesultant Flow Depth at Street Crown (Safety Factor Applied) $d_{CROWN} = \frac{0.00}{0.00}$ 2.70 inches IINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm | Max Flow Based on Allowable Depth (Safety Factor Applied) | | | | cfs |
| Inches Minor Storm Major Storm | Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | | | | inches |
| | Resultant Flow Depth at Street Crown (Safety Factor Applied) | - | | | |
| | | - | | | - |
| | MINOR STORM Allowable Capacity is based on Depth Criterion | • • | | | |



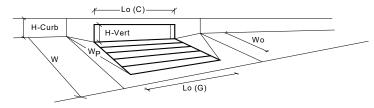
| Design Information (Input) | | MINOR | MAJOR | |
|---|--|------------|--------------|----------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | linches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 2 | 2 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_0 =$ | 5.00 | 5.00 | ft |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W ₀ = | | N/A | - Int |
| 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 = 0.3) | C _f =G = C _f =C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | - J-D | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | Q _o = | 1.6 | 3.8 | lcfs |
| Water Spread Width | Q₀ - T = | 7.3 | 10.3 | ft |
| Water Depth at Flowline (outside of local depression) | d = 1 | 2.4 | 3.1 | linches |
| | | 0.0 | 0.0 | linches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | | | Inches |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.339 | 0.238 | |
| 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 |
| Discharge Behind the Curb Face | $Q_{BACK} =$ | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | 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 |
| 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 | 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 | |
| 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 | 7 |
| Clogging Factor for Multiple-unit Grate Inlet | GrateClog = | N/A | N/A | 7 |
| 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 = | N/A | N/A | 1. |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 1 |
| 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_{\rm h} = $ | 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 = | 0.143 | 0.106 | ∃ft/ft |
| Required Length LT to Have 100% Interception | L _T = | 6.31 | 11.23 | ft |
| Under No-Clogging Condition | · L | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L =[| 6.31 | 10.00 | lft |
| Interception Capacity | $Q_i =$ | 1.6 | 3.7 | lcfs |
| Under Clogging Condition | | MINOR | MAJOR | → |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | 7 |
| 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 | |
| Actual Interception Capacity | $\mathbf{Q}_{a} =$ | 1.6 | 3.7 | cfs |
| Carry-Over Flow = $Q_{b/GRATE}$ - Q_a | $Q_a = Q_b =$ | 0.0 | 0.1 | cfs |
| Summary | Q b = 1 | MINOR | MAJOR | 1010 |
| Total Inlet Interception Capacity | Q =[| 1.6 | 3.7 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | | 0.0 | 0.1 | cfs |
| Capture Percentage = Q_a/Q_a = | Qь = С% = | 100 | 97 | Cfs % |
| $ Capture rescentage = Q_a/Q_0 =$ | L% = | 100 | 97 | 70 |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | |
|---|--|---------------------|---------------------|---|
| Grandview Reserve | | bepen und opi | cuu) | |
| Basin B-8 (DP 12b) | | | | |
| - TBACK TCHOWN | | | | |
| - T, Taax - | | | | |
| SBACK W Ta | | | | |
| STREET CROWN | | | | |
| P P S CROWN | | | | |
| | | | | |
| 111-1/ | | | | |
| Gutter Geometry: Maximum Allowable Width for Savand Bakind Curb | [| 75 | ام | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = n _{BACK} = | 0.020 | | |
| | HBACK - | 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 = | 0.000 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{\text{STREET}} = L$ | 0.016 | J | |
| | | Minor Storm | Major Storn | 1 |
| 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 | - | | | |
| Manimum Cana aits for 1/2 Churat based On Allowable Canad | | M: CI | M : Ci | |
| Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) | v =[| Minor Storm 3.84 | Major Storm 3.84 | linches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | d _c = | 0.8 | 0.8 | linches |
| 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) Maximum Flow Based On Allowable Spread | Q _{BACK} = | 0.0 SUMP | 0.0 SUMP | cfs cfs |
| Flow Velocity within the Gutter Section | Q _T = V = | 0.0 | 0.0 | fps |
| /*d Product: Flow Velocity times Gutter Flowline Depth | v*d = | 0.0 | 0.0 | |
| · · · · · · · · · · · · · · · · · · · | - L | | | |
| 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 |
| Sutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | E ₀ = | 0.153 | 0.079 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | Q _{X TH} = Q _X = | 0.0 | 0.0 | lcfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_{\rm X} = Q_{\rm W} = 1$ | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 0.0 | |
| 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) | $\mathbf{Q}_{d} = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix}$ | 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 | | THIOL STOLL | | <u>. </u> |



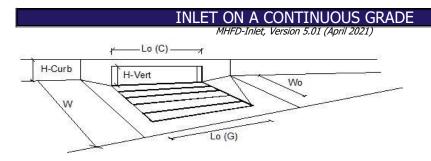
| Design Information (Input) CDOT Type R Curb Opening | | MINOR | MAJOR | - |
|--|---|-------------------|---------------|--------------|
| Type of Inlet | Type = | | Curb Opening | 4 |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 4 | 4 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | - | MINOR | MAJOR | Verride Dept |
| Length of a Unit Grate | $L_{o}(G) =$ | N/A | 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 | N/A | 7 |
| 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 | 1 |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $\ddot{C}_{o}(G) =$ | N/A | N/A | 1 |
| Curb Opening Information | -0(-) | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_{0}(C) = [$ | 5.00 | 5.00 | feet |
| 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 |
| | | 2.00 | 2.00 | feet |
| | W _p = | | | Teel |
| 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 | 4 |
| 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 | |
| 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 | Q _{oi} = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa} =$ | N/A | N/A | |
| Grate Capacity as Mixed Flow | Qoa - L | MINOR | MAJOR | |
| Interception without Clogging | o _[| N/A | N/A | lcfs |
| | Q _{mi} = | | | cfs |
| Interception with Clogging | $Q_{ma} =$ | N/A | N/A | |
| Resulting Grate Capacity (assumes clogged condition) | Q _{Grate} = | N/A | N/A | cis |
| Curb Opening Flow Analysis (Calculated) | | MINOR | MAJOR | - |
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | 4 |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| 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) | - | MINOR | MAJOR | _ |
| 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 | -coa | MINOR | MAJOR | - |
| Interception without Clogging | Q _{mi} = | 17.0 | 36.7 | lcfs |
| Interception with Clogging | Q _{ma} = | 16.5 | 35.5 | |
| Resulting Curb Opening Capacity (assumes clogged condition) | $Q_{ma} =$ | 9.7 | 34.3 | cfs |
| Resultant Street Conditions | -ccurb - | MINOR | MAJOR | 10.0 |
| | | | | Track |
| Total Inlet Length | | 20.00 | 20.00 | 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 | 7 |
| 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 |
| character and the reduction ractor for Long fillets | Grate - | 1975 | 11/5 | |
| | | MINOR | MAJOR | |
| Total Inlat Intercontion Conscipu (accurace classed condition) | n – [[] | 9.7 | MAUOR 34.3 | cfs |
| Total Inlet Interception Capacity (assumes clogged condition) | $\mathbf{Q}_{\mathbf{a}} = \mathbf{Q}_{\mathbf{p} \in \mathbf{A} \in \mathbf{R} \in \mathbf{Q} \cup \mathbf{R} \in \mathbf{Q}}$ | <u>9.7</u> 8.0 | 26.0 | cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | | 8.0 | 1 26.0 | |

| Grandview Reserve Basin B-9 (DP 13) Totage: Transmitter of the system of | $T_{BACK} = \begin{bmatrix} T_{BACK} = \\ S_{BACK} = \\ n_{BACK} = \end{bmatrix}$ $H_{CURB} = \begin{bmatrix} T_{CROWN} = \\ W = \\ S_{W} = \\ T_{MAX} = \end{bmatrix}$ | 7.5 0.020 0.020 6.00 16.0 0.83 0.020 0.083 0.000 0.016 Minor Storm 16.0 4.4 | ft ft/ft inches ft ft/ft ft/ft ft/ft ft/ft 16.0 7.7 | |
|---|--|---|--|-------------------|
| Toreer 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 Spread for Minor & Major Storm Check boxes are not applicable in SUMP conditions 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 Flowline (usually 2") <th>$S_{BACK} = \begin{bmatrix} \\ n_{BACK} = \end{bmatrix}$$H_{CURB} = \begin{bmatrix} \\ T_{CROWN} = \end{bmatrix}$$W = \\ S_X = \\ S_W = \\ S_O = \\ n_{STREET} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$</th> <th>0.020 0.020 6.00 16.0 0.83 0.020 0.083 0.000 0.016 Minor Storm 16.0</th> <th>ft/ft inches ft ft ft/ft ft/ft ft/ft ft/ft Major Storm 16.0</th> <th></th> | $S_{BACK} = \begin{bmatrix} \\ n_{BACK} = \end{bmatrix}$ $H_{CURB} = \begin{bmatrix} \\ T_{CROWN} = \end{bmatrix}$ $W = \\ S_X = \\ S_W = \\ S_O = \\ n_{STREET} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$ | 0.020 0.020 6.00 16.0 0.83 0.020 0.083 0.000 0.016 Minor Storm 16.0 | ft/ft inches ft ft ft/ft ft/ft ft/ft ft/ft Major Storm 16.0 | |
| T. Two T. Two T. Two T. Two T. Two T. Two Cutter 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) 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 Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) Wertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (dc, - (W * S_x * 12)) | $S_{BACK} = \begin{bmatrix} \\ n_{BACK} = \end{bmatrix}$ $H_{CURB} = \begin{bmatrix} \\ T_{CROWN} = \end{bmatrix}$ $W = \\ S_X = \\ S_W = \\ S_O = \\ n_{STREET} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$ | 0.020 0.020 6.00 16.0 0.83 0.020 0.083 0.000 0.016 Minor Storm 16.0 | ft/ft inches ft ft ft/ft ft/ft ft/ft ft/ft Major Storm 16.0 | |
| The test of the second of the | $S_{BACK} = \begin{bmatrix} \\ n_{BACK} = \end{bmatrix}$ $H_{CURB} = \begin{bmatrix} \\ T_{CROWN} = \end{bmatrix}$ $W = \\ S_X = \\ S_W = \\ S_O = \\ n_{STREET} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$ | 0.020 0.020 6.00 16.0 0.83 0.020 0.083 0.000 0.016 Minor Storm 16.0 | ft/ft inches ft ft ft/ft ft/ft ft/ft ft/ft Major Storm 16.0 | |
| THEFT 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 Cypically 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 Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Up and Gutter Flowline (usually 2") Gutter Depression (dc - (W * S_* 12)) | $S_{BACK} = \begin{bmatrix} \\ n_{BACK} = \end{bmatrix}$ $H_{CURB} = \begin{bmatrix} \\ T_{CROWN} = \end{bmatrix}$ $W = \\ S_X = \\ S_W = \\ S_O = \\ n_{STREET} = \begin{bmatrix} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$ | 0.020 0.020 6.00 16.0 0.83 0.020 0.083 0.000 0.016 Minor Storm 16.0 | ft/ft inches ft ft ft/ft ft/ft ft/ft ft/ft Major Storm 16.0 | |
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| Sutter Cross Slope (Typically 2 inches over 24 inches or 0.083 ft/ft) treet Longitudinal Slope - Enter 0 for sump condition danning's Roughness for Street Section (typically between 0.012 and 0.020) Max. Allowable Spread for Minor & Major Storm dax. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions Maximum Capacity for 1/2 Street based On Allowable Spread Vater Depth without Gutter Depression (Eq. ST-2) (ertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) | $S_W = \begin{bmatrix} S_W \\ S_O \end{bmatrix} = \begin{bmatrix} n_{STREET} \end{bmatrix}$ | 0.083 0.000 0.016 Minor Storm 16.0 | ft/ft ft/ft Major Storm 16.0 | |
| Street Longitudinal Slope - Enter 0 for sump condition Aanning'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 Maximum Capacity for 1/2 Street based On Allowable Spread Vater 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)) | $S_0 = \begin{bmatrix} \\ n_{STREET} = \end{bmatrix}$ $T_{MAX} = \begin{bmatrix} \end{bmatrix}$ | 0.000 0.016 Minor Storm 16.0 | ft/ft Major Storm 16.0 | |
| 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 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)) | n _{STREET} = [| 0.016 Minor Storm 16.0 | Major Storm | |
| 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 Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) (ertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) | T _{MAX} = | Minor Storm 16.0 | 16.0 | |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions 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)) | | 16.0 | 16.0 | |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions 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)) | | 16.0 | 16.0 | |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Check boxes are not applicable in SUMP conditions 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)) | | | | |
| Check boxes are not applicable in SUMP conditions 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 ($d_c - (W * S_x * 12)$) | GMAX - L | | . // | inches |
| Maximum Capacity for 1/2 Street based On Allowable Spread Vater Depth without Gutter Depression (Eq. ST-2) Vartical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d_c - (W * S _x * 12)) | | Г | | |
| Vater Depth without Gutter Depression (Eq. ST-2) /ertical Depth between Gutter Lip and Gutter Flowline (usually 2") Gutter Depression (d _c - (W * S _x * 12)) | | 1, | A | |
| /ertical Depth between Gutter Lip and Gutter Flowline (usually 2") Sutter Depression (d _c - (W * S _x * 12)) | | Minor Storm | Major Storm | 1 |
| Sutter Depression (d_c - (W * S _x * 12)) | y = | 3.84 | 3.84 | inches |
| | d _C = | 0.8 | 0.8 | inches |
| | a = | 0.63 | 0.63 | inches |
| Vater Depth at Gutter Flowline | _ d = | 4.47 | 4.47 | linches |
| Nowable Spread for Discharge outside the Gutter Section W (T - W) Sutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $T_X =$ | 15.2 | 15.2 | ft |
| Discharge outside the Gutter Section W, carried in Section T_x | $E_0 =$ | 0.149 | 0.149 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | Q _X = Q _W = | 0.0 | 0.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Qw = Q _{BACK} = | 0.0 | 0.0 | cfs |
| faximum Flow Based On Allowable Spread | $Q_{BACK} =$ | SUMP | SUMP | cfs |
| low Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| /*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 |
| Sutter 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} Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | Q _{X TH} = | 0.0 | 0.0 | cfs cfs |
| Social Discharge outside the Gutter Section W, (limited by distance Γ_{CROWN}) Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_X =$ | 0.0 | | |
| Discharge within the Gutter Section w $(Q_d - Q_X)$ Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _W = | 0.0 | 0.0 | |
| Fotal Discharge for Major & Minor Storm (Pre-Safety Factor) | Q _{BACK} = Q = | 0.0 | 0.0 | cfs |
| Average Flow Velocity Within the Gutter Section | Q = V = | 0.0 | 0.0 | |
| /*d Product: Flow Velocity Times Gutter Flowline Depth | v = V*d = | 0.0 | 0.0 | -1 ¹⁴⁵ |
| Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm | R = | SUMP | SUMP | - |
| Hax Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} = \mathbf{I}$ | SUMP | SUMP | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | | | | linches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | | | inches |
| | | | | _ |
| IINOR STORM Allowable Capacity is based on Depth Criterion IAJOR STORM Allowable Capacity is based on Depth Criterion | - | Minor Storm SUMP | Major Storm | cfs |



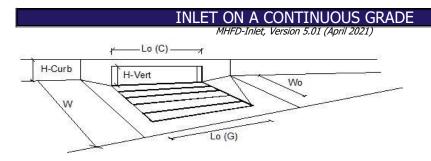
| | Design Information (Input) CDOT Type R Curb Opening | т Г | MINOR | MAJOR Curb Opening | 7 |
|------------|--|---|-------|-----------------------|-----------------|
| | Type of Inlet | Type = | | Curb Opening | inches |
| | Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| | Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | 4 |
| | Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| | Grate Information | _ | MINOR | MAJOR | Verride Depth |
| | Length of a Unit Grate | $L_{o}(G) =$ | N/A | N/A | feet |
| N | Width of a Unit Grate | W _o = | N/A | N/A | feet |
| A | Area Opening Ratio for a Grate (typical values 0.15-0.90) | A _{ratio} = | N/A | N/A | 7 |
| | 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 | 1 |
| | Grate Orifice Coefficient (typical value 0.60 - 0.80) | C _o (G) = | N/A | N/A | - |
| | Curb Opening Information | -0(-) | MINOR | MAJOR | |
| | Length of a Unit Curb Opening | $L_0(C) =$ | 5.00 | 5.00 | feet |
| | Height of Vertical Curb Opening in Inches | $H_{vert} =$ | 6.00 | 6.00 | linches |
| | Height of Curb Orifice Throat in Inches | | 6.00 | 6.00 | linches |
| | 5 | H _{throat} = | 63.40 | 63.40 | - |
| | Angle of Throat (see USDCM Figure ST-5) | Theta = | | | degrees feet |
| | Side Width for Depression Pan (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | reet |
| | 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 | |
| | Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| | Grate Capacity as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | - |
| I | Interception without Clogging | Q _{wi} = | N/A | N/A | cfs |
| I | Interception with Clogging | Q _{wa} = | N/A | N/A | cfs |
| | Grate Capacity as a Orifice (based on Modified HEC22 Method) | -Cwa | MINOR | MAJOR | |
| | Interception without Clogging | Q _{oi} = | N/A | N/A | cfs |
| | Interception with Clogging | $Q_{oa} =$ | N/A | N/A | lcfs |
| | Grate Capacity as Mixed Flow | Q _{oa} – L | MINOR | MAJOR | |
| | | о Г | | | 7-6- |
| | 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) | - | MINOR | MAJOR | - |
| | Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | _ |
| | Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| | Curb Opening as a Weir (based on Modified HEC22 Method) | _ | MINOR | MAJOR | _ |
| I | Interception without Clogging | Q _{wi} = | 6.1 | 20.2 | cfs |
| I | Interception with Clogging | Q _{wa} = | 5.7 | 18.9 | cfs |
| | Curb Opening as an Orifice (based on Modified HEC22 Method) | | MINOR | MAJOR | - |
| | Interception without Clogging | Q _{oi} = | 16.8 | 21.9 | Cfs |
| | Interception with Clogging | Q _{oa} = | 15.7 | 20.6 | cfs |
| | Curb Opening Capacity as Mixed Flow | -coa — | MINOR | MAJOR | → ··- |
| | Interception without Clogging | Q _{mi} = | 9.4 | 19.6 | lcfs |
| | Interception with Clogging | Q _{mi} = Q _{ma} = | 8.8 | 19.0 | cfs |
| | Resulting Curb Opening Capacity (assumes clogged condition) | $Q_{ma} =$ $Q_{curb} =$ | 5.7 | 18.3 18.3 | cfs |
| | Resultant Street Conditions | Curb - | MINOR | MAJOR | 13 |
| | | | | | 74. |
| | Total Inlet Length | | 10.00 | 10.00 | feet |
| | Resultant Street Flow Spread (based on street geometry from above) | , T = | 15.6 | 29.4 | ft.>T-Crown |
| ∏ F | Resultant Flow Depth at Street Crown | d _{CROWN} = | 0.0 | 3.2 | inches |
| . ∥. | | | | | |
| | Low Head Performance Reduction (Calculated) | - | MINOR | MAJOR | - |
| 10 | 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 | |
| 0 | | | 0.82 | 1.00 | 7 |
| | | $KF_{Curb} = I$ | 0.02 | | |
| | Curb Opening Performance Reduction Factor for Long Inlets | RF _{Curb} = RF _{Grate} = | N/A | N/A | |
| | | RF _{Curb} = RF _{Grate} = | | N/A | |
| | Curb Opening Performance Reduction Factor for Long Inlets | | N/A | | |
| | Curb Opening Performance Reduction Factor for Long Inlets | | | N/A MAJOR 18.3 |]]cfs |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum Al | | | | |
|--|-------------------------|---------------------|-------------|----------|
| Grandview Reserve | | | | |
| Basin C-1 (DP 17b) | | | | |
| Succe W T, Taux Succe W T, Taux T, T, Taux T, T, Taux T, T, T | | | | |
| | | | | |
| Gutter Geometry: | | | 1. | |
| 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 | V = | 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 = | 0.005 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{STREET} = | 0.016 | 1 | |
| | | | - | |
| | - | Minor Storm | Major Storn | <u>1</u> |
| 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 Storn | 1 |
| 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_{χ} | Q _X = | 11.5 | 11.5 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | Q _w = | 2.0 | 2.0 | 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 = | 13.5 | 13.5 | cfs |
| Flow Velocity within the Gutter Section | V = | 1.2 | 1.2 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d =[| 0.5 | 0.5 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storn | n |
| Theoretical Water Spread | т _{тн} = [| 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 | 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 |
| 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 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | 1.00 | 0.70 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | Q _d = | 12.5 | 42.1 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | 4.36 | 6.69 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 2.22 | inches |
| MINOR STORM Allowable Canacity is based on Donth Criterion | | Minor Storm | Major Storm | • |
| MINOR STORM Allowable Capacity is based on Depth Criterion | _ | Minor Storm 12.5 | Major Storm | <u>I</u> |



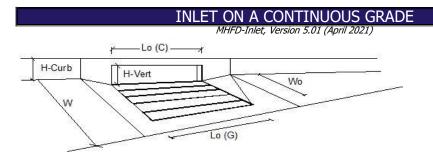
| Design Information (Input) | | MINOR | MAJOR | |
|---|------------------------|------------|---------------|--------------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units 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 | |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W ₀ = | N/A | N/A | - Ift |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | C _r -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 | UFC - | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | Q _o = | 6.8 | 16.0 | lcfs |
| Water Spread Width | Q₀ - T = | 12.3 | 16.0 | - dis Ift |
| Water Depth at Flowline (outside of local depression) | d = | 3.6 | 4.7 | linches |
| | - | 0.0 | 0.3 | linches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | | | |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.196 | 0.139 | -6- |
| 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 |
| Discharge Behind the Curb Face | $Q_{BACK} =$ | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | A _W = | 0.22 | 0.30 | sq 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) | , | 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 | 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 | |
| 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 | 7 |
| Clogging Factor for Multiple-unit Grate Inlet | GrateClog = | N/A | N/A | 7 |
| Effective (unclogged) Length of Multiple-unit Grate Inlet | L, = | 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 = | N/A | N/A | 1. |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 1 |
| 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) | 0 _b = | N/A | N/A | cfs |
| Curb or Slotted Inlet Opening Analysis (Calculated) | E 12 | MINOR | MAJOR | |
| Equivalent Slope S_{e} (based on grate carry-over) | S _e = | 0.091 | 0.071 | _ft/ft |
| Required Length L_T to Have 100% Interception | L _T = | 16.42 | 28.60 | - Ift |
| Under No-Clogging Condition | -1-1 | 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 = | 6.7 | 11.8 | cfs |
| Under Clogging Condition | Qi - [| MINOR | MAJOR | |
| Clogging Coefficient | 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 | |
| Actual Interception Capacity | | 6.7 | 14.34 11.7 | cfs |
| | $Q_a =$ | | 4.3 | |
| Carry-Over Flow = $Q_{b(GRATF)}$ - Q_a | Q _b = | 0.1 | | cfs |
| Summary | ^ 1 | MINOR | MAJOR | |
| Total Inlet Interception Capacity | Q = | 6.7 | 11.7 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.1 | 4.3 | cfs |
| Capture Percentage = Q_a/Q_o = | C% = | 98 | 73 | % |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | |
|--|---|---------------------|---------------------|------------------|
| Grandview Reserve Basin C-2 (DP 17a) | | | | |
| | | | | |
| T, T _{MAX} | | | | |
| | | | | |
| STREET CROWN | | | | |
| P T T | | | | |
| 0 5 | | | | |
| 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 | н – Г | 6.00 | Tinchoc | |
| Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown | H _{CURB} = T _{CROWN} = | <u> </u> | inches 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 = | 0.025 | 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 | T _{MAX} = | 16.0 | 16.0 | ft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | d _{MAX} = | 4.4 | 7.7 | linches |
| Allow Flow Depth at Street Crown (check box for yes, leave blank for no) | | | 1 | |
| | | | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) | v =[| Minor Storm 3.84 | Major Storm 3.84 | 1 linches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y = d _C = | 0.8 | 0.8 | linches |
| 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 | $Q_X =$ | 11.5 | 11.5 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | Q _W = | 2.0 | 2.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread | Q _{BACK} = | 0.0 13.5 | 0.0 | cfs cfs |
| Flow Velocity within the Gutter Section | Q _T = V = | 1.2 | 1.2 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | v = V*d = | 0.5 | 0.5 | |
| | · L | | • | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | |
| Theoretical Water Spread | T _{TH} = | 15.6 | 29.4 | ft ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eg. ST-7) | T _{X TH} = | 14.7 0.153 | 28.6 | |
| Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | Е ₀ = 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 |
| 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 | _ |
| Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm | R = | 1.00 | 0.70 | <u> </u> |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $Q_d =$ | 12.5 | 42.1 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) | d = | 4.36 | 6.69 | inches inches |
| Container now Deput at Succe Crown (Sarety Factor Applieu) | d _{CROWN} =[| 0.00 | 2.22 | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | - | Minor Storm | Major Storm | <u>1</u> |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 12.5 | 42.1 | cfs |



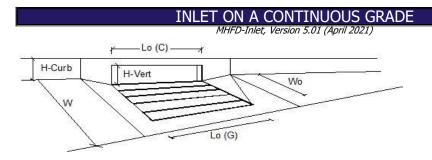
| Design Information (Input) | | MINOR | MAJOR | |
|---|-----------------------------------|------------|--------------|----------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of 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 | |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W ₀ = | N/A | N/A | - Ift |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_{f}-G =$ | N/A | N/A | -" |
| | C _f -C = | 0.10 | 0.10 | - |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | Cf=C = | MINOR | MAJOR | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | 0 -1 | 11.3 | 26.3 | lcfs |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | Q ₀ = T = | | | |
| Water Spread Width | · | 15.0 | 16.0 | |
| 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 _o = | 0.160 | 0.116 | |
| Discharge outside the Gutter Section W, carried in Section T_x | Q _x = | 9.5 | 23.3 | 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 = | 0.26 | 0.36 | sq ft |
| Velocity within the Gutter Section W | V _w = | 6.9 | 8.5 | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 7.2 | 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 | N/A | 1 |
| Under No-Clogging Condition | o divite | MINOR | MAJOR | |
| Minimum Velocity Where Grate Splash-Over Begins | V ₀ = | 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 |
| Under Clogging Condition | Qi - [| MINOR | MAJOR | |
| Clogging Coefficient for Multiple-unit Grate Inlet | GrateCoef = | N/A | N/A | 7 |
| Clogging Factor for Multiple-unit Grate Inlet | GrateClog = | N/A | N/A N/A | - |
| Effective (unclogged) Length of Multiple-unit Grate Inlet | | N/A N/A | N/A N/A | -ft |
| | | N/A | N/A N/A | |
| Minimum Velocity Where Grate Splash-Over Begins | V _o = | / | | 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 = | <u>N/A</u> | N/A | cfs |
| Curb or Slotted Inlet Opening Analysis (Calculated) | | MINOR | MAJOR | - |
| 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 |
| 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 | $Q_i =$ | 9.6 | 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 | 7 |
| Effective (Unclogged) Length | L _e = | 14.34 | 14.34 | ft |
| Actual Interception Capacity | Qa = | 9.6 | 15.1 | cfs |
| Carry-Over Flow = $Q_{h(GRATE)} - Q_a$ | $\dot{\mathbf{Q}}_{\mathbf{b}} =$ | 1.7 | 11.2 | cfs |
| Summary | <u> </u> | MINOR | MAJOR | · |
| Total Inlet Interception Capacity | Q = | 9.6 | 15.1 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | $Q_b =$ | 1.7 | 11.2 | cfs |
| Capture Percentage = Q_a/Q_a = | Qь – С% = | 85 | 57 | % |
| $ cupture creating = Q_2/Q_0 =$ | C 70 - 1 | 0.5 | | 1 / 2 |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | ijor Stor |
|--|-------------------------|---------------------|---------------------|-----------|
| Grandview Reserve | | Deptil and Spi | eau) | |
| Basin C-4 (DP 17c) | | | | |
| There is a construction of the construction of | | | | |
| Gutter Geometry: | т _Г | 75 |]م | |
| 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 | V = | 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 = | 0.020 | 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 | 1 7.1 | |
| | | | - | |
| | _ | Minor Storm | Major Storn | <u>n</u> |
| 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 Canadity for 1/2 Street based On Allowable Spread | | Minor Charm | Major Charm | |
| Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) | v = [| Minor Storm 3.84 | Major Storn 3.84 | linches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y = d _C = | 0.8 | 0.8 | inches |
| Gutter Depression (d_c - (W * S _x * 12)) | a = | 0.63 | 0.63 | linches |
| Water Depth at Gutter Flowline | d = | 4.47 | 4.47 | linches |
| 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) | $E_0 = 1$ | 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 | | Minor Storm | Major Storn | n |
| Theoretical Water Spread | т _{тн} =Г | 15.6 | 29.4 | ll Ift |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{х тн} = | 14.7 | 28.6 | - |
| 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} = | 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 ($Q_d - Q_X$) | $\vec{Q}_{W} = \vec{P}$ | 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 = | 1.1 | 1.6 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.4 | 1.0 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | R = | 1.00 | 0.83 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $Q_d = [$ | 11.2 | 45.0 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | 4.36 | 7.17 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 2.70 | inches |
| | | | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = [| Minor Storm 11.2 | Major Storn 45.0 | n cfs |



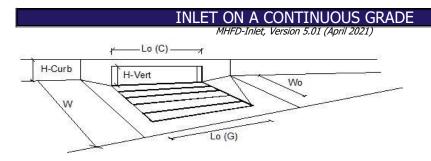
| Design Information (Input) | | MINOR | MAJOR | |
|--|-------------------------|-------|--------------|------------|
| Type of Inlet | Type = | - | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number of Units in the 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) | $\overline{W_{o}} = $ | 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' | 90-1 | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | $Q_o = [$ | 5.8 | 20.8 | lcfs |
| Water Spread Width | τ= | 12.1 | 16.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 3.5 | 5.4 | linches |
| Water Depth at Flowing (outside of local depression) Water Depth at Street Crown (or at T_{MAX}) | d _{CROWN} = | 0.0 | 0.9 | linches |
| Ratio of Gutter Flow to Design Flow | $U_{CROWN} = E_0 = I$ | 0.200 | 0.121 | |
| Discharge outside the Gutter Section W, carried in Section T_v | | 4.7 | 18.3 | cfs |
| 5 | Q _x = | 1.2 | 2.5 | |
| Discharge within the Gutter Section W | Q _w = | 0.0 | 0.0 | cfs cfs |
| Discharge Behind the Curb Face | $Q_{BACK} =$ | | | |
| Flow Area within the Gutter Section W | A _W = | 0.22 | 0.34 | sq ft |
| Velocity within the Gutter Section W | | 5.4 | 7.3 | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 6.5 | 8.4 | inches |
| Grate Analysis (Calculated) | F | MINOR | MAJOR | ٦۵ |
| 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 | ., г | MINOR | MAJOR | 7. |
| Minimum Velocity Where Grate Splash-Over Begins | V ₀ = | N/A | N/A | fps |
| Interception Rate of Frontal Flow | $R_{f} =$ | N/A | N/A | 4 |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 4. |
| 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 | _ |
| 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 | |
| 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 = | 0.093 | 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 | _ |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 14.91 | 15.00 | ft |
| Interception Capacity | Q _i = | 5.8 | 13.6 | 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 | Q _a = | 5.8 | 13.4 | cfs |
| Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a | Q _b = | 0.0 | 7.4 | cfs |
| Summary | | MINOR | MAJOR | _ |
| Total Inlet Interception Capacity | Q =[| 5.8 | 13.4 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.0 | 7.4 | cfs |
| Capture Percentage = Q_a/Q_0 = | C% = | 100 | 64 | % |

| Grandview Reserve Basin C-S (DP 17d)SummMinor StarmMax. Allowable Spread for Minor & Major StormMax. Allowable Spread for Minor & Major StormMax. Allowable Spread for Minor & Major StormMax. SummMajor StormMax. SummMagior StormMax. SummMagior StormMax. Summ </th <th>(Based on Regulated Criteria for Maximum A</th> <th></th> <th></th> <th></th> <th>ajor Stor</th> | (Based on Regulated Criteria for Maximum A | | | | ajor Stor |
|---|--|-----------------------|---------------|-------------|-----------|
| SummGutter Geometry: Maximum Allowable Width for Spread Behind Curb Site Sope Behind Curb (typically between 0.012 and 0.020)Taxicx = 7.5 The Summer Street Colspan= 0.020The Summer S | Grandview Reserve | | bepen and opi | cuu) | |
| SubscriptionGutter Geometry:Gutter Geometry:SubscriptionSubscriptionSide Slope Behind Curb (bynically between 0.012 and 0.020)Height of Curb at Gutter Flow LineDistance from Curb Face to Street CrownGutter WithStreet Transverse SlopeGutter With Street CrownMinor Street Section (typically between 0.012 and 0.020)Minor Street Section (| | | | | |
| Maximum AllowableTexc:7.5ftSide Slope Behind Curb (lave blank for no conveyance credit behind curb) $T_{Secc} = 0.020$ ft/ftManning's Roughness Behind Curb (typically between 0.012 and 0.020) $T_{Maxc} = 0.020$ ft/ftHeight of Curb at Gutter Flow Line $H_{CurBl} = 0.020$ ft/ftDistance from Curb Face to Street Crown $T_{Curb Rec} = 0.020$ ft/ftGutter Width $V = 0.83$ ftStreet Transverse Slope $S_x = 0.020$ ft/ftStreet Longitudinal Slope - Enter 0 for sump condition $S_y = 0.003$ ft/ftManing's Roughness for Street Section (typically between 0.012 and 0.020) $S_y = 0.016$ ft/ftMax. Allowable Spread for Minor & Major Storm $T_{Max} = 1.4.4$ 7.7 incheMax Malowable Copt at Street Crown (check box for yes, leave blank for no) $T_{Max} = 0.63$ 0.63 incheMaximum Capacity for 1/2 Street based On Allowable Spread $y = 3.84$ 3.84 incheMater Depth without Gutter Depression (fc, $(Y + S_1 + 2)$) $a = 0.63$ 0.63 incheMaximum Capacity for 1/2 Street based on Allowable Spread $Y = 15.2$ 15.2 incheMaximum Capacity for 1/2 Street based on Allowable Spread $Y = 15.5$ 15.2 incheDischarge outside the Gutter Section W (T - W) $T_x = 15.5$ 15.2 incheGutter Poression (fc, $(Y + 2)$ S_y $S_y = 0.00$ 0.0 incheDischarge outside the Gutter Section W (T - W) $T_x = 15.5$ 10.5 ftMaximum Capacity for 1/2 Street based | Seece T, Teaco STREET | | | | |
| 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) 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 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm Max. Allowable Spread for Discharge outside the Gutter Section W (T - W) Gutter Depth at Gutter Flowline for Minor & Major Storm Mater Depth at Gutter Flowline (tusually 2") Gutter Depression (dc (W * S, * 12)) Water Depth at Gutter Section W (Q ₁ - Q ₂) Discharge within the Gutter Section W (Q ₁ - Q ₂) Discharge within the Gutter Section W (Q ₁ - Q ₂) Discharge outside the Gutter Section W (T - W) Maximum Capacity for 1/2 Street based on Allowable Depth Maximum Flow Based On Allowable Spread Flow Velocity 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 (Minet W ydita In Section T _{X TH} Actual Discharge outside the Gutter Section W (Q ₁ - Q ₂) Discharge outside the Gutter Section W (Minet W ydita In Section T _{X TH} Actual Discharge outside the Gutter Section W (Minet W ydita In Section T _{X TH} Actual Discharge outside the Gutter Section W (Minet W ydita In Section T _{X TH} Actual Discharge outside the Gutter Section W (C - W) Gutter Flow Velocity Within the Gutter Section W (Minet W ydita In Section T _{X TH} Actual Discharge outside the Gutter Section W (Minet W ydita In Section T _{X TH} | | т_[| 2 5 |]م | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) $n_{BCK} = 0.020$ Height of Curb at Gutter Flow Line $H_{CURB} = 6.00$ inchesDistance from Curb Face to Street Crown $T_{CROW} = 0.83$ ftGutter Width $W = 0.83$ ftStreet Transverse Stope $S_0 = 0.015$ ft/ftStreet Longitudinal Stope - Enter 0 for sump condition $S_0 = 0.015$ ft/ftMax. Allowable Spread for Minor & Major Storm $S_0 = 0.015$ ft/ftMax. Allowable Spread for Minor & Major Storm $T_{MAK} = 4.4$ 7.7 Max. Mlowable Depth at Gutter Flowline for Minor & Major Storm $T_{MAK} = 4.4$ 7.7 Maximum Capacity for 1/2 Street based On Allowable SpreadMinor StormMinor StormMatter Depth without Gutter Depression ($G_1 - 0.01$ $S_1 + 4.4$ 7.4 Vertical Depth at Street Crown (check box for yes, leave blank for no) $Winor Storm$ Minor StormMaxer Depth at Street Crown (check box for yes, leave blank for no) $Winor Storm$ Minor StormMaxer Depth at Gutter Flowline (usually 2'') $a = 0.63$ 0.63 incheAltowable Spread for Discharge outside the Gutter Section W (T - W) $T_X = 15.2$ 15.2 15.2 Discharge outside the Gutter Section W ($Q_1 - Q_2$) $Q_0 = 0.63$ 0.61 0.64 Discharge outside the Gutter Section W ($Q_1 - Q_2$) $Q_0 = 0.63$ 0.63 incheDischarge outside the Gutter Section W ($Q_1 - Q_2$) $Q_0 = 0.63$ 0.63 incheDischarge outside the Gutter Section W ($Q_1 - Q_2$) $Q_0 = 0.63$ $0.$ | | | | | |
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| Water Depth without Gutter Depression (Eq. ST-2) $y = 3.84$ 3.84 $inche$ Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") $a = 0.63$ 0.63 $inche$ Gutter Depression ($d_c - (W * S_x * 12)$) $a = 0.63$ 0.63 $inche$ Water Depth at Gutter Flowline $d = 4.47$ 4.47 $inche$ 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) $Q_x = 8.9$ 8.9 cfs Discharge within the Gutter Section W ($Q_1 - Q_x$) $Q_w = 1.6$ 1.6 1.6 cfs Discharge behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{acxx} = 0.0$ 0.0 0.0 cfs Maximum Capacity for $1/2$ Street based on Allowable Depth $V = 1.0$ 1.0 1.0 ffs Maximum Capacity for $1/2$ Street based on Allowable Depth $T_{TH} = 14.7$ 28.6 ff Maximum Capacity for $1/2$ Street based on Allowable Depth T_{CROWN} $Q_w = 1.5$ 0.153 0.079 Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ $Q_x = 8.2$ 48.1 cfs Actual Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ $Q_x = 8.2$ 41.7 cfs Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_w = 1.5$ $4.1.7$ cfs Discharge outside the Gutter Section W, carried in Section $T_{X,TH}$ $Q_x = 8.2$ 41.7 cfs Actual Discharge outside the Gutter Section W, carried in S | and the begun at succe crown (check box for yes, leave blank for hoy | | 8 | 1. T. C. | |
| 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 Behind the Curtle Section W, carried in Section T _x Discharge Behind the Curtle (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section V V*d Product: Flow Velocity times Gutter Flowline Depth Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Discharge outside the Gutter Section W, carried in Section T _x Cutter 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, 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, (limited by distance T _{CROWN}) Discharge Behind the Curth (e.g., sidewalk, driveways, & lawns) Discharge Behind the Curth (e.g., sidewalk, driveways, & lawns) Discharge Flow Velocity Within the Gutter Section V = 0.9 Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section Max Flow Based on Allowable Depth (Safety Factor Applied) Wat Flow Based on Allowable Depth (Safety Factor Applied) Part 46.8 Crs | Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storr | n |
| 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 outside 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 W V*d Product: Flow Velocity times Gutter Flowline Depth 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 Cutter 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, carried in Section T _{x TH} Actual Discharge outside the Gutter Section W, carried in Section T _{x TH} Cutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge within the Gutter Section W, carried in Section T _{x TH} Actual Discharge outside the Gutter Section W, carried in Section T _{x TH} Cutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) Discharge Behind the Cutter Section W, (limited by distance T _{CROWN}) Que = 1.5 4.1 cfs 0.0 0.0.9 cfs Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section W (Q _i - Q _x) We deciter Flow Viet Flow Inter Graways, & lawns) Cosharge Row Velocity Within the Gutter Section W = 0.3 0.9 Max Flow Based on Allowable Depth (Safety Factor Applied) Que = 9.7 46.8 cfs | Water Depth without Gutter Depression (Eq. ST-2) | y =[| | | inches |
| Water Depth at Gutter Flowlined 4.47 4.47 incheAllowable Spread for Discharge outside the Gutter Section W (T - W)Tx = 15.2 15.2 ftGutter Flow Ratio by FHWA HEC-22 method (Eq. ST-7)Eo 0.149 0.149 0.149 Discharge outside the Gutter Section W, carried in Section Tx Q_x 8.9 8.9 cfs Discharge behind the Curb (e.g., sidewalk, driveways, & lawns) Q_{acck} 0.0 0.0 cfs Maximum Flow Based On Allowable Spread Q_T 1.6 1.6 cfs Flow Velocity within the Gutter SectionV 1.0 1.0 1.0 Maximum Capacity for 1/2 Street based on Allowable Depth V^*d V^*d V^*d V^*d Theoretical Discharge outside the Gutter Section W, carried in Section Tx TH Q_x 8.2 48.1 cfs Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) E_0 0.153 0.079 0.079 Theoretical Discharge outside the Gutter Section W, carried in Section Tx TH Q_x 8.2 48.1 cfs Actual Discharge outside the Gutter Section W, carried in Section Tx TH Q_x 8.2 41.7 cfs Discharge within the Gutter Section W ($Q_a - Q_x$) Q_w Q_w 0.0 0.0 0.9 cfs Discharge for Major & Minor Storm (Pre-Safety Factor) Q_w Q_w 0.14 0.4 0.4 Discharge for Welocity Within the Gutter Section W, (limited by distance T _{CROWN}) Q_x 8.2 41.7 cfs <td>Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")</td> <td>d_C =</td> <td>0.8</td> <td>0.8</td> <td>inches</td> | Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | d _C = | 0.8 | 0.8 | inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) $T_x =$ 15.2 15.2 ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 =$ 0.149 0.149 0.149 Discharge within the Gutter Section W (Qr - Qx) $Q_x =$ 8.9 8.9 cfs Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_w =$ 1.6 1.6 cfs Maximum Flow Based On Allowable Spread $V =$ 0.0 0.0 cfs Flow Velocity within the Gutter Section $V =$ 0.4 0.4 0.4 Maximum Capacity for $1/2$ Street based on Allowable Depth $V^*d =$ 0.4 0.4 Theoretical Water Spread $T_{TH} =$ 15.6 29.4 ftMinor Storm Or Discharge outside the Gutter Section W (T - W) $T_{XTH} =$ 14.7 28.6 ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 =$ 0.153 0.079 ftTheoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} $Q_x =$ 8.2 48.1 cfsActual Discharge outside the Gutter Section W, carried in Section T_{XTH} $Q_x =$ 8.2 48.1 cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_W =$ 1.5 4.1 cfsDischarge Nubin the Gutter Section W (Qa - Qa) $Q_w =$ 0.0 0.9 cfs Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_W =$ 0.5 4.1 cfs Discharge Behind the Curb (e.g., sidewalk, drive | | | | | inches |
| 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 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 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, carried in Section T _{x TH} Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Discharge Flow Velocity Within the Gutter Section W, carried in Section T _{x TH} Actual Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section W*d Product: Flow Velocity Within the Gutter Section W*d Product: How Velocity Times Gutter Flowline Depth Max Flow Based on Allowable Depth (Safety Factor Applied) Based Safety Factor Applied) Based Safety Factor Applied) Based Safety Factor Applied) Based Safety Factor Applied | | | | | inches |
| Discharge outside the Gutter Section W, carried in Section T _x 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 Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Discharge outside the Gutter Section W (T - W) Gutter 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, climited by distance T _{CROWN}) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Discharge Flow Velocity Within the Gutter Section W, (limited by distance T _{CROWN}) Discharge Flow Velocity Within the Gutter Section W (Q ₂ - Q ₃) Discharge Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Within the Gutter Section V = 0.9 Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Flowline Depth V*d Product: Flow Velocity Times Gutter Flowline Depth V*d Product: Flow Velocity Times Gutter Flowline Depth Max Flow Based on Allowable Depth (Safety Factor Applied) Discharge Add on Allowable Depth (Safety Factor Applied) Que = 0.7 Add = 0.7 A | | | | | ft |
| 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 W (T - W) Gutter 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, Carried in Section T _{X TH} Actual Discharge outside the Gutter Section W, (Limited by distance T _{CROWN}) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) 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 Y*d Product: Flow Velocity Times Gutter Flowline Depth Maximum Capacity For Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Times Gutter Flowline Depth Stope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq 6^{or}$) Storm Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 9.7$ 46.8 Cfs | | | | | <u> </u> |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) Maximum Flow Based On Allowable Spread Flow Velocity within the Gutter Section Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread 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, 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, (Imited by distance T _{CROWN}) 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 Stope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) Que 9.7 466.8 cfs | | | | | |
| Maximum Flow Based On Allowable Spread $Q_T =$ 10.510.5cfsFlow Velocity within the Gutter SectionV*dII <td< td=""><td></td><td></td><td></td><td></td><td></td></td<> | | | | | |
| Flow Velocity within the Gutter Section $V =$ 1.01.0fpsV*d Product: Flow Velocity times Gutter Flowline Depth $V^*d =$ 0.4 0.4 0.4 Maximum Capacity for 1/2 Street based on Allowable Depth $V^*d =$ 0.4 0.4 0.4 Theoretical Water SpreadTTH = $1.5.6$ 29.4 ftTheoretical Discharge outside the Gutter Section W (T - W) $T_{TH} =$ $1.5.6$ 29.4 ftGutter 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 Tx TH $Q_{XTH} =$ 8.2 48.1 cfsActual Discharge outside the Gutter Section W, (limited by distance T _{CROWN}) $Q_w =$ 1.5 4.1 cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{WE} =$ 0.0 0.9 cfsDischarge Flow Velocity Within the Gutter Section $V =$ 0.9 1.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V^*d =$ 0.3 0.9 fpsSlope-Based Opeth Safety Reduction Factor for Major & Minor (d $\ge 6^\circ)$ Storm $R =$ 1.00 1.00 fpsMax Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 9.7 46.8 cfs | | | | | |
| V*d Product: Flow Velocity times Gutter Flowline DepthV*d = 0.4 0.4 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_{XTH} $T_{TH} =$ 15.6 29.4 Actual Discharge outside the Gutter Section W, carried in Section T_{XTH} $Q_{XTH} =$ 8.2 48.1 cfsDischarge within the Gutter Section W (Q _a - Q _X) $Q_W =$ 1.5 4.1 cfsDischarge for Major & Minor Storm (Pre-Safety Factor) $Q_W =$ 1.5 4.1 cfsAverage Flow Velocity Times Gutter Flowline Depth $Winor (d \ge 6'')$ Storm $V^*d =$ 0.3 0.9 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 9.7 46.8 cfs | | | | | |
| Maximum Capacity for 1/2 Street based on Allowable DepthMaior StormTheoretical Water Spread $T_{TH} = 15.6$ 29.4It heoretical Spread for Discharge outside the Gutter Section W (T - W) $T_{X TH} = 14.7$ 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 $T_{X TH}$ $E_0 = 0.153$ 0.079Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_X = 8.2$ 48.1cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_W = 1.5$ 4.1cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q = 9.7$ 46.8cfsAverage Flow Velocity Within the Gutter Section $V = 0.9$ 1.4fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V*d = 0.3$ 0.91.00Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 9.7$ 46.8cfs | | | | | |
| Theoretical Water SpreadT _{TH} =15.629.4ftTheoretical Spread for Discharge outside the Gutter Section W (T - W)T _{X TH} =15.629.4ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)T _{X TH} =14.728.6ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)E _O =0.1530.079Theoretical Discharge outside the Gutter Section W, carried in Section T _{X TH} & & & & & & & & & & & & & & & & & & & | · · · · · · · · · · · · · · · · · · · | · . | - | ļ | |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) $T_{XTH} =$ 14.728.6ftGutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) $E_0 =$ 0.1530.079Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} $Q_{XTH} =$ 8.248.1cfsActual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_X =$ 8.241.7cfsDischarge within the Gutter Section W ($Q_a - Q_A$) $Q_W =$ 1.54.1cfsDischarge for Major & Minor Storm (Pre-Safety Factor) $Q_B =$ 9.746.8cfsAverage Flow Velocity Within the Gutter Section Tellowine Depth $V^*d =$ 0.30.91.4fpsSlope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^{"}$) StormR1.001.001.00Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 9.746.8cfs | | - | Minor Storm | Major Storn | <u>n</u> |
| Gutter 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}R_248.1cfsActual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})Q_X =8.241.7cfsDischarge within the Gutter Section W (Q_d - Q_X)Q_W =1.54.1cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns)Q_BACK =0.00.9cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor)Q9.746.8cfsAverage Flow Velocity Within the Gutter SectionV =0.91.4fpsV*d Product: Flow Velocity Times Gutter Flowline DepthV*d =0.30.9Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") StormR =1.001.00Max Flow Based on Allowable Depth (Safety Factor Applied)Q_d =9.746.8cfs | | | | | |
| 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 Behind the Curb (e.g., sidewalk, driveways, & lawns) Total Discharge for Major & Minor Storm (Pre-Safety Factor) Average Flow Velocity Within the Gutter Section Theorem Composition of the Section V and the Gutter Section Provided for Major & Minor Storm (Pre-Safety Factor) Average 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) Queta Section V and the Section Composition of the S | | | | | ft |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) $Q_X =$ 8.2 41.7 cfsDischarge within the Gutter Section W ($Q_d - Q_X$) $Q_W =$ 1.5 4.1 cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} =$ 0.0 0.9 cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q =$ 9.7 46.8 cfsAverage Flow Velocity Within the Gutter Section $V =$ 0.9 1.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V*d =$ 0.3 0.9 1.6 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm $R =$ 1.00 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 9.7 46.8 cfs | | | | | <u> </u> |
| Discharge within the Gutter Section W $(Q_d - Q_x)$ $Q_W =$ 1.5 4.1 cfsDischarge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} =$ 0.0 0.9 cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q =$ 9.7 46.8 cfsAverage Flow Velocity Within the Gutter Section $V =$ 0.9 1.4 fpsYed Product: Flow Velocity Times Gutter Flowline Depth $V*d =$ 0.3 0.9 1.4 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6^n$) Storm $R =$ 1.00 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 9.7 46.8 cfs | | | | | |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) $Q_{BACK} =$ 0.0 0.9 cfsTotal Discharge for Major & Minor Storm (Pre-Safety Factor) $Q =$ 9.7 46.8 cfsAverage Flow Velocity Within the Gutter Section $V =$ 0.9 1.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V*d =$ 0.3 0.9 1.4 Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq 6^{"}$) StormR = 1.00 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d =$ 9.7 46.8 cfs | | | | | |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) $Q = 9.7$ 46.8cfsAverage Flow Velocity Within the Gutter Section $V = 0.9$ 1.4fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V*d = 0.3$ 0.9Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq 6^{"}$) Storm $R = 1.00$ 1.00Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 9.7$ 46.8cfs | | | | | |
| Average Flow Velocity Within the Gutter Section $V = 0.9$ 1.4 fpsV*d Product: Flow Velocity Times Gutter Flowline Depth $V*d = 0.3$ 0.9 Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm $R = 1.00$ 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) $Q_d = 9.7$ 46.8cfs | | | | | |
| V*d Product: Flow Velocity Times Gutter Flowline DepthV*d = 0.3 0.9 Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") StormR = 1.00 1.00 Max Flow Based on Allowable Depth (Safety Factor Applied) \mathbf{Q}_d = 9.7 46.8 \mathbf{cfs} | | | - | | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") StormR =1.001.00Max Flow Based on Allowable Depth (Safety Factor Applied)Qd =9.746.8cfs | | | | | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) Qd = 9.7 46.8 cfs | | | | | |
| | | | | | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) d = 4.36 7.68 inche | | | - | | inches |
| | Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | | inches |
| | | - | | | _ |
| MINOR STORM Allowable Capacity is based on Depth Criterion Minor Storm Major Storm Major Storm Major Storm Qallow = 9.7 46.8 cfs | MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storr | n |



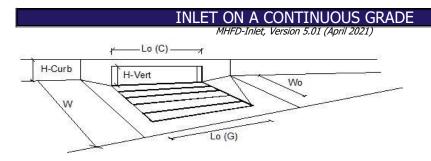
| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---------------------|---------------|----------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | linches |
| Total Number of Units in the Inlet (Grate 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 | 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 = 0.3) | C _f -C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | Cf=C = [| MINOR | MAJOR | |
| | 0 -1 | - | | lcfs |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | Q ₀ = T = | 5.5 12.5 | 20.2 | ft |
| Water Spread Width | , i i i i i i i i i i i i i i i i i i i | | 16.0 | |
| Water Depth at Flowline (outside of local depression) | d = | 3.6 | 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 = | 0.193 | 0.116 | 4, |
| Discharge outside the Gutter Section W, carried in Section T_x | Q _x = | 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 |
| Velocity within the Gutter Section W | V _W = | 4.8 | 6.5 | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 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 | 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 | |
| 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 | 7 |
| Clogging Factor for Multiple-unit Grate Inlet | GrateClog = | N/A | N/A | 7 |
| Effective (unclogged) Length of Multiple-unit Grate Inlet | L, = | 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 = | N/A | N/A | 1. |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 1 |
| 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) | $\hat{\mathbf{Q}}_{\mathbf{b}} =$ | N/A | N/A | cfs |
| Curb or Slotted Inlet Opening Analysis (Calculated) | L U 1 | MINOR | MAJOR | 10.0 |
| Equivalent Slope S_e (based on grate carry-over) | S _e = | 0.090 | 0.062 |]ft/ft |
| Required Length L_T to Have 100% Interception | -e L _T = | 14.40 | 33.15 | - Ift |
| Under No-Clogging Condition | -1-1 | MINOR | MAJOR | ⊣ |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 14.40 | 15.00 | Tft |
| Interception Capacity | Q _i = | 5.5 | 13.4 | |
| Under Clogging Condition | Qi - [| MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.31 | 1.31 | ٦ |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.04 | 0.04 | - |
| Effective (Unclogged) Length | | 14.34 | 14.34 | ft |
| Actual Interception Capacity | L _e = | <u>14.34</u> 5.5 | 14.54 13.2 | cfs |
| | Q _a = | | | |
| $Carry-Over Flow = Q_{h(GRATE)} - Q_a$ | Q _b = | 0.0 | 7.0 | cfs |
| Summary | - | MINOR | MAJOR | 7.4 |
| 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 |
| Capture Percentage = Q_a/Q_a = | C% = | 100 | 65 | % |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | |
|---|---------------------------|-------------------|-------------|-------------------------|
| Grandview Reserve | | | - | |
| Basin C-6 (DP 17e) | | | | |
| | | | | |
| SBACK W I T. | | | | |
| SBACK W T, | | | | |
| STREET | | | | |
| P P S | | | | |
| I of Sal | | | | |
| v/ | | | | |
| Gutter Geometry: Maximum Allounda Width for Savard Babind Curb | т _Г | 7.5 | ٦ | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | | |
| naming's Roughness benniti 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 = | 0.015 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{street} = | 0.016 | | |
| | | | | |
| | - r | 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 Allow Flow Depth at Street Crown (check box for yes, leave blank for no) | d _{MAX} = | 4.4 | 7.7 | inches |
| Allow Flow Depth at Street Clowin (check box for yes, leave blank for ho) | | 1 | 19 | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | 1 |
| 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 | <u> </u> |
| Discharge outside the Gutter Section W, carried in Section T_X | $Q_X =$ | 8.9 | 8.9 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _W = | <u>1.6</u> 0.0 | 1.6 | cfs cfs |
| Maximum Flow Based On Allowable Spread | $Q_{BACK} = $ $Q_T = $ | 10.5 | 10.5 | |
| Flow Velocity within the Gutter Section | V = | 1.0 | 1.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | v = V*d = | 0.4 | 0.4 | |
| | · L | - | | |
| 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 (Eq. ST-7) | $E_0 = $ | 0.153 | 0.079 | \dashv |
| 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) Total Discharge for Major & Minor Storm (Pre-Safety Factor) | $Q_{BACK} =$ | 0.0 | 0.9 | cfs cfs |
| Average Flow Velocity Within the Gutter Section | Q = V = | 0.9 | 46.8 | fps |
| V*d Product: Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth | v = V*d = | 0.9 | 0.9 | \dashv ^{'ps} |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | v∾u = R = | 1.00 | 1.00 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | 9.7 | 46.8 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | v a – d = | 4.36 | 7.68 | linches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 3.22 | inches |
| | c.town | | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | - | Minor Storm | Major Storm | |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 9.7 | 46.8 | cfs |

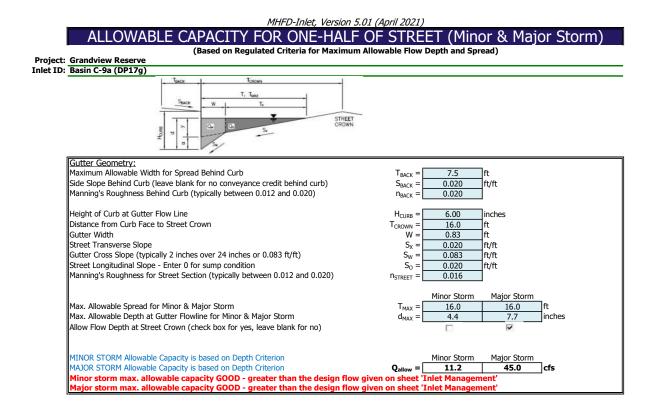


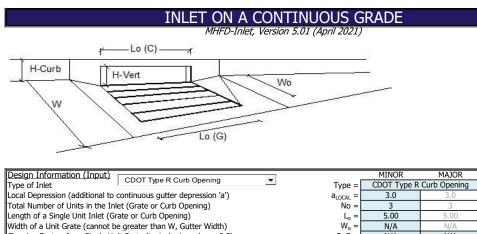
| Design Information (Input) | _ | MINOR | MAJOR | |
|---|--------------------------------------|-------------|--------------|---------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | linches |
| Total Number 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) | Ц _о = W _о = | | 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) | Cf-C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | Cf=C = | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | 0 - | | | lcfs |
| | Q _o = T = | 3.3 10.3 | 11.7 | ft |
| Water Spread Width | | | 16.0 | |
| Water Depth at Flowline (outside of local depression) | d = | 3.1 | 4.6 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.2 | inches |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.237 | 0.142 | - , |
| Discharge outside the Gutter Section W, carried in Section T_x | Q _x = | 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 | 7.6 | 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 | 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 | |
| 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 | |
| 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 | |
| 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 Se (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 | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 10.30 | 15.00 | ft |
| Interception Capacity | $Q_i =$ | 3.3 | 9.8 | cfs |
| Under Clogging Condition | | MINOR | MAJOR | - |
| Clogging Coefficient | CurbCoef = | 1.31 | 1.31 | 7 |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.04 | 0.04 | 7 |
| Effective (Unclogged) Length | L _e = | 14.34 | 14.34 | ft |
| Actual Interception Capacity | $\mathbf{Q}_{a}^{-e} =$ | 3.3 | 9.7 | cfs |
| Carry-Over Flow = $Q_{h(GRATE)}$ - Q_a | $Q_{\rm b} =$ | 0.0 | 2.0 | cfs |
| Summary | X 0 | MINOR | MAJOR | |
| Total Inlet Interception Capacity | Q = | 3.3 | 9.7 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | $Q_b =$ | 0.0 | 2.0 | cfs |
| Capture Percentage = Q_a/Q_o = | Q₀ = C% = | 100 | 83 | % |
| | 570 - | 1VV | | |

| ALLOWABLE CAPACITY FOR ONE-HALF O (Based on Regulated Criteria for Maximum All | | | | |
|--|-------------------------|--------------|--------------|------------------|
| Grandview Reserve | | | | |
| Basin C-8 (DP 17f) | | | | |
| T. Tux Stack W Ts Stack W Ts CROWN | | | | |
| Gutter Geometry: | - | 7.5 | 10 | |
| Maximum Allowable Width for Spread Behind Curb | T _{BACK} = | 7.5 | ft | |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | ft/ft | |
| | 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 | 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 | |
| | | 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) | | | 2 | |
| | | | 1.000 | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | - | Minor Storm | Major Storn | |
| 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)) Water Depth at Gutter Flowline | a = d = | 0.63 | 0.63 | inches inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | u = 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 | $\overline{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 | |
| Theoretical Water Spread | т _{тн} = [| 15.6 | 29.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | $T_{XTH} =$ | 14.7 | 29.4 | |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | E ₀ = | 0.153 | 0.079 | -1 |
| 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 |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | Q _w = | 1.8 | 5.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 1.1 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | 11.8 | 56.6 | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 1.1 | 1.7 | fps |
| V*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.4 | 1.1 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) | R = Q d = | 1.00 11.8 | 0.77 43.8 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | Q d =d = | 4.36 | 6.96 | linches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 2.49 | inches |
| ······································ | CROWIN | 0.00 | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 11.8 | 43.8 | cfs |



| Design Information (Input) | | MINOR | MAJOR | |
|---|--|----------------------------|---------------|---------|
| Type of Inlet | Type = | | 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 | |
| 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 = 0.3) | C _f -C = | 0.10 | 0.10 | - |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | Cf=C = | MINOR | MAJOR | |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | 0 -1 | - | 1 | lcfs |
| | Q ₀ = T = | 8.6 | 20.0 | |
| Water Spread Width | , i i i i i i i i i i i i i i i i i i i | 13.8 | 16.0 | |
| Water Depth at Flowline (outside of local depression) | d = | 3.9 | 5.2 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.7 | inches |
| Ratio of Gutter Flow to Design Flow | E ₀ = | 0.174 | 0.125 | - |
| Discharge outside the Gutter Section W, carried in Section T_x | 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} = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | A _W = | 0.24 | 0.33 | sq ft |
| 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) | | 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 | 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 | |
| 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 | 7 |
| Clogging Factor for Multiple-unit Grate Inlet | GrateClog = | N/A | N/A | 7 |
| Effective (unclogged) Length of Multiple-unit Grate Inlet | L, = | 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 = | N/A | N/A | |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 1 |
| 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) | $\mathbf{Q}_{\mathbf{b}}^{\mathbf{a}} =$ | N/A | N/A | cfs |
| Curb or Slotted Inlet Opening Analysis (Calculated) | E 11 | MINOR | MAJOR | |
| Equivalent Slope S_e (based on grate carry-over) | S _e = | 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 | = - [| MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T) | L =[| 15.00 | 15.00 | Tft |
| Interception Capacity | Q _i = | 8.0 | 13.3 | lcfs |
| Under Clogging Condition | Qi - [| MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.31 | 1.31 | 7 |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.04 | 0.04 | - |
| Effective (Unclogged) Length | | 14.34 | 14.34 | |
| Actual Interception Capacity | L _e = | <u>14.34</u> 8.0 | 14.54 13.1 | cfs |
| | Q _a = | 0.6 | 6.9 | crs |
| Carry-Over Flow = $Q_{h/GRATE}$ - Q_a | Q _b = | | | us |
| Summary | ^ 1 | MINOR | MAJOR | |
| Total Inlet Interception Capacity | Q = | 8.0 | 13.1 | cfs |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.6 | 6.9 | cfs |
| Capture Percentage = Q_a/Q_o = | C% = | 93 | 66 | % |

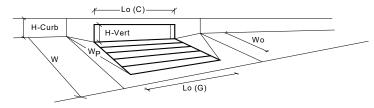




| Length of a Single Unit Inlet (Grate or Curb Opening) | L _o = | 5.00 | 5.00 | ft |
|---|-------------------------|--------------|---------------|------------|
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W _o = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_{f}-G =$ | N/A | N/A | |
| 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 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' Total Inlet Interception Capacity | Q =[| MINOR 6.2 | MAJOR 13.1 | cfs |
| | Q = Q _b = | | | cfs cfs |

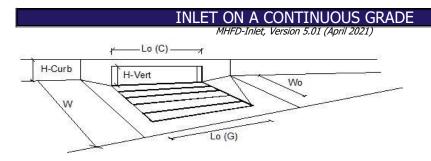
inches

| (Based on Regulated Criteria for Maximum Allow Grandview Reserve Basin C-9b (DP17h) | | | | |
|--|-------------------------|---------------------|---------------------|--------|
| Teach Tcachen Seach T, Taax W Tr | | | | |
| SBACK W T. | | | | |
| The street 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) | SBACK = | 0.020 | ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | n _{BACK} = | 0.020 | 1,0,10 | |
| | La concerte La | | 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 = | 0.018 | 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 _{STREET} = | 0.016 |] | |
| | | | | |
| | - r | 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 =[| 3.46 | 3.46 | 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 = | 0.65 | 0.65 | inches |
| Water Depth at Gutter Flowline | d = | 4.10 | 4.10 | inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | т _х = | 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 | 1 |
| Discharge outside the Gutter Section W, carried in Section T_{χ} | 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 | Т _{тн} = [| 17.2 | 32.6 |]ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{х тн} = | 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 | 7 |
| 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 |
| | | | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | Minor Storm SUMP | Major Storm SUMP | cfs |



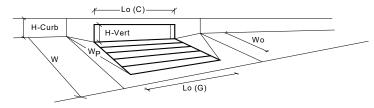
| Design Information (Input) CDOT Type R Curb Opening | | MINOR | MAJOR | - |
|---|--|----------|--------------|-----------------|
| Type of Inlet | Type = | | Curb Opening | 4 |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 4 | 4 | _ |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | - | MINOR | MAJOR | Verride Deptr |
| Length of a Unit Grate | $L_{o}(G) =$ | N/A | 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 | 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 | 1 |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | Č _o (G) = | N/A | N/A | 1 |
| Curb Opening Information | -0(-/ [| MINOR | MAJOR | _ |
| Length of a Unit Curb Opening | $L_0(C) = $ | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert} =$ | 6.00 | 6.00 | linches |
| Height of Curb Orifice Throat in Inches | | 6.00 | 6.00 | linches |
| 5 | H _{throat} = | | | _ |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees feet |
| 1 Side Width for Depression Pan (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | reet |
| 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 | 4 |
| 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 | |
| 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) | Civia L | 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 | Q _{0a} – L | MINOR | MAJOR | |
| | о Г | | | 7-6- |
| 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) | - | MINOR | MAJOR | - |
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | 4 |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| 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) | | MINOR | MAJOR | - |
| Interception without Clogging | Q _{oi} = | 33.6 | 43.9 | lcfs |
| Interception with Clogging | $Q_{oa} =$ | 32.5 | 42.4 | cfs |
| Curb Opening Capacity as Mixed Flow | -cua L | MINOR | MAJOR | 7 |
| Interception without Clogging | Q _{mi} = | 17.0 | 36.7 | lcfs |
| Interception with Clogging | | 16.5 | 35.5 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{ma} = Q_{Curb} = | <u> </u> | 35.5 34.3 | cfs |
| | Curb - | | | 03 |
| Resultant Street Conditions | . г | MINOR | MAJOR | - . |
| Total Inlet Length | L = | 20.00 | 20.00 | feet |
| Resultant Street Flow Spread (based on street geometry from above) | . T= | 17.2 | 32.6 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | d _{CROWN} = | 0.3 | 3.6 | 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 | - Ift |
| 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 | | N/A | N/A | - |
| Grated milet Performance Reduction Factor for Long Inlets | RF _{Grate} = | IN/A | IN/A | _ |
| | | MINOR | | |
| | | MINOR | MAJOR | - - |
| Total Inlet Interception Capacity (assumes clogged condition) | Q_a = | 9.7 | 34.3 | cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | 5.9 | 29.5 | cfs |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum Al | | | | , |
|---|--------------------------------------|-------------------|----------------|--------------|
| Grandview Reserve | | | - | |
| Basin C-7 (DP 18a) | | | | |
| | | | | |
| SBACK T, TMAX | | | | |
| | | | | |
| STREET | | | | |
| S C C C C C C C C C C C C C C C C C C C | | | | |
| | | | | |
| 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 | ft | |
| Street Transverse Slope Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | S _X = | 0.020 | ft/ft ft/ft | |
| Street Longitudinal Slope - Enter 0 for sump condition | S _W = S ₀ = | 0.083 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{street} = | 0.022 | | |
| | JINEET L | | - | |
| | _ | Minor Storm | Major Storn | <u>n</u> |
| 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 Storn | n |
| 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 Allowable Spread for Discharge outside the Gutter Section W (T - W) | _d = | 4.47 | 4.47 | inches ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | T _X = E ₀ = | 15.2 0.149 | 15.2 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 Storn | n |
| Theoretical Water Spread | т _{тн} = [| 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} = | 10.0 | 58.3 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | Q _X = | 10.0 | 50.6 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | Q _W = | 1.8 | 5.0 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 1.1 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = V = | 11.8 | 56.6 | cfs |
| Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth | V = V*d = | <u>1.1</u> 0.4 | 1.7 | fps |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | v≁a = R = | 1.00 | 0.77 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | 11.8 | 43.8 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | t a 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 Charry | Maion Charm | |
| | | Minor Storm | Major Storn | 0 |



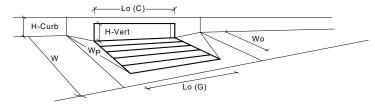
| Local Depression (additional to continuous gutter depression 'a') $a_{LOCAL} =$ 3.0 3.0 inchesTotal Number of Units in the Inlet (Grate or Curb Opening)No = 3 3 3 ftLength of a Single Unit Inlet (Grate or Curb Opening)Lo = 5.00 5.00 ftWidth of a Unit Grate (cannot be greater than W, Gutter Width) $W_o =$ N/A N/A N/A Clogging Factor for a Single Unit Grate (typical min. value = 0.5) $C_{r}-C =$ 0.10 0.10 Street Hydraulics: OK - Q < Allowable Street Capacity' | |
|--|--|
| Total Number of Units in the Inlet (Grate or Curb Opening)No =33Length of a Single Unit Inlet (Grate or Curb Opening)Lo = 5.00 5.00 ftWidth of a Unit Grate (cannot be greater than W, Gutter Width)Wo = N/A N/A ftClogging Factor for a Single Unit Grate (typical min. value = 0.5) $C_{r}-G$ N/A N/A ftClogging Factor for a Single Unit Grate (typical min. value = 0.1) $C_{r}-C$ 0.10 0.10 Street Hydraulics: OK - Q < Allowable Street Capacity'Design Discharge for Half of Street (from Inlet Management) Q_o 11.3 26.3 Water Spread WidthT 15.3 16.0 ftWater Depth at Flowline (outside of local depression)d 4.3 5.7 inches | |
| Length of a Single Unit Inlet (Grate or Curb Opening)Lo5.005.00ftWidth of a Unit Grate (cannot be greater than W, Gutter Width)WoN/AN/AftClogging Factor for a Single Unit Grate (typical min. value = 0.5)Cr-G =N/AN/ACloqaique Factor for a Single Unit Curb Opening (typical min. value = 0.1)Cr-C =0.100.10Street Hydraulics: OK - O < Allowable Street Capacity' | |
| 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) $C_{\Gamma}G =$ N/A N/A ft Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) $C_{\Gamma}C =$ 0.10 0.10 Street Hydraulics: OK - O < Allowable Street Capacity' | |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) $C_{\Gamma}G =$ N/A N/A Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) $C_{\Gamma}C =$ 0.10 0.10 Street Hydraulics: OK - Q < Allowable Street Capacity' | |
| Cloquing Factor for a Single Unit Curb Opening (typical min. value = 0.1) $C_{\Gamma}C$ = 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 T = 15.3 16.0 ft Water Depth at Flowline (outside of local depression) d = 4.3 5.7 inches | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' MINOR MAJOR Design Discharge for Half of Street (from Inlet Management) $Q_o = 11.3$ 26.3 cfs Water Spread Width T = 15.3 16.0 ft Water Depth at Flowline (outside of local depression) d = 4.3 5.7 inches | |
| Design Discharge for Half of Street (from Inlet Management) $Q_o = 11.3$ 26.3cfsWater Spread WidthT = 15.316.0ftWater Depth at Flowline (outside of local depression)d = 4.35.7inches | |
| Water Spread WidthT =15.316.0ftWater Depth at Flowline (outside of local depression)d = 4.3 5.7 inches | |
| Water Depth at Flowline (outside of local depression) $d = 4.3$ 5.7 | |
| | |
| water Depth at Street Crown (or at I_{MAX}) $d_{CROWN} = 0.0$ 1.3 inches | |
| | |
| Ratio of Gutter Flow to Design Flow $E_0 = 0.156 0.113$ | |
| Discharge outside the Gutter Section W, carried in Section T_x $Q_x = 9.5$ 23.3 cfs | |
| Discharge within the Gutter Section W Q _w = <u>1.8</u> <u>3.0</u> 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 $V_W = 6.6$ 8.1 fps | |
| Water Depth for Design Condition d _{IOCAI} = 7.3 8.7 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 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 Frontal Flow R _f = N/A N/A | |
| Interception Rate of Side Flow $P_{x} = N/A N/A$ | |
| 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 | |
| Clogging Factor for Multiple-unit Grate Inlet GrateClog N/A N/A | |
| Effective (unclogged) Length of Multiple-unit Grate Inlet $J_{\mu} = N/A - N/A$ ft | |
| Linearth (integrated in the second integrated in the second integrated in the second integrated integrated integrated in the second integrated | |
| The rest of the second | |
| Interception Rate of Side Flow $R_{x} = N/A N/A$ | |
| Interception reaction of the movement of the movement $V_{A} = \frac{1}{V/A}$ $\frac{1}{V/A}$ $\frac{1}{V/A}$ dctual 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) $Q_0 = \frac{V/A}{V/A} + \frac{V/A}{V/A} + \frac{V/A}{Cfs}$ | |
| $Carry over Flow = Q_n - [N/A] N/A Carry over a constrained of next dys finet) Q_h - [N/A] N/A Carry over Flow = Q_n - [N/A] N/A Carry over a constrained of next dys finet) N/A Carry ov$ | |
| | |
| | |
| | |
| 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 $Q_i = 9.6$ 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 $Q_a = 9.6$ 15.1cfs | |
| Carry-Over Flow = $Q_{h}(GRATE)$ - Q_{a} Q_{b} = 1.7 11.2 cfs | |
| Summary MINOR MAJOR | |
| Total Inlet Interception Capacity Q = 9.6 15.1 cfs | |
| Total Inlet Carry-Over Flow (flow bypassing inlet) Qb = 1.7 11.2 cfs | |
| Capture Percentage = Q_a/Q_a = C% = 85 57 % | |

| (Based on Regulated Criteria for Maximum All | | | | jor Stor |
|--|--|---------------|---------------|----------|
| Grandview Reserve | | | , | |
| Basin C-10 (DP 18b) | | | | |
| TEACK TCROWN | | | | |
| T, Tuux | | | | |
| Stack W Ta | | | | |
| STREET CROWN | | | | |
| B P Q Q S CROWN | | | | |
| 2 | | | | |
| 111 1 7 | | | | |
| 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 | 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 = | 0.000 | 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 | т _Г | Minor Storm | Major Storm | ו ft |
| Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | T _{MAX} = d _{MAX} = | 16.0 4.4 | 16.0 7.7 | inches |
| Check boxes are not applicable in SUMP conditions | u _{MAX} – [| | | |
| | | 1.2 | <i>J</i> = 1; | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storm | <u>1</u> |
| Nater Depth without Gutter Depression (Eq. ST-2) | y = | 3.84 | 3.84 | inches |
| /ertical 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) Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | T _X = | 15.2 0.149 | 15.2 | ft |
| Discharge outside the Gutter Section W, carried in Section T_x | E ₀ = Q _X = | 0.149 | 0.149 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_{\rm X} = Q_{\rm W} = 1$ | 0.0 | 0.0 | crs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Maximum Flow Based On Allowable Spread | $\mathbf{Q}_{T} =$ | SUMP | SUMP | cfs |
| Flow Velocity within the Gutter Section | V = | 0.0 | 0.0 | fps |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| | - | | | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | - r | Minor Storm | Major Storm | |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | | 15.6 | 29.4 | ft ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | Т _{х тн} = Е ₀ = | 14.7 0.153 | 28.6 0.079 | |
| Theoretical Discharge outside the Gutter Section W, carried in Section $T_{x TH}$ | ⊏ ₀ = Q _{X тн} = | 0.153 | 0.079 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | $Q_{X TH} = Q_{X} =$ | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_X$) | $Q_{\rm X} = Q_{\rm W} = 1$ | 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) | QBACK = | 0.0 | 0.0 | cfs |
| Average Flow Velocity Within the Gutter Section | v = | 0.0 | 0.0 | fps |
| /*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | <u> </u> |
| 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 Capacity is based on Depth Criterion | | Minor Storm | Major Storm | |
| | | wunor Storm | Water Storm | 1 |



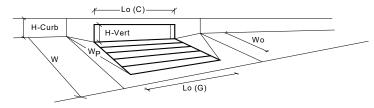
| Design Information (Input) | CDOT Type R Curb Opening | - | MINOR | MAJOR | - |
|--|--|--|-------------|--------------|----------------|
| Type of Inlet | | Type = | CDOT Type R | | - |
| | continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate of | r Curb Opening) | No = | 3 | 3 | |
| Water Depth at Flowline (outs | de of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | - | MINOR | MAJOR | Verride 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 Grat | e (typical values 0.15-0.90) | A _{ratio} = | N/A | N/A | 1 |
| | rate (typical value 0.50 - 0.70) | $C_f(G) =$ | N/A | N/A | - |
| Grate Weir Coefficient (typical | | $C_{w}(G) = C_{w}(G) = C_{w}(G)$ | N/A | N/A | - |
| Grate Orifice Coefficient (typical | | $C_{0}(G) = C_{0}(G) $ | N/A N/A | N/A N/A | 4 |
| | | C ₀ (G) = [| | , | _ |
| Curb Opening Information | | | MINOR | MAJOR | 76 |
| Length of a Unit Curb Opening | | $L_{o}(C) =$ | 5.00 | 5.00 | feet |
| Height of Vertical Curb Openir | | H _{vert} = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat | | H _{throat} = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM F | | Theta = | 63.40 | 63.40 | degrees |
| | (typically the gutter width of 2 feet) | $W_p =$ | 2.00 | 2.00 | feet |
| Clogging Factor for a Single C | urb 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 | 1 |
| Curb Opening Orifice Coefficie | | $C_{o}(C) =$ | 0.67 | 0.67 | 1 |
| Grate Flow Analysis (Calcula | | | MINOR | MAJOR | • |
| Clogging Coefficient for Multip | | Coef = | N/A | N/A | ٦ |
| Clogging Factor for Multiple U | | Clog = | N/A N/A | N/A N/A | 4 |
| | | clog = [| | | |
| | ased on Modified HEC22 Method) | - T | MINOR | MAJOR | ٦. |
| Interception without Clogging | | Q _{wi} = | N/A | N/A | cfs |
| Interception with Clogging | | Q _{wa} = | N/A | N/A | cfs |
| | (based on Modified HEC22 Method) | _ | 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 Flo | w | coa L | MINOR | MAJOR | _ |
| Interception without Clogging | <u> </u> | Q _{mi} = | N/A | N/A | lcfs |
| Interception with Clogging | | $Q_{ma} = $ | N/A | N/A | cfs |
| | | $Q_{ma} =$ $Q_{Grate} =$ | N/A N/A | N/A N/A | cfs |
| Resulting Grate Capacity (assu Curb Opening Flow Analysis | | CGrate - | MINOR | MAJOR | |
| | | с f. Г | - | | 7 |
| Clogging Coefficient for Multip | | Coef = | 1.31 | 1.31 | - |
| Clogging Factor for Multiple U | | Clog = | 0.04 | 0.04 | |
| | sed on Modified HEC22 Method) | - | MINOR | MAJOR | - |
| Interception without Clogging | | Q _{wi} = | 7.5 | 26.6 | cfs |
| Interception with Clogging | | Q _{wa} = | 7.2 | 25.4 | cfs |
| Curb Opening as an Orifice | (based on Modified HEC22 Method) | | 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 N | lived Flow | -coa — L | MINOR | MAJOR | → |
| Interception without Clogging | | Q _{mi} = | 12.8 | 27.5 | lcfs |
| | | | | | lcfs |
| Interception with Clogging | the foregoing a second se | | 12.2 7.2 | 26.3 25.4 | |
| | ity (assumes clogged condition) | Q _{Curb} = | | | us |
| Resultant Street Conditions | | | MINOR | MAJOR | 7 |
| Total Inlet Length | | L = [| 15.00 | 15.00 | feet |
| | based on street geometry from above) | T = | 15.6 | 29.4 | ft.>T-Crown |
| Resultant Flow Depth at Stree | : Crown | d _{CROWN} = | 0.0 | 3.2 | inches |
| | | _ | | | |
| Low Head Performance Rec | uction (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 |
| | e Reduction Factor for Long Inlets | RF _{Combination} = | 0.41 | 0.72 | 417 |
| | duction Factor for Long Inlets | | 0.41 | 0.72 | 4 |
| | | RF _{Curb} = | | | 4 |
| Grated Inlet Performance Red | uction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | 1 |
| | | | | | |
| | | - | MINOR | MAJOR | - |
| Total Inlet Interception Capac | ty (assumes clogged condition) | Q _a = | 7.2 | 25.4 | cfs |
| | • Minor and Major Storms(>Q PEAK) | Q PEAK REQUIRED = | 6.9 | 23.4 | cfs |

| (Based on Regulated Criteria for Maximum All | | | | jor Stor |
|--|--|----------------------|---------------------|--------------|
| Grandview Reserve | | | , | |
| Basin C-11 (DP 19) | | | | |
| - TRACK - TCROWN - | | | | |
| T, Twax | | | | |
| SBACK W T. | | | | |
| STREET CROWN | | | | |
| B D CROWN | | | | |
| 2 1 1 2 - | | | | |
| 114 12 | | | | |
| Gutter Geometry: | | | 1. | |
| 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 |] | |
| | | | | |
| Max. Allowable Spread for Minor & Major Storm | т "Г | Minor Storm 16.0 | Major Storm 16.0 | 1 Ift |
| Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | T _{MAX} = d _{MAX} = | 4.4 | 7.7 | inches |
| Check boxes are not applicable in SUMP conditions | u _{MAX} – [| | | |
| | | 6 | , | |
| 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 |
| /ertical 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 |
| Nater Depth at Gutter Flowline Allowable Spread for Discharge outside the Gutter Section W (T - W) | d = | 5.35 | 5.35 | inches ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | T _X = E ₀ = | <u>14.0</u> 0.372 | 14.0 0.372 | |
| Discharge outside the Gutter Section W, carried in Section T_x | $Q_X =$ | 0.0 | 0.372 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_W = $ | 0.0 | 0.0 | |
| 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 |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d =[| 0.0 | 0.0 | |
| Maximum Canacity for 1/2 Streat bacad on Allowable Death | | Minor Cham | Mair: Ch- | |
| Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread | т _{тн} =[| Minor Storm 11.9 | Major Storm 25.7 | 1 Ift |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | $T_{XTH} = T_{TH}$ | 9.9 | 23.7 | |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $E_0 =$ | 0.497 | 0.228 | \dashv |
| Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH} | Q _{X TH} = | 0.0 | 0.220 | 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 ($Q_d - Q_X$) | $\vec{Q}_{W} = \vec{Q}_{W}$ | 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 |
| /*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 Capacity is based on Depth Criterion | | Minor Storm | Major Storm | h |
| anon or or an microable capacity is based on Depth Chterion | _ | CHILDE STOLLE | major storn | |



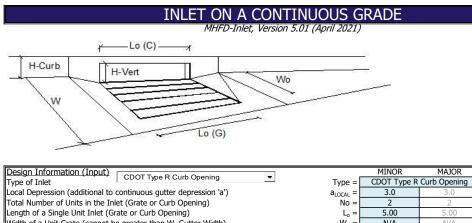
| Design Information (Input) | | MINOR | MAJOR | |
|--|-----------------------------|-------|--------------|----------------|
| Type of Inlet | Type = | | Curb Opening | 1 |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | linches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | MINOR | MAJOR | Verride Depths |
| Length of a Unit Grate | L ₀ (G) = | N/A | N/A | lfeet |
| 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 | |
| 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 | - |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | C ₀ (G) = | N/A | N/A | 4 |
| Curb Opening Information | | MINOR | MAJOR | 4 |
| Length of a Unit Curb Opening | $L_0(C) = $ | 5.00 | 5.00 | feet |
| 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 |
| 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 | 1 |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_{0}(C) = $ | 0.67 | 0.67 | 1 |
| Grate Flow Analysis (Calculated) | / | MINOR | MAJOR | • |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | 7 |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | 1 |
| Grate Capacity as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | 4 |
| Interception without Clogging | Q _{wi} = | N/A | N/A | lcfs |
| Interception with Clogging | Q _{wa} = | N/A | N/A | cfs |
| Grate Capacity as a Orifice (based on Modified HEC22 Method) | Civia L | MINOR | MAJOR | |
| Interception without Clogging | $Q_{0i} = [$ | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa} =$ | N/A | N/A | cfs |
| Grate Capacity as Mixed Flow | coa L | 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) | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | 7 |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | 1 |
| Curb Opening as a Weir (based on Modified HEC22 Method) | - | MINOR | MAJOR | - |
| Interception without Clogging | Q _{wi} = | 2.7 | 10.1 | cfs |
| 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 | Q _{oi} = | 8.4 | 11.0 | cfs |
| Interception with Clogging | Q _{oa} = | 7.6 | 9.9 | 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 | 8.8 | cfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{Curb} = | 2.4 | 8.8 | cfs |
| Resultant Street Conditions | | MINOR | MAJOR | |
| Total Inlet Length | L = [| 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on street geometry from above) | Т = [| 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 _{Grate} = | N/A | N/A | ft |
| Depth for Curb Opening Weir Equation | d _{Curb} = | 0.20 | 0.47 | ft |
| Combination Inlet Performance Reduction Factor for Long Inlets | RF _{Combination} = | 0.56 | 0.98 | |
| Curb Opening Performance Reduction Factor for Long Inlets | RF _{Curb} = | 1.00 | 1.00 | |
| Grated Inlet Performance Reduction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | |
| | | | | _ |
| | | MINOR | MAJOR | _ |
| Total Inlet Interception Capacity (assumes clogged condition) | Q _a = | 2.4 | 8.8 | cfs |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | 1.0 | 2.3 | cfs |

| (Based on Regulated Criteria for Maximum All | | | | jor Stor |
|--|--|--------------------|--------------------|------------------|
| Grandview Reserve | omable rion | bepen and opi | cuu) | |
| Basin C-12 (DP 20) | | | | |
| TEACK - TCHOWN - | | | | |
| SBACK W I To | | | | |
| | | | | |
| STREET CROWN | | | | |
| The second secon | | | | |
| | | | | |
| 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 | 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 Manning's Roughness for Street Section (typically between 0.012 and 0.020) | S ₀ = | 0.000 0.016 | ft/ft | |
| naming 5 reaginess for Successed on (typically between 0.012 and 0.020) | n _{street} = | 0.010 | 1 | |
| | | Minor Storm | Major Storm | <u>1</u> |
| 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 | 1 |
| 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)) Water Depth at Gutter Flowline | a = d = | 0.63 4.47 | 0.63 | inches inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | т _х = | 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 = | 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) Maximum Flow Based On Allowable Spread | Q _{BACK} = | 0.0 | 0.0 | cfs cfs |
| Flow Velocity within the Gutter Section | Q _T = V = | SUMP 0.0 | SUMP 0.0 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | v = V*d = | 0.0 | 0.0 | |
| | Ľ | | | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | - r | Minor Storm | Major Storm | ı Tft |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = Т _{х тн} = | 15.6 14.7 | 29.4 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*d Product: Flow Velocity Times Gutter Flowline Depth | V = V*d = | 0.0 | 0.0 | fps |
| V [*] d Product: Flow Velocity Times Gutter Flowline Depth Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm | v≁a = R = | SUMP | SUMP | - |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | SUMP | SUMP | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | | | 1 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | | | inches |
| MINOR STORM Allowable Canacity is based on Donth Criterion | | Minor Storm | Major Storm | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storm | 1 |



| .90) - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) | $Type = \\ a_{icci} = \\ No = \\ No = \\ Ponding Depth = \\ C_{0} (G) = \\ C_{r} (C) = \\ C_$ | 3.00 1 4.4 MINOR N/A N/A N/A N/A N/A N/A MINOR S.00 6.00 7.00 0.10 3.60 0.67 MINOR N/A | Curb Opening 3.00 1 7.7 MAJOR N/A N/A N/A N/A N/A N/A MAJOR 0.10 3.60 0.67 MAJOR N/A N/A MAJOR N/A N/A MAJOR N/A N/A N/A N/A N/A N/A N/A N/A | inches inches ✓ Override Depth: feet feet inches inches degrees feet cfs cfs cfs cfs cfs cfs cfs |
|---|--|--|---|---|
| 90) - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{aligned} \text{No} &= \\ \text{Ponding Depth} &= \\ \\ \text{L}_{o} (\text{G}) &= \\ \\ \text{W}_{o} &= \\ \\ \text{A}_{ratio} &= \\ \\ \text{C}_{r} (\text{G}) &= \\ \\ \text{C}_{w} (\text{G}) &= \\ \\ \text{C}_{w} (\text{G}) &= \\ \\ \text{C}_{w} (\text{G}) &= \\ \\ \text{H}_{vert} &= \\ \\ \text{H}_{trroat} &= \\ \\ \text{H}_{trroat} &= \\ \\ \text{H}_{trroat} &= \\ \\ \text{H}_{trroat} &= \\ \\ \text{H}_{wro} &= \\ \\ \text{C}_{w} (\text{C}) &= \\ \\ \text{C}_{w} (\text{C}) &= \\ \\ \text{C}_{w} (\text{C}) &= \\ \\ \text{Coef} &= \\ \\ \text{Clog} &= \\ \\ \\ \text{Coef} &= \\ \\ \\ \text{Q}_{wi} &= \\ \\ \\ \\ \text{Q}_{wi} &= \\ \\ \\ \\ \\ \\ \text{Q}_{oi} &= \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $ | 1 4.4 MINOR N/A N/A N/A N/A N/A MINOR 5.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 | 1 7.7 MAJOR N/A N/A N/A N/A N/A N/A MAJOR 0.00 6.00 6.00 6.00 6.00 6.00 6.00 6.0 | inches ✓ Override Depth: feet feet inches inches degrees feet cfs cfs cfs cfs cfs cfs cfs |
| 1.90) - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{l} \mbox{Ponding Depth} = \left[\begin{array}{c} L_{o} \left(G \right) = \\ W_{o} = \\ A_{ratio} = \\ C_{r} \left(G \right) = \\ C_{w} \left(G \right) = \\ C_{o} \left(G \right) = \\ C_{o} \left(G \right) = \\ C_{o} \left(G \right) = \\ H_{vert} = \\ H_{vert} = \\ H_{vora} = \\ C_{r} \left(C \right) = \\ C_{v} \left(C \right) = \\ C_{v} \left(C \right) = \\ C_{o} \left(C \right) = \\ C$ | 4.4 MINOR N/A N/A N/A N/A N/A MINOR 5.00 6.00 7.00 8.00 0.10 7.00 8.00 7.00 | MAJOR N/A N/A N/A N/A N/A N/A MAJOR 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A N/A N/A N/A | Override Depth: feet feet inches inches degrees feet Cfs cfs cfs cfs |
| 1.90) - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $ \begin{array}{c} L_{o}\left(G\right) = \\ W_{o} = \\ W_{o} = \\ C_{r}\left(G\right) = \\ C_{v}\left(G\right) = \\ C_{o}\left(G\right) = \\ C_{o}\left(G\right) = \\ L_{o}\left(C\right) = \\ H_{vert} = \\ H_{throat} = \\ W_{o} = \\ C_{r}\left(C\right) = \\ C_{o}\left(C\right) = \\ $ | MINOR N/A N/A N/A N/A N/A N/A N/A MINOR 5.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 | MAJOR N/A N/A N/A N/A N/A N/A MAJOR 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A N/A N/A N/A | Override Depth: feet feet inches inches degrees feet Cfs cfs cfs cfs |
| - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{split} W_{o} &= \\ A_{ratio} &= \\ C_{f} & (G) &= \\ C_{w} & (G) &= \\ C_{o} & (G) &= \\ C_{o} & (G) &= \\ H_{vert} &= \\ H_{troat} &= \\ H_{troat} &= \\ H_{troat} &= \\ C_{f} & (C) &= \\ C_{w} & (C) &= \\ C_{w} & (C) &= \\ C_{o} & (C) &= \\ C_$ | N/A N/A N/A N/A N/A N/A N/A S.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 | N/A N/A N/A N/A N/A N/A N/A MAJOR N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | feet feet inches inches degrees feet cfs cfs cfs cfs |
| - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{split} W_{o} &= \\ A_{ratio} &= \\ C_{f} & (G) &= \\ C_{w} & (G) &= \\ C_{o} & (G) &= \\ C_{o} & (G) &= \\ H_{vert} &= \\ H_{troat} &= \\ H_{troat} &= \\ H_{troat} &= \\ C_{f} & (C) &= \\ C_{w} & (C) &= \\ C_{w} & (C) &= \\ C_{o} & (C) &= \\ C_$ | N/A N/A N/A N/A N/A N/A MINOR 5.00 6.00 6.00 6.00 6.00 6.00 6.00 6.00 | N/A N/A N/A N/A N/A MAJOR 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6.3.40 2.00 0.10 3.60 0.67 MAJOR N/A N/A MAJOR N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | feet inches inches degrees feet cfs cfs cfs cfs cfs |
| - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} A_{ratio} = \\ C_r\left(G\right) = \\ C_w\left(G\right) = \\ C_o\left(G\right) = \\ C_o\left(G\right) = \\ L_0\left(C\right) = \\ H_{vet} = \\ H_{vet} = \\ H_{vere} = \\ H_{vere} = \\ C_{v}\left(C\right) = \\ C_{v}\left(C\right) = \\ C_{v}\left(C\right) = \\ C_{o}\left(C\right) = \\ Coef = \\ Clog = \\ Clog = \\ Q_{wa} = \\ Q_{wa} = \\ Q_{oa} = \\ Q_{oa} = \\ Q_{oa} = \\ Q_{mi} = \\ Q_{$ | N/A N/A N/A N/A MINOR 5.00 6.00 6.00 6.00 6.3.40 2.00 0.10 3.60 0.67 MINOR N/A N/A N/A N/A N/A N/A N/A MINOR N/A N/A | N/A N/A N/A N/A MAJOR 5.00 6.00 6.00 6.00 63.40 2.00 0.10 3.60 0.67 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | feet inches inches degrees feet cfs cfs cfs cfs cfs |
| - 0.70) idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} C_{r}\left(G\right) = \\ C_{w}\left(G\right) = \\ C_{o}\left(G\right) = \\ C_{o}\left(G\right) = \\ H_{vert} = \\ H_{throat} = \\ Theta = \\ C_{v}\left(C\right) = \\ C_{v}\left(C\right) = \\ C_{o}\left(C\right) = \\ C_{o}\left$ | N/A N/A N/A MINOR 5.00 6.00 6.00 6.00 6.00 0.63.40 2.00 0.10 3.60 0.67 MINOR N/A N/A N/A N/A N/A N/A N/A N/A N/A | N/A N/A N/A MAJOR 5.00 6.00 6.00 63.40 2.00 0.10 0.67 MAJOR N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| idth of 2 feet) lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} C_{r}\left(G\right) = \\ C_{w}\left(G\right) = \\ C_{o}\left(G\right) = \\ C_{o}\left(G\right) = \\ H_{vert} = \\ H_{throat} = \\ Theta = \\ C_{v}\left(C\right) = \\ C_{v}\left(C\right) = \\ C_{o}\left(C\right) = \\ C_{o}\left$ | N/A N/A N/A MINOR 5.00 6.00 6.00 6.00 0.10 3.60 0.67 MINOR N/A N/A N/A N/A MINOR N/A MINOR N/A MINOR N/A N/A | N/A N/A MAJOR 5.00 6.00 6.00 63.40 2.00 0.10 3.60 0.67 MAJOR N/A N/A MAJOR N/A N/A N/A N/A N/A N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} C_{o} \left(G \right) = \left[\begin{array}{c} L_{o} \left(C \right) = \\ H_{vert} = \\ H_{trrot} = \\ H_{ttrot} = \\ Theta = \\ W_{o} = \\ C_{v} \left(C \right) = \\ C_{w} \left(C \right) = \\ C_{w} \left(C \right) = \\ C_{o} \left(C \right) = \\ \end{array} \right] \end{array}$ | N/A MINOR 5.00 6.00 63.40 2.00 0.10 3.60 0.67 MINOR N/A N/A N/A N/A N/A MINOR N/A N/A N/A N/A N/A N/A N/A | N/A MAJOR 5.00 6.00 6.00 63.40 2.00 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A N/A N/A N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} C_{o} \left(G \right) = \left[\begin{array}{c} L_{o} \left(C \right) = \\ H_{vert} = \\ H_{trrot} = \\ H_{ttrot} = \\ Theta = \\ W_{o} = \\ C_{v} \left(C \right) = \\ C_{w} \left(C \right) = \\ C_{w} \left(C \right) = \\ C_{o} \left(C \right) = \\ \end{array} \right] \end{array}$ | N/A MINOR 5.00 6.00 63.40 2.00 0.10 3.60 0.67 MINOR N/A N/A N/A N/A N/A MINOR N/A N/A N/A N/A N/A N/A N/A | N/A MAJOR 5.00 6.00 6.00 63.40 2.00 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A N/A N/A N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} L_{o}\left(C\right) = \\ H_{vert} = \\ H_{troot} = \\ Theta = \\ W_{p} = \\ C_{f}\left(C\right) = \\ C_{w}\left(C\right) = \\ C_{w}\left(C\right) = \\ C_{o}\left(C\right) = \\ Coef = \\ Clog = \\ Q_{wi} = \\ Q_{wi} = \\ Q_{wi} = \\ Q_{oi} = \\ Q_{oi} = \\ Q_{oi} = \\ Q_{mi} = \\ \end{array}$ | MINOR 5.00 6.00 6.00 0.10 3.60 0.67 MINOR N/A N/A MINOR N/A N/A MINOR N/A MINOR N/A MINOR N/A MINOR N/A | MAJOR 5.00 6.00 6.00 6.01 0.02 0.10 3.60 0.67 MAJOR N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{aligned} H_{vert} &= \\ H_{troat} &= \\ H_{troat} &= \\ Theta &= \\ W_0 &= \\ C_r & (C) &= \\ C_w & (C) &= \\ C_w & (C) &= \\ C_0 & (C) &= \\ Cos &= \\ Q_{vta} &= \\ Q_{vta} &= \\ Q_{ot} &= \\$ | 5.00 6.00 63.40 2.00 0.10 3.60 0.67 MINOR N/A N/A MINOR N/A N/A MINOR N/A MINOR N/A | 5.00 6.00 6.00 63.40 2.00 0.10 3.60 0.67 MAJOR N/A N/A MAJOR N/A N/A MAJOR N/A N/A N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{aligned} H_{vert} &= \\ H_{troat} &= \\ H_{troat} &= \\ Theta &= \\ W_0 &= \\ C_r & (C) &= \\ C_w & (C) &= \\ C_w & (C) &= \\ C_0 & (C) &= \\ Cos &= \\ Q_{vta} &= \\ Q_{vta} &= \\ Q_{ot} &= \\$ | 6.00 6.00 6.3.40 2.00 0.10 3.60 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | 6.00 6.00 63.40 2.00 0.10 3.60 0.67 MAJOR N/A N/A MAJOR N/A N/A N/A N/A N/A N/A | inches inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{l} H_{throat} = \\ Theta = \\ W_{p} = \\ C_{q} \left(C\right) = \\ C_{w} \left(C\right) = \\ C_{w} \left(C\right) = \\ Cog = \\ Clog = \\ Qog = \\ Qwi = \\ Qwi = \\ Qog = \\ Q$ | 6.00 63.40 2.00 0.10 3.60 0.67 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | 6.00 63.40 2.00 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A N/A N/A N/A N/A | inches degrees feet cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $Theta = \\ W_o = \\ C_f (C) = \\ C_w (C) = \\ C_o (C) = \\ Coef = \\ Clog = \\ Q_{wa} = \\ Q_{wa} = \\ Q_{ca} = \\ Q_{ca} = \\ Q_{cn} = \\ Q_{mi} = \\ Q_{$ | 63.40 2.00 0.10 3.60 0.67 MINOR N/A MINOR N/A MINOR N/A MINOR N/A MINOR N/A | 63.40 2.00 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A N/A N/A N/A N/A | degrees feet cfs cfs cfs cfs cfs cfs cfs |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{split} W_{p} &= \\ C_{f}\left(C\right) &= \\ C_{w}\left(C\right) &= \\ C_{o}\left(C\right) &= \\ C_{o}\left(C\right) &= \\ Coef &= \\ Clog &= \\ Q_{wi} &= \\ Q_{wa} &= \\ Q_{wa} &= \\ Q_{oi} &= \\ Q_{oa} &= \\ Q_{oi} &= \\ Q_{oa} &= \\ Q_{mi} &= \\ \\ Q_{mi} &= \\ \\ Q_{mi} &= \\$ | 2.00 0.10 3.60 0.67 N/A N/A N/A MINOR N/A MINOR N/A MINOR N/A | 2.00 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A | freet cris cris cris cris cris cris |
| lue 0.10) 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} C_{f}\left(C\right) =\\ C_{w}\left(C\right) =\\ C_{o}\left(C\right) =\end{array} \end{array}$ $\begin{array}{c} Coef =\\ Clog =\\ Q_{wi} =\\ Q_{wa} =\\ Q_{oa} =\\ Q_{oa} =\\ Q_{oa} =\\ Q_{mi} =\end{array}$ | 0.10 3.60 0.67 MINOR N/A MINOR N/A MINOR N/A MINOR N/A | 0.10 3.60 0.67 MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A | cfs cfs cfs cfs cfs cfs |
| 0.70) C22 Method) IEC22 Method) | $\begin{array}{c} C_{w}\left(C\right)=\\ C_{o}\left(C\right)=\\ \end{array}\\ \begin{array}{c} Coef=\\ Clog=\\ \\ Q_{wi}=\\ \\ Q_{wa}=\\ \\ Q_{oi}=\\ \\ Q_{oa}=\\ \\ Q_{mi}=\\ \end{array}$ | 3.60 0.67 N/A N/A MINOR N/A MINOR N/A MINOR N/A MINOR N/A | 3.60 0.67 N/A N/A MAJOR N/A MAJOR N/A N/A N/A N/A N/A | _cfs _cfs _cfs _cfs |
| 0.70) C22 Method) IEC22 Method) | $C_{o}(C) = \begin{bmatrix} \\ Coef \\ Clog \\ \end{bmatrix} = \begin{bmatrix} \\ Q_{wi} \\ Q_{wa} \\ \end{bmatrix} = \begin{bmatrix} \\ Q_{ci} \\ Q_{co} \\ \end{bmatrix}$ $Q_{ci} = \begin{bmatrix} \\ Q_{co} \\ \end{bmatrix}$ $Q_{mi} = \begin{bmatrix} \\ \end{bmatrix}$ | 0.67 MINOR N/A MINOR N/A MINOR N/A MINOR N/A MINOR N/A | 0.67 MAJOR N/A N/A MAJOR N/A MAJOR N/A MAJOR N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| C22 Method) IEC22 Method) | $Coef = \\Clog = \begin{bmatrix} \\ Q_{wi} \\ Q_{wa} \end{bmatrix} = \begin{bmatrix} \\ Q_{wa} \\ Q_{oi} \end{bmatrix} = \begin{bmatrix} \\ Q_{oi} \\ Q_{oi} \end{bmatrix} = \begin{bmatrix} \\ Q_{$ | MINOR N/A N/A MINOR N/A MINOR N/A MINOR N/A | MAJOR N/A N/A N/A N/A MAJOR N/A N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| IEC22 Method) | $Clog = \begin{bmatrix} Q_{wi} \\ Q_{wa} \end{bmatrix} = \begin{bmatrix} Q_{oi} \\ Q_{oa} \end{bmatrix} = \begin{bmatrix} Q_{oa} \\ Q_{oa} \end{bmatrix} = \begin{bmatrix} Q_{oa} \end{bmatrix}$ | N/A N/A MINOR N/A MINOR N/A N/A MINOR N/A | N/A N/A MAJOR N/A MAJOR N/A N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| IEC22 Method) | $Clog = \begin{bmatrix} Q_{wi} \\ Q_{wa} \end{bmatrix} = \begin{bmatrix} Q_{oi} \\ Q_{oa} \end{bmatrix} = \begin{bmatrix} Q_{oa} \\ Q_{oa} \end{bmatrix} = \begin{bmatrix} Q_{oa} \end{bmatrix}$ | N/A MINOR N/A N/A MINOR N/A MINOR N/A | N/A MAJOR N/A N/A MAJOR N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| IEC22 Method) | $\begin{array}{l} Q_{wi} = \\ Q_{wa} = \\ Q_{oi} = \\ Q_{oa} = \\ Q_{mi} = \end{array}$ | MINOR N/A N/A MINOR N/A MINOR N/A | MAJOR N/A N/A MAJOR N/A N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| IEC22 Method) | $\begin{array}{l} Q_{wi} = \\ Q_{wa} = \\ Q_{oi} = \\ Q_{oa} = \\ Q_{mi} = \end{array}$ | MINOR N/A N/A MINOR N/A MINOR N/A | MAJOR N/A N/A MAJOR N/A N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| · | $Q_{wa} = \begin{bmatrix} \\ Q_{ol} = \\ Q_{oa} = \end{bmatrix}$ $Q_{mi} = \begin{bmatrix} \\ \end{bmatrix}$ | N/A MINOR N/A N/A MINOR N/A | N/A MAJOR N/A N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| · | $Q_{wa} = \begin{bmatrix} \\ Q_{ol} = \\ Q_{oa} = \end{bmatrix}$ $Q_{mi} = \begin{bmatrix} \\ \end{bmatrix}$ | N/A MINOR N/A N/A MINOR N/A | N/A MAJOR N/A N/A MAJOR N/A | _cfs _cfs _cfs _cfs |
| · | Q _{oi} = [Q _{oa} = [Q _{mi} = [| MINOR N/A N/A MINOR N/A | MAJOR N/A N/A MAJOR N/A | cfs cfs cfs |
| · | $Q_{oa} = [$ $Q_{mi} = [$ | N/A N/A MINOR N/A | N/A N/A MAJOR N/A | cfs cfs |
| | $Q_{oa} = [$ $Q_{mi} = [$ | N/A MINOR N/A | N/A MAJOR N/A | cfs cfs |
| | Q _{mi} = | MINOR N/A | MAJOR N/A | cfs |
| | Q _{mi} = Q _{ma} = | N/A | N/A | |
| | Q _{mi} = Q _{ma} = | | | |
| | Q _{ma} = [| | | |
| | _ [™] _ ⊢ | N/A | N/A | cfs |
|) | Q _{Grate} = | N/A | N/A | cfs |
| | r | MINOR | MAJOR | - |
| | Coef = | 1.00 | 1.00 | |
| | Clog = | 0.10 | 0.10 | |
| 22 Method) | - | MINOR | MAJOR | _ |
| | Q _{wi} = | 3.7 | 10.1 | cfs |
| | Q _{wa} = | 3.4 | 9.1 | cfs |
| HEC22 Method) | | MINOR | MAJOR | _ |
| <u>.</u> | Q _{oi} = | 8.4 | 11.0 | cfs |
| | Q _{oa} = | 7.6 | 9.9 | cfs |
| | -coa - | MINOR | MAJOR | |
| | Q _{mi} = | 5.2 | 9.8 | lcfs |
| | Q _{mi} = Q _{ma} = | 4.7 | 8.8 | |
| ondition) | Q _{ma} = Q _{Curb} = | 3.4 | 8.8 | |
| onuid0H) | Curb - | | | |
| | . г | MINOR | MAJOR | |
| | L = | 5.00 | 5.00 | feet |
| etry from above) | T = | 15.6 | 29.4 | ft.>T-Crown |
| | d _{CROWN} = | 0.0 | 3.2 | inches |
| | | | | |
| | - | MINOR | MAJOR | _ |
| | d _{Grate} = | N/A | N/A | ft |
| | d _{Curb} = | 0.29 | 0.57 | ft |
| | | 0.56 | 0.98 | 7 |
| Long Inlets | | | | 1 |
| | | | | - |
| g Inlets | | | | |
| g Inlets | KF _{Grate} = | | | |
| g Inlets | Kr _{Grate} = [| MINOP | MAIOD | |
| g Inlets | RF _{Grate} = [Q _a = [| MINOR 3.4 | MAJOR 8.8 | cfs |
| | Long Inlets Ig Inlets | d _{Curb} = Long Inlets RF _{Combination} = | $d_{Curb} = \frac{0.29}{0.29}$ Long Inlets RF _{Combination} = 0.56 in Inlets RF _{Curb} = 1.00 | $d_{Curb} = \frac{0.29 0.57}{0.29 0.56}$ $g \text{ Inlets} \qquad RF_{Curb} = \frac{0.56 0.98}{1.00 1.00}$ $RF_{Grate} = \frac{N/A N/A}{0.000}$ |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | |
|---|--------------------------------------|----------------------|---------------------|--------------|
| Grandview Reserve | | bepen and opi | cuuj | |
| Basin D-1 (DP 22) | | | | |
| TBACK - TCROWN - | | | | |
| Stuck W I Tr | | | | |
| | | | | |
| STREET CROWN | | | | |
| Berg P | | | | |
| | | | | |
| Cuttor Coorectory | | | | |
| Gutter Geometry: Maximum Allowable Width for Spread Behind Curb | T _{BACK} = | 7.5 | Tft | |
| 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 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | S _X = | 0.020 | ft/ft | |
| Sutter Cross Slope (typically 2 incres over 24 incres or 0.083 ft/ft) Street Longitudinal Slope - Enter 0 for sump condition | S _W = S ₀ = | 0.083 | ft/ft ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{STREET} = | 0.010 | | |
| | SINCEI | | - | |
| | - | Minor Storm | Major Storn | <u>n</u> |
| 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 Storn | n |
| 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 Allowable Spread for Discharge outside the Gutter Section W (T - W) | d = T _x = | 4.47 | 4.47 | inches ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $I_X = E_0 = I$ | <u>15.2</u> 0.149 | 15.2 0.149 | |
| Discharge outside the Gutter Section W, carried in Section T_X | $Q_X =$ | 7.3 | 7.3 | dcfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_w = 1$ | 1.3 | 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 | cfs |
| Flow Velocity within the Gutter Section | V = | 0.8 | 0.8 | fps |
| V*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.3 | 0.3 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storn | n |
| Theoretical Water Spread | т _{тн} = [| 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 $T_{X\text{TH}}$ | Q _{х тн} = | 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 | 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 = V = | 7.9 | 38.2 | cfs |
| Average Flow Velocity Within the Gutter Section V*d Product: Flow Velocity Times Gutter Flowline Depth | V = V*d = | 0.8 | 0.7 | fps |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d > 6") Storm | v∾u = R = | 1.00 | 1.00 | |
| Max Flow Based on Allowable Depth (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | 7.9 | 38.2 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | d = | 4.36 | 7.68 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 3.22 | inches |
| | | | | |
| MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = [| Minor Storm 7.9 | Major Storn 38.2 | n cfs |

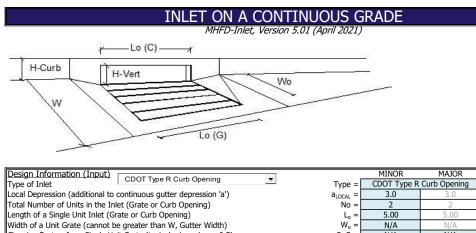


| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W _o = | N/A | N/A | ft | |
|---|-------------------------|-------|-------|------------|--|
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | C _f -G = | N/A | N/A | | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | C _f -C = | 0.10 | 0.10 | | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | | MINOR | MAJOR | | |
| Total Inlet Interception Capacity | Q = | 4.2 | 6.9 | cfs | |
| Total Inlet Carry-Over Flow (flow bypassing inlet) | Q _b = | 0.4 | 4.0 | cfs | |
| Capture Perceptage = Ω_{-}/Ω_{-} = | C% - | 92 | 64 | 0 % | |

inches

ft

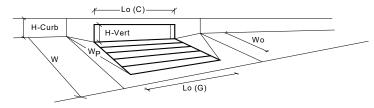
| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum Al | | | | .joi-3001 |
|---|-----------------------------|---------------------|---------------------|--------------|
| Grandview Reserve | | bepen and op | leady | |
| Basin D-2 (DP 23) | | | | |
| - TBACK TCROWN | | | | |
| T, Taxx | | | | |
| SBACK W T, | | | | |
| STREET CROWN | | | | |
| | | | | |
| * | | | | |
| 111 19 | | | | |
| Gutter Geometry: | | | - | |
| Naximum 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 Cutter Flow Line | ц _Г | 6.00 | Tinchoc | |
| Height of Curb at Gutter Flow Line Distance from Curb Face to Street Crown | H _{CURB} = | <u>6.00</u> 16.0 | inches ft | |
| Sutter Width | T _{CROWN} = W = | 0.83 | ft | |
| Street Transverse Slope | $VV = S_x = I$ | 0.83 | ft/ft | |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | S _W = | 0.020 | 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} = | 0.010 | | |
| | | | - | |
| | | Minor Storm | Major Storn | n |
| 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 Canacity for 1/2 Street based On Allowable Spread | | Minor Charm | Majar Charm | ~ |
| Maximum Capacity for 1/2 Street based On Allowable Spread Nater Depth without Gutter Depression (Eq. ST-2) | v =[| Minor Storm 3.84 | Major Storn 3.84 | n linches |
| /ertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y = d _C = | 0.8 | 0.8 | inches |
| Sutter 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) | т _х = | 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 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 | cfs |
| low Velocity within the Gutter Section | V = | 0.8 | 0.8 | fps |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.3 | 0.3 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storn | n |
| Theoretical Water Spread | Т _{тн} = [| 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 | -17 |
| 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 | 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 = | 7.9 | 38.2 | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 0.8 | 1.2 | fps |
| /*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 | <u> </u> |
| 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 |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | $d_{CROWN} = L$ | 0.00 | 3.22 | inches |
| INOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | n |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 7.9 | 38.2 | cfs |



| Length of a Single Unit Inlet (Grate or Curb Opening) | L _o = [| 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 | |
| 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 | |
| | Q =[| MINOR 1.7 | MAJOR 3.8 | cfs |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | Q = [Q _b = | - | | cfs cfs |

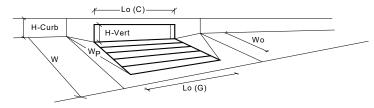
inches

| (Based on Regulated Criteria for Maximum All | | | | ijor Stor |
|--|-----------------------|--------------------|-------------|-----------|
| Grandview Reserve | owable now | Depth and Spi | cauj | |
| Basin D-3 (DP 24) | | | | |
| Teacer Succe W Te | | | | |
| | | | | |
| Gutter Geometry: | | 7.5 | 10 | |
| Maximum Allowable Width for Spread Behind Curb | T _{BACK} = | 7.5 | ft | |
| Side Slope Behind Curb (leave blank for no conveyance credit behind curb) Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = | 0.020 | ft/ft | |
| Manning's Roughness Benning 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 | 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 Chain | Mair: Chi | |
| Max Allowable Spread for Minor & Major Storm | т_Г | Minor Storm | Major Storn | n ft |
| Max. Allowable Spread for Minor & Major Storm Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | T _{MAX} = | <u>16.0</u> 4.4 | 16.0 7.7 | inches |
| | d _{MAX} = | | | Inches |
| Check boxes are not applicable in SUMP conditions | | | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | | Minor Storm | Major Storn | n |
| 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_{χ} | 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 |
| /*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 Storn | n |
| Theoretical Water Spread | т _{тн} = [| 15.6 | 29.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | т _{х тн} = | 14.7 | 28.6 | |
| 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 _{х тн} = | 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 | -1 |
| 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 Storn | n |



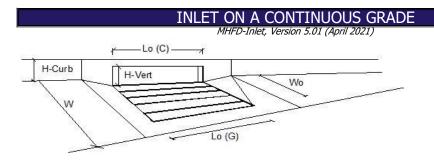
| Design Information (Input) | CDOT Type R Curb Opening | | MINOR | MAJOR | |
|----------------------------------|--|--|-------------|--------------|----------------|
| Type of Inlet | | Type = | CDOT Type R | | 4 |
| | o continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate of | | No = | 3 | 3 | |
| Water Depth at Flowline (outs | ide of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | _ | MINOR | MAJOR | Verride 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 | e (typical values 0.15-0.90) | A _{ratio} = | N/A | N/A | 1 |
| | rate (typical value 0.50 - 0.70) | $C_{f}(G) =$ | N/A | N/A | - |
| Grate Weir Coefficient (typical | | $C_{w}(G) =$ | N/A | N/A | - |
| Grate Orifice Coefficient (typic | | $C_{0}(G) = C_{0}(G) = C_{0}(G)$ | N/A | N/A | - |
| Curb Opening Information | | C ₀ (O) = [| MINOR | MAJOR | |
| Length of a Unit Curb Opening | | L (C) - [| 5.00 | 5.00 | feet |
| | | $L_{o}(C) =$ | | | |
| Height of Vertical Curb Openin | | H _{vert} = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat i | | H _{throat} = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM F | | Theta = | 63.40 | 63.40 | degrees |
| | (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single C | urb 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 | 1 |
| Curb Opening Orifice Coefficie | | $C_{0}^{W}(C) =$ | 0.67 | 0.67 | 1 |
| Grate Flow Analysis (Calcula | | / | MINOR | MAJOR | • |
| Clogging Coefficient for Multip | | Coef = | N/A | N/A | 7 |
| Clogging Factor for Multiple U | | Clog = | N/A N/A | N/A | - |
| | | ciog = L | MINOR | MAJOR | |
| | ased on Modified HEC22 Method) | а Г | | | 7.0 |
| Interception without Clogging | | Q _{wi} = | N/A | N/A | cfs |
| Interception with Clogging | | Q _{wa} = | N/A | N/A | cfs |
| | (based on Modified HEC22 Method) | _ | 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 Flo | W | | MINOR | MAJOR | - |
| Interception without Clogging | | Q _{mi} = | N/A | N/A | lcfs |
| Interception with Clogging | | Q _{ma} = | N/A | N/A | cfs |
| Resulting Grate Capacity (assu | umos claggad condition) | Q _{Grate} = | N/A | N/A | cfs |
| Curb Opening Flow Analysis | | Colate | MINOR | MAJOR | |
| Clogging Coefficient for Multip | | Coef = | 1.31 | 1.31 | 7 |
| Clogging Factor for Multiple U | | Clog = | 0.04 | 0.04 | - |
| | | ciog = L | | | |
| | ased on Modified HEC22 Method) | - T | MINOR | MAJOR | |
| Interception without Clogging | | Q _{wi} = | 7.5 | 26.6 | cfs |
| Interception with Clogging | | Q _{wa} = | 7.2 | 25.4 | cfs |
| Curb Opening as an Orifice | (based on Modified HEC22 Method) | _ | 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 N | lixed Flow | | MINOR | MAJOR | - |
| Interception without Clogging | | Q _{mi} = | 12.8 | 27.5 | cfs |
| Interception with Clogging | | | 12.0 | 26.3 | cfs |
| | ity (assumes clogged condition) | Q _{ma} = Q _{curb} = | 7.2 | 20.3 25.4 | |
| | | Curb – | | | 113 |
| Resultant Street Conditions | | | MINOR | MAJOR | ٦. |
| Total Inlet Length | | L = | 15.00 | 15.00 | feet |
| | based on street geometry from above) | T = | 15.6 | 29.4 | ft.>T-Crown |
| Resultant Flow Depth at Street | t Crown | d _{CROWN} = | 0.0 | 3.2 | inches |
| | | _ | | | |
| Low Head Performance Rec | luction (Calculated) | | MINOR | MAJOR | |
| Depth for Grate Midwidth | | d _{Grate} = | N/A | N/A | ٦ft |
| Depth for Curb Opening Weir | Equation | d _{Curb} = | 0.29 | 0.57 | |
| | e Reduction Factor for Long Inlets | | 0.29 | 0.72 | - `` |
| | | RF _{Combination} = | | | - |
| | duction Factor for Long Inlets | RF _{Curb} = | 0.67 | 0.88 | 4 |
| Grated Inlet Performance Red | uction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | _ |
| | | | | | |
| | | - | MINOR | MAJOR | _ |
| Total Inlat Intercontian Connei | ty (assumes clogged condition) | Q _a = [| 7.2 | 25.4 | cfs |
| Total Thet Interception Capaci | | | | 18.2 | |

| (Based on Regulated Criteria for Maximum Allo | | | | jor Stor |
|---|--|---------------------|---------------------|----------|
| Grandview Reserve | wable now | Depth and Spi | eau) | |
| Basin D-4 (DP 25) | | | | |
| | | | | |
| | | | | |
| 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 | 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 = | 0.020 | 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 | 1 7 12 | |
| · · · · · · | | | - | |
| | - | 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 Canacity for 1/2 Street based On Allowable Spread | | Minor Chorne | Majar Charm | |
| Maximum Capacity for 1/2 Street based On Allowable Spread Water Depth without Gutter Depression (Eq. ST-2) | y =[| Minor Storm 3.84 | Major Storm 3.84 | inches |
| Vertical Depth between Gutter Lip and Gutter Flowline (usually 2") | y – 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 | linches |
| 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 | lcfs |
| 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 |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Maximum Capacity for 1/2 Street based on Allowable Donth | | Minor Ctorm | Major Starm | |
| Maximum Capacity for 1/2 Street based on Allowable Depth Theoretical Water Spread | т_Г | Minor Storm 15.6 | Major Storm 29.4 | ∃ft |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = Т _{х тн} = | 15.6 | 29.4 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | і _{хтн} = E ₀ = | 0.153 | 0.079 | " |
| Theoretical Discharge outside the Gutter Section W, carried in Section T_{xTH} | $Q_{XTH} =$ | 0.155 | 0.079 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | $Q_X TH = Q_X = Q$ | 0.0 | 0.0 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_x$) | $Q_{\rm X} = Q_{\rm W} = 1$ | 0.0 | 0.0 | cfs |
| Discharge Behind the Curte (e.g., sidewalk, driveways, & lawns) | Qw = Q _{BACK} = | 0.0 | 0.0 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | QBACK - | 0.0 | 0.0 | |
| 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) | $\mathbf{Q}_{d} = \mathbf{I}$ | SUMP | SUMP | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | - d | 55Pir | | linches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | | | linches |
| ······································ | CROWN | | 1 | · •• |
| 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 |



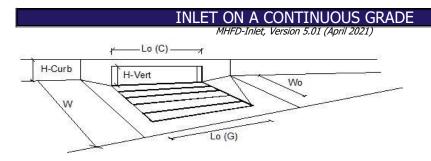
| Design Information (Input) CDOT Type R Curb Opening | | MINOR | MAJOR | 7 |
|---|--|-------|---------------|-----------------|
| Type of Inlet | Type = | | Curb Opening | la ale a a |
| Local Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 2 | 2 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | _ | MINOR | MAJOR | Verride Depths |
| Length of a Unit Grate | $L_{o}(G) =$ | N/A | 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 | N/A | 1 |
| 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 | 1 |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{o}(G) =$ | N/A | N/A | 1 |
| Curb Opening Information | -0(-) | MINOR | MAJOR | 4 |
| Length of a Unit Curb Opening | $L_{0}(C) =$ | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert} =$ | 6.00 | 6.00 | linches |
| Height of Curb Orifice Throat in Inches | | 6.00 | 6.00 | linches |
| 5 | H _{throat} = | 63.40 | 63.40 | - |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | | | degrees feet |
| 1 Side Width for Depression Pan (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | reet |
| 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 | |
| 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) | Civid L | MINOR | MAJOR | |
| Interception without Clogging | Q _{oi} = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa} =$ | N/A | N/A | lcfs |
| Grate Capacity as Mixed Flow | Q _{oa} – L | MINOR | MAJOR | |
| | о Г | | | 7.4 |
| 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) | - | MINOR | MAJOR | - |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | 1 |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| Curb Opening as a Weir (based on Modified HEC22 Method) | - | MINOR | MAJOR | _ |
| Interception without Clogging | Q _{wi} = | 6.1 | 20.2 | cfs |
| Interception with Clogging | Q _{wa} = | 5.7 | 18.9 | cfs |
| Curb Opening as an Orifice (based on Modified HEC22 Method) | | MINOR | MAJOR | - |
| Interception without Clogging | Q _{oi} = | 16.8 | 21.9 | cfs |
| Interception with Clogging | Q _{oa} = | 15.7 | 20.6 | cfs |
| Curb Opening Capacity as Mixed Flow | -coa — | MINOR | MAJOR | |
| Interception without Clogging | Q _{mi} = | 9.4 | 19.6 | lcfs |
| Interception with Clogging | Q _{mi} = | 8.8 | 19.0 | lcfs |
| Resulting Curb Opening Capacity (assumes clogged condition) | Q _{ma} = Q _{Curb} = | 5.7 | 18.3 18.3 | cfs |
| | Curb - | | | |
| Resultant Street Conditions | | MINOR | MAJOR | ٦. |
| Total Inlet Length | L = | 10.00 | 10.00 | 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} = | 0.82 | 1.00 | 1 |
| Grated Inlet Performance Reduction Factor for Long Inlets | RF _{Grate} = | N/A | N/A | 1 |
| orace intervention and conclusion ractor for long inters | Grate - | 11/1 | 11/1 | 4 |
| | | MINOR | MAJOR | |
| Total Talet Intercention Connects (accurate days days days | • 「 | 5.7 | MAJOR 18.3 |] of o |
| Total Inlet Interception Capacity (assumes clogged condition) Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK) | Q _a = | | | cfs cfs |
| | $Q_{PEAK REQUIRED} =$ | 3.7 | 8.5 | ICTE |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum Al | | | | |
|---|--------------------------------------|---------------|--------------|------------------|
| Grandview Reserve | iowable i iow | Depth and Spi | eau) | |
| Basin E-1 (DP 27) | | | | |
| Tonore Sever T, Texceen T, | | | | |
| Gutter Geometry: | | | 1- | |
| 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 | | | | |
| Jistance from Curb Face to Street Crown Gutter Width | T _{CROWN} = W = | 16.0 | ft H | |
| Sutter width Street Transverse Slope | - | 0.83 | ft ft/ft | |
| Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft) | S _X = S _W = | 0.020 | ft/ft | |
| Street Longitudinal Slope - Enter 0 for sump condition | $S_0 =$ | 0.083 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | n _{STREET} = | 0.033 | | |
| | SIKEEL - | 0.010 | - | |
| | | Minor Storm | Major Storn | n |
| 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) | _ | | 2 | |
| | | | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | r | Minor Storm | Major Storn | |
| Nater 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)) Nater Depth at Gutter Flowline | a = d = | 0.63 | 0.63 | inches inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | u = T _X = | 15.2 | 15.2 | ft |
| Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7) | $E_0 = 1$ | 0.149 | 0.149 | '' |
| Discharge outside the Gutter Section W, carried in Section T_X | $Q_{x} =$ | 13.2 | 13.2 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_{W} = $ | 2.3 | 2.3 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 0.0 | Cfs |
| Maximum Flow Based On Allowable Spread | $\mathbf{Q}_{\mathrm{T}} =$ | 15.5 | 15.5 | cfs |
| Flow Velocity within the Gutter Section | v = | 1.4 | 1.4 | fps |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.5 | 0.5 | |
| | - | | | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | - | Minor Storm | Major Storn | |
| 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} = | 12.2 | 71.4 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | Q _X = | 12.2 | 61.9 | cfs |
| Discharge within the Gutter Section W ($Q_d - Q_x$) | Qw = | 2.2 | 6.1 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 1.3 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | 14.4 | 69.4 | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 1.4 | 2.1 | fps |
| /*d Product: Flow Velocity Times Gutter Flowline Depth Flowe-Based Depth Safety Reduction Factor for Major & Minor ($d > 6$ ") Storm | V*d = R = | 0.5 | 1.3 | |
| Slope-Based Depth Safety Reduction Factor for Major & Minor ($d \ge 6$ ") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) | | 1.00 14.4 | 0.56 38.8 | cfs |
| Nax Flow Based on Allowable Depth (Safety Factor Applied) Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | $\mathbf{Q}_{d} =$ | | | crs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) Resultant Flow Depth at Street Crown (Safety Factor Applied) | d = d _{CROWN} = | 4.36 | 6.15 1.68 | inches |
| | CROWN - | 0.00 | 1.00 | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | n |
| | | | | |



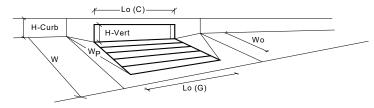
| Decian Information (Input) | | MINOR | MAJOR | |
|---|------------------------------|-----------|--------------|----------|
| Design Information (Input) CDOT Type R Curb Opening Type of Inlet Image: Contract of the second sec | Type = | | Curb Opening | - |
| Local Depression (additional to continuous gutter depression 'a') | ·· • | 3.0 | 3.0 | linches |
| | a _{LOCAL} = No = | 3 | 3 | |
| Total Number of Units in the Inlet (Grate or Curb Opening) Length of a Single Unit Inlet (Grate or Curb Opening) | | 5.00 | 5.00 | ft |
| | $L_0 =$ | | 5.00 N/A | - 1 |
| Width of a Unit Grate (cannot be greater than W, Gutter Width) | W _o = | 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' | о Г | MINOR | MAJOR | ٦. ا |
| Design Discharge for Half of Street (from <i>Inlet Management</i>) | $Q_0 =$ | 9.5 | 22.1 | cfs |
| Water Spread Width | T = | 13.3 | 16.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 3.8 | 5.0 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.6 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o =$ | 0.181 | 0.130 | _ |
| Discharge outside the Gutter Section W, carried in Section T_x | Q _x = | 7.8 | 19.3 | cfs |
| Discharge within the Gutter Section W | Q _w = | 1.7 | 2.9 | cfs |
| Discharge Behind the Curb Face | Q _{BACK} = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | A _W = | 0.23 | 0.32 | sq ft |
| Velocity within the Gutter Section W | V _w = | 7.3 | 9.0 | fps |
| 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 | N/A | 1 |
| 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 | -1. I |
| Interception Rate of Side Flow | R _x = | N/A | N/A | 1 |
| 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 | ן ר |
| 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 | -1'25 |
| 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) | $Q_a = Q_b =$ | N/A | N/A | cfs |
| Curb or Slotted Inlet Opening Analysis (Calculated) | Q b = 1 | MINOR | MAJOR | |
| Equivalent Slope S_{e} (based on grate carry-over) | S _e = | 0.086 | 0.067 | ∃ft/ft |
| Required Length L_{T} to Have 100% Interception | | 20.35 | 35.08 | ft ft |
| Under No-Clogging Condition | $L_T = [$ | MINOR | MAJOR | _"` |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L _T) | L =[| 15.00 | 15.00 | ∃ft |
| | | 8.6 | 15.00 | cfs |
| Interception Capacity | $Q_i = [$ | MINOR | MAJOR | Jus |
| Under Clogging Condition | CurbCoef = | | | ר I |
| Clogging Coefficient | - | 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 = | 8.6 | 13.8 | cfs |
| $Carry-Over Flow = Q_{h(GRATE)} - Q_a$ | Q _b = | 0.9 | 8.3 | cfs |
| <u>Summary</u> | - T | MINOR | MAJOR | ا ۔ |
| Total Inlet Interception Capacity | Q = | 8.6 | 13.8 | cfs |
| | | | | |
| Total Inlet Carry-Over Flow (flow bypassing inlet) Capture Percentage = Q_a/Q_a = | Q _b = C% = | 0.9 90 | 8.3 63 | cfs % |

| ALLOWABLE CAPACITY FOR ONE-HALF C (Based on Regulated Criteria for Maximum All | | | | Joi 3001 |
|--|--|----------------|-------------|------------------|
| Grandview Reserve | owable now | Deptil and Spi | eauj | |
| Basin E-2 (DP 28) | | | | |
| - TBACK - TCROWN - | | | | |
| T, Taxx | | | | |
| Suck W T, | | | | |
| STREET | | | | |
| | | | | |
| I I Sal | | | | |
| | | | | |
| Gutter Geometry: | F | 7 5 | ٦ | |
| Maximum Allowable Width for Spread Behind Curb Side Slope Behind Curb (leave blank for no conveyance credit behind curb) | T _{BACK} = | 7.5 | ft ft/ft | |
| Manning's Roughness Behind Curb (typically between 0.012 and 0.020) | S _{BACK} = n _{BACK} = | 0.020 | | |
| | 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 = | 0.035 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{\text{STREET}} = $ | 0.016 | 1 | |
| | | Minor Storm | Major Storn | . |
| 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) | | Π | 7 | |
| | | A 1 | | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | - | Minor Storm | Major Storn | |
| Water Depth without Gutter Depression (Eq. ST-2) | y = | 3.84 | 3.84 | inches |
| /ertical Depth between Gutter Lip and Gutter Flowline (usually 2") | d _C = a = | 0.8 | 0.8 | inches |
| Gutter Depression (d _c - (W * S _x * 12)) Nater Depth at Gutter Flowline | a = d = | 0.63 | 0.63 | inches inches |
| Allowable Spread for Discharge outside the Gutter Section W (T - W) | u = 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 = | 13.6 | 13.6 | cfs |
| Discharge within the Gutter Section W ($Q_T - Q_X$) | $Q_W =$ | 2.4 | 2.4 | 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 = | 16.0 | 16.0 | cfs |
| Flow Velocity within the Gutter Section | V = | 1.5 | 1.5 | fps |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.5 | 0.5 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storn | n |
| Theoretical Water Spread | Т _{тн} = [| 15.6 | 29.4 | ft |
| Theoretical Spread for Discharge outside the Gutter Section W (T - W) | т _{х тн} = | 19.0 | 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 _{х тн} = | 12.6 | 73.5 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | Q _X = | 12.6 | 63.8 | cfs |
| Discharge within the Gutter Section W (Q_d - Q_X) | Q _w = | 2.3 | 6.3 | cfs |
| Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns) | Q _{BACK} = | 0.0 | 1.4 | cfs |
| Total Discharge for Major & Minor Storm (Pre-Safety Factor) | Q = | 14.8 | 71.4 | cfs |
| Average Flow Velocity Within the Gutter Section | V = | 1.4 | 2.2 | fps |
| /*d Product: Flow Velocity Times Gutter Flowline Depth | V*d = | 0.5 | 1.4 | _ |
| Slope-Based Depth Safety Reduction Factor for Major & Minor (d \geq 6") Storm Max Flow Based on Allowable Depth (Safety Factor Applied) | R = Q d = | 1.00 14.8 | 0.53 38.1 | cfs |
| Resultant Flow Depth at Gutter Flowline (Safety Factor Applied) | Q _d = d = | 4.36 | 6.04 | inches |
| Resultant Flow Depth at Street Crown (Safety Factor Applied) | d _{CROWN} = | 0.00 | 1.57 | inches |
| | -ckowin - | 0.00 | 1.57 | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storn | 1 |
| MAJOR STORM Allowable Capacity is based on Depth Criterion | Q _{allow} = | 14.8 | 38.1 | cfs |



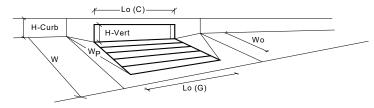
| Design Information (Input) | | MINOR | MAJOR | |
|---|--------------------------------------|---------|--------------|------------------|
| Type of Inlet | Type = | | Curb Opening | |
| Local Depression (additional to continuous gutter depression 'a') | a _{LOCAL} = | 3.0 | 3.0 | inches |
| Total Number 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 | |
| | $C_{f}-G =$ | N/A | N/A N/A | - ^{III} |
| 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 -C = | 0.10 | 0.10 | |
| Street Hydraulics: OK - Q < Allowable Street Capacity' | 0 | MINOR | MAJOR | ٦, |
| 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) | d = | 3.9 | 5.1 | inches |
| Water Depth at Street Crown (or at T _{MAX}) | d _{CROWN} = | 0.0 | 0.6 | inches |
| Ratio of Gutter Flow to Design Flow | E _o = | 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 ft |
| Velocity within the Gutter Section W | V _w = | 7.6 | 9.3 | fps |
| Water Depth for Design Condition | d _{LOCAL} = | 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 | N/A | 7 |
| Under No-Clogging Condition | | MINOR | MAJOR | _ |
| Minimum Velocity Where Grate Splash-Over Begins | V ₀ = | 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 |
| Under Clogging Condition | ~ I | MINOR | MAJOR | |
| Clogging Coefficient for Multiple-unit Grate Inlet | 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 | | N/A | N/A N/A | - _{ft} |
| Minimum Velocity Where Grate Splash-Over Begins | V _o = | N/A | N/A N/A | fps |
| Interception Rate of Frontal Flow | v _o – R _f = | N/A | N/A N/A | |
| Interception Rate of Side Flow | $R_f = R_x = 1$ | 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 | <u>N/A</u> | 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 = [| 21.17 | 36.56 | _ft |
| Under No-Clogging Condition | , | MINOR | MAJOR | ٦. |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T) | L = | 15.00 | 15.00 | ft |
| Interception Capacity | Q _i = | 9.0 | 14.5 | 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 | Q _a = | 8.9 | 14.3 | cfs |
| Carry-Over Flow = $Q_{b(GRATE)}$ - Q_a | $Q_{\rm b} =$ | 1.2 | 9.3 | cfs |
| Summary | | 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 | cfs |
| Capture Percentage = Q_a/Q_c = | C% = | 88 | 61 | - % |
| 3.0 3.0 | 2,10 | | | |

| (Based on Regulated Criteria for Maximum Allo | wable Flow | Depth and Spi | read) | |
|--|--|----------------|-------------|----------|
| Grandview Reserve | | Deptil and Opi | cuu) | |
| Basin E-3 (DP 29) | | | | |
| - Твиск - Тсязим - | | | | |
| T, T _{MAX} | | | | |
| SBACK W Tu | | | | |
| STREET | | | | |
| # > Q. Q. STREET CROWN | | | | |
| 2 P + | | | | |
| | | | | |
| 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 | 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 | 1 | |
| | | Minor Storm | Major Storm | |
| Max. Allowable Spread for Minor & Major Storm | т _Г | 16.0 | 16.0 | l Tft |
| Max. Allowable Depth at Gutter Flowline for Minor & Major Storm | T _{MAX} = d _{MAX} = | 4.4 | 7.7 | inches |
| Check boxes are not applicable in SUMP conditions | GMAX - L | | | |
| | | 6 | , | |
| Maximum Capacity for 1/2 Street based On Allowable Spread | _ | Minor Storm | Major Storm | 1 |
| 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 | \dashv |
| 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) Maximum Flow Based On Allowable Spread | Q _{BACK} = | 0.0 | 0.0 | cfs |
| • | Q _T = V = | SUMP | SUMP | cfs |
| Flow Velocity within the Gutter Section V*d Product: Flow Velocity times Gutter Flowline Depth | V = V*d = | 0.0 | 0.0 | fps |
| v a riodaci. How velocity limes dutter flowline Depth | v·u =[| 0.0 | 0.0 | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | | Minor Storm | Major Storm | ı |
| 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_{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 |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | Minor Storm | Major Storm | |
| | | | | |



| | cDOT Type R Curb Opening | | MINOR | MAJOR | - |
|---------------------------------|--|---|---------------------|--------------|---------------|
| | pe of Inlet | Type = | | Curb Opening | 4 |
| | cal Depression (additional to continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| | mber of Unit Inlets (Grate or Curb Opening) | No = | 4 | 4 | |
| | ater Depth at Flowline (outside of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| | ate Information | - | MINOR | MAJOR | Verride Deptr |
| | ngth of a Unit Grate | $L_{o}(G) =$ | N/A | N/A | feet |
| | dth of a Unit Grate | W _o = | N/A | N/A | feet |
| | ea Opening Ratio for a Grate (typical values 0.15-0.90) | A _{ratio} = | N/A | N/A | |
| Clo | ogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_{f}(G) =$ | N/A | N/A | |
| Gra | ate Weir Coefficient (typical value 2.15 - 3.60) | C _w (G) = | N/A | N/A | 7 |
| Gra | ate Orifice Coefficient (typical value 0.60 - 0.80) | $C_{o}(G) =$ | N/A | N/A | 7 |
| Cur | rb Opening Information | | MINOR | MAJOR | - |
| Len | ngth of a Unit Curb Opening | $L_{0}(C) = [$ | 5.00 | 5.00 | feet |
| | ight of Vertical Curb Opening in Inches | H _{vert} = | 6.00 | 6.00 | inches |
| | ight of Curb Orifice Throat in Inches | H _{throat} = | 6.00 | 6.00 | inches |
| | gle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| | le Width for Depression Pan (typically the gutter width of 2 feet) | $W_p =$ | 2.00 | 2.00 | feet |
| | baging Factor for a Single Curb Opening (typical value 0.10) | | 0.10 | 0.10 | |
| | | $C_{f}(C) =$ | | | - |
| | rb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w(C) =$ | 3.60 | 3.60 | 4 |
| | rb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_{o}(C) =$ | 0.67 | 0.67 | |
| | ate Flow Analysis (Calculated) | - | MINOR | MAJOR | - |
| | ogging Coefficient for Multiple Units | Coef = | N/A | N/A | 4 |
| | ogging Factor for Multiple Units | Clog = | N/A | N/A | |
| | ate Capacity as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | _ |
| | rerception without Clogging | Q _{wi} = | N/A | N/A | cfs |
| Inte | erception with Clogging | Q _{wa} = | N/A | N/A | cfs |
| Gra | ate Capacity as a Orifice (based on Modified HEC22 Method) | · - | MINOR | MAJOR | - |
| Inte | rerception without Clogging | Q _{oi} = | N/A | N/A | cfs |
| | erception with Clogging | Q _{oa} = | N/A | N/A | lcfs |
| | ate Capacity as Mixed Flow | -coa L | MINOR | MAJOR | |
| | erception without Clogging | Q _{mi} = | N/A | N/A | lcfs |
| | reception with Clogging | $Q_{ma} = $ | N/A | N/A | lcfs |
| | | Q _{ma} = | N/A | N/A N/A | |
| Res Cu | sulting Grate Capacity (assumes clogged condition) Irb Opening Flow Analysis (Calculated) | CGrate - | MINOR | MAJOR | |
| | | с f. Г | | | 7 |
| | ogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | - |
| | ogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| | rb Opening as a Weir (based on Modified HEC22 Method) | | MINOR | MAJOR | ٦. |
| | terception without Clogging | Q _{wi} = | 10.0 | 35.4 | cfs |
| | erception with Clogging | Q _{wa} = | 9.7 | 34.3 | cfs |
| | rb Opening as an Orifice (based on Modified HEC22 Method) | _ | MINOR | MAJOR | _ |
| Inte | erception without Clogging | Q _{oi} = | 33.6 | 43.9 | cfs |
| Inte | erception with Clogging | Q _{oa} = | 32.5 | 42.4 | cfs |
| | rb Opening Capacity as Mixed Flow | | MINOR | MAJOR | _ |
| | rerception without Clogging | Q _{mi} = | 17.0 | 36.7 | cfs |
| | reception with Clogging | Q _{ma} = | 16.5 | 35.5 | |
| | sulting Curb Opening Capacity (assumes clogged condition) | Q _{Curb} = | 9.7 | 34.3 | cfs |
| | esultant Street Conditions | ccarb | MINOR | MAJOR | 1 - |
| | tal Inlet Length | L = [| 20.00 | 20.00 | feet |
| | sultant Street Flow Spread (based on street geometry from above) | L = _ T = [| 15.6 | 20.00 | ft.>T-Crown |
| | sultant Flow Depth at Street Crown | - | 0.0 | 3.2 | inches |
| Res | Suitant Flow Deput at Street Crown | d _{CROWN} = | 0.0 | 3.2 | |
| | un lies d Deufermannen De duetien (Col., L. L. 1) | | | | |
| | w Head Performance Reduction (Calculated) | | MINOR | MAJOR | ٦. |
| | pth for Grate Midwidth | d _{Grate} = | N/A | N/A | ft |
| Dep | | - h | 0.29 | 0.57 | ft |
| Dep | pth for Curb Opening Weir Equation | d _{Curb} = | | | |
| Dep Dep | | $u_{Curb} =$ RF _{Combination} = | 0.41 | 0.72 | |
| Dep Dep Cor | pth for Curb Opening Weir Equation | | | 0.72 0.88 | - |
| Dep Dep Con Cur | , pth for Curb Opening Weir Equation mbination Inlet Performance Reduction Factor for Long Inlets | RF _{Combination} = RF _{Curb} = | 0.41 | | - |
| Dep Dep Con Cur | , pth for Curb Opening Weir Equation mbination Inlet Performance Reduction Factor for Long Inlets rb Opening Performance Reduction Factor for Long Inlets | RF _{Combination} = | 0.41 0.67 | 0.88 | |
| Dep Dep Con Cur | , pth for Curb Opening Weir Equation mbination Inlet Performance Reduction Factor for Long Inlets rb Opening Performance Reduction Factor for Long Inlets | RF _{Combination} = RF _{Curb} = | 0.41 0.67 N/A | 0.88 N/A | |
| Dep Dep Con Cur Gra | , pth for Curb Opening Weir Equation mbination Inlet Performance Reduction Factor for Long Inlets rb Opening Performance Reduction Factor for Long Inlets | RF _{Combination} = RF _{Curb} = | 0.41 0.67 | 0.88 | |

| (Based on Regulated Criteria for Maximum Alle | | | | jor Stor |
|--|--|--------------|--------------|--------------|
| Grandview Reserve | | | - | |
| Basin E-4 (DP 30) | | | | |
| | | | | |
| SEACK W I Tr | | | | |
| | | | | |
| STREET CROWN | | | | |
| The second secon | | | | |
| | | | | |
| | | | | |
| 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 | | |
| | HBACK - | 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 = | 0.000 | ft/ft | |
| Manning's Roughness for Street Section (typically between 0.012 and 0.020) | $n_{\text{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 |
| Check boxes are not applicable in SUMP conditions | -MAX L | | | |
| | | A | | |
| 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 |
| /ertical 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 Allowable Spread for Discharge outside the Gutter Section W (T - W) | d = T _X = | 4.47 | 4.47 | inches 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 | $Q_{\rm X} =$ | 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 |
| /*d Product: Flow Velocity times Gutter Flowline Depth | V*d = | 0.0 | 0.0 | |
| Varianum Canadin far 1/2 Church haard All | | Min en Ci | Maria Ci | |
| Maximum Capacity for 1/2 Street based on Allowable Depth | т_Г | Minor Storm | Major Storm | |
| Theoretical Water Spread Theoretical Spread for Discharge outside the Gutter Section W (T - W) | Т _{тн} = Т _{х тн} = | 15.6 14.7 | 29.4 28.6 | ft ft |
| Sutter 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} | с _о = Q _{х тн} = | 0.155 | 0.079 | cfs |
| Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN}) | $Q_X TH = Q_X = $ | 0.0 | 0.0 | |
| 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 | Major Storm | |
| MINOR STORM Allowable Capacity is based on Depth Criterion | | | | |



| Design Information (Input) | CDOT Type R Curb Opening | _ | MINOR | MAJOR | _ |
|------------------------------------|--|----------------------------------|-------------------|--------------|----------------|
| Type of Inlet | ,, , , , , , , , , , , , , , , , , , , | Type = | CDOT Type R | | - |
| | continuous gutter depression 'a' from above) | a _{local} = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or | Curb Opening) | No = | 4 | 4 | |
| Water Depth at Flowline (outsid | le of local depression) | Ponding Depth = | 4.4 | 7.7 | inches |
| Grate Information | | - | MINOR | MAJOR | Verride 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 Gra | | $C_f(G) =$ | N/A | N/A | - |
| Grate Weir Coefficient (typical) | | $C_{w}(G) = C_{w}(G) = C_{w}(G)$ | N/A | N/A | - |
| Grate Orifice Coefficient (typical | | $C_{0}(G) = C_{0}(G) = C_{0}(G)$ | N/A N/A | N/A | - |
| Curb Opening Information | 1 value 0.00 - 0.00) | C ₀ (G) = [| MINOR | , | _ |
| | | | | MAJOR | lfeet |
| Length of a Unit Curb Opening | | $L_{o}(C) =$ | 5.00 | 5.00 | |
| Height of Vertical Curb Opening | | H _{vert} = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat ir | | H _{throat} = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Fi | | Theta = | 63.40 | 63.40 | degrees |
| | (typically the gutter width of 2 feet) | W _p = | 2.00 | 2.00 | feet |
| | rb 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 | 7 |
| Curb Opening Orifice Coefficier | | C ₀ (C) = | 0.67 | 0.67 | 1 |
| Grate Flow Analysis (Calcula | | | MINOR | MAJOR | • |
| Clogging Coefficient for Multiple | | Coef = | N/A | N/A | 7 |
| Clogging Factor for Multiple Un | | Clog = | N/A N/A | N/A | - |
| | ised on Modified HEC22 Method) | clog = L | MINOR | MAJOR | |
| | ised on Modified TIEC22 Method | о Г | | | 7-6- |
| Interception without Clogging | | Q _{wi} = | N/A | N/A | cfs |
| Interception with Clogging | | Q _{wa} = | N/A | N/A | cfs |
| | based on Modified HEC22 Method) | _ | 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 | N | | MINOR | MAJOR | - |
| Interception without Clogging | _ | Q _{mi} = | N/A | N/A | lcfs |
| Interception with Clogging | | Q _{ma} = | N/A | N/A | cfs |
| Resulting Grate Capacity (assur | mes clogged condition) | Q _{Grate} = | N/A | N/A | cfs |
| Curb Opening Flow Analysis | (Calculated) | Coluce | MINOR | MAJOR | |
| Clogging Coefficient for Multiple | | Coef = | 1.33 | 1.33 | 7 |
| Clogging Factor for Multiple Un | | Clog = | 0.03 | 0.03 | - |
| | | ciug = L | | | _ |
| | sed on Modified HEC22 Method) | о Г | MINOR | MAJOR | 7-6- |
| Interception without Clogging | | Q _{wi} = | 10.0 | 35.4 | cfs |
| Interception with Clogging | | Q _{wa} = | 9.7 | 34.3 | cfs |
| | based on Modified HEC22 Method) | _ | MINOR | MAJOR | _ |
| Interception without Clogging | | Q _{oi} = | 33.6 | 43.9 | cfs |
| Interception with Clogging | | Q _{oa} = | 32.5 | 42.4 | cfs |
| Curb Opening Capacity as M | ixed Flow | | MINOR | MAJOR | - |
| Interception without Clogging | | Q _{mi} = | 17.0 | 36.7 | cfs |
| Interception with Clogging | | Q _{ma} = | 16.5 | 35.5 | lcfs |
| Resulting Curb Opening Capacit | a (assumes clogged condition) | Q _{ma} = | 9.7 | 34.3 | cfs |
| Resultant Street Conditions | y (assumes clogged condition) | Curb - | MINOR | MAJOR | |
| | | . г | | | 76 |
| Total Inlet Length | | L = | 20.00 | 20.00 | feet |
| | 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 Redu | uction (Calculated) | | MINOR | MAJOR | _ |
| Depth for Grate Midwidth | | d _{Grate} = | N/A | N/A | ft |
| Depth for Curb Opening Weir E | quation | d _{Curb} = | 0.29 | 0.57 | ft |
| | Reduction Factor for Long Inlets | RF _{Combination} = | 0.41 | 0.72 | 1 |
| Curb Opening Performance Rec | | RF _{Curb} = | 0.67 | 0.88 | 4 |
| Grated Inlet Performance Redu | | | N/A | 0.88 N/A | 4 |
| Grateu Iniel Performance Redu | CUONT ACTOR TOT LONG THEIS | RF _{Grate} = | IN/A | IN/A | 4 |
| | | | MINOD | MAJOD | |
| | | | MINOR | MAJOR | 7. |
| ITotal Inlet Interception Capacit | y (assumes clogged condition) | Q_a = | 9.7 9.0 | 34.3 21.0 | cfs cfs |
| | Minor and Major Storms(>Q PEAK) | $Q_{PEAK REQUIRED} =$ | | | |

| | Worksheet for | Basin D | -7 Swale |
|-----------------------|-----------------|----------|-----------------|
| Project Description | | | |
| Friction Method | Manning Formula | | |
| Solve For | Normal Depth | | |
| Input Data | | | |
| Roughness Coefficient | | 0.035 | |
| Channel Slope | | 0.02000 | ft/ft |
| Left Side Slope | | 3.00 | ft/ft (H:V) |
| Right Side Slope | | 3.00 | ft/ft (H:V) |
| Bottom Width | | 1.00 | ft |
| Discharge | | 7.30 | ft³/s |
| | | | |
| Results | | | |
| Normal Depth | | 0.71 | ft |
| Flow Area | | 2.22 | ft ² |
| Wetted Perimeter | | 5.49 | ft |
| Hydraulic Radius | | 0.40 | ft |
| Top Width | | 5.26 | ft |
| Critical Depth | | 0.67 | ft |
| Critical Slope | | 0.02558 | ft/ft |
| Velocity | | 3.28 | ft/s |
| Velocity Head | | 0.17 | ft |
| Specific Energy | | 0.88 | ft |
| Froude Number | | 0.89 | |
| Flow Type | Subcritical | | |
| GVF Input Data | | | |
| Downstream Depth | | 0.00 | ft |
| Length | | 0.00 | ft |
| Number Of Steps | | 0 | |
| GVF Output Data | | | |
| Upstream Depth | | 0.00 | ft |
| Profile Description | | | |
| Profile Headloss | | 0.00 | ft |
| Downstream Velocity | | Infinity | ft/s |
| Upstream Velocity | | Infinity | ft/s |
| Normal Depth | | 0.71 | ft |
| Critical Depth | | 0.67 | ft |
| Channel Slope | | 0.02000 | ft/ft |
| - | | | |

Worksheet for Basin D-7 Swale

 Bentley Systems, Inc.
 Haestad Methods Sol External Operations
 External Operation
 External Operation<

3/3/2022 9:26:29 AM

Worksheet for Basin D-7 Swale

GVF Output Data

Critical Slope

0.02558 ft/ft

3/3/2022 9:26:29 AM

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APPENDIX E 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 | 4.21 | 65 |
| A-2b | 2.75 | 88 |
| A-3 | 0.36 | 100 |
| A-4a | 6.05 | 65 |
| A-4b | 3.81 | 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 | 35.45 | 64.3 |

Pond B

| Basin | Area | % Imp |
|-------|-------|-------|
| B-1 | 3.33 | 65 |
| B-2 | 4.51 | 65 |
| B-3 | 4.05 | 65 |
| B-4 | 1.35 | 78.2 |
| 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 | 28.28 | 63.2 |

| Pon | d | C |
|-------|---|---|
| 1 011 | u | C |

| Basin | Area | % Imp |
|-------|-------|-------|
| C-1 | 4.12 | 65 |
| C-2 | 2.71 | 65 |
| C-3 | 1.56 | 65 |
| C-4 | 2.47 | 65 |
| C-5 | 3.09 | 65 |
| C-6 | 2.10 | 65 |
| C-7 | 6.72 | 65 |
| C-8 | 5.11 | 65 |
| C-9a | 3.50 | 65 |
| C-9b | 3.69 | 65 |
| C-10 | 3.51 | 65 |
| C-11 | 0.46 | 65 |
| C-12 | 1.79 | 65 |
| C-13 | 2.37 | 2 |
| Total | 43.20 | 61.5 |

Pond D

| Basin | Area | % Imp |
|-------|-------|-------|
| D-1 | 2.98 | 65 |
| D-2 | 0.87 | 65 |
| D-3 | 3.66 | 65 |
| D-4 | 2.00 | 65 |
| D-5 | 1.53 | 35.7 |
| D-7 | 1.80 | 50.3 |
| Total | 12.84 | 59.4 |

Pond E

| Basin | Area | % Imp |
|-------|-------|-------|
| E-1 | 5.13 | 65 |
| E-2 | 5.42 | 65 |
| E-3 | 3.20 | 65 |
| E-4 | 6.28 | 65 |
| E-5 | 1.13 | 2 |
| Total | 21.16 | 61.6 |

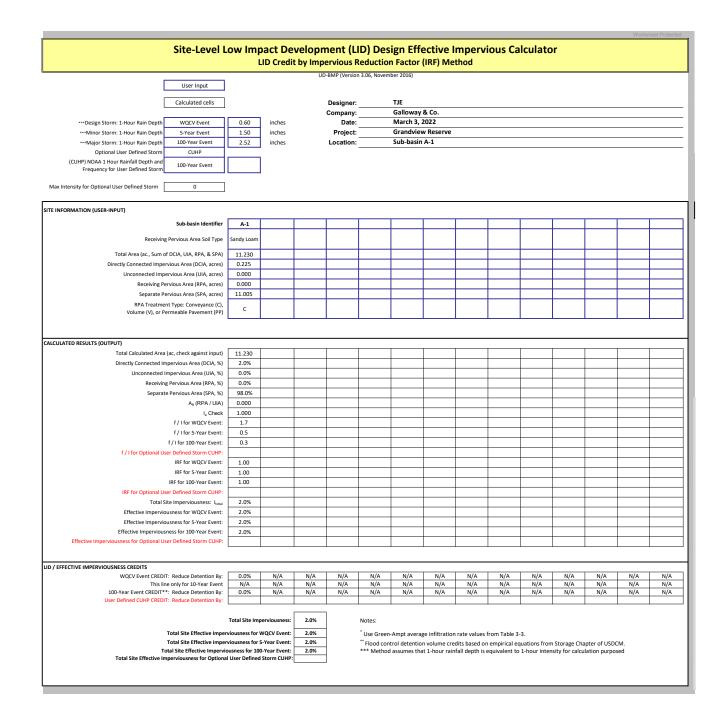
| Site | e-Level L | | | • | • | • | • | | • | ious Ca | Iculato | r | | | |
|---|----------------------------|---------------|----------------|----------------|---------------|----------------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|
| | | I | LID Credi | | | | | (IRF) Me | thod | | | | | | |
| | | | | UD | -BMP (Versior | n 3.06, Novem | ber 2016) | | | | | | | | |
| Us | er Input | | | | | | | | | | | | | | |
| Calcu | ulated cells | | | | Designer: | | TJE | | | | | | | | |
| | | | | | Company: | | Galloway | & Co. | | | | | | | |
| ***Design Storm: 1-Hour Rain Depth WQ | QCV Event | 0.60 | inches | | Date: | | March 3, 2 | 2022 | | | | | | | |
| ***Minor Storm: 1-Hour Rain Depth 5-Ye | ear Event | 1.50 | inches | | Project: | | Grandviev | we Reserve | | | | | | | |
| ***Major Storm: 1-Hour Rain Depth 100-1 | Year Event | 2.52 | inches | | Location: | | Pond A | | | | | | | | |
| Optional User Defined Storm | CUHP | | | | | | | | | | | | | | |
| (CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm | Year Event | | | | | | | | | | | | | | |
| Max Intensity for Optional User Defined Storm | 0 | | | | | | | | | | | | | | |
| TE INFORMATION (USER-INPUT) | | | | | | | | | | | | | | | |
| Sub-t | 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 | s 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 | |
| Total Area (ac., Sum of DCIA, UI | IA. RPA. & SPA1 | | 4.210 | 2.750 | 0.360 | 6.050 | 3.810 | 0.350 | 2,760 | 0.230 | 5,440 | 4.910 | 1.020 | 3.560 | |
| Directly Connected Impervious Are | | | 2.736 | 2.420 | 0.360 | 3.933 | 2.477 | 0.350 | 1.794 | 0.230 | 4.080 | 3.192 | 0.663 | 0.570 | |
| Unconnected Impervious Ar | | | 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 Ar | | | 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 Ar | rea (SPA, acres) | | 1.474 | 0.330 | 0.000 | 2.117 | 1.333 | 0.000 | 0.966 | 0.000 | 1.360 | 1.718 | 0.357 | 2.990 | |
| RPA Treatment Type: C Volume (V), or Permeable | | | с | с | с | с | с | с | с | с | с | с | с | с | |
| Total Calculated Area (ac, check Directly Connected Impervious | Area (DCIA, %) | | 4.210 65.0% | 2.750 88.0% | 0.360 | 6.050 65.0% | 3.810 65.0% | 0.350 | 2.760 65.0% | 0.230 | 5.440 75.0% | 4.910 65.0% | 1.020 65.0% | 3.560 16.0% | |
| Unconnected Imperviou | | | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | |
| Receiving Pervious | | | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | |
| Separate Pervious | ł | | 35.0% | 12.0% 0.000 | 0.0% | 35.0% | 35.0% | 0.0% | 35.0% | 0.0% | 25.0% | 35.0% | 35.0% | 84.0% | |
| | A _R (RPA / UIA) | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 0.000 | 1.000 | 1.000 | 0.000 | |
| f/Ifo | or WQCV Event: | | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.7 | 1.000 | 1.7 | |
| | or 5-Year Event: | | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | |
| | LOO-Year Event: | | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | |
| f / I for Optional User Define | d Storm CUHP: | | | | | | | | | | | | | | |
| IRF fo | or WQCV Event: | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| | or 5-Year Event: | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| | LOO-Year Event: | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| IRF for Optional User Define | | | 65.00/ | 00.00 | 400.05 | 65.001 | 65.00/ | 400.001 | 65.00 | 400.001 | 75.00/ | 65.00 | CT 001 | 45.000 | |
| Total Site Imperv | | | 65.0% 65.0% | 88.0% 88.0% | 100.0% | 65.0% | 65.0% 65.0% | 100.0% 100.0% | 65.0% 65.0% | 100.0% | 75.0% 75.0% | 65.0% 65.0% | 65.0% 65.0% | 16.0% | |
| Effective Imperviousness fo Effective Imperviousness fo | | | 65.0% | 88.0% 88.0% | 100.0% | 65.0% 65.0% | 65.0% | 100.0% | 65.0% 65.0% | 100.0% | 75.0% | 65.0% 65.0% | 65.0% | 16.0% | |
| Effective Imperviousness for 1 | ł | | 65.0% | 88.0% | 100.0% | 65.0% | 65.0% | 100.0% | 65.0% | 100.0% | 75.0% | 65.0% | 65.0% | 16.0% | |
| Effective Imperviousness for Optional User Define | | | 05.0% | 00.076 | 100.076 | 05.076 | 05.0% | 100.076 | 05.0% | 100.076 | 75.0% | 05.0% | 05.0% | 10.0% | |
| | | | | | | | | | | | | | | | |
| O / EFFECTIVE IMPERVIOUSNESS CREDITS WOCV Event CREDIT: Reduce | e 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 | r 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 User Defined CUHP CREDIT: Reduce | | 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 Im | perviousness: | 64.3% |] | Notes: | | | | | | | | | |
| Total Site | e Effective Imperv | iousness for | WQCV Event: | 64.3% | 1 | * Use Green | -Ampt average | ge infiltration | rate values | from Table ? | -3. | | | | |
| Total Site | | | | | 4 | | . unbr aveid | 5~ mmu au01 | are values | | J. | | | | |
| Total Site | e Effective Imperv | iousness for | 5-Year Event: | 64.3% | | Flood con | trol detentio | n volume cre | dits based or | n empirical eq | uations from | Storage Cha | apter of USD | CM. | |

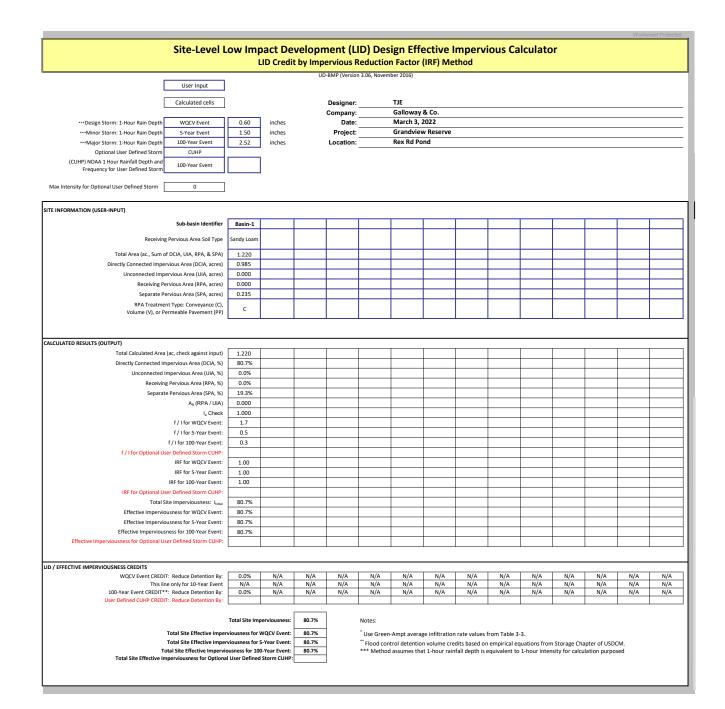
| Site-Level | | LID Credi | • | • | | • | | • | | | | | | |
|--|--|--|----------------------|---------------------|--------------------------------------|----------------|---|----------------|--|-------------|---------------|------------|------------|------|
| | | LID Creat | | | | | (IRF) We | τησα | | | | | | |
| User Input | | | UD | -BMP (Versior | 1 3.06, Noverr | iber 2016) | | | | | | | | |
| Oser input | | | | | | | | | | | | | | |
| Calculated cells | | | | Designer: | | TJE | | | | | | | | |
| | | | | Company: | | Galloway | | | | | | | | |
| ***Design Storm: 1-Hour Rain Depth WQCV Event | 0.60 | inches | | Date: | | March 3, | | | | | | | | |
| ***Minor Storm: 1-Hour Rain Depth 5-Year Event | 1.50 | inches | | Project: | | Grandviev | w Reserve | | | | | | | |
| ***Major Storm: 1-Hour Rain Depth 100-Year Event Optional User Defined Storm CUHP | 2.52 | inches | | Location: | | Pond B | | | | | | | | |
| (CUHP) NOAA 1 Hour Bainfall Donth and | | 1 | | | | | | | | | | | | |
| Frequency for User Defined Storm | | | | | | | | | | | | | | |
| Aax Intensity for Optional User Defined Storm 0 | | | | | | | | | | | | | | |
| Aax Intensity for Optional User Defined Storm 0 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| EINFORMATION (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) | 3.330 | 4.510 | 4.050 | 1.350 | E 130 | 2.280 | 0.890 | 2 220 | 2.420 | 1.100 | | | | - |
| Directly Connected Impervious Area (DCIA, acres) | 2.165 | 2.932 | 2.633 | 1.350 | 5.120 3.328 | 1.482 | 0.890 | 3.230 2.100 | 1.573 | 0.022 | | | | |
| Unconnected Impervious Area (UCA, acres) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 | | | | |
| 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) | 1.166 | 1.579 | 1.418 | 0.294 | 1.792 | 0.798 | 0.312 | 1.131 | 0.847 | 1.078 | | | | |
| RPA Treatment Type: Conveyance (C), | c | с | с | с | с | с | с | с | с | с | | | | |
| Volume (V), or Permeable Pavement (PP) | Ĺ | Ľ | Ľ | Ľ | Ľ | Ľ | Ľ | Ľ | Ľ | Ĺ | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| CULATED RESULTS (OUTPUT) | | | | 1 | | | 1 | | | | | | 1 | - |
| Total Calculated Area (ac, check against input) | 3.330 | 4.510 | 4.050 | 1.350 | 5.120 | 2.280 | 0.890 | 3.230 | 2.420 | 1.100 | | | | |
| Directly Connected Impervious Area (DCIA, %) | 65.0% | 65.0% | 65.0% | 78.2% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 2.0% | | | | |
| Unconnected Impervious Area (UIA, %) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | | | | |
| Receiving Pervious Area (RPA, %) Separate Pervious Area (SPA, %) | 35.0% | 35.0% | 35.0% | 21.8% | 35.0% | 35.0% | 35.0% | 35.0% | 35.0% | 98.0% | | | | |
| Separate Pervious Area (SPA, %) A _R (RPA / UIA) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | - |
| A _R (KFA / UA) | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | | | |
| f/I for WQCV Event: | 1.7 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | | | |
| 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 | | | | |
| 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 | | | | |
| 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: | | | | | | | | | | | | | 1 | |
| Total Site Imperviousness: Itotal | 65.0% | 65.0% | 65.0% | 78.2% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 2.0% | | ļ | | - |
| Effective Imperviousness for WQCV Event: | 65.0% | 65.0% | 65.0% | 78.2% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 2.0% | | | | |
| Effective Imperviousness for 5-Year Event: Effective Imperviousness for 100-Year Event: | 65.0% 65.0% | 65.0% 65.0% | 65.0% 65.0% | 78.2% | 65.0% 65.0% | 65.0% 65.0% | 65.0% | 65.0% 65.0% | 65.0% 65.0% | 2.0% | | | | |
| | 65.0% | 65.0% | 65.0% | /8.2% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 2.0% | | | | |
| Effective Imperviousness for Ontional User Defined Storm CUHP | L | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | 1 | |
| Effective Imperviousness for Optional User Defined Storm CUHP: | | | | | | | | | | | | | | |
| | | | | 1 | | | | | | | | | | |
| / EFFECTIVE IMPERVIOUSNESS CREDITS | 0.771 | 0.55 | 0.711 | | 0.0% | 0.0% | 0.0% N/A | 0.0% N/A | 0.0% N/A | 0.0% N/A | N/A N/A | N/A N/A | N/A N/A | N// |
| / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: | 0.0% | 0.0% | 0.0% | 0.0% | | | | | | | | | | N// |
| / EFFECTIVE IMPERVIOUSNESS CREDITS | 0.0% N/A 0.0% | 0.0% N/A 0.0% | 0.0% N/A 0.0% | 0.0% N/A 0.0% | N/A 0.0% | N/A 0.0% | 0.0% | 0.0% | 0.0% | -364.4% | N/A | N/A | N/A | 11// |
| / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: This line only for 10-Year Event | N/A | N/A | N/A | N/A | N/A | | | | | | N/A | | N/A | IN/F |
| / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: This line only for 10-Year Event 100-Year Event CREDIT**: Reduce Detention By: | N/A 0.0% | N/A 0.0% | N/A 0.0% | N/A | N/A | | | | | | N/A | | N/A | |
| / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: This line only for 10-Year Event 100-Year Event CREDIT**: Reduce Detention By: | N/A 0.0% | N/A | N/A | N/A | N/A | | | | | | N/A | | N/A | N// |
| / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: This line only for 10-Year Event 100-Year Event CREDIT**: Reduce Detention By: | N/A 0.0% Total Site Im | N/A 0.0% | N/A 0.0% | N/A | N/A 0.0% Notes: | | 0.0% | 0.0% | 0.0% | -364.4% | N/A | | N/A | |
| / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: This line only for 10-Year Event 100-Year Event CREDIT**: Reduce Detention By: User Defined CUHP CREDIT: Reduce Detention By: | N/A 0.0% Total Site Im rviousness for | N/A 0.0% perviousness: WQCV Event: 5-Year Event: | N/A 0.0% 63.2% | N/A | N/A 0.0% Notes: * Use Green | 0.0% | 0.0% ge infiltration n volume cre | 0.0% | 0.0% from Table 3 n empirical ee | -364.4% | n Storage Cha | N/A | см. | |

| ÷. | ite-Level L | ow Im | hact De | velopn | nent (I I | D) Des | ign Fff | ective I | mnerv | ious Ca | Iculato | r | | | |
|--|--|---|--|---|--|--|--|--|---|--|--|--|---|--|--|
| | ILE-LEVEI L | | ID Credit | • | | • | • | | • | ious ca | iculato | " | | | |
| | | | ID Creun | | | | | | liiou | | | | | | |
| | Unerland | | | UD | -BMP (Versior | 1 3.06, Novem | ber 2016) | | | | | | | | |
| | User Input | | | | | | | | | | | | | | |
| Cal | lculated cells | | | | Designer: | | TJE | | | | | | | | |
| | | | | | Company: | | Galloway | | | | | | | | |
| ••••Design Storm: 1-Hour Rain Depth V | WQCV Event | 0.60 | inches | | Date: | | March 3, 2 | | | | | | | | |
| | 5-Year Event | 1.50 | inches | | Project: | | Grandviev | w Reserve | | | | | | | |
| | 00-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 | 00-Year Event | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Max Intensity for Optional User Defined Storm | 0 | | | | | | | | | | | | | | |
| TE INFORMATION (USER-INPUT) | | | | | | | | | | | | | | | |
| | ıb-basin Identifier | C-1 | C-2 | C-3 | C-4 | C-5 | C-6 | C-7 | C-8 | C-9a | C-9b | C-10 | C-11 | C-12 | C-13 |
| | | | | | | | | | | | | | | | |
| | ous 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 Lo |
| Total Area (ac., Sum of DCIA, | | 4.120 | 2.710 | 1.560 | 2.470 | 3.090 | 2.100 | 6.720 | 5.110 | 3.500 | 3.690 | 3.510 | 0.460 | 1.790 | 2.370 |
| Directly Connected Impervious A | | 2.678 | 1.762 | 1.014 | 1.606 | 2.009 | 1.365 | 4.368 | 3.322 | 2.275 | 2.399 | 2.282 | 0.299 | 1.164 | 0.047 |
| Unconnected Impervious | | 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 | | 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 | | 1.442 | 0.949 | 0.546 | 0.865 | 1.082 | 0.735 | 2.352 | 1.789 | 1.225 | 1.292 | 1.229 | 0.161 | 0.627 | 2.323 |
| RPA Treatment Type Volume (V), or Permeab | | c | с | с | с | с | с | с | c | с | с | с | с | с | с |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| ALCULATED RESULTS (OUTPUT) | | | | | | | | | | | 1 | | | | |
| Total Calculated Area (ac, ch | | 4.120 | 2.710 | 1.560 | 2.470 | 3.090 | 2.100 | 6.720 | 5.110 | 3.500 | 3.690 | 3.510 | 0.460 | 1.790 | 2.370 |
| Directly Connected Impervio | | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 65.0% | 2.0% |
| Unconnected Impervi | | 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% |
| | ous Area (RPA, %) | 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% |
| Separate Pervio | ious Area (SPA, %) A _R (RPA / UIA) | 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 |
| | I _a Check | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| f/1 | I for WQCV Event: | 1.7 | 1.000 | 1.7 | 1.7 | 1.7 | 1.000 | 1.7 | 1.000 | 1.000 | 1.000 | 1.000 | 1.7 | 1.000 | 1.7 |
| | 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 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | | | | | | | | | | | | | | |
| | or 100-Year Event: | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| | | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| f / I for f / I for Optional User Defi | | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 1.00 | 0.3 |
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| f / I fo f / L for Optional User Defi IRF IRF IRF for Optional User Defi Total Stie Imp Effective Imperviousness Effective Imperviousness Effective Imperviousness Effective Imperviousness for Optional User Defi D / EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Redi This Iline only. 100-Year Event CREDIT*: Redi User Defined CUHP CREDIT: Redi Total St | ined Storm CUHP: for WQCV Event: for 5-Year Event: ined Storm CUHP: hereit test soft of 5-Year Event: ined Storm CUHP: for VQCV Event: ined Storm CUHP: for 10-Year Event: for 10-Year Event: for 10-Year Event: for 10-Year Event: for 10-Year Event: Store Detention By: Use Detention By: Use Detention By: Site Effective Imperies Site Effective Imperies a Effective Imperies | 1.00 1.00 1.00 1.00 5.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% Total Site Important Site Construction of the second | 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% everviousness: WQCV Event: 5-Year Event: 0-Year Event: | 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 65.0% 65.0% 65.0% 65.0% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% Notes: * Use Green ** Flood con | 1.00 1.00 1.00 65.0% 65.0% 65.0% 0.0% N/A 0.0% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 0.0% N/A 0.0% 0.0% | 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 0.0% N/A 0.0% 1.00 0.0% | 1.00 1.00 65.0% 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 0.0% N/A 0.0% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.1% | 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.00 1.00 1.00 2.0% 2.0% 2.0% 2.0% 0.0% |

| | • | bact De | • | • | | • | | • | .545 Ca | iculatu | | | | |
|--|--|---|---|--|---|--|------------|------------|------------|-------------------|------------|------------|------------|-----|
| | | LID Credi | | | | | (IRF) Me | thod | | | | | | |
| | | | UD | -BMP (Versior | 3.06, Novem | ber 2016) | | | | | | | | |
| User Input | | | | | | | | | | | | | | |
| Calculated cells | | | | Designer: | | TJE | | | | | | | | |
| | | | | Company: | | Galloway | | | | | | | | |
| ***Design Storm: 1-Hour Rain Depth WQCV Event | 0.60 | inches | | Date: | | March 3, 2 | | | | | | | | |
| ***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 D | | | | | | | | |
| Optional User Defined Storm CUHP (CUHP) NOAA 1 Hour Rainfall Depth and 200 Year French | | 1 | | | | | | | | | | | | |
| Frequency for User Defined Storm | | | | | | | | | | | | | | |
| Max Intensity for Optional User Defined Storm 0 | | | | | | | | | | | | | | |
| E INFORMATION (USER-INPUT) | | | | | | | | | | | | | | |
| Sub-basin Identifier | D-1 | D-2 | D-3 | D-4 | D-5 | D-7 | | | | | | | | |
| Developed a contraction of the | | | | | | | | | | | | | | |
| Receiving Pervious Area Soil Type | Sandy Loam | Sandy Loam | Sandy Loam | Sandy Loam | Sandy Loam | Sandy Loam | | | | | | | | |
| Total Area (ac., Sum of DCIA, UIA, RPA, & SPA) | 2.980 | 0.870 | 3.660 | 2.000 | 1.530 | 1.800 | | | | | | | | |
| Directly Connected Impervious Area (DCIA, acres) | 1.937 | 0.566 | 2.379 | 1.300 | 0.546 | 0.905 | | | | | | | | |
| Unconnected Impervious Area (UIA, acres) | 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 | | | | | | | | |
| Separate Pervious Area (SPA, acres) | 1.043 | 0.305 | 1.281 | 0.700 | 0.984 | 0.895 | | | | | | | | |
| RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP) | с | С | с | с | с | С | | | | | | | | |
| LCULATED RESULTS (OUTPUT) Total Calculated Area (ac, check against input) Directly Connected Impervious Area (DCIA, %) | 2.980 65.0% | 0.870 | 3.660 65.0% | 2.000 65.0% | 1.530 35.7% | 1.800 50.3% | | | | | | | | |
| Unconnected Impervious Area (UIA, %) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | | | | | | | | |
| | | | | | | | | | | | | | | - |
| Receiving Pervious Area (RPA, %) | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | | | | | | | | |
| Separate Pervious Area (SPA, %) | 35.0% | 35.0% | 35.0% | 35.0% | 0.0% 64.3% | 0.0% 49.7% | | | | | | | | |
| Separate Pervious Area (SPA, %) A _R (RPA / UIA) | 35.0% 0.000 | 35.0% 0.000 | 35.0% 0.000 | 35.0% 0.000 | 0.0% 64.3% 0.000 | 0.0% 49.7% 0.000 | | | | | | | | |
| Separate Pervious Area (SPA, %) | 35.0% | 35.0% | 35.0% | 35.0% | 0.0% 64.3% | 0.0% 49.7% | | | | | | | | |
| Separate Pervious Area (SPA, %) A _R (RPA / UIA) I _a Check | 35.0% 0.000 1.000 | 35.0% 0.000 1.000 | 35.0% 0.000 1.000 | 35.0% 0.000 1.000 | 0.0% 64.3% 0.000 1.000 | 0.0% 49.7% 0.000 1.000 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _R (RPA / UIA) I ₂ Check f / I for WQCV Event: | 35.0% 0.000 1.000 1.7 | 35.0% 0.000 1.000 1.7 | 35.0% 0.000 1.000 1.7 | 35.0% 0.000 1.000 1.7 | 0.0% 64.3% 0.000 1.000 1.7 | 0.0% 49.7% 0.000 1.000 1.7 | | | | | | | | |
| Separate Pervious Area (SPA, %) A ₆ (RPA / UIA) I ₆ Check f / I for WQCV Event: f / I for S-Year Event: f / I for 100-Year Event: f / I for 100-Year Event: f / I for Optional User Defined Storm CUHP: | 35.0% 0.000 1.000 1.7 0.5 0.3 | 35.0% 0.000 1.000 1.7 0.5 0.3 | 35.0% 0.000 1.000 1.7 0.5 0.3 | 35.0% 0.000 1.000 1.7 0.5 0.3 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UM) I _o Check f / I for WCV Event: f / I for 5-Year Event: f / I for 5-Year Event: f / I for Optional User Defined Storm CUHP: IRF for WQCV Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UA) I _e Obeck f / I for WCCV Event: f / I for S-Year Event: f / I for 30-Year Event: f / I for Optional User Defined Storm CUHP: IRF for WCCV Event: IRF for S-Year Event: IRF for S-Year Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UIA) I _e Check f / I for WQCV Event: f / I for 100-Year Event: f / I for 100-Year Event: IRF for WQCV Event: IRF for SVear Event: IRF for 100-Year Event: IRF for 100-Year Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UIA) I _e Check f / I for WQCV Event: f / I for S-Year Event: f / I for 100-Year Event: f / I for Optional User Defined Storm CUHP: IRF for S-Year Event: IRF for 100-Year Event: IRF for 100-Year Event: IRF for Optional User Defined Storm CUHP: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UIA) I _e Check f / I for WQCV Event: f / I for 100-Year Event: f / I for 100-Year Event: IRF for WQCV Event: IRF for SVear Event: IRF for 100-Year Event: IRF for 100-Year Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UM) I _o Check f / I for WCCV Event: f / I for S-Year Event: f / I for S-Year Event: f / I for OVCV Event: IRF for WCCV Event: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for Optional USE Pelined Storm CUHP: Total Site Imperviousness: I _{butal} | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UA) I _e Obeck f / I for WCCV Event: f / I for S-Year Event: f / I for S-Year Event: f / I for OD/Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for OD/Year Event: Total Site Imperviousness: I _{ugal} Effective Imperviousness: I _{ugal} | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 50.3% | | | | | | | | |
| Separate Pervious Area (SPA, %) A _e (RPA / UIA) I _e Check f / I for WQCV Event: f / I for S-Year Event: f / I for 100-Year Event: f / I for 100-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for Optional User Defined Storm CUHP: Total Site Imperviousness for WGCV Event: Effective Imperviousness for S-Year Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 35.7% 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 50.3% 50.3% | | | | | | | | |
| Separate Pervious Area (SPA, %) A ₄ (RPA / UA) I ₅ Check I ₇ / for WCCV Event: I ₇ / for S-Year Event: I ₇ / for OPtional User Defined Storm CUPP: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: Effective Imperviousness for S-Year Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 35.7% 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 50.3% 50.3% | | | | | | | | |
| Separate Pervious Area (SPA, %) A _u (RPA / UA) I _u Check // I for WCCV Event: // I for S-Year Event: // I for JOY-Var Event: // I for Optional User Defined Storm CUHP: IRF for JOY-Var Event: IRF for JOY-Var Event: IRF for JOY-Var Event: IRF for Dytomal User Defined Storm CUHP: Total Site Imperviousness for WQCV Event: Effective Imperviousness for 100-Year Event: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 35.7% 35.7% 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 50.3% 50.3% 50.3% | | | | | | | | |
| Separate Pervious Area (SPA, %) A _k (RPA / UA) I _k Orbeck I _k Check I _k Thor WCX Vexen: I _k Thor S-Year Event: I _k Thor Optional User Defined Storm CUHP: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: IRF for S-Year Event: Effective Imperviousness for S-Year Event: Effective Imperviousness for S-Year Event: IRF Interviousness for Optional User Defined Storm CUHP: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 35.7% 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 50.3% 50.3% | 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 | |
| Separate Pervious Area (SPA, %) A _k (RPA/UM) I _k Check I _k Chor VOLV Event: I _k Chor Svear Event: I _R For Svear Event: I _R For VQCV Event I _R For 100-Year Event: I _R For 100-Year Event: I _R For Optional User Defined Storm CUHP: Total Site Imperviousness for VQCV Event: Effective Imperviousness for 100-Year Event: Effective Imperviousness for Optional User Defined Storm CUHP: D/ EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 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% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 35.7% 35.7% 35.7% | 0.0% 49.7% 0.000 1.70 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 1.00 | | | | | | | | N/A |
| Separate Pervious Area (SPA, %) A _a (RPA / UA) A _a (RPA / UA) I _b Check (/ 1 for WOCV Event: f / 1 for S-Year Event: f / 1 for 200-Year Event: IRF for Optional User Defined Storm CUHP: IRF for S-Year Event: IRF for S-Year Event: IRF for Optional User Defined Storm CUHP: Total Site Imperviousness for S-Year Event: Effective Imperviousness for S-Year Event: Effective Imperviousness for S-Year Event: Effective Imperviousness for S-Year Event: Effective Imperviousness for JO-Year Event: DO-Year Event CREDIT: Reduce Detention By: This line only for JO-Year Event 100-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: This Imperviousness for JO-Year Event IDO-Year Event CREDIT: Reduce Detention By: IDO-Year Event CRE | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 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% 65.0% 65.0% N/A 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% 65.0% 0.0% N/A 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% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 35.7% 35.7% 35.7% 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 50.3% 50.3% 50.3% 50.3% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/. |
| Separate Pervious Area (SPA, %) A, (RPA / UA) I, Check // I for WOCV Event: // I for SYear Event: // I for JOY Vear Event: // I for OVOV Far Event: IRF for OVOV Event: IRF for OVVEAR Event: IRF for OVVEAR Event: IRF for OVVEAR Event: IRF for OVVEAR Event: Effective Imperviousness for SY-Bar Event: Effective Imperviousness for VOVVE Event: Ide Vove Interviousness for VOVVE Event: Ide Culty CREDIT: Reduce Detention By: User Defined CUHP CREDIT: Reduce Detention By: | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% N/A | 35.0% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% N/A | 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% 65.0% 65.0% | 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% 65.0% | 0.0% 64.3% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 1.00 35.7% 35.7% 35.7% 35.7% 35.7% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 50.3% 50.3% 50.3% 50.3% | N/A N/A | N/A N/A | N/A N/A | N/A N/A | N/A | N/A | N/A | N// |
| Separate Pervious Area (SPA, %) A _a (RPA / UA) A _a (RPA / UA) I _b Check (f / I for WCCV Event: f / I for S-Year Event: f / I for OPVear Event: IRF for OPVear Event: IRF for VCV Event: IRF for OPVear Event: IRF for OPVear Event: IRF for OPVear Event: IRF for OPVear Event: Effective Imperviousness for S-Year Event: Effective Imperviousness for JO-Year Event: Effective Imperviousness for JO-Year Event: Effective Imperviousness for JO-Year Event: Effective Imperviousness for Optional User Defined Storm CUHP: D/ EFFECTIVE IMPERVIOUSNESS CREDITS WQCV Event CREDIT: Reduce Detention By: Tis line on fy OU-Year Event 100-Year Event CREDIT**: Reduce Detention By: Tis line on fy OU-Year Event | 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% 65.0% 7.7 0.5 0.3 0.0% 0.0% 0.0% N/A 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% 65.0% 65.0% 65.0% 9 0.0% N/A 0.0% WQCV Event: | 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% 65.0% 0.0% N/A 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% 65.0% | 0.0% 64.3% 0.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 35.7% 35.7% 35.7% 35.7% 0.0% N/A 0.0% N/A 0.0% | 0.0% 49.7% 0.000 1.000 1.7 0.5 0.3 1.00 1.00 1.00 1.00 1.00 50.3% 50.3% 50.3% 50.3% | N/A N/A | N/A N/A | N/A N/A | N/A N/A -3. | N/A N/A | N/A N/A | N/A N/A | N// |

| | | • | | • | nent (L ervious F | • | • | | • | | | | | | |
|--|--|--|---|--|---|---|----------------------------|------------------------------|------------|---|------------|------------|------------|------------|-----|
| | | | LID Credi | | | | | | ethod | | | | | | |
| User Ing | t | | | UD | D-BMP (Version | n 3.06, Novem | ber 2016) | | | | | | | | |
| Osering | л | | | | | | | | | | | | | | |
| Calculated | cells | | | | Designer: | | TJE | | | | | | | | |
| | | | | | Company: | | Galloway | | | | | | | | |
| ***Design Storm: 1-Hour Rain Depth WQCV Ev | | 0.60 | inches | | Date: | | March 3, | | | | | | | | |
| ***Minor Storm: 1-Hour Rain Depth 5-Year Ev | | 1.50 | inches | | Project: | | Grandviev | v Reserve | | | | | | | |
| ••••Major Storm: 1-Hour Rain Depth 100-Year E Optional User Defined Storm CUHP | /ent | 2.52 | inches | | Location: | | Pond E | | | | | | | | |
| (CUHP) NOAA 1 Hour Painfall Donth and | | | 1 | | | | | | | | | | | | |
| Frequency for User Defined Storm | /ent | | | | | | | | | | | | | | |
| Max Intensity for Optional User Defined Storm 0 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| E INFORMATION (USER-INPUT) | | | | | | | | | | | | | | | |
| Sub-basin | dentifier | E-1 | E-2 | E-3 | E-4 | E-5 | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Receiving Pervious Area | Joil Type | Sandy Loam | Sandy Loam | Sandy Loam | Sandy Loam | Sandy Loam | | | | | | | | | |
| Total Area (ac., Sum of DCIA, UIA, RPA | ι, & SPA) | 5.130 | 5.420 | 3.200 | 6.280 | 1.130 | | | | | | | | | |
| Directly Connected Impervious Area (DC | ,, | 3.335 | 3.523 | 2.080 | 4.082 | 0.023 | | | | | | | | | |
| Unconnected Impervious Area (U | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| Receiving Pervious Area (RF | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| Separate Pervious Area (SF | | 1.796 | 1.897 | 1.120 | 2.198 | 1.107 | | | | | | | | | |
| RPA Treatment Type: Convey Volume (V), or Permeable Paver | | с | с | с | с | с | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| LCULATED RESULTS (OUTPUT) | | | | | | | | | | | | | | | |
| Total Calculated Area (ac, check again | st input) | 5.130 | 5.420 | 3.200 | 6.280 | 1.130 | | | | | | | | | |
| Directly Connected Impervious Area | DCIA, %) | 65.0% | 65.0% | 65.0% | 65.0% | 2.0% | | | | | | | | | |
| Unconnected Impervious Area | | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | | | | | | | | | |
| Receiving Pervious Area | | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | | | | | | | | | |
| Separate Pervious Area | | 35.0% | 35.0% | 35.0% | 35.0% | 98.0% | | | | | | | | | |
| A _R (R | PA / UIA) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| | Oharda | 1.000 | 1 000 | 1 000 | | 1 000 | | | | | | | | | |
| f / I for WO | I _a Check | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | | | | | | | | | |
| f / I for WQ f / I for 5-Ye | V Event: | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | | | | | | | | | |
| f / I for WQ f / I for 5-Ye f / I for 100-Ye | CV Event: ar Event: | | | | | | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye | CV Event: ar Event: ar Event: | 1.7 0.5 | 1.7 0.5 | 1.7 0.5 | 1.7 0.5 | 1.7 0.5 | | | | | | | | | |
| f / I for 5-Ye | CV Event: ar Event: ar Event: m CUHP: | 1.7 0.5 | 1.7 0.5 | 1.7 0.5 | 1.7 0.5 | 1.7 0.5 | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for Optional User Defined Stor | CV Event: ar Event: ar Event: m CUHP: CV Event: | 1.7 0.5 0.3 | 1.7 0.5 0.3 | 1.7 0.5 0.3 | 1.7 0.5 0.3 | 1.7 0.5 0.3 | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for Optional User Defined Stor IRF for WQt | EV Event: ar Event: ar Event: m CUHP: EV Event: ar Event: | 1.7 0.5 0.3 1.00 | 1.7 0.5 0.3 1.00 | 1.7 0.5 0.3 1.00 | 1.7 0.5 0.3 1.00 | 1.7 0.5 0.3 1.00 | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for Optional User Defined Stor IRF for VQu IRF for 5-Ye | EV Event: ar Event: ar Event: m CUHP: EV Event: ar Event: ar Event: | 1.7 0.5 0.3 1.00 1.00 | 1.7 0.5 0.3 1.00 1.00 | 1.7 0.5 0.3 1.00 1.00 | 1.7 0.5 0.3 1.00 1.00 | 1.7 0.5 0.3 1.00 1.00 | | | | | | | | | |
| f / I for 5-Ye f / I for 10-Ye f / I for Optional User Defined Stor IRF for WQi IRF for S-Ye IRF for 20-Ye IRF for Optional User Defined Stor Total Site Imperviousr | CV Event: ar Event: ar Event: m CUHP: CV Event: ar Event: ar Event: m CUHP: ess: I _{total} | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 2.0% | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for 100-Ye I f / I for Optional User Defined Stor I RF for Ye I RF for Ye I RF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for WQ | V Event: ar Event: ar Event: m CUHP: V Event: ar Event: ar Event: m CUHP: ess: I _{total} V Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for Optional User Defined Stor IRF for S-Ye IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for V/Qi Effective Imperviousness for 5-Ye | V Event: ar Event: ar CUHP: V Event: ar Event: ar Event: ar Event: ess: I _{total} V Event: ar Event: ar Event: ar Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for Optional User Defined Stor IRF for WQU IRF for 5-Ye IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for WQU Effective Imperviousness for 5-Ye Effective Imperviousness for 5-Ye | V Event: ar Event: ar Event: m CUHP: V Event: ar Event: ar Event: ar Event: ess: I _{total} V Event: ar Event: ar Event: ar Event: ar Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% | | | | | | | | | |
| f / I for 5-Ye f / I for 100-Ye f / I for Optional User Defined Stor IRF for S-Ye IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for V/Qi Effective Imperviousness for 5-Ye | V Event: ar Event: ar Event: m CUHP: V Event: ar Event: ar Event: ar Event: ess: I _{total} V Event: ar Event: ar Event: ar Event: ar Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% | | | | | | | | | |
| f / I for 5-Ye f / I for 10-Ye f / I for 10-Ye IRF for WQi IRF for WQi IRF for S-Ye IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for 5-Ye Effective Imperviousness for 10-Ye Effective Imperviousness for 10-Ye | V Event: ar Event: ar Event: m CUHP: V Event: ar Event: ar Event: ar Event: ess: I _{total} V Event: ar Event: ar Event: ar Event: ar Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% | | | | | | | | | |
| f / 1 for 5.ve f / 1 for 10.ve f / 1 for 10.ve f / 1 for Optional User Defined Stor IRF for WQU IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for 5 ve Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye | EV Event: ar Event: ar Event: m CUHP: EV Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: m CUHP: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 2.0% 2.0% 2.0% | | | | | | | | | |
| f / 1 for 5-Ye f / 1 for 100-Ye f / 1 for 100-Ye IRF for QDIonal User Defined Stor IRF for AVQi IRF for 3-Ye IRF for QDIonal User Defined Stor Total Site Impervious Effective Imperviousness for VOV Effective Imperviousness for 5-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for ODIONE Effective Imperviousness for ODIONE Effective Imperviousness for ODIONE Effective Imperviousness for ODIONE D / EFFECTIVE IMPERVIOUSNESS CREDITS WC/C VEVent CREDIT: Reduce Deter | EV Event: ar Eve | 1.7 0.5 0.3 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 5.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% 0.0% | N/A | N/A | | | | N/A | N/A | N/A N/A | |
| f / 1 for 5.ve f / 1 for 10.ve f / 1 for 100.ve f / 1 for Optional User Defined Stor IRF for WQU IRF for S.ve IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for 5.ve Effective Imperviousness for 10.ve Effective Imperviousness for 10.ve Effective Imperviousness for 5.ve Effective Imperviousness for 5.ve UQCV Event CREDIT: Reduce Dette This line only for 10.vr | EV Event: ar Event: ar Event: T Event: ar Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 2.0% 2.0% 2.0% 2.0% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N// |
| f / 1 for 5-Ye f / 1 for 100-Ye f / 1 for Optional User Defined Stor IRF for VQU IRF for S-Ye IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for VQU Effective Imperviousness for 5-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 100-Ye Effective Imperviousness for 2010-Ye Effective Imperviousness for 2010-Ye WC/V Event CREDIT: Reduce Dete | EV Event: ar Event: ar Event: W Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event thion By: the Event ar Event ar Event ar Event | 1.7 0.5 0.3 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 5.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% 0.0% | | | | | | | | | N// |
| f / 1 for 5.ve f / 1 for 10.ve f / 1 for 10.ve f / 1 for Optional User Defined Stor IRF for VQU IRF for 5.ve IRF for Optional User Defined Stor Total Ste Impervious Effective Imperviousness for 100-ve Effective Imperviousness for 200-ve Effective | EV Event: ar Event: ar Event: W Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event thion By: the Event ar Event ar Event ar Event | 1.7 0.5 0.3 1.00 1.00 65.0% 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% 2.0% 2.0% 2.0% 2.0% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N// |
| f / 1 for 5.ve f / 1 for 10.ve f / 1 for 10.ve f / 1 for Optional User Defined Stor IRF for VQU IRF for 5.ve IRF for Optional User Defined Stor Total Ste Impervious Effective Imperviousness for 100-ve Effective Imperviousness for 0.ptional User Defined Stor Ve Effective Imperviousness for Optional User Defined Stor Total Stor Ve Effective Imperviousness for Optional User Defined Stor Ve Effective Imperviousness for 0.ptional User Defined Stor Total Interviousness for 0.ptional User Defined Stor Ve Ffective Imperviousness for 0.ptional User Defined Stor Ve Ffective Imperviousness for 0.ptional User Defined Stor Ve Ffective Imperviousness for 0.ptional User Defined Stor | EV Event: ar Event: ar Event: W Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event: ar Event thion By: the Event ar Event ar Event ar Event | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 2.0% 2.0% 2.0% 2.0% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| f / 1 for 5.ve f / 1 for 10.ve f / 1 for Optional User Defined Star IRF for VQU IRF for S.ve IRF for Optional User Defined Star Total Site Impervious Effective Imperviousness for 50.ve Effective Imperviousness for 100.ve Effective Imperviousness for 100.ve D / EffectTVE IMPERVIOUSNESS CREDITS INGUE VEWENT CREDIT: Reduce Dete User Defined CUHP CREDIT: Reduce Dete User Defined CUHP CREDIT: Reduce Dete | V Event: ar Event: ar Event: ar Event: v Event: v Event: ar Event: ar Event: ar Event: v Event: ar E | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 0.0% N/A 0.0% Total Site Imy viousness for | 1.7 0.5 0.3 1.00 1.00 65.0% 65.0% 65.0% 0.0% N/A 0.0% Perviousness: WQCV Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% 61.6% 61.6% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% 2.0% 0.0% N/A -354.7% Notes: | N/A N/A -Ampt averaş | 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 | N/A |
| f / 1 for 5.ve f / 1 for 10.ve f / 1 for 0ptional User Defined Stor IRF for WQU IRF for S-Ve IRF for Optional User Defined Stor Total Site Impervious Effective Imperviousness for 50-Ve Effective Imperviousness for 10.ve Effective Imperviousness for 10.ve USCV Event CREDIT: Reduce Dete User Defined CUHP CREDIT: Reduce Dete | V Event: ar Event: to UHP: the ar Event: the ar Event: th | 1.7 0.5 0.3 1.00 1.00 1.00 5.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 0.0% N/A 0.0% N/A 0.0% Store Vent: 5-Year Event: | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% 65.0% 65.0% 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 1.00 65.0% 65.0% 65.0% | 1.7 0.5 0.3 1.00 1.00 2.0% 2.0% 2.0% 2.0% 2.0% 2.0% 2.0% 2 | N/A N/A -Ampt averag | N/A N/A ge infiltratio | N/A N/A | N/A N/A from Table 3 n empirical e | N/A N/A | N/A | N/A N/A | N/A N/A | N/A |





DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

| | Project: Grandview | - Pond A |
|------------------|--------------------------|---------------------|
| | Basin ID: | |
| 100-1701 | | |
| VOLUME EURY WOCY | | 100-YEAR |
| PERMANENT | ZONE 1 AND 2 ORIFICES | ORIFICE |
| | xample Zone Configurati | on (Retention Pond) |

Watershed Information

| tersneu miormation | | |
|---|------------|---------|
| Selected BMP Type = | EDB | |
| Watershed Area = | 35.45 | acres |
| Watershed Length = | 2,360 | ft |
| Watershed Length to Centroid = | 1,180 | ft |
| Watershed Slope = | 0.020 | ft/ft |
| Watershed Imperviousness = | 64.90% | 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.

| uic | embedded colorado orban nyaro | graphinoccua | 10. | Optional U |
|---------|-----------------------------------|--------------|-----------|------------|
| Water Q | uality Capture Volume (WQCV) = | 0.750 | acre-feet | |
| Exces | s Urban Runoff Volume (EURV) = | 2.854 | acre-feet | |
| 2-yr | Runoff Volume (P1 = 1.19 in.) = | 2.109 | acre-feet | 1.19 |
| 5-) | r Runoff Volume (P1 = 1.5 in.) = | 2.766 | acre-feet | 1.50 |
| 10-yr | Runoff Volume (P1 = 1.75 in.) = | 3.293 | acre-feet | 1.75 |
| 25 | 5-yr Runoff Volume (P1 = 2 in.) = | 3.982 | acre-feet | 2.00 |
| 50-yr | Runoff Volume (P1 = 2.25 in.) = | 4.658 | acre-feet | 2.25 |
| 100-yr | Runoff Volume (P1 = 2.52 in.) = | 5.480 | acre-feet | 2.52 |
| 500-yr | Runoff Volume (P1 = 3.68 in.) = | 8.908 | acre-feet | 3.68 |
| Appr | oximate 2-yr Detention Volume = | 1.856 | acre-feet | |
| Appr | oximate 5-yr Detention Volume = | 2.427 | acre-feet | |
| Appro | ximate 10-yr Detention Volume = | 2.926 | acre-feet | |
| Appro | ximate 25-yr Detention Volume = | 3.521 | acre-feet | |
| Appro | ximate 50-yr Detention Volume = | 3.880 | acre-feet | |
| Approx | imate 100-yr Detention Volume = | 4.254 | acre-feet | |
| | | | | |

Define Zones and Basin Geometry

| enne zones and basin deonied y | | |
|---|-------|-----------------|
| Zone 1 Volume (WQCV) = | 0.750 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 2.104 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 1.400 | acre-feet |
| Total Detention Basin Volume = | 4.254 | 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 |
| | | |

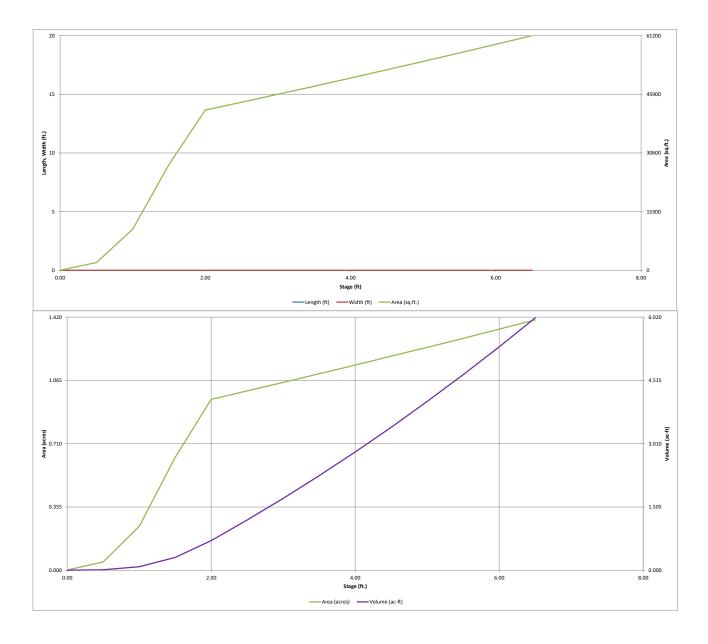
Calculated Total Basin Volume (V_{total}) = user

ft³ acre-feet

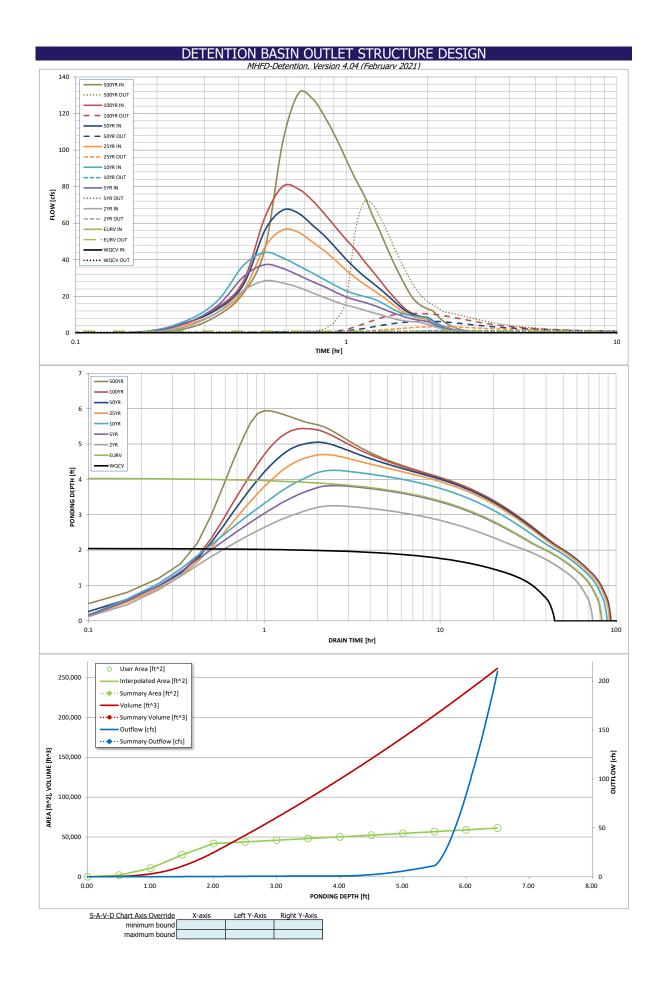
| | Depth Increment = | 0.50 | ft Optional | | 1 | | Optional | | | |
|------------------------|--------------------------------|---------------|------------------------|----------------|---------------|----------------------------|-------------------------------------|----------------|------------------------------|-------------------|
| d) | Stage - Storage Description | Stage (ft) | Override Stage (ft) | Length (ft) | Width (ft) | Area (ft ²) | Override Area (ft ²) | Area (acre) | Volume (ft ³) | Volume (ac-ft) |
| | Top of Micropool | | 0.00 | | | | 35 | 0.001 | | |
| | 6971 | | 0.50 | | | | 2,047 | 0.047 | 520 | 0.012 |
| | 6072 | | 1.00 | | | | 10,771 27,585 | 0.247 | 3,725 | 0.086 |
| | 6972 | | 1.50 2.00 | | | | 41,785 | 0.633 | 13,313 30,656 | 0.306 |
| | 6973 | | 2.50 | | | | 43,839 | 1.006 | 52,062 | 1.195 |
| | | | 3.00 | | | | 45,918 | 1.054 | 74,501 | 1.710 |
| | 6974 | | 3.50 | | | | 48,022 | 1.102 | 97,986 | 2.249 |
| | 6075 | | 4.00 | | | | 50,151 | 1.151 | 122,529 | 2.813 |
| | 6975 | | 4.50 5.00 | | | | 52,306 54,486 | 1.201 | 148,144 174,842 | 3.401 4.014 |
| | 6976 | | 5.50 | | | | 56,691 | 1.301 | 202,636 | 4.652 |
| | | | 6.00 | | | | 58,921 | 1.353 | 231,538 | 5.315 |
| | 6977 | | 6.50 | | | | 61,176 | 1.404 | 261,562 | 6.005 |
| al User Overrides | | | | | | | | | | |
| acre-feet acre-feet | | | | | | | | | | |
| 19 inches | | | | | | | | | | |
| 50 inches | | | | | | | | | | |
| 75 inches | | | | | | | | | | |
| 00 inches | | | | | | | | | | |
| 25 inches | | | | | | | | | | |
| 52 inches 68 inches | | | | | | | | | | |
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DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



| | | | <u>DASIN UU</u> | ILE <u>I SIRU</u> | CTURE DE | | | | |
|--|---|---|--|---|--|--|--|---|---|
| Project | Grandview - Pond | МН | | ision 4.04 (Februar | | | | | |
| Basin ID: | | ~ | | | | | | | |
| ZONE 3 | | | | Estimated | Estimated | | | | |
| | | | | Stage (ft) | Volume (ac-ft) | Outlet Type | | | |
| VOLUME EURY WOCY | | | Zone 1 (WQCV) | 2.05 | 0.750 | Orifice Plate |] | | |
| | 100-YEAR ORIFICE | | Zone 2 (EURV) | 4.04 | 2.104 | Rectangular Orifice | 1 | | |
| PERMANENT ORIFICES | ORIFICE | | Zone 3 (100-year) | 5.20 | 1.400 | Weir&Pipe (Restrict) | | | |
| POOL Example Zone | Configuration (Re | tention Pond) | . , , | Total (all zones) | 4.254 | | 1 | | |
| User Input: Orifice at Underdrain Outlet (typical | y used to drain WQ | CV in a Filtration BN | <u>4P)</u> | | | 1 | Calculated Parame | ters for Underdrain | |
| Underdrain Orifice Invert Depth = | N/A | ft (distance below | the filtration media | surface) | Under | drain Orifice Area = | N/A | ft² | |
| Underdrain Orifice Diameter = | N/A | inches | | | Underdrai | n Orifice Centroid = | N/A | feet | |
| | | | | | | | | | |
| User Input: Orifice Plate with one or more orific Invert of Lowest Orifice = | 0.00 | | to drain WQCV and bottom at Stage = | | | ice Area per Row = | Calculated Parame 1.979E-02 | <u>ters for Plate</u> ft ² | |
| Depth at top of Zone using Orifice Plate = | 2.05 | • • | bottom at Stage = bottom at Stage = | • | - | iptical Half-Width = | N/A | feet | |
| Orifice Plate: Orifice Vertical Spacing = | 8.20 | inches | - bottom ut Stuge | 010 | | ical Slot Centroid = | N/A | feet | |
| Orifice Plate: Orifice Area per Row = | 2.85 | sq. inches (diamete | er = 1-7/8 inches) | | | Elliptical Slot Area = | N/A | ft ² | |
| | | | . , | | | • | , | 1 | |
| | | | | | | | | | |
| User Input: Stage and Total Area of Each Orific | | - | | 1 | 1 | Т | 1 | 1 | Ъ |
| | Row 1 (required) | Row 2 (optional) | Row 3 (optional) | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) | 4 |
| Stage of Orifice Centroid (ft) | | 0.70 | 1.40 | | | | | | + |
| Orifice Area (sq. inches) | 2.85 | 2.85 | 2.85 | | | | | | J |
| | Row 9 (optional) | Pour 10 (antions) | Pour 11 (antions) | Row 12 (optional) | Pow 12 (antian-I) | Bow 14 (antion-1) | Bow 15 (antions) | Dow 16 (antion-1) | 1 |
| Stago of Orifico Controid (ft) | | Row 10 (optional) | Row 11 (optional) | Row 12 (optional) | Row 13 (optional) | Row 14 (optional) | Row 15 (optional) | Row 16 (optional) | 1 |
| Stage of Orifice Centroid (ft) Orifice Area (sq. inches) | | | | | | | | | 1 |
| onnee Area (sq. menes) | | | | | | | | | 1 |
| User Input: Vertical Orifice (Circular or Rectang | ular) | | | | | | Calculated Parame | ters for Vertical Ori | fice |
| | Zone 2 Rectangula | Not Selected | | | | | Zone 2 Rectangula | Not Selected |] |
| Invert of Vertical Orifice = | 2.05 | N/A | | n bottom at Stage = | | rtical Orifice Area = | 0.06 | N/A | ft ² |
| Depth at top of Zone using Vertical Orifice = | 4.04 | N/A | | n bottom at Stage = | 0 ft) Vertica | I Orifice Centroid = | 0.06 | N/A | feet |
| Vertical Orifice Height = | 1.50 | N/A | inches | | | | | | |
| | | | i in ala a a | | | | | | |
| Vertical Orifice Width = | 6.00 | | inches | | | | | | |
| | | Outlet Pine OR Rec | | al Weir (and No Out | tlet Pine) | | Calculated Parame | ters for Overflow W | leir |
| Vertical Orifice Width = | r Sloped Grate and | | | al Weir (and No Out | tlet Pipe) | | Calculated Parame | | / <u>eir</u> |
| User Input: Overflow Weir (Dropbox with Flat c | | Not Selected | tangular/Trapezoida | | | e Upper Edge, H _r = | Zone 3 Weir | Not Selected | /eir |
| | r Sloped Grate and Zone 3 Weir | | tangular/Trapezoida | al Weir (and No Ou bottom at Stage = 0 fi |) Height of Grat | e Upper Edge, H _t = Veir Slope Length = | r | |] |
| User Input: Overflow Weir (Dropbox with Flat c Overflow Weir Front Edge Height, Ho = | r Sloped Grate and Zone 3 Weir 4.04 | Not Selected N/A | tangular/Trapezoid ft (relative to basin t | bottom at Stage = 0 fl |) Height of Grat Overflow V | | Zone 3 Weir 4.79 | Not Selected N/A | feet |
| User Input: Overflow Weir (Dropbox with Flat or Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = | r Sloped Grate and Zone 3 Weir 4.04 3.00 | Not Selected N/A N/A | tangular/Trapezoid ft (relative to basin t feet | bottom at Stage = 0 fl Gi | e) Height of Grat Overflow V rate Open Area / 10 | Veir Slope Length = | Zone 3 Weir 4.79 3.09 3.74 6.46 | Not Selected N/A N/A | feet |
| User Input: Overflow Weir (Dropbox with Flat or Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope Horiz. Length of Weir Sides = Overflow Grate Type = | r Sloped Grate and Zone 3 Weir 4.04 3.00 4.00 3.00 Type C Grate | Not Selected N/A N/A N/A N/A N/A | tangular/Trapezoid ft (relative to basin t feet H:V feet | bottom at Stage = 0 fl Gi Ov | e) Height of Grat Overflow V rate Open Area / 10 verflow Grate Open | Veir Slope Length = 00-yr Orifice Area = | Zone 3 Weir 4.79 3.09 3.74 | Not Selected N/A N/A N/A | feet feet |
| User Input: Overflow Weir (Dropbox with Flat of Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = | r Sloped Grate and Zone 3 Weir 4.04 3.00 4.00 3.00 | Not Selected N/A N/A N/A N/A | tangular/Trapezoid ft (relative to basin t feet H:V | bottom at Stage = 0 fl Gi Ov | e) Height of Grat Overflow V rate Open Area / 10 verflow Grate Open | Veir Slope Length = 00-yr Orifice Area = Area w/o Debris = | Zone 3 Weir 4.79 3.09 3.74 6.46 | Not Selected N/A N/A N/A N/A | feet feet ft ² |
| User Input: Overflow Weir (Dropbox with Flat of Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = | r Sloped Grate and Zone 3 Weir 4.04 3.00 4.00 3.00 Type C Grate 50% | Not Selected N/A N/A N/A N/A N/A N/A | tangular/Trapezoid ft (relative to basin t feet H:V feet % | bottom at Stage = 0 fl Gi ດາ | Height of Grat Overflow V rate Open Area / 10 verflow Grate Oper Overflow Grate Ope | Veir Slope Length = 00-yr Orifice Area = 1 Area w/o Debris = en Area w/ Debris = | Zone 3 Weir 4.79 3.09 3.74 6.46 3.23 | Not Selected N/A N/A N/A N/A N/A | feet feet ft ² ft ² |
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| User Input: Overflow Weir (Dropbox with Flat of Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = User Input: Emergency Spillway (Rectangular or Spillway Invert Stage= Spillway Crest Length = Spillway End Slopes = Freeboard above Max Water Surface = Restrictor Plate Height Norm Return Period = One-Hour Rainfall Depth (in) = CUHP Runoff Volume (acre-ft) = CUHP Runoff Volume (acre-ft) = Inflow Hydrograph Volume (acre-ft) = CUHP Redevelopment Peak Q (cfs) = Predevelopment Unit Peak Flow, Q (cfs/acre) = Peak Inflow Q (cfs) = Ratio Peak Outflow to Predevelopment Q = Structure Controlling Flow = Max Velocity through Grate 1 (fps) = Time to Drain 97% of Inflow Volume (hours) = Maximum Ponding Depth (t) = | r Sloped Grate and. Zone 3 Weir 4.04 3.00 4.00 3.00 Type C Grate 50% C(Circular Orifice, R Zone 3 Restrictor 0.25 18.00 17.00 Trapezoidal) 5.50 60.00 4.00 1.00 Trapezoidal) 5.50 60.00 4.00 1.00 The user can over WQCV N/A 0.750 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A estrictor Plate, or Rr Not Selected N/A N/A R/A R/A R/A R/A R/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N | tangular/Trapezoidi ft (relative to basin t feet H:V feet 9% ectangular Orifice) ft (distance below ba inches inches inches bottom at Stage = 1/P hydrographs and 2 Year 1.19 2.102 2.109 2.102 2.109 2.102. | bottom at Stage = 0 ff Gi O O asin bottom at Stage = Half-Cent = 0 ft) | Height of Grat Overflow V rate Open Area / 10 verflow Grate Open Verflow Grate Open Dverflow Grate Open Outle tral Angle of Restrict Spillway D Stage at Basin Area at Basin Volume at entering new value 10 Year 1.75 3.293 3.293 0.5 0.1 1.3 2.4 Overflow Weir 1 0.1 N/A 77 83 4.26 | <pre>veir Slope Length = 00-yr Orifice Area = Area w/o Debris = an Area w/ Debris = alculated Parameter butlet Orifice Area = t Orifice Centroid = t Orifice</pre> | Zone 3 Weir 4.79 3.09 3.74 6.46 3.23 S for Outlet Pipe w/ Zone 3 Restrictor 1.73 0.73 2.67 Calculated Parame 0.57 7.07 1.40 6.00 S0 Year 2.25 4.658 4.658 9.9 0.28 6.7.1 6.4 0.6 Overflow Weir 1 0.8 N/A 78 85 5.05 | Not Selected N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | F). feet feet ft ² ft ² ft ² feet radians |
| User Input: Overflow Weir (Dropbox with Flat of Overflow Weir Front Edge Height, Ho = Overflow Weir Grate Slope = Horiz. Length of Weir Grate Slope Horiz. Length of Weir Grate Slope Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = User Input: Emergency Spillway (Rectangular or Spillway Invert Stage= Spillway Crest Length = Spillway Crest Length = Spillway Crest Length = Spillway End Slopes = Freeboard above Max Water Surface = CUHP Runoff Volume (arce-ft) = One-Hour Rainfall Depth (in) = CUHP Redevelopment Peak Q (cfs) = Predevelopment Unit Peak Flow, q (cfs/arce) = Peak Outflow Q (cfs) = Ratio Peak Outflow to Predevelopment Q = Structure Controlling Flow Max Velocity through Grate 1 (fps) = Max Velocity through Grate 1 (fps) = Max Velocity through Grate 1 (fps) = Time to Drain 99% of Inflow Volume (hours) = Time to Drain 99% of Inflow Volume (hours) | r Sloped Grate and Zone 3 Weir 4.04 3.00 4.00 3.00 Type C Grate 50% C(Circular Orifice, R Zone 3 Restrictor 0.25 18.00 17.00 Trapezoidal) 5.50 60.00 4.00 1.00 Trapezoidal) 7 <i>The user can over</i> WQCV N/A 0.750 N/A 0.750 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A estrictor Plate, or R N/A N/A N/A ft (relative to basin feet H:V feet ide the default CUH EURV N/A 2.854 N/A | tangular/Trapezoidi ft (relative to basin t feet H:V feet distance below basin inches inches inches bottom at Stage = 10 bottom at Stage = 119 2.109 2.109 0.2 0.2 0.01 28.5 0.8 N/A Vertical Orifice 1 N/A N/A N/A 64 69 | bottom at Stage = 0 ff Gi Ov Casin bottom at Stage = Half-Cent = 0 ft) | Height of Grat Overflow V rate Open Area / 10 verflow Grate Open Overflow Grate Open C C <l< td=""><td>Veir Slope Length = 20-yr Orifice Area = A rea w/o Debris = an Area w/ Debris = alculated Parameter Nutlet Orifice Area = t Orifice Centroid = tor Plate on Pipe = Design Flow Depth= Top of Freeboard = Top of Freeboard = Top of Freeboard = Cop of Freeboard = Cop of Freeboard = 2.00 3.982 3.982 4.9 0.14 56.4 3.4 0.7 0.7 0.4 N/A 78 85</td><td>Zone 3 Weir 4.79 3.09 3.74 6.46 3.23 s for Outlet Pipe w/ Zone 3 Restrictor 1.73 0.73 2.67 Calculated Parame 0.57 7.07 1.40 6.00 frographs table (Co. 50 Year 2.25 4.658 9.9 0.28 67.1 6.4 0.6 Overflow Weir 1 0.8 N/A 78 85</td><td>Not Selected N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A</td><td>F). F). 500 Year radians F). 500 Year 3.68 8.908 43.0 1.21 1.31.1 71.8 1.7 Spillway 2.5 N/A 70 82</td></l<> | Veir Slope Length = 20-yr Orifice Area = A rea w/o Debris = an Area w/ Debris = alculated Parameter Nutlet Orifice Area = t Orifice Centroid = tor Plate on Pipe = Design Flow Depth= Top of Freeboard = Top of Freeboard = Top of Freeboard = Cop of Freeboard = Cop of Freeboard = 2.00 3.982 3.982 4.9 0.14 56.4 3.4 0.7 0.7 0.4 N/A 78 85 | Zone 3 Weir 4.79 3.09 3.74 6.46 3.23 s for Outlet Pipe w/ Zone 3 Restrictor 1.73 0.73 2.67 Calculated Parame 0.57 7.07 1.40 6.00 frographs table (Co. 50 Year 2.25 4.658 9.9 0.28 67.1 6.4 0.6 Overflow Weir 1 0.8 N/A 78 85 | Not Selected N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | F). F). 500 Year radians F). 500 Year 3.68 8.908 43.0 1.21 1.31.1 71.8 1.7 Spillway 2.5 N/A 70 82 |



DETENTION BASIN OUTLET STRUCTURE DESIGN Outflow Hydrograph Workbook Filename:

| | | | | | | th inflow hydrog | | | | CUIUD |
|---------------|--------------------|------------|------------|----------------|----------------|------------------|----------------|----------------|----------------|----------------|
| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | | 50 Year [cfs] | 100 Year [cfs] | |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.34 | 0.03 | 2.01 |
| | 0:15:00 0:20:00 | 0.00 | 0.00 | 2.98 | 4.84 | 6.01 | 4.04 10.97 | 5.10 | 4.94 | 9.29 |
| | 0:25:00 | 0.00 | 0.00 | 11.08 23.17 | 14.67 30.62 | 17.31 36.83 | 22.92 | 12.83 26.21 | 13.68 28.19 | 21.63 45.46 |
| | 0:30:00 | 0.00 | 0.00 | 28.50 | 37.33 | 44.00 | 46.89 | 55.86 | 62.97 | 104.50 |
| | 0:35:00 | 0.00 | 0.00 | 27.28 | 35.17 | 41.02 | 56.36 | 67.15 | 80.13 | 131.14 |
| | 0:40:00 | 0.00 | 0.00 | 24.87 | 31.53 | 36.67 | 54.99 | 65.39 | 78.64 | 128.15 |
| | 0:45:00 | 0.00 | 0.00 | 21.92 | 28.05 | 32.75 | 49.70 | 58.94 | 72.37 | 118.25 |
| | 0:50:00 | 0.00 | 0.00 | 19.29 | 25.12 | 29.06 | 44.82 | 52.96 | 64.98 | 106.76 |
| | 0:55:00 | 0.00 | 0.00 | 17.03 | 22.20 | 25.74 | 39.41 | 46.40 | 57.57 | 94.76 |
| | 1:00:00 1:05:00 | 0.00 | 0.00 | 15.15 | 19.65 | 22.96 | 34.34 | 40.23 | 51.00 | 84.00 |
| | 1:10:00 | 0.00 | 0.00 | 13.89 12.49 | 17.95 16.74 | 21.18 19.90 | 30.12 26.57 | 35.11 30.87 | 45.41 39.18 | 74.97 64.47 |
| | 1:15:00 | 0.00 | 0.00 | 11.16 | 15.34 | 19.90 | 23.71 | 27.45 | 33.86 | 55.30 |
| | 1:20:00 | 0.00 | 0.00 | 9.98 | 13.75 | 17.01 | 20.77 | 23.98 | 28.60 | 46.32 |
| | 1:25:00 | 0.00 | 0.00 | 8.85 | 12.20 | 14.79 | 17.97 | 20.66 | 23.78 | 38.18 |
| | 1:30:00 | 0.00 | 0.00 | 7.79 | 10.79 | 12.74 | 15.15 | 17.36 | 19.55 | 31.09 |
| [| 1:35:00 | 0.00 | 0.00 | 6.92 | 9.65 | 11.09 | 12.57 | 14.33 | 15.79 | 24.76 |
| | 1:40:00 | 0.00 | 0.00 | 6.38 | 8.49 | 10.04 | 10.46 | 11.83 | 12.65 | 19.52 |
| | 1:45:00 | 0.00 | 0.00 | 6.11 | 7.66 | 9.43 | 9.11 | 10.28 | 10.68 | 16.36 |
| | 1:50:00 | 0.00 | 0.00 | 5.97 | 7.10 | 9.03 | 8.31 | 9.35 | 9.50 | 14.41 |
| | 1:55:00 2:00:00 | 0.00 | 0.00 | 5.38 | 6.68 | 8.59 | 7.79 | 8.77 | 8.73 | 13.10 |
| | 2:05:00 | 0.00 | 0.00 | 4.79 | 6.22 | 7.94 | 7.43 | 8.36 | 8.19 | 12.17 |
| | 2:10:00 | 0.00 | 0.00 | 3.84 2.96 | 5.02 3.86 | 6.39 4.92 | 6.01 4.60 | 6.75 5.16 | 6.52 4.90 | 9.62 7.18 |
| | 2:15:00 | 0.00 | 0.00 | 2.28 | 2.97 | 3.78 | 3.52 | 3.95 | 3.70 | 5.38 |
| | 2:20:00 | 0.00 | 0.00 | 1.75 | 2.27 | 2.87 | 2.68 | 3.00 | 2.81 | 4.08 |
| | 2:25:00 | 0.00 | 0.00 | 1.33 | 1.72 | 2.16 | 2.02 | 2.27 | 2.13 | 3.08 |
| | 2:30:00 | 0.00 | 0.00 | 1.00 | 1.27 | 1.61 | 1.50 | 1.68 | 1.59 | 2.30 |
| | 2:35:00 | 0.00 | 0.00 | 0.74 | 0.93 | 1.19 | 1.11 | 1.24 | 1.18 | 1.71 |
| | 2:40:00 | 0.00 | 0.00 | 0.54 | 0.68 | 0.89 | 0.83 | 0.93 | 0.89 | 1.28 |
| | 2:45:00 | 0.00 | 0.00 | 0.38 | 0.48 | 0.63 | 0.60 | 0.67 | 0.64 | 0.92 |
| | 2:50:00 | 0.00 | 0.00 | 0.24 | 0.33 | 0.42 | 0.41 | 0.46 | 0.44 | 0.62 |
| | 2:55:00 | 0.00 | 0.00 | 0.14 | 0.20 | 0.26 | 0.26 | 0.29 | 0.27 | 0.38 |
| | 3:00:00 3:05:00 | 0.00 | 0.00 | 0.07 | 0.11 | 0.13 | 0.14 | 0.15 | 0.14 | 0.20 |
| | 3:10:00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.05 | 0.08 | 0.06 | 0.06 | 0.08 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 4:55:00 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| l | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically. The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft ²] | Area [acres] | Volume [ft ³] | Volume [ac-ft] | Total Outflow [cfs] | |
|--------------------------------|---------------|----------------------------|-----------------|------------------------------|-------------------|---------------------------|--|
| | | | | | | | For best results, include the |
| | | | | | | | stages of all grade slope |
| | | | | | | | changes (e.g. ISV and Floor) from the S-A-V table on |
| | | | | | | | Sheet 'Basin'. |
| | | | | | | | 4 |
| | | | | | | | Also include the inverts of all outlets (e.g. vertical orifice, |
| | | | | | | | overflow grate, and spillway |
| | | | | | | | overflow grate, and spillway where applicable). |
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MHFD-Detention, Version 4.04 (February 2021)

| Pr | oject: Grandview - Pond B |
|--------------|--|
| Bas | in ID: |
| | 2011 2 20 |
| POOL Example | Zone Configuration (Retention Pond) |

Watershed Information

| Selected BMP Type = | EDB | | | | | |
|--|--------|---------|--|--|--|--|
| Watershed Area = | 28.28 | acres | | | | |
| Watershed Length = | 1,700 | ft | | | | |
| Watershed Length to Centroid = | 850 | ft | | | | |
| Watershed Slope = | 0.020 | ft/ft | | | | |
| Watershed Imperviousness = | 64.20% | 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.

| the embedded colorado orban nyaro | graphinioceau | | Optional U |
|--|---------------|-----------|------------|
| Water Quality Capture Volume (WQCV) = | 0.592 | acre-feet | |
| Excess Urban Runoff Volume (EURV) = | 2.245 | acre-feet | |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 1.658 | acre-feet | 1.19 |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 2.175 | acre-feet | 1.50 |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 2.590 | acre-feet | 1.75 |
| 25-yr Runoff Volume (P1 = 2 in.) = | 3.137 | acre-feet | 2.00 |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 3.674 | acre-feet | 2.25 |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 4.327 | acre-feet | 2.52 |
| 500-yr Runoff Volume (P1 = 3.68 in.) = | 7.052 | acre-feet | 3.68 |
| Approximate 2-yr Detention Volume = | 1.460 | acre-feet | |
| Approximate 5-yr Detention Volume = | 1.909 | acre-feet | |
| Approximate 10-yr Detention Volume = | 2.303 | acre-feet | |
| Approximate 25-yr Detention Volume = | 2.773 | acre-feet | |
| Approximate 50-yr Detention Volume = | 3.057 | acre-feet | |
| Approximate 100-yr Detention Volume = | 3.355 | acre-feet | |
| | | | |

Define Zones and Basin Geometry

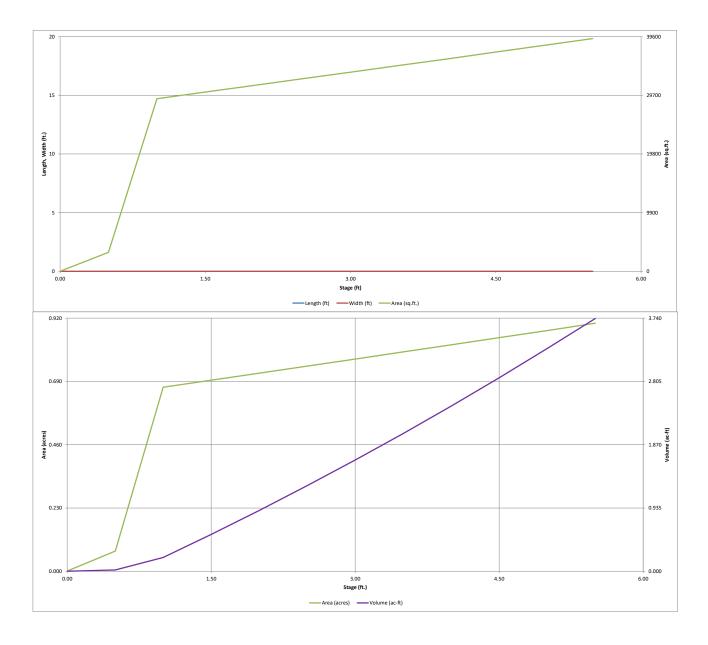
| chine zones and basin deomedy | | |
|---|-------|-----------------|
| Zone 1 Volume (WQCV) = | 0.592 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 1.653 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 1.110 | acre-feet |
| Total Detention Basin Volume = | 3.355 | acre-feet |
| Initial 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 |
| Colordate d Total Deale Maluera (M. 1) | | a sure for at |

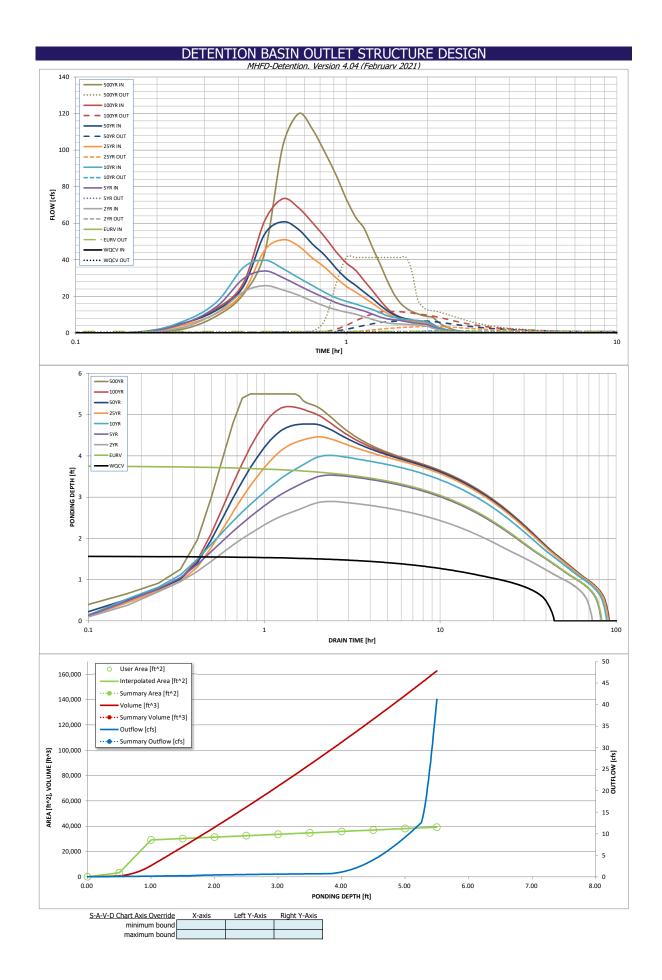
Calculated Total Basin Volume (V_{total}) = user

acre-feet

| | Depth Increment = | 0.50 | ft | | | | Optional | | | |
|------------------------|-------------------|-------|----------------------|--------|-------|--------------------|-------------------------|--------|--------------------|----------------|
| d) | Stage - Storage | Stage | Optional Override | Length | Width | Area | 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 | 800 | 0.019 |
| | 6964 | | 1.00 | | | | 3,203 29,135 | 0.669 | 809 8,894 | 0.019 |
| | 0504 | | 1.50 | | | | 30,250 | 0.694 | 23,740 | 0.204 |
| | 6965 | | 2.00 | | | | 31,366 | 0.720 | 39,144 | 0.899 |
| | | | 2.50 | | | | 32,485 | 0.746 | 55,107 | 1.265 |
| | 6966 | | 3.00 | | | | 33,606 | 0.771 | 71,629 | 1.644 |
| | | | 3.50 | | | | 34,729 | 0.797 | 88,713 | 2.037 |
| | 6967 | | 4.00 4.50 | | | | 35,856 36,987 | 0.823 | 106,360 124,570 | 2.442 2.860 |
| | 6968 | | 5.00 | | | | 38,126 | 0.875 | 124,570 | 3.291 |
| | 6968.5 | | 5.50 | | | | 39,275 | 0.902 | 162,698 | 3.735 |
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| acre-feet acre-feet | | | | | | | | | | |
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MHFD-Detention, Version 4.04 (February 2021)





DETENTION BASIN OUTLET STRUCTURE DESIGN Outflow Hydrograph Workbook Filename:

| | The user can o | verride the calcu | lated inflow hyd | lrographs from t | his workbook wi | th inflow hydrog | raphs developed | l in a separate pr | ogram. | |
|---------------|--------------------|-------------------|------------------|------------------|-----------------|------------------|-----------------|--------------------|----------------|----------------|
| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.04 | 2.10 |
| | 0:15:00 | 0.00 | 0.00 | 3.12 | 5.08 | 6.29 | 4.23 | 5.28 | 5.16 | 9.38 |
| | 0:20:00 | 0.00 | 0.00 | 11.10 22.43 | 14.55 29.65 | 17.11 35.73 | 10.80 22.18 | 12.57 25.29 | 13.48 27.23 | 21.07 43.95 |
| | 0:30:00 | 0.00 | 0.00 | 25.88 | 33.87 | 39.78 | 45.24 | 54.14 | 61.34 | 102.23 |
| | 0:35:00 | 0.00 | 0.00 | 23.48 | 30.21 | 35.16 | 50.99 | 60.80 | 73.32 | 119.91 |
| | 0:40:00 | 0.00 | 0.00 | 20.59 | 25.95 | 30.11 | 47.49 | 56.55 | 68.34 | 111.46 |
| | 0:45:00 | 0.00 | 0.00 | 17.37 | 22.25 | 25.97 | 40.94 | 48.58 | 60.30 | 98.87 |
| | 0:50:00 | 0.00 | 0.00 | 14.67 12.68 | 19.22 16.55 | 22.13 19.18 | 35.95 30.13 | 42.50 35.41 | 52.43 44.46 | 86.49 73.33 |
| | 1:00:00 | 0.00 | 0.00 | 11.36 | 14.74 | 17.30 | 25.51 | 29.79 | 38.28 | 63.34 |
| | 1:05:00 | 0.00 | 0.00 | 10.30 | 13.31 | 15.75 | 22.37 | 26.02 | 34.22 | 56.90 |
| | 1:10:00 | 0.00 | 0.00 | 8.77 | 11.93 | 14.22 | 19.15 | 22.17 | 28.36 | 46.74 |
| | 1:15:00 | 0.00 | 0.00 | 7.35 | 10.30 | 12.78 | 16.26 | 18.74 | 23.10 | 37.66 |
| | 1:20:00 | 0.00 | 0.00 | 6.19 | 8.73 | 11.04 | 13.24 | 15.17 | 17.84 | 28.73 |
| | 1:30:00 | 0.00 | 0.00 | 5.43 5.03 | 7.68 | 9.41 8.41 | 10.75 8.74 | 12.22 9.89 | 13.46 10.46 | 21.35 16.40 |
| | 1:35:00 | 0.00 | 0.00 | 4.82 | 6.82 | 7.78 | 7.52 | 8.48 | 8.72 | 13.50 |
| | 1:40:00 | 0.00 | 0.00 | 4.70 | 6.16 | 7.32 | 6.76 | 7.61 | 7.66 | 11.68 |
| | 1:45:00 | 0.00 | 0.00 | 4.62 | 5.61 | 7.00 | 6.25 | 7.03 | 6.93 | 10.42 |
| | 1:50:00 | 0.00 | 0.00 | 4.56 | 5.22 | 6.77 | 5.91 | 6.64 | 6.44 | 9.57 |
| | 1:55:00 2:00:00 | 0.00 | 0.00 | 3.99 3.50 | 4.93 4.57 | 6.44 5.86 | 5.67 5.50 | 6.38 6.19 | 6.08 5.85 | 8.95 8.56 |
| | 2:05:00 | 0.00 | 0.00 | 2.63 | 3.44 | 4.39 | 4.16 | 4.67 | 4.40 | 6.42 |
| | 2:10:00 | 0.00 | 0.00 | 1.92 | 2.49 | 3.17 | 3.00 | 3.37 | 3.18 | 4.62 |
| | 2:15:00 | 0.00 | 0.00 | 1.39 | 1.80 | 2.28 | 2.17 | 2.43 | 2.31 | 3.35 |
| | 2:20:00 | 0.00 | 0.00 | 1.00 | 1.28 | 1.64 | 1.56 | 1.75 | 1.67 | 2.42 |
| | 2:25:00 2:30:00 | 0.00 | 0.00 | 0.70 | 0.89 | 1.15 | 1.09 | 1.22 | 1.17 | 1.69 |
| | 2:35:00 | 0.00 | 0.00 | 0.47 | 0.60 | 0.80 | 0.76 | 0.85 | 0.81 | 1.17 0.81 |
| | 2:40:00 | 0.00 | 0.00 | 0.18 | 0.26 | 0.33 | 0.33 | 0.37 | 0.35 | 0.51 |
| | 2:45:00 | 0.00 | 0.00 | 0.09 | 0.14 | 0.18 | 0.19 | 0.21 | 0.20 | 0.28 |
| | 2:50:00 | 0.00 | 0.00 | 0.04 | 0.06 | 0.07 | 0.08 | 0.09 | 0.08 | 0.11 |
| | 2:55:00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| | 3:00:00 3:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:30:00 3:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 4:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 5:35:00 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically. The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft ²] | Area [acres] | Volume [ft ³] | Volume [ac-ft] | Total Outflow [cfs] | |
|--------------------------------|---------------|----------------------------|-----------------|------------------------------|-------------------|---------------------------|---|
| | | | | | | | For best results, include the |
| | | | | | | | stages of all grade slope |
| | | | | | | | changes (e.g. ISV and Floor) from the S-A-V table on |
| | | | | | | | Sheet 'Basin'. |
| | | | | | | | _ |
| | | | | | | | Also include the inverts of all |
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| | | | | | | | overflow grate, and spillway, where applicable). |
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MHFD-Detention, Version 4.04 (February 2021)

| Project: | Grandview - Pond C |
|-----------|--------------------------------|
| Basin ID: | |
| | AND 1 100 YEAR OWFICE |
| | Configuration (Retention Pond) |

Watershed Information

| Selected BMP Type = | EDB | | | | | |
|--|--------|---------|--|--|--|--|
| Watershed Area = | 43.20 | acres | | | | |
| Watershed Length = | 1,890 | ft | | | | |
| Watershed Length to Centroid = | 1,050 | ft | | | | |
| Watershed Slope = | 0.020 | ft/ft | | | | |
| Watershed Imperviousness = | 62.00% | 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.

| the embedded Colorado Urban Hydro | graph Procedu | ure. | Optional Use | r Overrid |
|--|---------------|-----------|--------------|-----------|
| Water Quality Capture Volume (WQCV) = | 0.875 | acre-feet | | acre-fe |
| Excess Urban Runoff Volume (EURV) = | 3.280 | acre-feet | | acre-fe |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 2.439 | acre-feet | 1.19 | inches |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 3.207 | acre-feet | 1.50 | inches |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 3.822 | acre-feet | 1.75 | inches |
| 25-yr Runoff Volume (P1 = 2 in.) = | 4.648 | acre-feet | 2.00 | inches |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 5.461 | acre-feet | 2.25 | inches |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 6.456 | acre-feet | 2.52 | inches |
| 500-yr Runoff Volume (P1 = 3.68 in.) = | 10.609 | acre-feet | 3.68 | inches |
| Approximate 2-yr Detention Volume = | 2.129 | acre-feet | | |
| Approximate 5-yr Detention Volume = | 2.787 | acre-feet | | |
| Approximate 10-yr Detention Volume = | 3.367 | acre-feet | | |
| Approximate 25-yr Detention Volume = | 4.064 | acre-feet | | |
| Approximate 50-yr Detention Volume = | 4.487 | acre-feet | | |
| Approximate 100-yr Detention Volume = | 4.941 | acre-feet | | |
| | | | | |

Define Zones and Basin Geometry

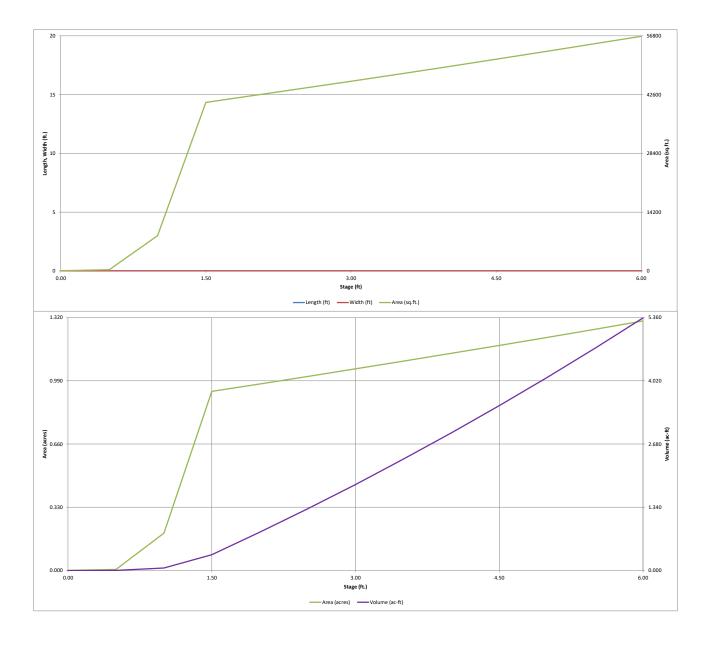
| The Lones and Basin Besined) | | |
|---|-------|-----------------|
| Zone 1 Volume (WQCV) = | 0.875 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 2.405 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 1.661 | acre-feet |
| Total Detention Basin Volume = | 4.941 | acre-feet |
| Initial 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 Pacin Volume (V) = | | acro foot |

Calculated Total Basin Volume (V_{total}) = user

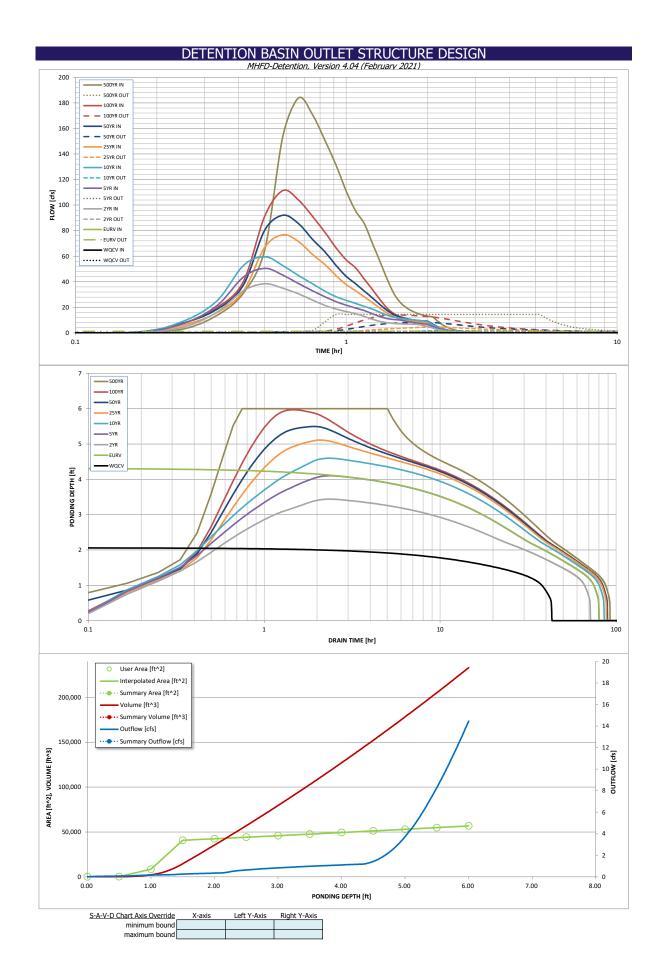
acre-feet

| | Depth Increment = Stage - Storage Description | 0.50 Stage (ft) | ft Optional Override Stage (ft) | Length (ft) | Width (ft) | Area (ft ²) | Optional Override Area (ft ²) | Area (acre) | Volume (ft ³) | Volume (ac-ft) |
|----------|---|-----------------------|--|----------------|---------------|----------------------------|---|----------------|------------------------------|-------------------|
| - | Top of Micropool | | 0.00 | | | | 35 | 0.001 | | |
| - | 6927 | | 0.50 | | | | 246 | 0.006 | 70 | 0.002 |
| | | | 1.00 | | | | 8,508 | 0.195 | 2,258 | 0.052 |
| | 6928 | | 1.50 | | | | 40,729 | 0.935 | 14,567 | 0.334 |
| | | | 2.00 | | | | 42,406 | 0.974 | 35,351 | 0.812 |
| - | 6929 | | 2.50 | | | | 44,107 | 1.013 | 56,979 | 1.308 |
| - | 6020 | | 3.00 | | | | 45,833 | 1.052 | 79,464 | 1.824 |
| - | 6930 | | 3.50 | | | | 47,584 | 1.092 | 102,818 127,054 | 2.360 |
| - | 6021 | | 4.00 | | | | 49,360 | 1.133 | - | 2.917 |
| - | 6931 | | 4.50 5.00 | | | | 51,160 52,986 | 1.174 1.216 | 152,184 178,221 | 3.494 4.091 |
| - | 6932 | | 5.50 | | | | 54,836 | 1.259 | 205,176 | 4.710 |
| - | 6932.5 | | 6.00 | | | | 56,711 | 1.302 | 233,063 | 5.350 |
| - | 000210 | | 0.00 | | | | 50,711 | 1.502 | 233,003 | 5.550 |
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MHFD-Detention, Version 4.04 (February 2021)



| | DE | : LEN LION | BASIN OU | ILEI SIRU | CTURE DE | SIGN | | | |
|---|---|--|--|---|--|--|--|--|---|
| Declaration | Grandview - Pond | МН | | sion 4.04 (Februar | | | | | |
| Basin ID: | | <u> </u> | | | | | | | |
| ZONE 3 | | | | Estimated | Estimated | | | | |
| 100-YR | | | | Stage (ft) | Volume (ac-ft) | Outlet Type | _ | | |
| VOLUME EURY WOCY | | | Zone 1 (WQCV) | 2.07 | 0.875 | Orifice Plate |] | | |
| | 100-YEAR ORIFICE | | Zone 2 (EURV) | 4.32 | 2.405 | Rectangular Orifice | 1 | | |
| PERMANENT ORIFICES | | | Zone 3 (100-year) | 5.69 | 1.661 | Weir&Pipe (Restrict) | | | |
| POOL Example Zone | Configuration (Re | tention Pond) | | Total (all zones) | 4.941 | | 1 | | |
| Jser Input: Orifice at Underdrain Outlet (typicall | <u>y used to drain WQ</u> | CV in a Filtration BN | <u>1P)</u> | | | - | Calculated Parame | ters for Underdrain | |
| Underdrain Orifice Invert Depth = | N/A | | the filtration media | surface) | | drain Orifice Area $=$ | N/A | ft² | |
| Underdrain Orifice Diameter = | N/A | inches | | | Underdrair | n Orifice Centroid = | N/A | feet | |
| Icor Input: Orifico Plato with and or more orific | oc or Elliptical Clot \ | Noir (typically used | to drain WOCV and | d/or EUDV/ in a codir | montation RMD) | | Coloridate d Demana | have fair Diata | |
| Jser Input: Orifice Plate with one or more orifice Invert of Lowest Orifice = | | 1 | bottom at Stage = | | | ice Area per Row = | Calculated Parame | ft ² | |
| Depth at top of Zone using Orifice Plate = | 2.07 | | bottom at Stage = | | - | iptical Half-Width = | N/A | feet | |
| Orifice Plate: Orifice Vertical Spacing = | 8.30 | inches | 5 | , | | ical Slot Centroid = | N/A | feet | |
| Orifice Plate: Orifice Area per Row = | 3.10 | sq. inches (diamete | er = 2 inches) | | E | Iliptical Slot Area = | N/A | ft² | |
| | | | | | | | | | |
| | | | | | | | | | |
| Jser Input: Stage and Total Area of Each Orifice | | | | Pow 4 (antional) | Bow E (antianal) | Dow 6 (antianal) | Bow 7 (antional) | Dow 9 (antions) | 1 |
| Stage of Orifice Centroid (ft) | Row 1 (required) 0.00 | Row 2 (optional) 0.69 | Row 3 (optional) 1.38 | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) | - |
| Orifice Area (sq. inches) | 3.10 | 3.10 | 3.10 | | | | | | 1 |
| Unite Area (sq. IICIES) | 5.10 | 3.10 | 3.10 | | | | | | 1 |
| | Row 9 (optional) | Row 10 (optional) | Row 11 (optional) | Row 12 (optional) | Row 13 (optional) | Row 14 (optional) | Row 15 (optional) | Row 16 (optional) |] |
| Stage of Orifice Centroid (ft) | | | | | | | | | |
| Orifice Area (sq. inches) | | | | | | | | | |
| Jser Input: Vertical Orifice (Circular or Rectang | ula v) | | | | | | Coloulated Devenue | have for Vertical Ori | Fina |
| user input: vertical Onlice (Circular or Rectange | Zone 2 Rectangular | Not Selected | 1 | | | | Calculated Parame Zone 2 Rectangular | | |
| Invert of Vertical Orifice = | 2.10 | N/A | ft (relative to basir | n bottom at Stage = | ()ft) Ve | rtical Orifice Area = | 0.08 | N/A | ft ² |
| Depth at top of Zone using Vertical Orifice = | 4.32 | N/A | | bottom at Stage = bottom at Stage = | | Orifice Centroid = | 0.08 | N/A | feet |
| Vertical Orifice Height = | 2.00 | N/A | inches | · socioli al stage | | | 0.00 | ,. | 1.000 |
| Vertical Orifice Width = | | | inches | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| Jser Input: Overflow Weir (Dropbox with Flat o | r Sloped Grate and | | tangular/Trapezoid | al Weir (and No Out | tlet Pipe) | | Calculated Parame | ters for Overflow W | <u>/eir</u> |
| | Zone 3 Weir | Not Selected | | | | | Zone 3 Weir | Not Selected |] |
| Overflow Weir Front Edge Height, Ho = | Zone 3 Weir 4.33 | Not Selected N/A | ft (relative to basin b | <u>al Weir (and No Out</u> bottom at Stage = 0 ft |) Height of Grat | e Upper Edge, H _t = | Zone 3 Weir 5.08 | Not Selected N/A | feet |
| Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = | Zone 3 Weir 4.33 3.00 | Not Selected N/A N/A | ft (relative to basin t feet | bottom at Stage = 0 ft |) Height of Grat Overflow W | /eir Slope Length = | Zone 3 Weir 5.08 3.09 | Not Selected N/A N/A |] |
| Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope = | Zone 3 Weir 4.33 3.00 4.00 | Not Selected N/A N/A N/A | ft (relative to basin t feet H:V | bottom at Stage = 0 ft Gr |) Height of Grat Overflow W rate Open Area / 10 | /eir Slope Length = 00-yr Orifice Area = | Zone 3 Weir 5.08 3.09 3.74 | Not Selected N/A N/A N/A | feet feet |
| Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = | Zone 3 Weir 4.33 3.00 4.00 3.00 | Not Selected N/A N/A N/A N/A | ft (relative to basin t feet | bottom at Stage = 0 ft Gr Ov |) Height of Grat Overflow W rate Open Area / 10 verflow Grate Open | /eir Slope Length = 00-yr Orifice Area = Area w/o Debris = | Zone 3 Weir 5.08 3.09 3.74 6.46 | Not Selected N/A N/A N/A N/A | feet feet ft ² |
| Overflow Weir Front Edge Height, Ho = Overflow Weir Front Edge Length = Overflow Weir Grate Slope = | Zone 3 Weir 4.33 3.00 4.00 | Not Selected N/A N/A N/A | ft (relative to basin t feet H:V | bottom at Stage = 0 ft Gr Ov |) Height of Grat Overflow W rate Open Area / 10 verflow Grate Open | /eir Slope Length = 00-yr Orifice Area = | Zone 3 Weir 5.08 3.09 3.74 | Not Selected N/A N/A N/A | feet feet |
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DETENTION BASIN OUTLET STRUCTURE DESIGN Outflow Hydrograph Workbook Filename:

| [| | | | | | | | in a separate pro | | CUUD |
|---------------|--------------------|------------|------------|----------------|----------------|----------------|----------------|-------------------|----------------|----------------|
| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | | 50 Year [cfs] | 100 Year [cfs] | - |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| - | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.51 | 0.05 | 3.03 |
| - | 0:15:00 | 0.00 | 0.00 | 4.50 | 7.31 | 9.07 | 6.10 | 7.64 | 7.45 19.79 | 13.68 |
| | 0:25:00 | 0.00 | 0.00 | 16.20 32.99 | 21.30 43.59 | 25.08 52.63 | 15.85 32.60 | 18.48 37.19 | 40.01 | 30.99 64.90 |
| | 0:30:00 | 0.00 | 0.00 | 38.46 | 50.54 | 59.57 | 66.90 | 80.41 | 91.32 | 153.70 |
| | 0:35:00 | 0.00 | 0.00 | 34.96 | 45.17 | 52.67 | 76.83 | 92.11 | 111.40 | 183.89 |
| | 0:40:00 | 0.00 | 0.00 | 30.52 | 38.60 | 44.85 | 71.51 | 85.56 | 103.98 | 170.98 |
| | 0:45:00 | 0.00 | 0.00 | 25.69 | 32.96 | 38.52 | 61.41 | 73.22 | 91.28 | 150.97 |
| | 0:50:00 | 0.00 | 0.00 | 21.61 | 28.38 | 32.71 | 53.60 | 63.65 | 78.96 | 131.50 |
| | 0:55:00 | 0.00 | 0.00 | 18.64 | 24.41 | 28.30 | 44.80 | 52.84 | 66.61 | 110.93 |
| - | 1:00:00 1:05:00 | 0.00 | 0.00 | 16.67 | 21.68 | 25.45 | 37.79 | 44.27 | 57.12 | 95.46 |
| | 1:10:00 | 0.00 | 0.00 | 15.06 12.78 | 19.49 17.39 | 23.08 20.74 | 33.00 28.13 | 38.48 32.64 | 50.86 42.01 | 85.47 69.97 |
| - | 1:15:00 | 0.00 | 0.00 | 12.78 | 14.97 | 18.57 | 23.73 | 27.38 | 33.91 | 55.77 |
| | 1:20:00 | 0.00 | 0.00 | 8.95 | 12.67 | 16.05 | 19.21 | 22.02 | 25.96 | 42.09 |
| ļ | 1:25:00 | 0.00 | 0.00 | 7.92 | 11.22 | 13.78 | 15.50 | 17.59 | 19.35 | 30.81 |
| | 1:30:00 | 0.00 | 0.00 | 7.37 | 10.47 | 12.35 | 12.71 | 14.36 | 15.11 | 23.79 |
| ļ | 1:35:00 | 0.00 | 0.00 | 7.08 | 10.02 | 11.42 | 10.97 | 12.36 | 12.67 | 19.67 |
| ļ | 1:40:00 | 0.00 | 0.00 | 6.91 | 9.06 | 10.75 | 9.89 | 11.12 | 11.14 | 17.01 |
| r | 1:45:00 1:50:00 | 0.00 | 0.00 | 6.79 6.70 | 8.25 7.66 | 10.28 9.94 | 9.15 8.66 | 10.29 9.74 | 10.11 9.40 | 15.20 13.96 |
| - | 1:55:00 | 0.00 | 0.00 | 5.89 | 7.66 | 9.94 | 8.66 | 9.74 | 9.40 8.89 | 13.96 |
| | 2:00:00 | 0.00 | 0.00 | 5.15 | 6.71 | 8.62 | 8.08 | 9.08 | 8.57 | 12.52 |
| - | 2:05:00 | 0.00 | 0.00 | 3.89 | 5.07 | 6.47 | 6.15 | 6.91 | 6.51 | 9.49 |
| ĺ | 2:10:00 | 0.00 | 0.00 | 2.81 | 3.65 | 4.63 | 4.39 | 4.93 | 4.66 | 6.77 |
| | 2:15:00 | 0.00 | 0.00 | 2.02 | 2.62 | 3.32 | 3.16 | 3.54 | 3.36 | 4.88 |
| | 2:20:00 | 0.00 | 0.00 | 1.44 | 1.85 | 2.37 | 2.26 | 2.53 | 2.41 | 3.50 |
| | 2:25:00 | 0.00 | 0.00 | 1.00 | 1.27 | 1.65 | 1.57 | 1.76 | 1.68 | 2.42 |
| - | 2:30:00 | 0.00 | 0.00 | 0.67 | 0.86 | 1.13 | 1.08 | 1.21 | 1.16 | 1.67 |
| - | 2:35:00 2:40:00 | 0.00 | 0.00 | 0.43 | 0.58 | 0.76 | 0.74 | 0.82 | 0.79 | 1.13 |
| - | 2:45:00 | 0.00 | 0.00 | 0.25 | 0.36 | 0.46 | 0.46 | 0.51 0.27 | 0.49 | 0.69 |
| | 2:50:00 | 0.00 | 0.00 | 0.05 | 0.08 | 0.09 | 0.10 | 0.11 | 0.10 | 0.13 |
| | 2:55:00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 |
| | 3:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 5:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically. The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft ²] | Area [acres] | Volume [ft ³] | Volume [ac-ft] | Total Outflow [cfs] | |
|--------------------------------|---------------|----------------------------|-----------------|------------------------------|-------------------|---------------------------|---|
| | | | | | | | For best results, include the |
| | | | | | | | stages of all grade slope |
| | | | | | | | changes (e.g. ISV and Floor) from the S-A-V table on |
| | | | | | | | Sheet 'Basin'. |
| | | | | | | | _ |
| | | | | | | | Also include the inverts of all |
| | | | | | | | outlets (e.g. vertical orifice, |
| | | | | | | | overflow grate, and spillway, where applicable). |
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MHFD-Detention, Version 4.04 (February 2021)

| Project: | Grandview - Pond D |
|-------------------|---|
| Basin ID: | |
| | 2 ONE 1 1 OND 2 OB YEAR OWFICE |
| POOL Example Zone | Configuration (Retention Pond) |

Watershed Information

| Selected BMP Type = | EDB | |
|---|------------|---------|
| Watershed Area = | 12.84 | acres |
| Watershed Length = | 1,200 | ft |
| Watershed Length to Centroid = | 600 | ft |
| Watershed Slope = | 0.020 | ft/ft |
| Watershed Imperviousness = | 59.40% | 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.

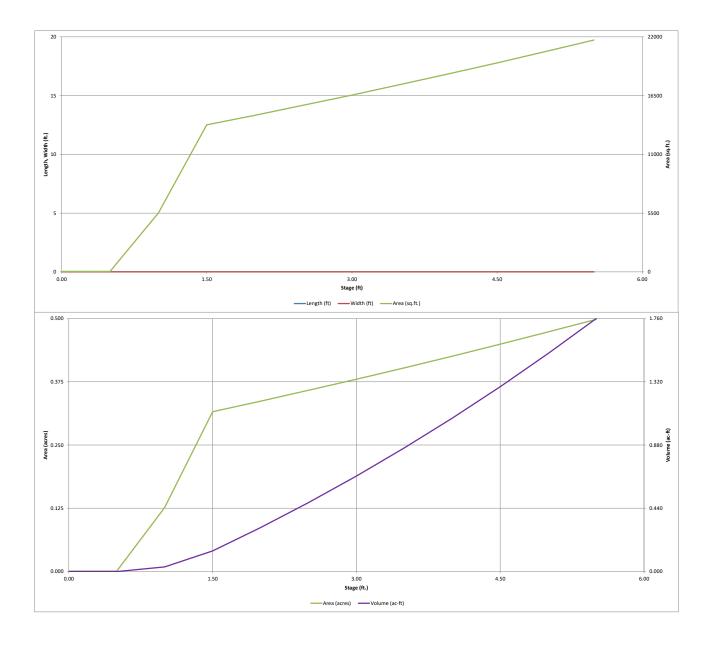
| ale embedded colorado orban nydro | graphinoceau | ic. | Optional U |
|--|--------------|-----------|------------|
| Water Quality Capture Volume (WQCV) = | 0.251 | acre-feet | |
| Excess Urban Runoff Volume (EURV) = | 0.923 | acre-feet | |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 0.678 | acre-feet | 1.19 |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 0.894 | acre-feet | 1.50 |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 1.066 | acre-feet | 1.75 |
| 25-yr Runoff Volume (P1 = 2 in.) = | 1.304 | acre-feet | 2.00 |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 1.538 | acre-feet | 2.25 |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 1.827 | acre-feet | 2.52 |
| 500-yr Runoff Volume (P1 = 3.68 in.) = | 3.032 | acre-feet | 3.68 |
| Approximate 2-yr Detention Volume = | 0.598 | acre-feet | |
| Approximate 5-yr Detention Volume = | 0.784 | acre-feet | |
| Approximate 10-yr Detention Volume = | 0.949 | acre-feet | |
| Approximate 25-yr Detention Volume = | 1.148 | acre-feet | |
| Approximate 50-yr Detention Volume = | 1.270 | acre-feet | |
| Approximate 100-yr Detention Volume = | 1.404 | acre-feet | |
| | | | |

Define Zones and Basin Geometry

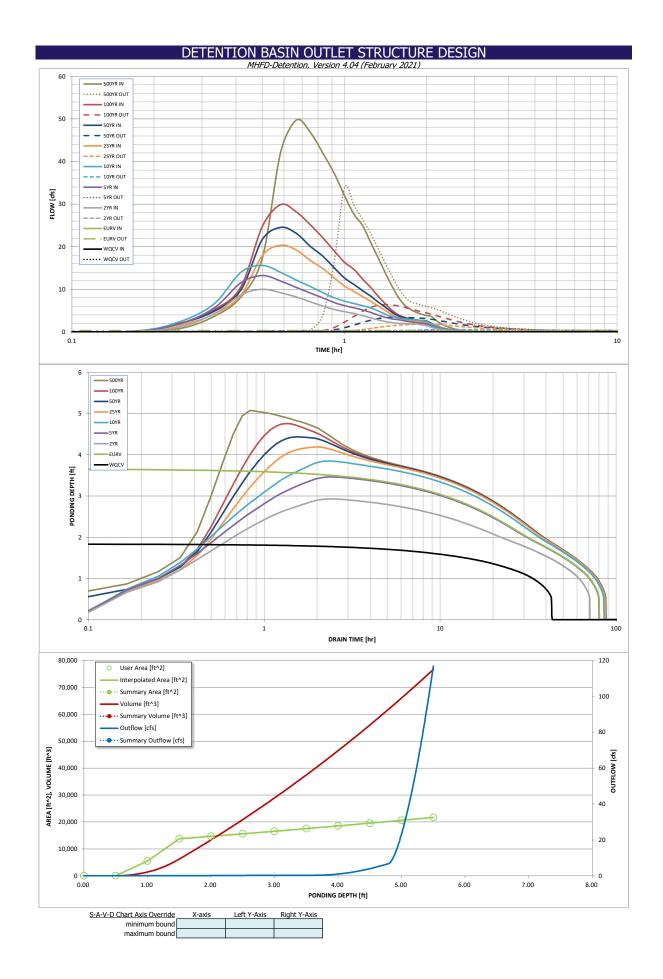
| enne zones and basin deonied y | | |
|---|-------|-----------------|
| Zone 1 Volume (WQCV) = | 0.251 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 0.672 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 0.481 | acre-feet |
| Total Detention Basin Volume = | 1.404 | acre-feet |
| Initial 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 |
| | | |

| NNo | | Depth Increment = | 0.50 | ft | | 1 | Optional | | | |
|--|-------------------|--------------------------------|---------------|------------------------------------|----------------|------|----------|-------|--------|-------------------|
| Portione | d) | Stage - Storage Description | Stage (ft) | Optional Override Stage (ft) | Length (ft) | | Override | | | Volume (ac-ft) |
| Image | | | | | | | | | () | (22.17) |
| Part Part Part < | | 6969 | | 0.50 | | | 35 | 0.001 | 18 | 0.000 |
| | | | | 1.00 | | | 5,514 | 0.127 | 1,404 | 0.032 |
| <form>< <tr> 999 0. 0. 0. 0. 0.0 0.00</tr></form> | | 6970 | | 1.50 | | | 13,763 | 0.316 | 6,223 | 0.143 |
| | | | | | | | | | | |
| | | | | 2.00 | | | 14,669 | 0.337 | 13,331 | 0.306 |
| | | 6971 | | 2.50 | | | 15,600 | 0.358 | 20,899 | 0.480 |
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| <form><form></form></form> | | 6074 | | | | | | | | 1.517 1.759 |
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| | al User Overrides | | | | | | | | | |
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MHFD-Detention, Version 4.04 (February 2021)



| | DE | TENTION | BASIN OUT | LET STRU | CTURE DE | SIGN | | | |
|--|--|--|--|--|---|--|--|---|---|
| Project | Grandview - Pond | МН | FD-Detention, Vers | | | | | | |
| Basin ID: | dianaview - Polia | | | | | | | | |
| ZONE 3 | | | | Estimated | Estimated | | | | |
| | | | | Stage (ft) | Volume (ac-ft) | Outlet Type | | | |
| VOLUME EURV WOCY | | - | Zone 1 (WQCV) | | 0.251 | Orifice Plate | | | |
| | 100-YEAR | | Zone 2 (EURV) | | 0.672 | Circular Orifice | | | |
| PERMANENT ORIFICES | ORIFICE | | Zone 3 (100-year) | | 0.481 | Weir&Pipe (Restrict) | | | |
| | Configuration (Re | tention Pond) | 2011e 5 (100-year) | Total (all zones) | 1.404 | Weirdripe (Result) | | | |
| User Input: Orifice at Underdrain Outlet (typicall | v used to drain WO | CV in a Filtration B | MP) | | 1.404 |] | Calculated Parame | ters for Underdrain | |
| Underdrain Orifice Invert Depth = | N/A | 1 | the filtration media | surface) | Under | Irain Orifice Area = | N/A | ft ² | |
| Underdrain Orifice Diameter = | N/A | inches | | Surface) | | Orifice Centroid = | N/A | feet | |
| | , | 1 | | | | | | - | |
| User Input: Orifice Plate with one or more orific | es or Elliptical Slot | Neir (typically used | to drain WQCV and | d/or EURV in a sedir | <u>mentation BMP)</u> | | Calculated Parame | ters for Plate | |
| Invert of Lowest Orifice = | 0.00 | ft (relative to basir | bottom at Stage = | • 0 ft) | WQ Orifi | ce Area per Row = | 6.597E-03 | ft ² | |
| Depth at top of Zone using Orifice Plate = | 1.84 | · · | bottom at Stage = | = 0 ft) | | ptical Half-Width = | N/A | feet | |
| Orifice Plate: Orifice Vertical Spacing = | 7.10 | inches | | | | ical Slot Centroid = | N/A | feet | |
| Orifice Plate: Orifice Area per Row = | 0.95 | sq. inches (diamet | er = 1-1/16 inches) | | E | lliptical Slot Area = | N/A | ft² | |
| | | | | | | | | | |
| | - D (| | | | | | | | |
| User Input: Stage and Total Area of Each Orifice | | | | Pow / (optional) | Pow E (optional) | Pow 6 (optional) | Pow 7 (ontional) | Pow 9 (ontional) | 1 |
| Stage of Outling Contu-11 (A) | Row 1 (required) | Row 2 (optional) 0.61 | Row 3 (optional) | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) | 1 |
| Stage of Orifice Centroid (ft) Orifice Area (sq. inches) | 0.00 | 0.61 | 0.95 | | | | | | 1 |
| Ornice Area (sq. inches) | 0.95 | 0.55 | 0.55 | | | | | | L |
| | Row 9 (optional) | Row 10 (optional) | Row 11 (optional) | Row 12 (optional) | Row 13 (optional) | Row 14 (optional) | Row 15 (optional) | Row 16 (optional) | 1 |
| Stage of Orifice Centroid (ft) | (optional) | | (optional) | | | (optional) | is (optional) | | 1 |
| Orifice Area (sq. inches) | | | | | | | | | 1 |
| | | | | • | | | | | - |
| Jser Input: Vertical Orifice (Circular or Rectangu | ular) | | _ | | | | Calculated Parame | ters for Vertical Ori | fice |
| | Zone 2 Circular | Not Selected | | | | | Zone 2 Circular | Not Selected | |
| Invert of Vertical Orifice = | 1.84 | N/A | | bottom at Stage = | | tical Orifice Area = | 0.02 | N/A | ft ² |
| Depth at top of Zone using Vertical Orifice = | 3.66 | N/A | - · | bottom at Stage = | 0 ft) Vertica | Orifice Centroid = | 0.09 | N/A | feet |
| Vertical Orifice Diameter = | 2.10 | N/A | inches | | | | | | |
| | | | | | | | | | |
| User Input: Overflow Weir (Dropbox with Flat o | r Clanad Crata and | Outlat Dina OD Dag | tangular/Trangzoid | al Wair (and No Out | tlat Dina) | | Calculated Darama | tors for Overflow M | loir |
| User Input. Overnow weir (Dropbox with Flat o | Zone 3 Weir | Not Selected | | | <u>liet ripe)</u> | | | ters for Overflow W | 1 |
| Overflow Weir Front Edge Height, Ho = | 3.67 | N/A | ft (relative to basin h | oottom at Stage = 0 ft |) Height of Grate | e Upper Edge, H _t = | Zone 3 Weir 4.42 | Not Selected N/A | feet |
| Overflow Weir Front Edge Length = | 3.00 | N/A | feet | ottom at Stage = 0 h |) Height of olda | | | | icci |
| Overflow Weir Grate Slope = | | ,,,, | | | Overflow W | leir Slone Length = | 3.09 | | feet |
| | 4.00 | N/A | 1 _{H·V} | G | | /eir Slope Length = 00-vr Orifice Area = | 3.09 9.78 | N/A | feet |
| - | 4.00 | N/A N/A | H:V feet | | rate Open Area / 10 | 00-yr Orifice Area = | 9.78 | N/A N/A | |
| Horiz. Length of Weir Sides = Overflow Grate Type = | 4.00 3.00 Type C Grate | N/A | H:V feet | Ov | | 0-yr Orifice Area = Area w/o Debris = | | N/A | ft ² |
| Horiz. Length of Weir Sides = | 3.00 | | + | Ov | rate Open Area / 10 verflow Grate Open | 0-yr Orifice Area = Area w/o Debris = | 9.78 6.46 | N/A N/A N/A | |
| Horiz. Length of Weir Sides = Overflow Grate Type = | 3.00 Type C Grate | N/A N/A | feet | Ov | rate Open Area / 10 verflow Grate Open | 0-yr Orifice Area = Area w/o Debris = | 9.78 6.46 | N/A N/A N/A | ft ² |
| Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = | 3.00 Type C Grate 50% | N/A N/A N/A | feet % | Ov | rate Open Area / 10 verflow Grate Open Overflow Grate Ope | 0-yr Orifice Area = Area w/o Debris = | 9.78 6.46 3.23 | N/A N/A N/A N/A | ft² ft² |
| Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = | 3.00 Type C Grate 50% | N/A N/A N/A | feet % | Ov | rate Open Area / 10 verflow Grate Open Overflow Grate Ope | 00-yr Orifice Area = Area w/o Debris = n Area w/ Debris = | 9.78 6.46 3.23 | N/A N/A N/A N/A | ft² ft² |
| Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = | 3.00 Type C Grate 50% | N/A N/A N/A estrictor Plate, or R | feet % ectangular Orifice) | Ov | rate Open Area / 10 verflow Grate Open Overflow Grate Ope <u>Ca</u> | 00-yr Orifice Area = Area w/o Debris = n Area w/ Debris = | 9.78 6.46 3.23 s for Outlet Pipe w/ | N/A N/A N/A / Flow Restriction Pl | ft² ft² |
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| Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = | 3.00 Type C Grate 50% c(Circular Orifice, R Zone 3 Restrictor 0.25 18.00 7.20 | N/A N/A N/A estrictor Plate, or R Not Selected N/A | feet % ectangular Orifice) ft (distance below ba inches | O) C | rate Open Area / 10 verflow Grate Open Overflow Grate Open <u>Ca</u> = 0 ft) O Outlet | 00-yr Orifice Area = Area w/o Debris = n Area w/ Debris = alculated Parameter utlet Orifice Area = t Orifice Centroid = | 9.78 6.46 3.23 s for Outlet Pipe w/ Zone 3 Restrictor 0.66 0.35 1.37 | N/A N/A N/A / Flow Restriction Pl Not Selected N/A N/A N/A | ft ² ft ² <u>ate</u> ft ² feet |
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DETENTION BASIN OUTLET STRUCTURE DESIGN Outflow Hydrograph Workbook Filename:

| | SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
|---------------|--------------------|------------|------------|--------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | | 50 Year [cfs] | 100 Year [cfs] | |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.14 | 0.01 | 0.82 |
| | 0:15:00 | 0.00 | 0.00 | 1.22 | 1.98 | 2.45 | 1.65 | 2.06 | 2.02 | 3.65 |
| | 0:20:00 | 0.00 | 0.00 | 4.31 | 5.64 | 6.63 | 4.18 | 4.87 | 5.23 | 8.19 |
| - | 0:25:00 | 0.00 | 0.00 | 8.70 | 11.54 | 13.98 | 8.62 | 9.84 | 10.58 | 17.32 |
| - | 0:30:00 | 0.00 | 0.00 | 10.01 | 13.22 | 15.60 | 17.92 | 21.71 | 24.78 | 42.24 |
| - | 0:35:00 | 0.00 | 0.00 | 9.20 8.20 | 11.94 10.43 | 13.96 12.15 | 20.35 19.20 | 24.52 23.11 | 29.86 28.16 | 49.75 46.81 |
| - | 0:45:00 | 0.00 | 0.00 | 7.05 | 9.10 | 10.66 | 16.73 | 20.05 | 25.10 | 41.98 |
| - | 0:50:00 | 0.00 | 0.00 | 6.06 | 7.98 | 9.22 | 14.90 | 17.79 | 22.09 | 37.24 |
| | 0:55:00 | 0.00 | 0.00 | 5.26 | 6.90 | 8.00 | 12.68 | 15.04 | 19.01 | 32.03 |
| | 1:00:00 | 0.00 | 0.00 | 4.73 | 6.16 | 7.24 | 10.77 | 12.68 | 16.36 | 27.62 |
| | 1:05:00 | 0.00 | 0.00 | 4.35 | 5.64 | 6.68 | 9.50 | 11.13 | 14.66 | 24.94 |
| | 1:10:00 | 0.00 | 0.00 | 3.80 | 5.17 | 6.16 | 8.28 | 9.65 | 12.38 | 20.87 |
| - | 1:15:00 | 0.00 | 0.00 | 3.28 | 4.57 | 5.62 | 7.20 | 8.36 | 10.37 | 17.27 |
| - | 1:20:00 | 0.00 | 0.00 | 2.81 | 3.92 3.39 | 4.91 4.12 | 6.02 4.99 | 6.95 5.73 | 8.29 6.50 | 13.66 10.55 |
| - | 1:30:00 | 0.00 | 0.00 | 2.42 | 3.39 | 3.57 | 4.99 | 4.54 | 4.98 | 7.94 |
| | 1:35:00 | 0.00 | 0.00 | 2.02 | 2.85 | 3.27 | 3.31 | 3.74 | 3.96 | 6.22 |
| | 1:40:00 | 0.00 | 0.00 | 1.96 | 2.57 | 3.07 | 2.91 | 3.28 | 3.38 | 5.25 |
| | 1:45:00 | 0.00 | 0.00 | 1.91 | 2.35 | 2.92 | 2.66 | 2.99 | 3.01 | 4.60 |
| | 1:50:00 | 0.00 | 0.00 | 1.88 | 2.19 | 2.82 | 2.49 | 2.80 | 2.77 | 4.16 |
| - | 1:55:00 | 0.00 | 0.00 | 1.66 | 2.06 | 2.68 | 2.38 | 2.67 | 2.59 | 3.85 |
| - | 2:00:00 | 0.00 | 0.00 | 1.47 | 1.92 | 2.45 | 2.30 | 2.58 | 2.47 | 3.63 |
| - | 2:05:00 2:10:00 | 0.00 | 0.00 | 1.12 | 1.46 | 1.87 | 1.76 | 1.97 | 1.86 | 2.72 |
| - | 2:15:00 | 0.00 | 0.00 | 0.84 | 1.09 0.81 | 1.39 | 1.30 0.96 | 1.46 | 1.37 | 1.99 1.48 |
| - | 2:20:00 | 0.00 | 0.00 | 0.46 | 0.60 | 0.76 | 0.50 | 0.80 | 0.76 | 1.40 |
| - | 2:25:00 | 0.00 | 0.00 | 0.34 | 0.43 | 0.55 | 0.52 | 0.58 | 0.55 | 0.79 |
| | 2:30:00 | 0.00 | 0.00 | 0.24 | 0.30 | 0.39 | 0.37 | 0.41 | 0.39 | 0.56 |
| | 2:35:00 | 0.00 | 0.00 | 0.17 | 0.21 | 0.28 | 0.27 | 0.30 | 0.28 | 0.41 |
| | 2:40:00 | 0.00 | 0.00 | 0.11 | 0.15 | 0.19 | 0.18 | 0.21 | 0.20 | 0.28 |
| | 2:45:00 | 0.00 | 0.00 | 0.07 | 0.09 | 0.12 | 0.12 | 0.13 | 0.12 | 0.18 |
| - | 2:50:00 | 0.00 | 0.00 | 0.03 | 0.05 | 0.06 | 0.07 | 0.07 | 0.07 | 0.09 |
| - | 3:00:00 | 0.00 | 0.00 | 0.01 | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 |
| | 3:05:00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ľ | 3:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| - | 3:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 3:35:00 3:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:55:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| - | 4:35:00 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| - | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| [| 4:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ŀ | 4:55:00 5:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| [| 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| - | 5:20:00 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ŀ | 5:45:00 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| t i i | 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically. The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft ²] | Area [acres] | Volume [ft ³] | Volume [ac-ft] | Total Outflow [cfs] | |
|--------------------------------|---------------|----------------------------|-----------------|------------------------------|-------------------|---------------------------|---|
| | | | | | | | For best results, include the |
| | | | | | | | stages of all grade slope |
| | | | | | | | changes (e.g. ISV and Floor) from the S-A-V table on |
| | | | | | | | Sheet 'Basin'. |
| | | | | | | | _ |
| | | | | | | | Also include the inverts of all |
| | | | | | | | outlets (e.g. vertical orifice, |
| | | | | | | | overflow grate, and spillway, where applicable). |
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MHFD-Detention, Version 4.04 (February 2021)

| Project: Grandview - Pond E | |
|--|---|
| Basin ID: | |
| | 1 |
| POOL Example Zone Configuration (Retention Pond) | |

Watershed Information

| ccisiica miorinadon | | |
|---|------------|---------|
| Selected BMP Type = | EDB | |
| Watershed Area = | 21.16 | acres |
| Watershed Length = | 1,800 | ft |
| Watershed Length to Centroid = | 900 | ft |
| Watershed Slope = | 0.020 | ft/ft |
| Watershed Imperviousness = | 61.60% | percent |
| Percentage Hydrologic Soil Group A = | 90.0% | percent |
| Percentage Hydrologic Soil Group B = | 10.0% | 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.

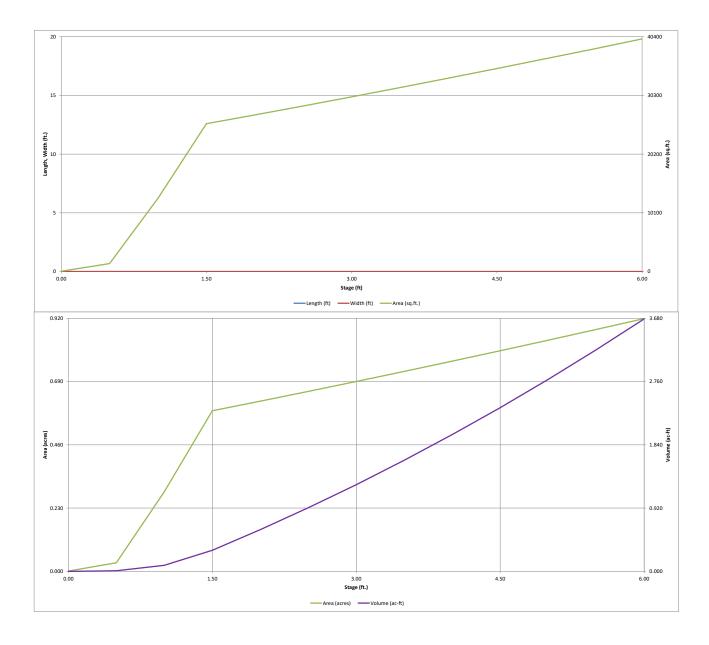
| are embedded colorado orban nyaro | graphinioceau | | Optional U |
|--|---------------|-----------|------------|
| Water Quality Capture Volume (WQCV) = | 0.426 | acre-feet | |
| Excess Urban Runoff Volume (EURV) = | 1.576 | acre-feet | |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 1.195 | acre-feet | 1.19 |
| 5-yr Runoff Volume (P1 = 1.5 in.) = | 1.568 | acre-feet | 1.50 |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 1.867 | acre-feet | 1.75 |
| 25-yr Runoff Volume (P1 = 2 in.) = | 2.322 | acre-feet | 2.00 |
| 50-yr Runoff Volume (P1 = 2.25 in.) = | 2.722 | acre-feet | 2.25 |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 3.227 | acre-feet | 2.52 |
| 500-yr Runoff Volume (P1 = 3.68 in.) = | 5.285 | acre-feet | 3.68 |
| Approximate 2-yr Detention Volume = | 1.040 | acre-feet | |
| Approximate 5-yr Detention Volume = | 1.366 | acre-feet | |
| Approximate 10-yr Detention Volume = | 1.661 | acre-feet | |
| Approximate 25-yr Detention Volume = | 1.982 | acre-feet | |
| Approximate 50-yr Detention Volume = | 2.176 | acre-feet | |
| Approximate 100-yr Detention Volume = | 2.395 | acre-feet | |
| | | | |

Define Zones and Basin Geometry

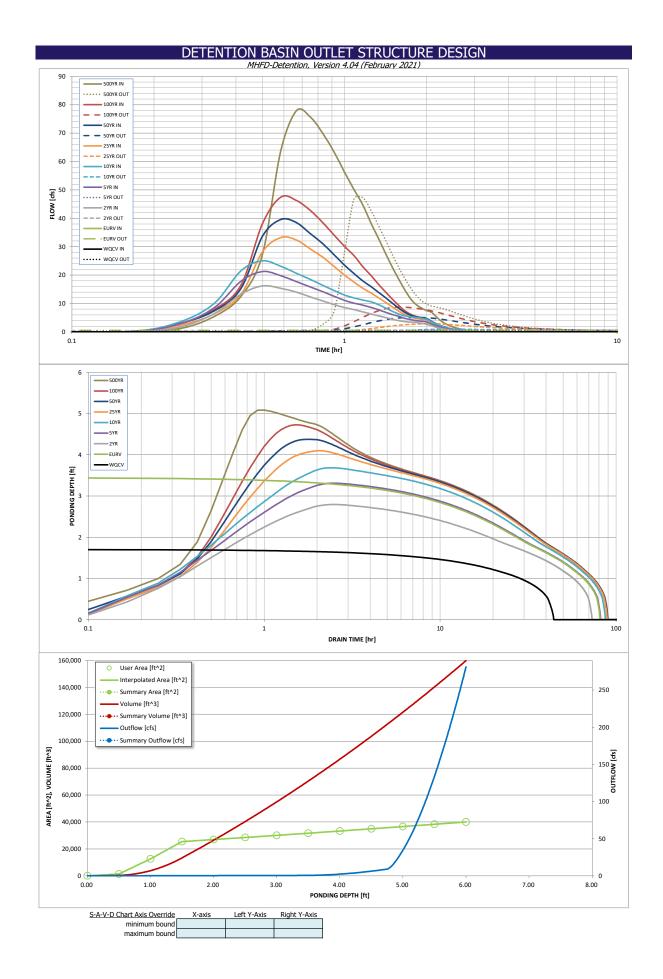
| enne zones and basin deonied y | | |
|---|-------|-----------------|
| Zone 1 Volume (WQCV) = | 0.426 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 1.150 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 0.819 | acre-feet |
| Total Detention Basin Volume = | 2.395 | acre-feet |
| Initial 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 |
| | | |

| | Depth Increment = | 0.50 | ft Optional | | | | Optional | | | |
|------------------------|--------------------------------|---------------|------------------------|----------------|---------------|----------------------------|-------------------------------------|----------------|------------------------------|-------------------|
| d) | Stage - Storage Description | Stage (ft) | Override Stage (ft) | Length (ft) | Width (ft) | Area (ft ²) | Override Area (ft ²) | Area (acre) | Volume (ft ³) | Volume (ac-ft) |
| | Top of Micropool | | 0.00 | | | | 35 | 0.001 | () | (22.13) |
| | | | 0.50 | | | | 1,362 | 0.031 | 349 | 0.008 |
| | 6947 | | 1.00 | | | | 12,615 | 0.290 | 3,843 | 0.088 |
| | 6948 | | 1.50 2.00 | | | | 25,422 26,944 | 0.584 0.619 | 13,352 26,443 | 0.307 |
| | | | 2.50 | | | | 28,490 | 0.654 | 40,302 | 0.925 |
| | 6949 | | 3.00 | | | | 30,062 | 0.690 | 54,940 | 1.261 |
| | 6050 | | 3.50 | | | | 31,660 | 0.727 | 70,370 | 1.615 |
| | 6950 | | 4.00 4.50 | | | | 33,282 34,931 | 0.764 | 86,606 103,659 | 1.988 2.380 |
| | 6951 | | 5.00 | | | | 36,604 | 0.840 | 121,543 | 2.790 |
| | | | 5.50 | | | | 38,303 | 0.879 | 140,270 | 3.220 |
| | 6952 | | 6.00 | | | | 40,027 | 0.919 | 159,852 | 3.670 |
| al User Overrides | | | | | | | | | | |
| acre-feet | | | | | | | | | | |
| acre-feet | | | | | | | | | | |
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MHFD-Detention, Version 4.04 (February 2021)



| | DE | TENTION | BASIN OU | ILEI SIRU | CIURE DE | | | | |
|---|--|---|--|---|--|--|--|---|--|
| Droject | Grandview - Pond | МН | | sion 4.04 (Februar | | | | | |
| Basin ID: | | - | | | | | | | |
| ZONE 3 | | | | Estimated | Estimated | | | | |
| 100-YR | | | | Stage (ft) | Volume (ac-ft) | Outlet Type | | | |
| VOLUME EURY WOCV | | | Zone 1 (WQCV) | 1.71 | 0.426 | Orifice Plate |] | | |
| | 100-YEAR ORIFICE | | Zone 2 (EURV) | 3.45 | 1.150 | Rectangular Orifice | | | |
| PERMANENT ORIFICES | | | Zone 3 (100-year) | 4.52 | 0.819 | Weir&Pipe (Restrict) | | | |
| POOL Example Zone | Configuration (Re | tention Pond) | | Total (all zones) | 2.395 | | 1 | | |
| User Input: Orifice at Underdrain Outlet (typical | <u>y used to drain WQ</u> | CV in a Filtration BN | <u>1P)</u> | | | - | Calculated Parame | ters for Underdrain | L |
| Underdrain Orifice Invert Depth = | N/A | ft (distance below | the filtration media | surface) | | drain Orifice Area $=$ | | ft ² | |
| Underdrain Orifice Diameter = | N/A | inches | | | Underdrair | n Orifice Centroid = | N/A | feet | |
| Llass Innuts, Ouifice Dista with and as more ouific | ee en Elliptical Clat) | Noix (trunianly used | | d/an EUDV/ in a codi | montation RMD) | | | | |
| User Input: Orifice Plate with one or more orific Invert of Lowest Orifice = | 0.00 | ft (relative to basin | - | | | ice Area per Row = | Calculated Parame 1.215E-02 | ft ² | |
| Depth at top of Zone using Orifice Plate = | 1.71 | ft (relative to basin | - | | - | iptical Half-Width = | | feet | |
| Orifice Plate: Orifice Vertical Spacing = | 6.80 | inches | 5 | | | ical Slot Centroid = | N/A | feet | |
| Orifice Plate: Orifice Area per Row = | 1.75 | sq. inches (diamete | er = 1-1/2 inches) | | E | Iliptical Slot Area = | N/A | ft² | |
| | | | | | | | | | |
| | | | | | | | | | |
| User Input: Stage and Total Area of Each Orific | | - | | Pour 4 (antional) | Bow E (antional) | Dow 6 (antianal) | Bow 7 (antional) | Dow 9 (antians) | 1 |
| Stage of Orifice Centroid (ft) | Row 1 (required) 0.00 | Row 2 (optional) 0.57 | Row 3 (optional) 1.14 | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) | - |
| Orifice Area (sq. inches) | | 1.75 | 1.14 | | | | | | |
| office Area (sq. inclus) | 1.75 | 1.75 | 1.75 | | | | | | |
| | Row 9 (optional) | Row 10 (optional) | Row 11 (optional) | Row 12 (optional) | Row 13 (optional) | Row 14 (optional) | Row 15 (optional) | Row 16 (optional) |] |
| Stage of Orifice Centroid (ft) | | | | | | | | | |
| Orifice Area (sq. inches) | | | | | | | | | |
| | | | | | | | <u></u> | | <u>~</u> |
| User Input: Vertical Orifice (Circular or Rectang | | Not Selected | 1 | | | | Calculated Parame | | <u>fice</u> |
| Invert of Vertical Orifice = | Zone 2 Rectangula 1.75 | N/A | ft (relative to bacir | n bottom at Stage = | 0ft) Vo | rtical Orifice Area = | Zone 2 Rectangular 0.04 | Not Selected | ft ² |
| Depth at top of Zone using Vertical Orifice = | 3.45 | N/A N/A | | bottom at Stage = bottom at Stage = | | I Orifice Centroid = | 0.04 | N/A N/A | feet |
| Vertical Orifice Height = | 1.50 | N/A | inches | i bottom at Stage = | vertica | | 0.00 | | Jiece |
| Vertical Orifice Width = | 4.00 | | inches | | | | | | |
| | | | | | | | | | |
| User Input: Overflow Weir (Dropbox with Flat o | r Sloped Grate and | Outlet Pine OR Rec | tangular/Transzoid | | | | | | |
| | | | | al Weir (and No Out | <u>tlet Pipe)</u> | | Calculated Parame | ters for Overflow W | <u>/eir</u> |
| | Zone 3 Weir | Not Selected | | al Weir (and No Out | | | Zone 3 Weir | Not Selected |] |
| Overflow Weir Front Edge Height, Ho = | Zone 3 Weir 3.45 | Not Selected N/A | ft (relative to basin l | al Weir (and No Out |) Height of Grate | e Upper Edge, H _t = | Zone 3 Weir 4.20 | Not Selected N/A | feet |
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| Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = User Input: Emergency Spillway (Rectangular or Spillway Invert Stage= Spillway Crest Length = Spillway Crest Length = Spillway Crest Length = Spillway End Slopes = Freeboard above Max Water Surface = Routed Hydrograph Results Design Storm Return Period = One-Hour Rainfall Depth (in) = CUHP Runoff Volume (arce-ft) = Inflow Hydrograph Volume (arce-ft) = CUHP Predevelopment Peak Q (cfs) = Predevelopment Unit Peak Flow, q (cfs/arce) = Peak Inflow Q (cfs) = Ratio Peak Outflow to Predevelopment Q = Structure Controlling Flow = Max Velocity through Grate 1 (fps) = Max Velocity through Grate 1 (fps) = | Zone 3 Weir 3.45 3.00 4.00 3.00 Type C Grate 50% c (Circular Orifice, R Zone 3 Restrictor 0.25 18.00 10.90 Trapezoidal) 4.75 60.00 4.00 1.00 The user can over WQCV N/A 0.426 N/A N/A N/A N/A N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A estrictor Plate, or Rr Not Selected N/A N/A It (relative to basin feet H:V feet EURV N/A 1.576 N/A 1.576 N/A | ft (relative to basin I feet H:V feet % ectangular Orifice) ft (distance below be inches inches bottom at Stage = hbottom at Stage = 2 Year 1.19 1.195 1.195 0.1 0.01 16.2 0.5 N/A Vertical Orifice 1 N/A | bottom at Stage = 0 ft Gr Ov C asin bottom at Stage = Half-Cent = 0 ft) 5 Year 1.50 1.568 1.568 0.3 0.01 21.2 0.5 2.0 Vertical Orifice 1 N/A | Height of Grate Overflow Weir 1 Prevention Grate Open Overflow Grate Open Care Care Ca | <pre>/eir Slope Length = 00-yr Orifice Area = Area w/o Debris = n Area w/ Debris = n Area w/ Debris = alculated Parameter utlet Orifice Area = t Orifice Centroid = t Orifice Cen</pre> | Zone 3 Weir 4.20 3.09 5.77 6.46 3.23 S for Outlet Pipe w/ Zone 3 Restrictor 1.12 0.52 1.78 Calculated Parame 0.40 6.15 0.92 3.67 S0 Year 2.25 2.722 2.722 7.6 0.36 39.6 5.1 0.7 Overflow Weir 1 0.7 N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A Flow Restriction Pl Not Selected N/A N/A N/A N/A N/A ters for Spillway feet feet acres acre-ft 100 Year 2.52 3.227 3.227 3.227 11.8 0.56 47.4 8.7 0.7 Overflow Weir 1 1.3 N/A | (7). |
| Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = User Input: Emergency Spillway (Rectangular or Spillway Invert Stage= Spillway Crest Length = Spillway Crest Length = Spillway Crest Length = Spillway Crest Length = Spillway End Slopes = Freeboard above Max Water Surface = Routed Hydrograph Results Design Storm Return Period = One-Hour Rainfall Depth (In) = CUHP Predevelopment Peak Q (cfs) = Predevelopment Unit Peak Flow, q (cfs/acre) = Peak Outflow Q (cfs) = Ratio Peak Outflow to Predevelopment Q = Structure Controlling Flow = Max Velocity through Grate 1 (fps) = | Zone 3 Weir 3.45 3.00 4.00 3.00 Type C Grate 50% (Circular Orifice, R Zone 3 Restrictor 0.25 18.00 10.90 Trapezoidal) 4.75 60.00 4.00 1.00 The user can over WQCV N/A N/A N/A N/A N/A N/A Plate N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A estrictor Plate, or Rr Not Selected N/A N/A N/A ft (relative to basin feet H:V feet EURV EURV K/A 1.576 N/A | ft (relative to basin l feet H:V feet % ft (distance below be inches inches bottom at Stage = 1/P hydrographs and 2 Year 1.19 1.195 | asin bottom at Stage = 0 ft Gr ON asin bottom at Stage = Half-Cent = 0 ft) # runoff volumes by 5 Year 1.50 1.568 1.568 0.3 0.01 21.2 0.5 2.0 Vertical Orifice 1 N/A | Height of Gratt Overflow Weir 1 Poerflow Grate Open Care of the open Care open <licare li="" open<=""></licare> | <pre>/eir Slope Length = 00-yr Orifice Area = Area w/o Debris = n Area w/ Debris = alculated Parameter utlet Orifice Area = t Orifice Centroid = t Orifice Centroid = tor Plate on Pipe = esign Flow Depth= Top of Freeboard = Top of Freeboard = Top of Freeboard = Cop of Freeboard = 2.322 2.322 2.322 4.6 0.22 3.3.2 2.9 0.6 Overflow Weir 1 0.4</pre> | Zone 3 Weir 4.20 3.09 5.77 6.46 3.23 S for Outlet Pipe w// Zone 3 Restrictor 1.12 0.52 1.78 Calculated Parame 0.40 6.15 0.92 3.67 SO Year 2.25 2.722 2.722 2.722 2.722 2.722 3.67 So Year 0.36 3.9.6 5.1 0.7 Overflow Weir 1 0.7 | Not Selected N/A | Feet feet ft ² ft ² ft ² feet radians 500 Year 3.68 5.285 7.79 |
| Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = User Input: Emergency Spillway (Rectangular or Spillway Invert Stage= Spillway Crest Length = Spillway End Slopes = Freeboard above Max Water Surface = One-Hour Rainfall Depth (in) = CUHP Runoff Volume (acre-ft) = Inflow Hydrograph Volume (acre-ft) = Inflow Hydrograph Volume (acre-ft) = CUHP Runoff Volume (acre) = OPTIONAL Override Predevelopment Peak Q (cfs) = Predevelopment Unit Peak Flow, q (cfs/acre) = Peak Outflow Q (cfs) = Ratio Peak Outflow to Predevelopment Q = Structure Controlling Flow = Max Velocity through Grate 1 (fps) = Time to Drain 97% of Inflow Volume (hours) = | Zone 3 Weir 3.45 3.00 4.00 3.00 Type C Grate 50% c (Circular Orifice, R Zone 3 Restrictor 0.25 18.00 10.90 Trapezoidal) 4.75 60.00 4.00 1.00 The user can over: N/A N/A N/A N/A N/A N/A N/A N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A estrictor Plate, or Rr Not Selected N/A N/A R/A R/A R/A R/A R/A N/A N/A N/A N/A N/A N/A N/A N/A N/A N | ft (relative to basin I feet H:V feet % ft (distance below be inches inches bottom at Stage = h bottom at Stage = 2 Year 1.19 1.195 1.195 0.1 0.1 16.2 0.5 N/A Vertical Orifice 1 N/A Vertical Orifice 1 N/A 69 2.79 | asin bottom at Stage = 0 ft Gi ON asin bottom at Stage = Half-Cent = 0 ft) # runoff volumes by 5 Year 1.50 1.568 0.3 0.01 21.2 0.5 2.0 Vertical Orifice 1 N/A 77 3.31 | Height of Gratt Overflow Weir 1 vate Open Area / 10 verflow Grate Open Cate open <licate li="" open<=""> Cate open <licate li="" open<=""></licate></licate> | leir Slope Length = 00-yr Orifice Area = Area w/o Debris = n Area w/ Debris = n Area w/ Debris = alculated Parameter utlet Orifice Area = t Orifice Centroid = ttor Plate on Pipe = lesign Flow Depth= Top of Freeboard = Top of Freeboard = Top of Freeboard = Cop of Freeboard = 2.322 2.322 4.6 0.22 3.3.2 2.9 0.6 Overflow Weir 1 0.4 N/A 76 83 4.10 | Zone 3 Weir 4.20 3.09 5.77 6.46 3.23 S for Outlet Pipe w/ Zone 3 Restrictor 1.12 0.52 1.78 Calculated Parame 0.40 6.15 0.92 3.67 SO Year 2.25 2.722 2.722 2.722 7.6 0.36 39.6 39.6 5.1 0.7 Overflow Weir 1 0.7 N/A 75 82 4.37 | Not Selected N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A | F). feet feet ft ² ft ² feet radians F). 500 Year 3.68 5.285 5.285 2.8.3 1.34 77.9 47.3 1.7 Spillway 1.7 N/A 66 79 5.08 |
| Overflow Weir Front Edge Length = Overflow Weir Grate Slope = Horiz. Length of Weir Sides = Overflow Grate Type = Debris Clogging % = User Input: Outlet Pipe w/ Flow Restriction Plate Depth to Invert of Outlet Pipe = Outlet Pipe Diameter = Restrictor Plate Height Above Pipe Invert = User Input: Emergency Spillway (Rectangular or Spillway Invert Stage= Spillway Crest Length = Spillway Crest Length = Spillway End Slopes = Freeboard above Max Water Surface = CUHP Runoff Volume (acre-ft) = Inflow Hydrograph Neume (acre-ft) = CUHP Predevelopment Peak Q (cfs) = Predevelopment Unit Peak Flow, q (cfs/acre) = Peak Outflow Q (cfs) = Ratio Peak Outflow to Predevelopment Q = Structure Controlling Flow = Max Velocity through Grate 1 (fps) = Max Velocity through Grate 1 (fps) = Time to Drain 97% of Inflow Volume (hours) = Time to Drain 97% of Inflow Volume (hours) = Time to Drain 97% of Inflow Volume (hours) = | Zone 3 Weir 3.45 3.00 4.00 3.00 Type C Grate 50% 2 (Circular Orifice, R Zone 3 Restrictor 0.25 18.00 10.90 Trapezoidal) 4.75 60.00 4.00 1.00 7he user can over WQCV N/A N/A N/A N/A N/A N/A N/A N/A | Not Selected N/A N/A N/A N/A N/A N/A N/A estrictor Plate, or R N/A N/A ft (relative to basin feet H:V feet ide the default CUH EURV N/A 1.576 N/A | ft (relative to basin l feet H:V feet % ectangular Orifice) ft (distance below be inches inches bottom at Stage = // hydrographs and 2 Year 1.195 1.195 1.195 0.1 0.01 16.2 0.5 N/A Vertical Orifice 1 N/A N/A 65 69 | bottom at Stage = 0 ft Gr Ov asin bottom at Stage = Half-Cent Half-Cent = 0 ft) 1.50 1.568 0.3 0.01 21.2 0.5 2.0 Vertical Orifice 1 N/A N/A 72 77 | Height of Grate Overflow Wrate Open Area / 10 verflow Grate Open Overflow Grate Open Care e 0 ft) O Outlet tral Angle of Restrict Spillway D Stage at T Basin Area Area Area Area Area Area Area Area | /eir Slope Length = 00-yr Orifice Area = Area w/o Debris = n Area w/o Debris = alculated Parameter utlet Orifice Area = t Orifice Centroid = to rifice Centroid = tor Plate on Pipe = lesign Flow Depth= Top of Freeboard = Top of Freeboard = 200 2.322 2.322 4.6 0.22 33.2 2.9 0.6 Overflow Weir 1 0.4 N/A 76 83 | Zone 3 Weir 4.20 3.09 5.77 6.46 3.23 s for Outlet Pipe w/ Zone 3 Restrictor 1.12 0.52 1.78 Calculated Parame 0.40 6.15 0.92 3.67 frographs table (Con 50 Year 2.25 2.722 2.722 7.6 0.36 39.6 5.1 0.7 Overflow Weir 1 0.7 N/A 75 82 | Not Selected N/A N/A N/A N/A N/A N/A N/A Flow Restriction PI Not Selected N/A N/A N/A N/A ters for Spillway feet feet acres acre-ft umns W through A 100 Year 2.52 3.227 3.227 3.227 11.8 0.56 47.4 8.7 0.7 Overflow Weir 1 1.3 N/A 73 82 | F). For the second sec |



DETENTION BASIN OUTLET STRUCTURE DESIGN Outflow Hydrograph Workbook Filename:

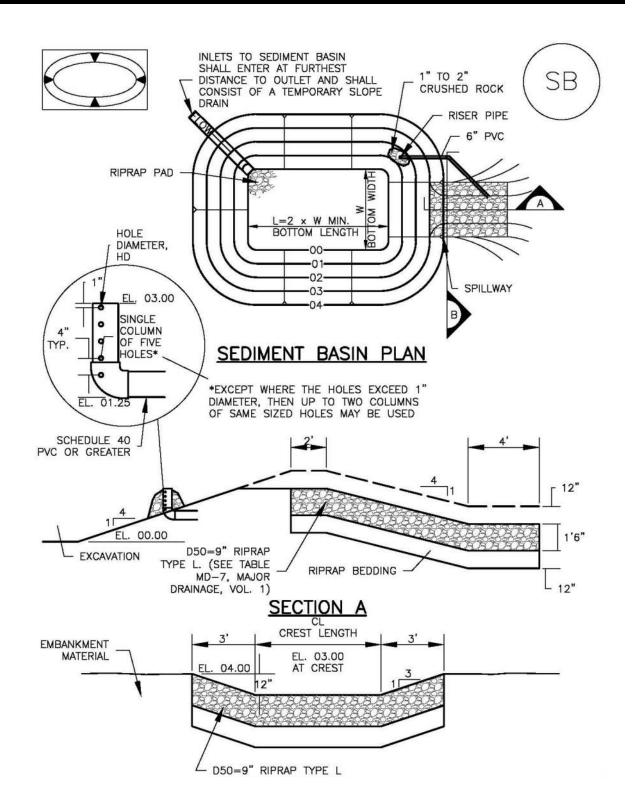
| | The user can o | verride the calcu | lated inflow hyd | lrographs from t | his workbook wi | th inflow hydrog | raphs developed | i in a separate pro | ogram. | |
|---------------|--------------------|-------------------|------------------|------------------|-----------------|------------------|-----------------|---------------------|----------------|----------------|
| [| SOURCE | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP | CUHP |
| Time Interval | TIME | WQCV [cfs] | EURV [cfs] | 2 Year [cfs] | 5 Year [cfs] | 10 Year [cfs] | 25 Year [cfs] | 50 Year [cfs] | 100 Year [cfs] | 500 Year [cfs |
| 5.00 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.20 | 0.02 | 1.20 |
| | 0:15:00 | 0.00 | 0.00 | 1.78 | 2.90 | 3.59 | 2.42 | 3.03 | 2.95 | 5.45 |
| | 0:20:00 | 0.00 | 0.00 | 6.45 13.28 | 8.51 17.82 | 10.03 21.49 | 6.34 13.18 | 7.40 | 7.91 16.39 | 12.47 27.11 |
| | 0:30:00 | 0.00 | 0.00 | 16.20 | 21.25 | 25.03 | 28.11 | 33.61 | 38.01 | 63.71 |
| | 0:35:00 | 0.00 | 0.00 | 15.36 | 19.79 | 23.11 | 33.22 | 39.56 | 47.43 | 77.87 |
| | 0:40:00 | 0.00 | 0.00 | 13.99 | 17.73 | 20.64 | 32.38 | 38.49 | 46.28 | 75.62 |
| | 0:45:00 | 0.00 | 0.00 | 12.32 | 15.79 | 18.47 | 29.14 | 34.53 | 42.70 | 69.89 |
| | 0:50:00 | 0.00 | 0.00 | 10.87 9.62 | 14.17 12.52 | 16.39 14.53 | 26.31 23.03 | 31.06 27.12 | 38.47 34.04 | 63.30 56.31 |
| | 1:00:00 | 0.00 | 0.00 | 8.57 | 11.09 | 14.33 | 20.03 | 23.53 | 30.14 | 50.09 |
| | 1:05:00 | 0.00 | 0.00 | 7.85 | 10.13 | 11.96 | 17.53 | 20.54 | 26.85 | 44.83 |
| | 1:10:00 | 0.00 | 0.00 | 7.04 | 9.46 | 11.25 | 15.40 | 17.99 | 23.03 | 38.35 |
| | 1:15:00 | 0.00 | 0.00 | 6.31 | 8.67 | 10.59 | 13.73 | 15.97 | 19.89 | 32.91 |
| | 1:20:00 | 0.00 | 0.00 | 5.66 | 7.78 | 9.61 | 12.01 | 13.93 | 16.77 | 27.53 |
| | 1:30:00 | 0.00 | 0.00 | 5.04 4.45 | 6.92 6.13 | 8.36 7.22 | 10.40 8.76 | 12.01 10.08 | 13.97 11.50 | 22.73 18.52 |
| | 1:35:00 | 0.00 | 0.00 | 3.94 | 5.47 | 6.28 | 7.27 | 8.32 | 9.29 | 14.74 |
| ĺ | 1:40:00 | 0.00 | 0.00 | 3.61 | 4.77 | 5.66 | 6.02 | 6.84 | 7.42 | 11.58 |
| | 1:45:00 | 0.00 | 0.00 | 3.44 | 4.30 | 5.31 | 5.19 | 5.87 | 6.18 | 9.59 |
| | 1:50:00 | 0.00 | 0.00 | 3.36 | 3.99 | 5.08 | 4.70 | 5.31 | 5.45 | 8.36 |
| | 1:55:00 2:00:00 | 0.00 | 0.00 | 3.01 2.68 | 3.75 3.50 | 4.83 4.45 | 4.40 4.19 | 4.96 4.72 | 4.98 4.64 | 7.54 |
| | 2:05:00 | 0.00 | 0.00 | 2.08 | 2.79 | 3.55 | 3.34 | 3.76 | 3.65 | 5.41 |
| | 2:10:00 | 0.00 | 0.00 | 1.66 | 2.15 | 2.74 | 2.57 | 2.88 | 2.75 | 4.04 |
| | 2:15:00 | 0.00 | 0.00 | 1.28 | 1.67 | 2.11 | 1.97 | 2.21 | 2.08 | 3.03 |
| | 2:20:00 | 0.00 | 0.00 | 0.99 | 1.28 | 1.61 | 1.50 | 1.69 | 1.58 | 2.29 |
| | 2:25:00 | 0.00 | 0.00 | 0.75 | 0.97 | 1.22 | 1.14 | 1.28 | 1.20 | 1.74 |
| | 2:30:00 2:35:00 | 0.00 | 0.00 | 0.57 | 0.72 | 0.91 | 0.85 | 0.95 | 0.90 | 1.30 0.97 |
| | 2:40:00 | 0.00 | 0.00 | 0.31 | 0.39 | 0.51 | 0.05 | 0.53 | 0.51 | 0.37 |
| | 2:45:00 | 0.00 | 0.00 | 0.22 | 0.28 | 0.36 | 0.35 | 0.39 | 0.37 | 0.53 |
| | 2:50:00 | 0.00 | 0.00 | 0.14 | 0.19 | 0.25 | 0.24 | 0.27 | 0.25 | 0.36 |
| | 2:55:00 | 0.00 | 0.00 | 0.09 | 0.12 | 0.15 | 0.15 | 0.17 | 0.16 | 0.22 |
| | 3:00:00 3:05:00 | 0.00 | 0.00 | 0.04 | 0.07 | 0.08 | 0.08 | 0.09 | 0.09 | 0.12 |
| | 3:10:00 | 0.00 | 0.00 | 0.02 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.05 |
| | 3:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 3:20:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 4:40:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
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| | 5:00:00 5:05:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:10:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:15:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:20:00 5:25:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:30:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:35:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:40:00 5:45:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:50:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 5:55:00 6:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically. The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

| Stage - Storage Description | Stage [ft] | Area [ft ²] | Area [acres] | Volume [ft ³] | Volume [ac-ft] | Total Outflow [cfs] | |
|--------------------------------|---------------|----------------------------|-----------------|------------------------------|-------------------|---------------------------|---|
| | | | | | | | For best results, include the |
| | | | | | | | stages of all grade slope |
| | | | | | | | changes (e.g. ISV and Floor) from the S-A-V table on |
| | | | | | | | Sheet 'Basin'. |
| | | | | | | | _ |
| | | | | | | | Also include the inverts of all |
| | | | | | | | outlets (e.g. vertical orifice, |
| | | | | | | | overflow grate, and spillway, where applicable). |
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| TABLE SB-1. SI | TABLE SB-1. SIZING INFORMATION FOR STANDARD SEDIMENT BASIN | | | | | | | | |
|--|--|-------------------------------------|--|--|--|--|--|--|--|
| Upstream Drainage Area (rounded to nearest acre), (ac) | Basin Bottom Width (W), (ft) | Spillway Crest Length (CL), (ft) | Hole Diameter (HD), (in) | | | | | | |
| 1 | 12 <u>k</u> 21 | 2 | ⁹ √12 ¹³ ∕16 | | | | | | |
| 2 | 28 | 3 | | | | | | | |
| J 4 | 33 1/2 | 5 | 9/6 | | | | | | |
| 5 | 38 1/2 | 8 | 2 % 2} ₃₂ 2} ₃₂ 23 ₃₂ 27 ₃₂ 27 ₃₂ 78 1516 3} ₃₂ | | | | | | |
| 6 | 43 | 9 | 21/32 | | | | | | |
| 7 | 47 <i>1</i> /4 | 11 | 25/32 | | | | | | |
| 8 | 51 | 12 | ²⁷ /32 | | | | | | |
| 9 | 55 | 13 | 7/8 | | | | | | |
| 10 | 58 1/4 | 15 | 15/16 | | | | | | |
| 11 | 61 64 | 16 18 | 3/32 | | | | | | |
| 13 | 67 1/2 | 19 | 1 1/ | | | | | | |
| 14 | 70 1/2 | 21 | 1 X6 | | | | | | |
| 15 | 73 1/4 | 22 | 1 ½ 1 ¾ | | | | | | |

SEDIMENT BASIN INSTALLATION NOTES

- 1. SEE PLAN VIEW FOR:
 - -LOCATION OF SEDIMENT BASIN.

-TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).

-FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.

-FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.

2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.

3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.

4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.

5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

6. PIPE SCH 40 OR GREATER SHALL BE USED.

7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES.

Also provide the MHFD calculation sheets for this design to verify drain times.

| TABLE SB-1. S | ZING INFORMATION FO | OR STANDARD SEDIMENT | BASIN |
|--|--|--|---|
| Upstream Drainage Area (rounded to nearest acre), (ac) | Basin Bottom Width (W), (ft) | Spillway Crest Length (CL), (ft) | Hole Diameter (HD), (in) |
| 1 2 3 4 5 6 7 8 9 10 11 | 12 ½ 21 28 33 ½ 38 ½ 43 47 ¼ 51 55 58 ¼ 61 | 2 3 5 6 8 9 11 12 13 15 | 932 13/6 12 9/6 21/32 23/32 25/32 27/32 27/32 78 15/6 31/2 |
| 12 | 64 | 18 | 1 |
| 13 14 15 | 67 ½ 70 ½ 73 ¼ | 21 22 | 1 K6 1 K8 1 K8 |

SEDIMENT BASIN INSTALLATION NOTES

- 1. SEE PLAN VIEW FOR:
 - -LOCATION OF SEDIMENT BASIN.

-TYPE OF BASIN (STANDARD BASIN OR NONSTANDARD BASIN).

-FOR STANDARD BASIN, BOTTOM WIDTH W, CREST LENGTH CL, AND HOLE DIAMETER, HD.

-FOR NONSTANDARD BASIN, SEE CONSTRUCTION DRAWINGS FOR DESIGN OF BASIN INCLUDING RISER HEIGHT H, NUMBER OF COLUMNS N, HOLE DIAMETER HD AND PIPE DIAMETER D.

2. FOR STANDARD BASIN, BOTTOM DIMENSION MAY BE MODIFIED AS LONG AS BOTTOM AREA IS NOT REDUCED.

3. SEDIMENT BASINS SHALL BE INSTALLED PRIOR TO ANY OTHER LAND-DISTURBING ACTIVITY THAT RELIES ON ON BASINS AS AS A STORMWATER CONTROL.

4. EMBANKMENT MATERIAL SHALL CONSIST OF SOIL FREE OF DEBRIS, ORGANIC MATERIAL, AND ROCKS OR CONCRETE GREATER THAN 3 INCHES AND SHALL HAVE A MINIMUM OF 15 PERCENT BY WEIGHT PASSING THE NO. 200 SIEVE.

5. EMBANKMENT MATERIAL SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY IN ACCORDANCE WITH ASTM D698.

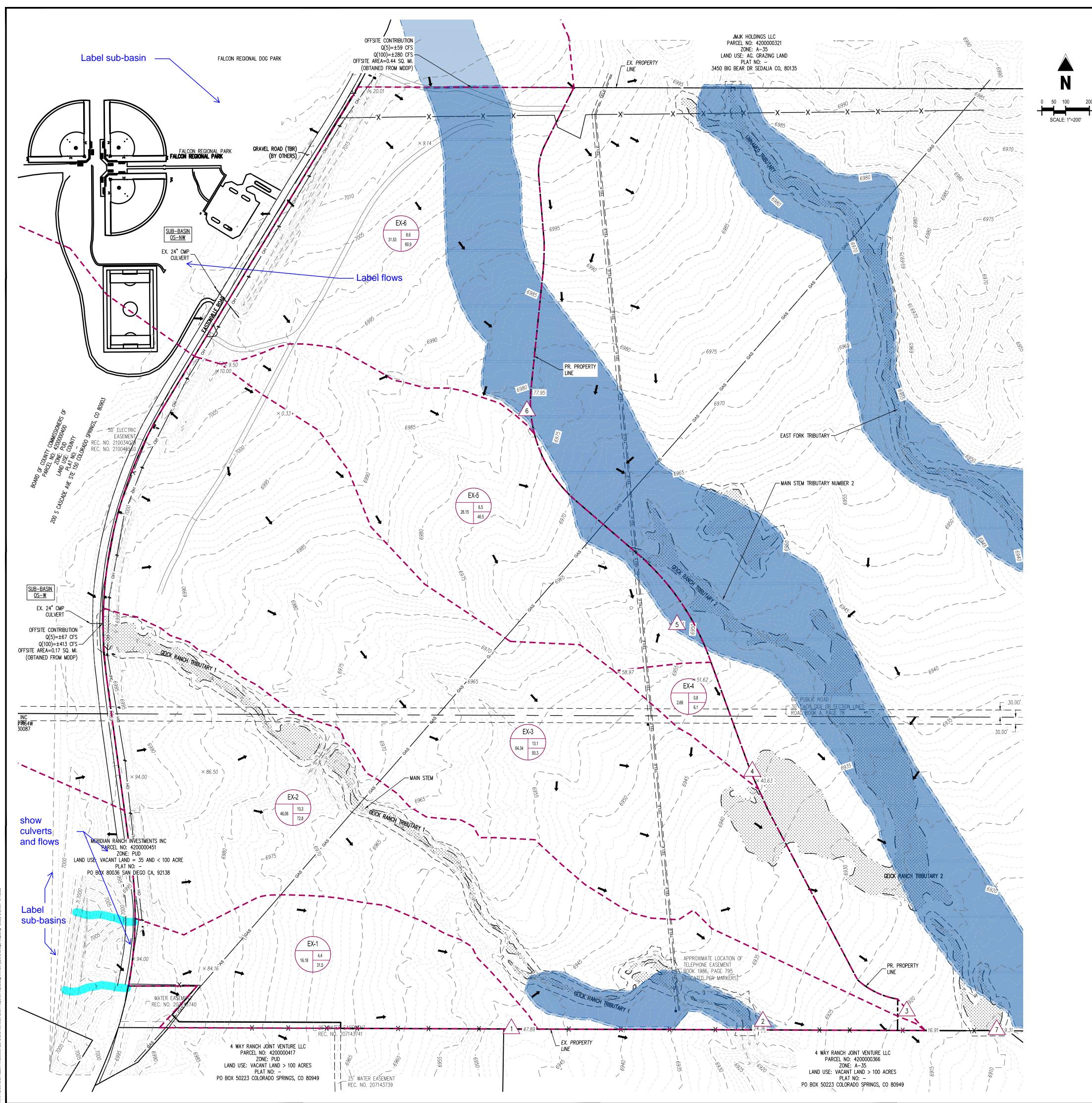
6. PIPE SCH 40 OR GREATER SHALL BE USED.

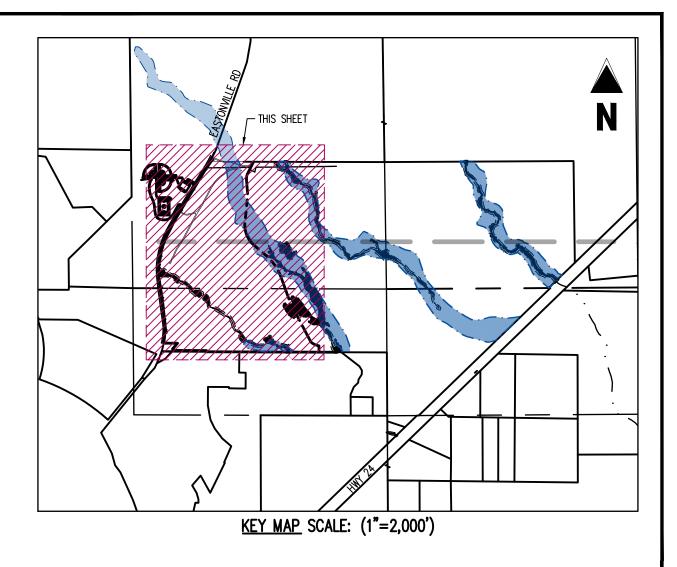
7. THE DETAILS SHOWN ON THESE SHEETS PERTAIN TO STANDARD SEDIMENT BASIN(S) FOR DRAINAGE AREAS LESS THAN 15 ACRES. SEE CONSTRUCTION DRAWINGS FOR EMBANKMENT, STORAGE VOLUME, SPILLWAY, OUTLET, AND OUTLET PROTECTION DETAILS FOR ANY SEDIMENT BASIN(S) THAT HAVE BEEN INDIVIDUALLY DESIGNED FOR DRAINAGE AREAS LARGER THAN 15 ACRES. _

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APPENDIX F

Drainage Maps





Galloway 6162 S. Willow Drive, Suite 320 Greenwood Village, CO 80111

303.770.8884 GallowayUS.com

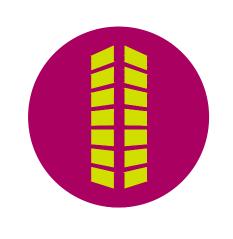


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DRAINAGE LEGEND

| | EXISTING PROPERTY LINE | |
|---------------------|---|--|
| | PROPOSED PROPERTY LINE | |
| — — —6485— — — | EXISTING MAJOR CONTOUR | |
| | EXISTING MINOR CONTOUR | |
| | BASIN BOUNDARY LINE | |
| | -BASIN DESIGNATION | |
| | -5-YEAR RUNOFF IN CUBIC FEET PER SECOND | |
| 0.71 4.8 | -100-YEAR RUNOFF IN CUBIC FEET PER SECOND | |
| <u> </u> | —BASIN AREA IN ACRES | |
| $\underline{\land}$ | DESIGN POINT | |
| | DIRECTION OF RUNOFF | |
| | EXISTING BOUNDARY EASEMENT | |
| TELE | EXISTING TELEPHONE LINE | |
| ОН | EXISTING POWER LINE | |
| XX | EXISTING FENCE | |
| GAS | EXISTING GAS LINE | |
| | EXISTING WETLANDS | |
| <u> </u> | EXISTING LIMITS OF WETLAND | |
| | EXISTING WETLAND SETBACK | |
| | EXISTING FEMA FLOOD PLAIN, ZONE A | |

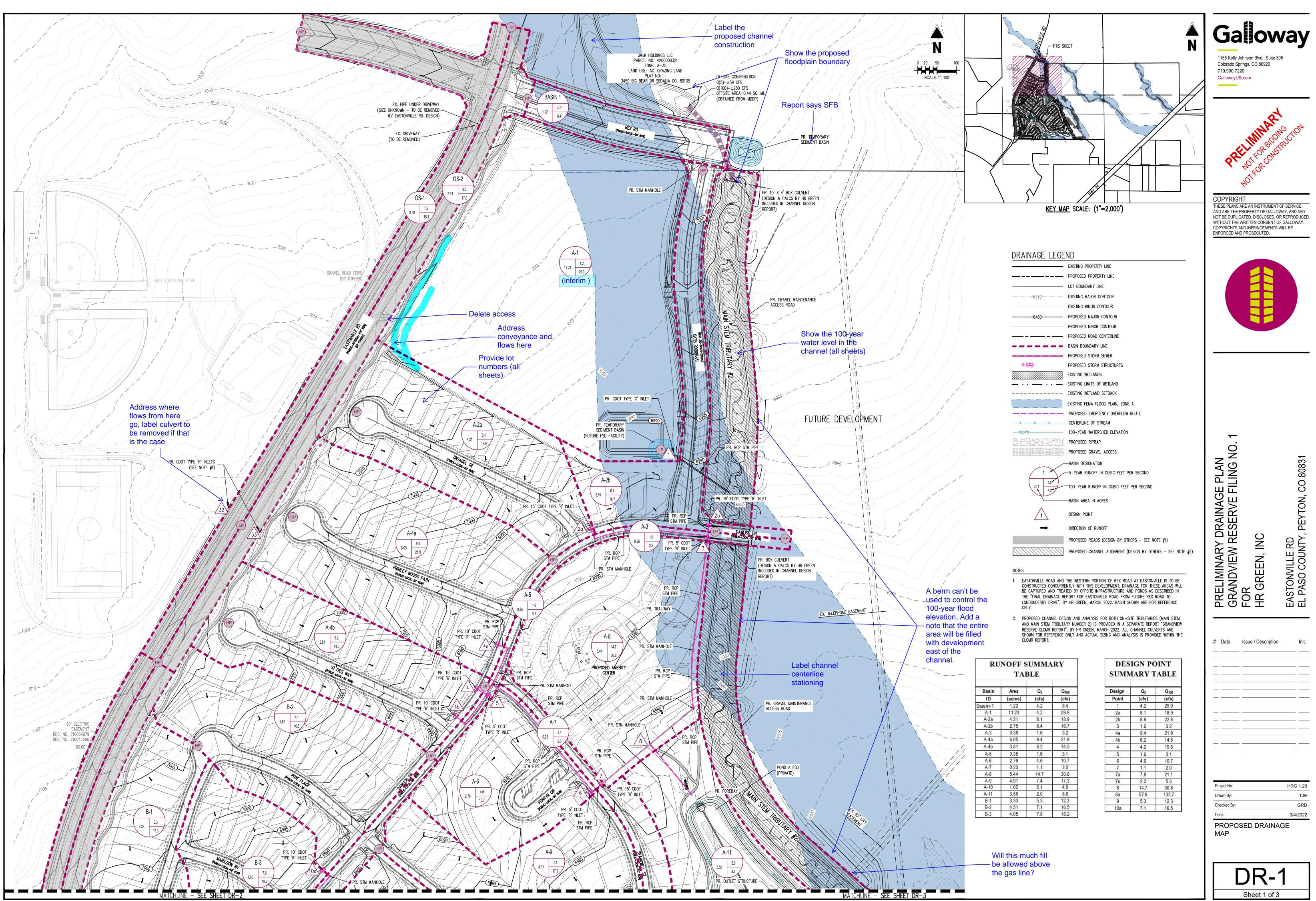
| RU | NOFF S TAF | | RY | | IGN PC IARY T | |
|-------|---------------|----------------|------------------|--------|------------------|------------------|
| Basin | Area | Q ₅ | Q ₁₀₀ | Design | Q 5 | Q ₁₀₀ |
| ID | (acres) | (cfs) | (cfs) | Point | (cfs) | (cfs) |
| EX-1 | 16.18 | 4.4 | 31.5 | 1 | 4.4 | 31.5 |
| EX-2 | 46.06 | 10.3 | 72.8 | 2 | 77.3 | 485.8 |
| EX-3 | 64.34 | 13.1 | 93.3 | 3 | 13.1 | 93.3 |
| EX-4 | 2.68 | 0.8 | 6.1 | 4 | 0.8 | 6.1 |
| EX-5 | 26.15 | 6.5 | 46.5 | 5 | 6.5 | 46.5 |
| EX-6 | 31.53 | 8.6 | 60.9 | 6 | 8.6 | 60.9 |
| | | | | 7 | 164.2 | 964.1 |

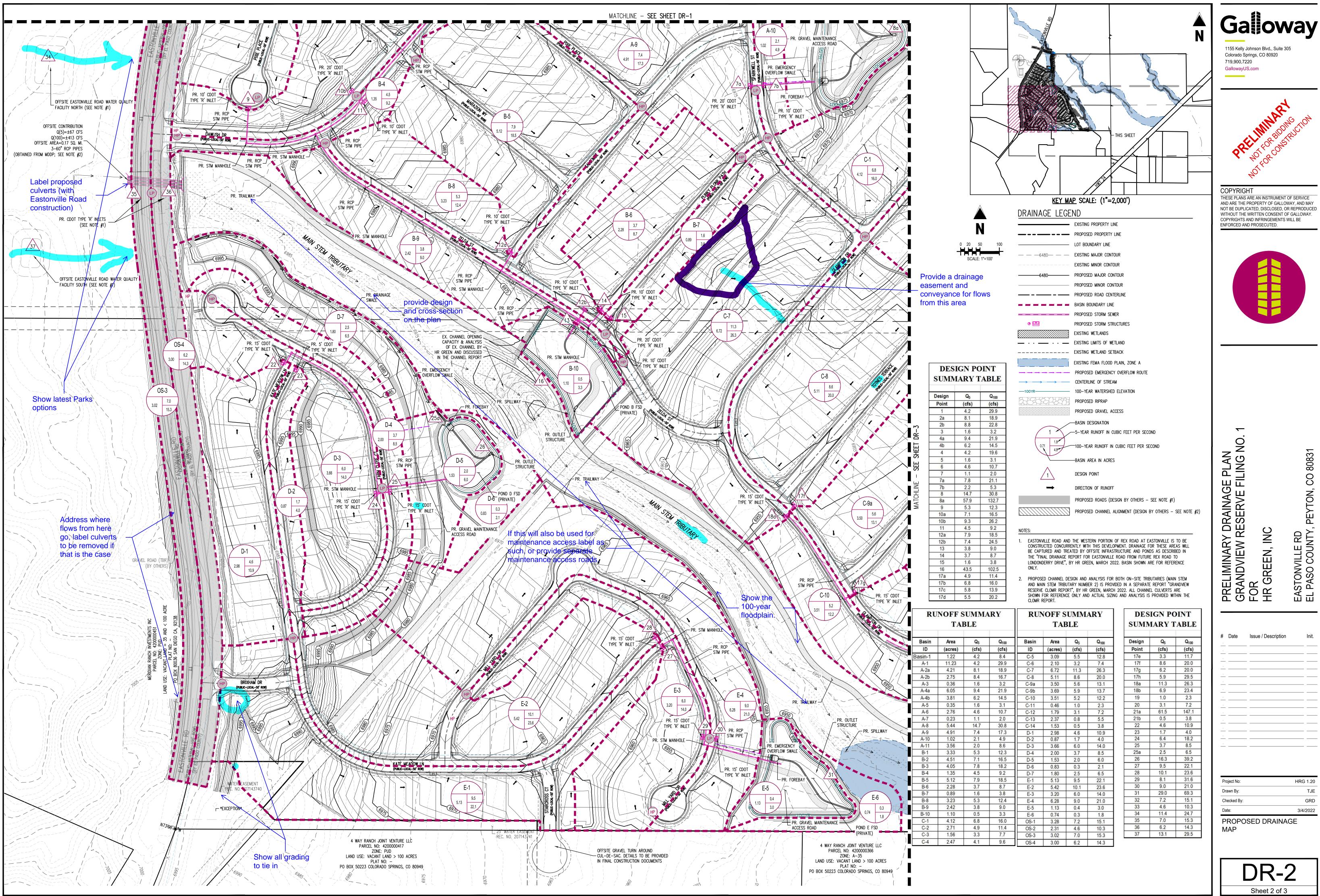


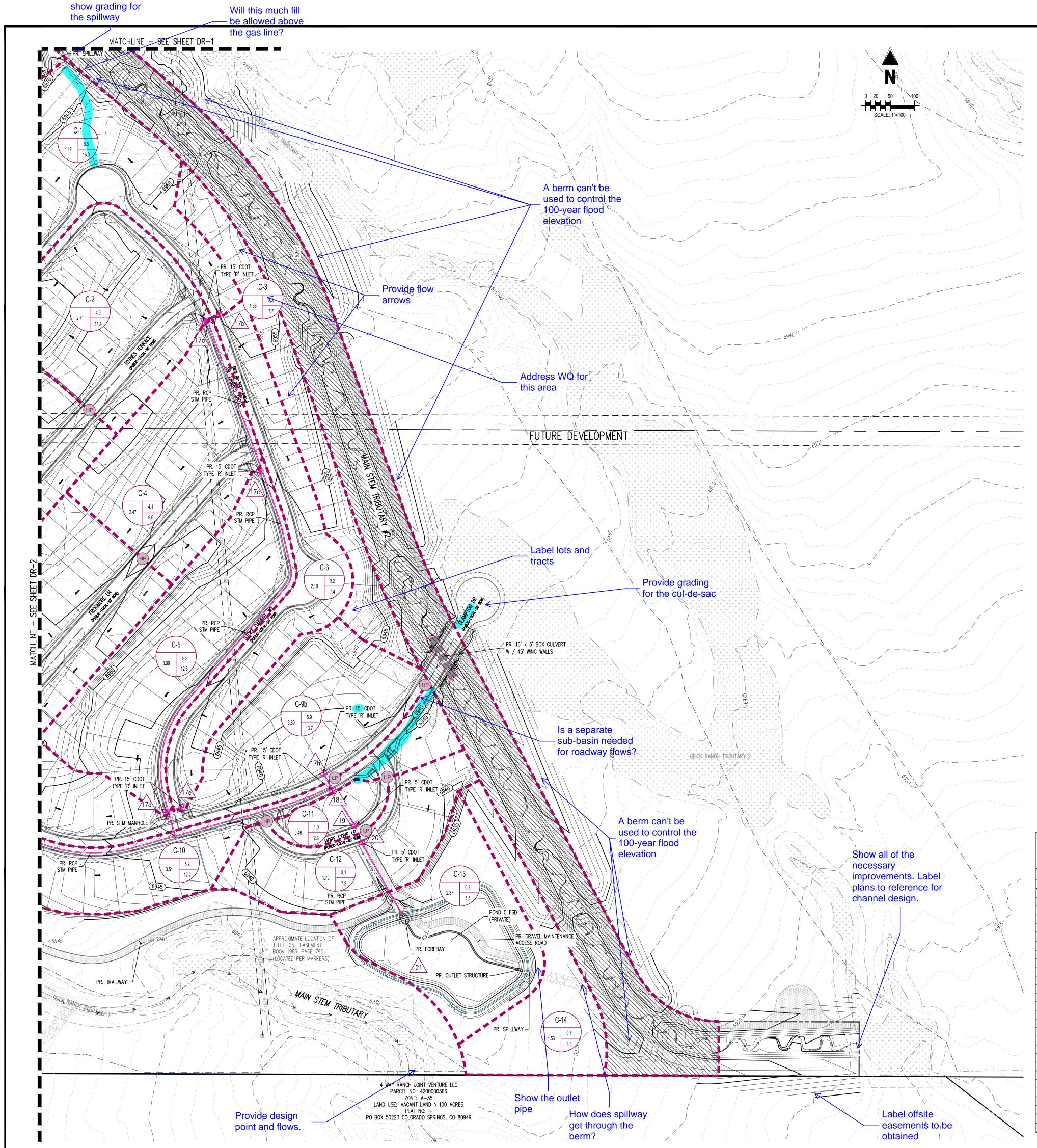
| PRELIMINARY DRAINAGE PLAN GRANDVIEW RESERVE | FOR HR GREEN, INC | EASTONVILLE RD EL PASO COUNTY, PEYTON, CO 80831 |
|--|----------------------|--|
| # Date | Issue / Description | Init. |
| - - - - - | | |
| - - - - | | |

| Project No: | HRG 1.20 |
|-----------------------|----------|
| Drawn By: | TJE |
| Checked By: | GRD |
| Date: | 3/1/2022 |
| EXISTING DRAINAGE MAP | |



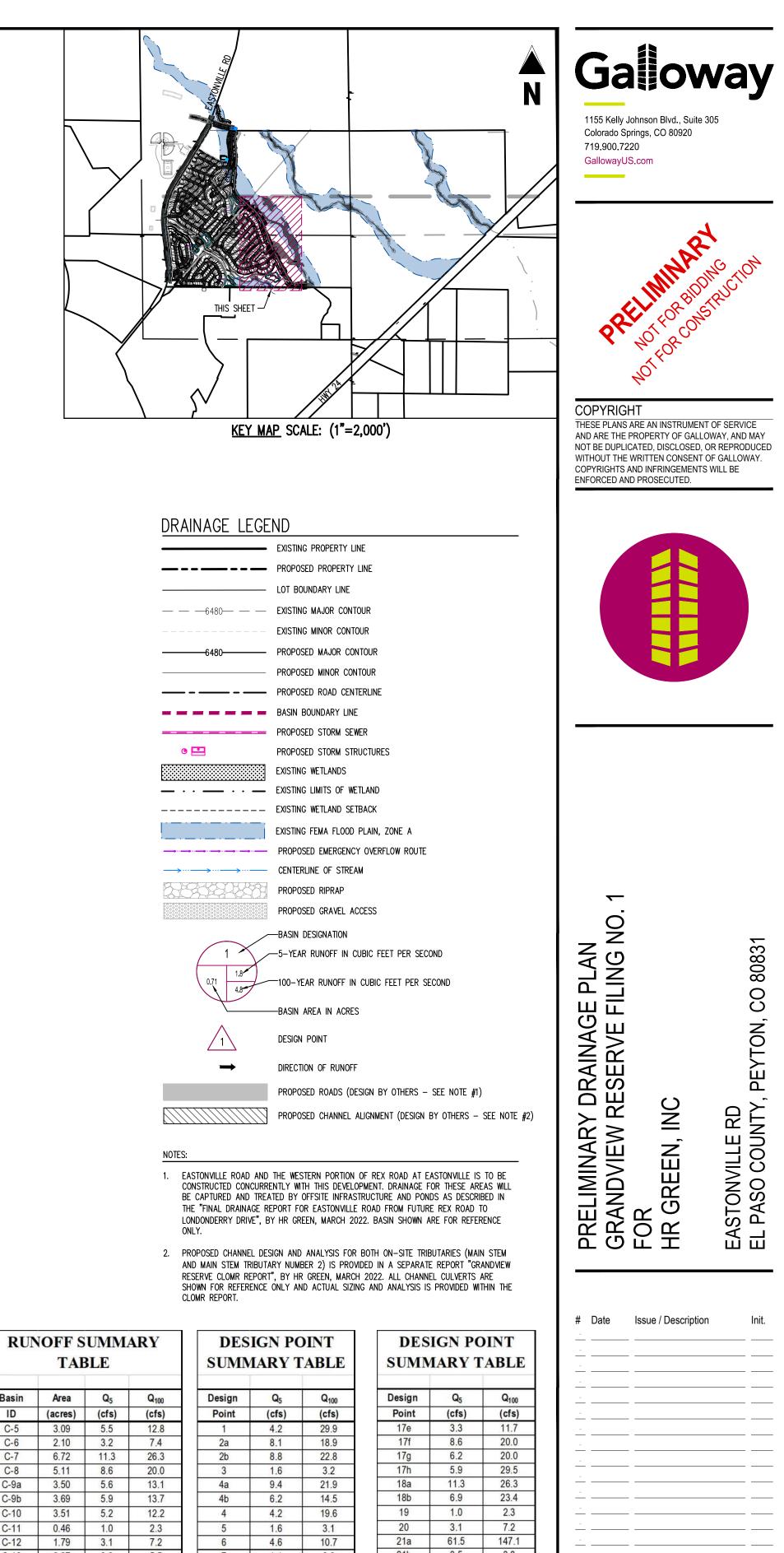






0, Falcon-HRG00001.20-GrandView0CIV\Drain Reports\Prop\Design\HRG01_Pr. Drainage Map.dwg - Treven Edwards - 3/4/2022

| RUNOFF SUMMARY TABLE | | | |
|-------------------------|---------|-------|------------------|
| | | | |
| Basin | Area | Q5 | Q ₁₀₀ |
| ID | (acres) | (cfs) | (cfs) |
| Basin-1 | 1.22 | 4.2 | 8.4 |
| A-1 | 11.23 | 4.2 | 29.9 |
| A-2a | 4.21 | 8.1 | 18.9 |
| A-2b | 2.75 | 8.4 | 16.7 |
| A-3 | 0.36 | 1.6 | 3.2 |
| A-4a | 6.05 | 9.4 | 21.9 |
| A-4b | 3.81 | 6.2 | 14.5 |
| A-5 | 0.35 | 1.6 | 3.1 |
| A-6 | 2.76 | 4.6 | 10.7 |
| A-7 | 0.23 | 1.1 | 2.0 |
| A-8 | 5.44 | 14.7 | 30.8 |
| A-9 | 4.91 | 7.4 | 17.3 |
| A-10 | 1.02 | 2.1 | 4.9 |
| A-11 | 3.56 | 2.0 | 8.6 |
| B-1 | 3.33 | 5.3 | 12.3 |
| B-2 | 4.51 | 7.1 | 16.5 |
| B-3 | 4.05 | 7.8 | 18.2 |
| B-4 | 1.35 | 4.5 | 9.2 |
| B-5 | 5.12 | 7.9 | 18.5 |
| B-6 | 2.28 | 3.7 | 8.7 |
| B-7 | 0.89 | 1.6 | 3.8 |
| B-8 | 3.23 | 5.3 | 12.4 |
| B-9 | 2.42 | 3.8 | 9.0 |
| B-10 | 1.10 | 0.5 | 3.3 |
| C-1 | 4.12 | 6.8 | 16.0 |
| C-2 | 2.71 | 4.9 | 11.4 |
| C-3 | 1.56 | 3.3 | 7.7 |
| C-4 | 2.47 | 4.1 | 9.6 |
| | | | |



| Project No: | HRG 1.20 |
|-------------------|----------|
| Drawn By: | TJE |
| Checked By: | GRD |
| Date: | 3/4/2022 |
| PROPOSED DRAINAGE | |

PROPOSED DRAINAG

DR-3 Sheet 3 of 3

7 1.1 2.0 7a 7.8 21.1 10.9 7b 2.2 5.3 8 14.7 30.8 14.0 8a 57.9 132.7 8.5 9 5.3 12.3 10a 7.1 16.5 2.1 10b 9.3 26.2 4.5 9.2 11 7.9 18.5 12a 7.4 24.5 12b 13 3.8 9.0 14 3.7 8.7 15 1.6 3.8 16 43.5 102.5

17a 4.9 11.4

17b 6.8 16.0

17c 5.8 13.9

17d 5.5 20.2

21b 0.5 3.8 22 4.6 10.9 23 1.7 4.0 24 6.4 18.2 3.7 8.5 25 2.5 25a 6.5 26 16.3 39.2 9.5 27 22.1 10.1 23.6 8.1 31.6 9.0 21.0 29.0 69.3 7.2 15.1 4.6 10.3 33 11.4 24.7 34 7.0 15.3 35 36 6.2 14.3 37 13.1 29.5

RUNOFF SUMMARY Basin Area Q₅ ID (acres) (cfs) (cfs) C-5 3.09 5.5 C-6 2.10 3.2 C-7 C-8 5.11 8.6 20.0 C-9a C-9b C-10 3.51 5.2 C-11 C-12 1.79 3.1 C-13 2.37 0.8 5.5 C-14 1.53 0.5 3.8 D-1 2.98 4.6 D-2 0.87 1.7 4.0 D-3 3.66 6.0 D-4 2.00 3.7 D-5 1.53 2.0 6.0 D-6 0.83 0.3 D-7 1.80 2.5 6.5 E-1 5.13 9.5 22.1 E-2 5.42 10.1 23.6 E-3 3.20 6.0 14.0 E-4 6.28 9.0 21.0 E-5 1.13 0.4 3.0 E-6 0.74 0.3 1.8 OS-1 3.28 7.2 15.1 OS-2 2.31 4.6 10.3 OS-3 3.02 7.0 15.3 OS-4 3.00 6.2 14.3