FINAL DRAINAGE REPORT
FOR
ELDORADO SPRINGS
PPR-19-032

November 5, 2019
Revised February 5, 2020
Revised March 26, 2021

Prepared for:

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ELDORADO SPRINGS

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 the criteria established by the City/County for drainage reports and said report is in conformity with the 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.

____ ____________
Chad D. Kuzbek, Colorado PE #35751 Date
For and on behalf of WestWorks Engineering

Developer's Statement:
I, the developer have read and will comply with all of the requirements specified in this drainage report and plan.

____
Business Name

By: _____________________________________

Title: ___________________________________

Address: _________________________________

____

El Paso County, Colorado:
Filed in accordance with 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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APPENDIX

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PURPOSE

The purpose of this final drainage report (FDR) is to identify specific solutions to drainage problems on site and off-site resulting from the development and platting of this subdivision.

GENERAL LOCATION AND DESCRIPTION

Eldorado Springs includes 15.5 acres located in a portion of the southwest corner of Section 33, Township 14 South and in the northwest corner of Section 4, Township 15 South, Range 66 West of the 6^{th} P.M. in El Paso County, Colorado. More specifically, the site is located near the southeast corner of Venetucci Boulevard and Bob Johnson Drive, south of the World Arena facility. The site is bounded by unplatted land to the east and west, single family residential Stratmoor Subdivision to the south, and Venetucci Boulevard to the north.

The site is currently undeveloped and drains from south to north over moderate slopes. Proposed development includes a multi-family apartment complex. Existing soils in the study area consist mostly of Schamber-Razor complex (SCS Map Unit Symbol 82 - Hydrologic Soil Group A) with a small portion being Nunn Clay loam (SCS Map Unit Symbol 59 - Hydrologic Soil Group C). The site is located in the Stratton Drainage Basin.

DRAINAGE BASINS AND SUB-BASINS

The site has been part of multiple drainage studies. Most recently, the site was previously studied in the, "Final Drainage Report for Independence Place at Cheyenne Mountain Filing No. 1," prepared by Classic Consulting Engineers & Surveyors, dated 1/27/2011. The existing conditions drainage map and description is taken directly from this previous study and quoted below:

"Existing Drainage Characteristics:
The site is located within the Stratton Drainage Basin. This site was originally studied as a part of the "Master Drainage Plan Harrison Street – 1-25 Vicinity Cheyenne Mountain Ranch," by Hartzell – Pfeiffenberger and Associates, Inc. dated November 15, 1973. Since then the site was included in additional basin analysis reports; "Stratton and Fischer's Canyon Drainage Basin Planning Study, Draft Hydraulic Analysis," by Muller Engineering Co. dated May 31, 1990; the "Master Drainage Report for Cheyenne Mountain Center and Final Drainage Report for Cheyenne Mountain Center Filing No. 1 and Cheyenne Meadows Road," by Drexel Barrell, dated October 1985; the "Hydrology Report Stratton Drainage Basin Outfall Study," by Drexel Barrell, dated June 1994; and the "Preliminary and Final Drainage Report and Plan for World Arena Subdivision No. 1," by Obering, Wurth & Associates, August 1994 revised March 1995.

The most recent master study drainage report for this area that included the proposed site was the "Hydrology Report Stratton Drainage Basin Outfall Study El Paso County, Colorado," by Drexel Barrell, dated June 9, 1994. This Hydrology Report by Drexel Barrell conforms to current El Paso County criteria and was performed based on minor modifications and revisions to TR-20 data prepared in the 1990 study by Muller Engineering Co. This Hydrology Report also updated the hydrologic modeling completed in the 1985 study by Drexel Barrell with the correct 2 hour and 24 hour storms that are utilized in the current criteria. This report provides the basis for the proposed site's allowable release rate since it sized and described the 90"/102" RCP storm outfall system (Sinton Outfall). This system runs parallel with the eastern site boundary, along the opposite site of Venetucci Blvd. A Drainage Map from the Drexel Barrell Hydrology Study is included in the appendix of this report for reference.

The proposed 15.46 acre site is included within Basin 009 of this previous study. At the time of the Drexel Barrell Hydrology Study, existing box culverts conveyed the runoff from Basin 009 under Venetucci Blvd./Old Hwy 85-87 to the existing 14' x 11.7' box culvert crossing under Interstate 25 and to the east into Fountain Creek. The development of Cheyenne Mountain Center constructed the 'Sinton Outfall' RCP storm sewer system that accepts the allowable release rates of the upstream parcels and conveys them along the historic drainage pattern of under I-25 and into the Sinton Channel, which connects to Fountain Creek. This large storm system consists of 102" RCP and 90" RCP storm main, with appropriate sized storm laterals to account for the flows quantified within the Drexel Barrell Hydrology Report. Basin 009 of this previous report consists of 0.147 square miles (94.08 acres) and was modeled using a CN value of 81 (SCS Method since entire study area was over 100 acres). Per the Drainage Criteria Manual Vol. 1 Table 5-5 a CN of 81 is equivalent to 1/3 acre home lots with all Group C soils, or about 1/6 acre home lots with all Group B soils. The existing Stratmoor Hills subdivision is also located within this Basin 009, with homes slightly over 2 lots per acre; and since these homes are within Group B ·soils, a more accurate CN value for the existing development would be around 71. Therefore, the remaining area of Basin 009 (the proposed Independence Place at Cheyenne Mountain Filing No. 1 site) is allowed to be substantially higher density than the calculated CN of 81. Also, runoff from Basin 008 of the previous report overflows the existing curb storm inlets and a portion drains onto the Venetucci Blvd. right-of-way within the Basin 009 area. Thus the actual total release from the developed site can be higher than the assumed Basin 009 flows (Q_{100} = 270 cfs, 24 hour duration storm event).

When the World Arena was constructed to the immediate north of the proposed site, street improvements were made to Venetucci Blvd. that expanded the existing storm sewer facilities constructed with the Sinton Outfall main (Drexel Barrell Report). Many curb inlets were placed along the improved roadways at the Cheyenne Meadows Road intersection and Bob Johnson Drive intersection. Using the "Preliminary and Final Drainage Report and Plan for World Arena Subdivision No. 1," by Obering, Wurth & Associates, August 1994 revised March 1995 and the "Roadway Improvement Package and Storm Sewer Package for US Highway 85187 (Venetucci Boulevard)," by Drexel Barrell including the as-built revisions; these storm modifications have been incorporated into this report and construction drawings *for the proposed development. The following will describe the existing runoff quantities and existing facilities in more detail at each of the existing design points.*

Design Point 1 *(Q_5 = 25.0 cfs, Q_{100} = 61.1 cfs) consists of flows from Basins EX-1, EX-2, and EX-3 all of which are within the existing Stratmoor Hills subdivision to the south-west of the proposed site. Basin EX-1 is 6.13 acres of existing home lots that drains to the east, overtops Stratmoor Drive and into Basin EX-2. The combined flows from EX-1 & EX-2 continue on the surface to the east and overtop Westcott Ave. drain into Basin EX-3. Roadside ditches along Chamberlin Ave. route all of the runoff from the three basins to DP-1, where an existing concrete storm pipe collects the water and routes it under Chamberlin Ave. and into the ravine to the east, within Basin EX-4. Although the density of the existing Stratmoor Hills subdivision is closer to 2 DU/Ac., C values corresponding with 3 DU/Ac. are used to conservatively estimate the runoff from the upstream basins (C_5 = 0.40, C_{100} = 0.55, Group B soils).*

Design Point 2 *(Q_5 = 38.2 cfs, Q_{100} = 92.1 cfs) consists of flows from DP-1 and Basins EX-4, EX-5, and EX-6. Basin EX-4 is 4.57 acres (B soils) of existing home lots that drains to the south into the outfall ravine from DP-1. Basin EX-5 is 4.93 acres (C soils) of existing roadway and home lots that drains into one of two ravines that meet at DP-2. Basin EX-6 is 3.96 acres (C soils) of existing home lots that drains to the north-east to DP-2. C soils were used throughout EX-5 & EX-6 to calculate the storm runoff higher and therefore more conservatively. See soils map in Appendix for separation of B and C soil groups. All of the runoff from these basins combine at this confluence point and continue north-east onto the proposed site and toward DP-3.*

Design Point 3 *(Q_5 = 45.2 cfs, Q_{100} = 107.9 cfs) consists of flows &om DP-2 and Basins EX-7 and EX-8. Slightly upstream and west of DP-3, manmade berms were constructed at some point in the past that prevents the runoff &om DP-2 &om continuing north to the existing culverts under Venetucci Blvd (as the Stratton Basin Hydrology Study anticipated). This man made berm instead routes the entire flow from DP-2 onto Westmark Ave. (DP-3) where the flow combines with the runoff &om Basins EX-7 & EX-8. This runoff continues north-east as surface flow on Westmark Ave. to DP-4. Documentation of why and when this berm, along with others located on the actual proposed site, does not exist as a drainage report for this existing Stratmoor Hills subdivision is not on file with E1 Paso County and there is no mention of diverting the flows with the Hydrology Report or any of the World Arena Subdivision drainage reports.*

Design Point 4 *(Q_5 = 49.6 cfs, Q_{100} = 118.3 cfs) consists of flows &om DP-3 and Basins EX-9 and EX-10. Basin EX-9 is 3.54 acres (C soils) of existing home lots and Westmark Ave. that drains down Westmark via curb and gutter and surface flow to the intersection of Venetucci Blvd. and Westmark Ave. (DP-4). Basin EX-10 is 1.11 acres (C soils) of on-site, undeveloped land that drains to this intersection and onto the roadway prior to the small culvert at DP-5. This combined runoff &om DP-4 flows onto Venetucci Blvd. and the adjacent roadside swale to Design Point 8.*

Design Point 5 *(Q_5 = 7.1 cfs, Q_{100} = 16.7 cfs) consists of runoff &om Basin EX-11, 3.83 acres (C soils) of mostly on-site, undeveloped land with a small portion of existing Stratmoor Hills homes and a portion of the western half of existing Venetucci Blvd. This runoff sheet flows to an existing 12" CMP storm pipe culvert that routes the runoff under Venetucci Blvd. and continues in the existing drainage pattern towards Interstate 25. This runoff combines with that from DP-8 and continues around the future World Arena Subd. Lot 2, Fil. 5 site to the existing 48" RCP I-25 crossing. The final drainage report for this World Arena parcel does not acknowledge or quantify the off-site tributary flows.*

Design Point 6 *(Q_5 = 10.4 cfs, Q_{100} = 25.3 cfs) consists of runoff &om Basin EX-12, 7.01 acres (C soils) of mostly on-site, undeveloped land with a small portion of existing Stratmoor Hills homes and a portion of the western half of existing Venetucci Blvd. This runoff sheet flows to this existing low point at DP-6. Previous reports drainage documents show an existing box culvert at this location that routes any runoff at this point under Venetucci Blvd. and directly toward the I-25 box culvert (Sinton Outfall). However, this box culvert has since been covered, or filled, with soil and is no longer functioning. Documentation on why this was done cannot be found on file with El Paso County. The Sinton Outfall storm system shown on the Drainage Map does provide a 48" RCP stub off the junction box that points directly to the DP-6 and this filled in box culvert. It is our understanding that this 48" stub was meant to connect to this low-point at DP-6, which would then leave the existing box culvert not needed. A field inspection of the manhole does indeed show only a capped 48" lateral toward DP-6, and it appears this runoff simply infiltrates into the ground at this location.*

Design Point 7 *(Q_5 = 30.5 cfs, Q_{100} = 83.9 cfs) consists of runoff from Basins EX-13 & EX-14 and the flow by from DP-11. Basin EX-13 is 8.63 acres (C soils) of mostly on-site, undeveloped land, a portion of the western half of Venetucci Blvd. and a small portion of existing Stratmoor Hills homes. Basin EX-14 is 13.75 acres that consists of mostly undeveloped land and a small portion of the existing homes as well as a portion of the adjacent Stratmoor Hills United Methodist Church and the western half of Venetucci Blvd. A substantial amount of runoff at this point (Q_5 = 3.1 cfs, Q_{100} = 21.2 cfs) comes from the water not intercepted by the inlets at Design Points 9 – 11. The existing curb along the west side of Venetucci Blvd. from the Cheyenne Meadows Rd. intersection ends just after the inlet at DP-11, thus the flow by drains into the roadside ditch to DP-7. The combined runoff is intercepted by an existing CDOT Type D storm inlet (3.5' x 8.5' inlet dimensions). This inlet was installed with the construction of the Sinton Outfall Storm System and an existing 48" RCP storm pipe conveys the intercepted runoff across Venetucci Blvd. and connects to the 90" main.*

Design Point 8 *(Q_5 = 52.1 cfs, Q_{100} = 124.2 cfs) consists of flows from DP-4 and Basin EX-15. Basin EX-15 is 2.64 acres (C soils) of off-site, undeveloped land, including a portion of existing Venetucci Blvd. An existing elliptical CMP culvert conveys this runoff under Venetucci Blvd. to the north and into the existing drainage pattern. This culvert is very under-sized for 120+ cfs and it can be assumed that significant ponding takes place at this location prior to flowing to the downstream facilities. The parcel to the north of DP-8 (across Venetucci Blvd.) is planned to be a hotel with surrounding parking. The development* *of the site will maintain the historic drainage pattern around the future development, but does change the overall outfall of the existing runoff. This World Arena Lot 2, Filing No. 5 (hotel site) construction was stopped after overlot grading and utility infrastructure was completed. Per the "Final Drainage Report for World Arena Subdivision Filing No. 5, Lot #2," by Matrix Design Group, Inc. (April 2008) the construction of Detention Pond #1 was to be outside of the existing drainage path to the existing 48" RCP under I-25. However, a site visit confirmed that the outlet pipe for this Pond 1 has been connected to the existing 48" interstate crossing and the existing low point (entry into the 48") has been filled in. Now, the existing drainage ponds approximately 2.0' and overtops into Pond #1, where a D-9 grate inlet within the pond intercepts the flows and passes them into the existing culvert.*

Design Point 9a *(Q_5 = 22.3 cfs, Q_{100} = 47.6 cfs) consists of runoff from Basin EX-20, 14.70 acres of existing single family subdivision and Cheyenne Meadows Road. An existing 8' D-10R at-grade curb inlet (4.5% street slope) intercepts a portion of this runoff (Q, = 5.7 cfs, Q,00= 5.9 cfs), while the rest continues down Cheyenne Meadows Rd. to the intersection with Venetucci Blvd.*

Design Point 9b *(Q_5 = 47.8 cfs, Q_{100} = 102.0 cfs) consists of runoff from Basin EX-16, 31.48 acres of existing single family subdivision and Cheyenne Meadows Road. An existing 8' D-1OR at-grade curb inlet (4.5% street slope) intercepts a portion of this runoff (Q, = 5.9 cfs, Q, 00= 12.7 cfs), while the rest continues down Cheyenne Meadows Rd. to the intersection with Venetucci Blvd. The combined intercepted runoff from DP-9a & DP-9b is routed in an existing 36" RCP storm pipe to the north to an existing channel, away from the Venetucci Blvd. and Cheyenne Meadows Rd. intersection. The large amount of flow-by (Q_5 = 41.9 cfs, Q_{100} = 89.3 cfs) continues to the submerged inlets at DP-9c.*

Design Point 9c *(Q_5 = 85.3 cfs, Q_{100} = 186.7 cfs) consists of runoff from Basins EX-21 and EX-22, as well as the flow by from DP-9a & DP-9b. Basin EX-21 is 14.83 acres of the existing single family Huckleberry Knoll Subdivision and Cheyenne Meadows Rd. Basin EX-22 is 4.46 acres of existing Stratmoor Hills Subdivision, existing Stratmoor Hills United Methodist Church, and existing Cheyenne Meadows Rd. Two existing D10-R curb inlets (20' & 30') exist on Cheyenne Meadows, west of Venetucci Blvd. The storm water at this point overtops the crown of the Cheyenne Meadows and completely submerges the inlets, thus changing the calculation used in quantifying the intercepted flow (See Calculations in Appendix). The total area of opening of the two combined inlets is 33.5 square feet (50.0' x 0'67), and based upon field as-builts of the curb return, the inlets only have 0.35' of depth before overtopping south down Venetucci Blvd. This results in both inlets only intercepting 57 cfs of both 5 and 100 year flows. The flow by from these inlets next hits the inlet at DP-10.*

Design Point 10 *(Q_5 = 28.3 cfs, Q_{100} = 129.7 cfs) has a 20' at-grade D10-R curb inlet that intercepts a large portion of the flow-by from DP-9c. Venetucci Blvd. has a slope of 1.3% at this inlet based upon field as- builts of the constructed curb. This 20' inlet intercepts Q_5 = 16.3 cfs and Q_{100}= 75.6, while the remainder continues to the next existing inlet at DP-11.*

Design Point 11 *(Q_5 = 12.0 cfs, Q_{100} = 54.1 cfs) has a 20' at-grade CDOT Type R curb inlet that intercepts a portion of the remaining flow-by from DP-9c & DP-10. Venetucci Blvd. has a slope of 2.8% at this inlet based upon field as-builts of the constructed curb. This 20' inlet intercepts Q_5 = 8.9 cfs and Q_{100} = 32.9 cfs while the remainder continues south down Venetucci Blvd. The existing curb and gutter along Venetucci ends just downstream of DP-11, therefore the flow-by (Q, = 3.1 cfs, Q_{100}= 21.2 cfs) runs off the edge of asphalt and enters the roadside ditch, which drains to the grated inlet at DP-7.*

Design Point 12 *(Q_5 = 3.1 cfs, Q_{100} = 6.0 cfs) consists of runoff from Basin EX-17, 0.80 acres of existing Venetucci Blvd. and adjacent landscape area that drains to an existing 5' at-grade CDOT Type R curb inlet Based upon field as-builts Venetucci Blvd. has a slope of3.0% at this inlet, resulting in intercepting Q_5 = 1.9 cfs and Q_{100} = 2.3, while the remainder continues within the curb to DP-13.*

Design Point 13 *(Q_5 = 3.4 cfs, Q_{100} = 8.2 cfs) consists of runoff from the flow-by of DP-12 and Basin EX-18, 0.68 acres of existing Venetucci Blvd. and adjacent landscape area that drains to an existing 5' at-grade CDOT Type R curb inlet. Based upon field as-builts Venetucci Blvd. has a slope of 0.7% at this inlet, resulting in intercepting Q, = 2.2 cfs and Q_{100}= 3.5 cfs. The non-intercepted runoff (Q_5 = 1.2 cfs, Q_{100}= 4.7 cfs) continues within the curb and gutter onto Bob Johnson Drive and west toward the overall basin outfall corridor.*

Design Point 14 *(Q_5 = 1.4 cfs, Q_{100} = 3.2 cfs) consists of runoff from Basin EX-19, 0.58 acres of existing Venetucci Blvd. and adjacent undeveloped right of way area. An existing modified Type D grated inlet drains this area and conveys the runoff into the 90" RCP Sinton Outfall system via a 48" RCP storm lateral. As mentioned previously, the existing alignments and storm facilities have been established through the "Roadway Improvement Package and Storm Sewer Package for US Highway 85/87 (Venetucci Boulevard)," by Drexel Barrell including the as-built revisions and field survey data.*

Summary of Existing Conditions

The existing Sinton Outfall Storm system was planned to intercept all of the Stratton Basin runoff at rates specified within the "Hydrology Report Stratton Drainage Basin Outfall Study El Paso County, Colorado," by Drexel Barrell, dated June 9, 1994. The construction of the large storm main system appears to have been completed in two separate phases, per the "M.D.D.P. for Cheyenne Mountain Center." The second phase included extending storm sewer laterals off of the main alignment to our proposed site location in order to convey the existing runoff as well as a future allowable runoff rate per the Hydrology Study. This extension of a 48" storm lateral was completed at the northernmost existing roadway crossing (Design Point 7). However, at Design Point 6, no such storm sewer extension off the main line was completed and it appears that the existing roadway culvert was filled in and does not pass historic runoff under Venetucci Blvd./Old Hwy 85/87. The construction plans for the 102"-90" RCP storm main show a 48" RCP stub pointed toward the filled in box culvert, but capped 8.0' outside of the manhole. It is our assumption that this 48" stub is meant to convey the runoff at this DP-6 location. Therefore, our proposed conditions will discuss extending this lateral under Venetucci Blvd. and into our proposed site. Drainage reports completed for the immediate downstream World Arena Subdivisions do not discuss any *off-site flows from the tributary area, including our site and the upstream Stratmoor Hills Subdivision, or mention extending this 48" stub to the edge of the Venetucci Blvd. right-of-way. The Hydrology Report specifies a developable 100-year flow rate from the proposed site and upstream Stratmoor Hills Subdivision as 270 cfs. The calculated combined 100-year existing flow rate at design points 6, 7, and 8 is 198 cfs. Therefore, substantial more development can be constructed with this Basin 009 before storm water detention is required.*

Also, the construction of the diversion berms on the proposed site that re-route the upstream tributary area (Stratmoor Hills) runoff directly to the Westmark Ave. and Venetucci Blvd. intersection are un-documented and seem to have been completed to eliminate the historic runoff to the 'filled in' culvert at DP-6. The existing CMP culverts at DP-5 and DP-8 are not adequately sized to convey all of the existing storm runoff that they currently receive. However, since it appears this drainage path is not natural and not per the previous drainage studies, we are proposing. intercepting the upstream, existing runoff and conveying it through the proposed site's public storm system and directly to the 90"/102" RCP Sinton Outfall system."

Developed Drainage Characteristics:

Development of the site is a multi-family residential apartment complex with clubhouse, park space, pool and amenity areas, garages, paved parking and drive aisles, and landscaping. Development of this site also includes adjacent public roadway improvements along Venetucci Boulevard and a portion of Westmark Avenue.

Developed drainage overview:

On site runoff along with some off-site tributary runoff will be collected on site and routed into 2 private full-spectrum detention and stormwater quality facilities (Pond A and Pond B). A limited portion of the existing downstream drainage infrastructure has been adequately designed for developed runoff from this site (102" RCP). However, the existing 102" RCP combines with an existing 78"RCP and connects to an undersized existing 72" RCP. This scenario is believed through witness accounts to have caused flooding in the one-way road underpass under I-25. For this reason, Pond A and B will be full-spectrum detention facilities so as not to contribute excess runoff to this condition.

Details of Ponds A and B shall be included with the Site Construction Drawings. Details include dissipation basins, trickle channels, outfall structures, emergency overflows, and maintenance access.

Basins with designations of EX are taken directly from the existing conditions analysis. Basins with designations of OS are off-site basins. Basins with designations of A drain to Pond A. Basins with designations of B drain to Pond B. Basins with designations C do not drain to pond facility.

Developed Drainage Design Point Descriptions:

DP-25 [Q_5 = 5 CFS/Q_{100} = 15 CFS]

DP-25 is a proposed CDOT Type C grated inlet in sump. DP-25 collects mostly off-site runoff from Basin OS-13C. Collected flows will by-pass Pond A and are routed via SD28 to SD25.

Design Point 1 (DP-1) [Q_5 = 2 CFS/Q_{100} = 4 CFS]

DP-1 is a proposed 5' wide Type R curb inlet in sump. DP-1 collects runoff from Basins OS-13B and A1. Collected flows are routed via storm drain design point SD1 to SD2.

DP-2 [Q_5 = 2 CFS/Q_{100} = 3 CFS]

DP-2 is a proposed 5' wide Type R curb inlet in sump. DP-1 collects runoff from Basin A2. Collected flows are routed via SD2 to SD3.

DP-3 [Q_5 = 2 CFS/Q_{100} = 3 CFS]

DP-3 is a proposed CDOT Type C grate inlet in sump. DP-3 collects runoff from Basin A3. Collected flows are routed via SD3 to SD4.

DP-4 [Q_5 = 1 CFS/Q_{100} = 2 CFS]

DP-4 is a proposed 5' wide Type R curb inlet in sump. DP-4 collects runoff from Basin A4. Collected flows are routed via SD4 to SD5.

DP-5 [Q_5 = 1 CFS/Q_{100} = 2 CFS]

DP-5 is a proposed 5' wide Type R curb inlet in sump. DP-5 collects runoff from Basin A5. Collected flows are routed via SD6 (Q_5 = 7 CFS/Q_{100} = 14 CFS) into Pond A. The discharge point into Pond A shall have a concrete energy dissipater.

DP-6 [Q_5 = 4 CFS/Q_{100} = 11 CFS]

DP-6 is a proposed 15' wide Type R curb inlet at grade. DP-6 collects runoff from Basins OS-13A and A6. Collected flows are routed via SD7 to SD8. Flow-by of Q_5 = 0 CFS/Q_{100} = 1.5 CFS will continue to DP-22.

DP-7 [Q_5 = 1 CFS/Q_{100} = 3 CFS]

DP-7 is a proposed system of landscape drains, pool deck grates, and roof drain collection for the clubhouse. DP-7 collects runoff from Basin A7. Collected flows are routed to the inlet at DP6.

DP-8 [Q_5 = 0.5 CFS/Q_{100} = 1 CFS]

DP-8 is a proposed 5' wide Type R curb inlet at grade. DP-8 collects runoff from Basin A8. Collected flows are routed via SD8 (Q_5 = 6 CFS/Q_{100} = 12 CFS) into Pond A. The discharge point into Pond A shall have a concrete energy dissipater.

DP-9 [Q_5 = 0.3 CFS/Q_{100} = 2 CFS]

DP-9 represents the sheet flow into Pond A.

DP-10 [Q_5 = 2 CFS/Q_{100} = 3 CFS]

DP-10 is a proposed CDOT Type C grate inlet in sump. DP-10 collects runoff from Basin B1. Collected flows are routed via SD10 to SD12.

DP-11 [Q_5 = 1 CFS/Q_{100} = 3 CFS]
DP-11 is a proposed 5' wide Type R curb inlet in sump. DP-11 collects runoff from Basin B2. Collected flows are routed via SD11 to SD12.

DP-12 [Q_5 = 2 CFS/Q_{100} = 3 CFS]
DP-12 is a proposed CDOT Type C grate inlet in sump. DP-12 collects runoff from Basin B3. Collected flows are routed via SD13 to SD16.

DP-13 [Q_5 = 10 CFS/Q_{100} = 20 CFS]
DP-13 is a proposed 20' wide Type R curb inlet in sump. DP-13 collects runoff from Basins OS-11 and B4. Collected flows are routed via SD14 to SD15.

DP-14 [Q_5 = 2 CFS/Q_{100} = 3 CFS]
DP-14 is a proposed 5' wide Type R curb inlet in sump. DP-14 collects runoff from Basin B5. Collected flows are routed via SD16 to SD18.

DP-15 [Q_5 = 2 CFS/Q_{100} = 4 CFS]
DP-15 is a proposed CDOT Type C grate inlet in sump. DP-15 collects runoff from Basin B6. Collected flows are routed via SD18 (Q_5 = 23 CFS/Q_{100} = 44 CFS) into Pond B. The discharge point into Pond B shall have a concrete energy dissipater.

DP-16 [Q_5 = 6 CFS/Q_{100} = 11 CFS]
DP-16 is a proposed 10' wide Type R curb inlet in sump. DP-16 collects runoff from Basins OS-12 and B7. Collected flows are routed via SD17 to SD18.

DP-24 [Q_5 = 2 CFS/Q_{100} = 4 CFS]
DP-24 represents a series of landscape drains running behind the buildings along Venetucci Blvd. These landscape drains are intended to collect runoff and roofdrains in Basin B11. Collected flows are routed via SD27 to Pond B.

DP-17 [Q_5 = 2 CFS/Q_{100} = 4 CFS]
DP-17 is a proposed 10' wide Type R curb inlet at grade. DP-17 collects runoff from Basin B8. Collected flows are routed via SD19 to SD20. Flow-by of Q_5 = 0 CFS/Q_{100} = 0.1 CFS will continue into Westmark Avenue.

DP-18 [Q_5 = 0.7 CFS/Q_{100} = 1 CFS]
DP-18 is a proposed 5' wide Type R curb inlet at grade. DP-18 collects runoff from Basin B9. Collected flows are routed via SD20 (Q_5 = 2 CFS/Q_{100} = 4 CFS) into Pond B. The discharge point into Pond B shall have a concrete energy dissipater. Flow-by of Q_5 = 0 CFS/Q_{100} = 0.1 CFS will continue into Westmark Avenue.

DP-19 [Q_5 = 1 CFS/Q_{100} = 2 CFS]
DP-19 represents the sheet flow into Pond B.

DP-20 [Q_5 = 40 CFS/Q_{100} = 100 CFS]

DP-20 is a proposed 48" RCP culvert to pick up off-site flows tributary to the existing drainageway south of the site. The collected runoff is not routed through a Pond facility. Instead it bypasses the site via SD21. Flows in SD21 are combined with the discharge from Pond B in SD22 (Q_5 = 40 CFS/Q_{100} = 105 CFS) will be routed under Venetucci Boulevard in a proposed 48" RCP storm tying to and existing 48" RCP stub that connects to an existing 102" RCP storm drain.

DP-21 [Q_5 = 29 CFS/Q_{100} = 59 CFS]
DP-21 is a proposed pair of 20' wide Type R curb inlets at grade. DP-21 collects runoff from Basin OS-14 and existing flow-by from DP-OS11. DP-OS11 is the last in a series of at-grade inlets in or near Cheyenne Meadows Road. Venetucci Boulevard does not have capacity to carry all of the existing runoff. Runoff to the inlets at DP-21 is modeled at maximum street capacity. Collected flows are routed via SD24 to SD25. Flow-by of Q_5 = 0.2 CFS/Q_{100} = 12 CFS will continue to DP-22.

DP-22 [Q_5 = 1 CFS/Q_{100} = 14 CFS]
DP-22 is a proposed 15' wide Type R curb inlet in sump. DP-22 collects runoff from Basin C1 and flow-by from DP-6 and DP-21. Collected flows are routed via SD23 to SD25. Flows in SD25 (Q_5 = 33 CFS/Q_{100} = 73 CFS) are a combination of flows from SD9, SD23, and SD24. These combined storm pipes will tie to the existing CDOT Type D grate inlet in the roadside ditch near the site entrance. SD25 is an existing 48" RCP under Venetucci Boulevard connecting to the existing 90" RCP running along the north side of Venetucci Boulevard.

DP-23 [Q_5 = 1 CFS/Q_{100} = 6 CFS]
DP-23 is street flow in Venetucci Boulevard near the intersection with Westmark Avenue. This flow is less than the historic flow at existing conditions DP-5 (Q_5 = 7 CFS/Q_{100} = 17 CFS).

DP-009 [Q_5 = 67 CFS/Q_{100} = 172 CFS]
DP-009 represents the total flow from Basin 009 as referenced in the Drexel Barrell Report. The storm drain outfall infrastructure installed based on the Drexel Barrell Report anticipated flows of Q_{100} = 270 CFS. This means that the downstream infrastructure will not be additionally burdened by runoff from this site and even additional development in the Basin.

4-Step Process Discussion:
Step 1. Employ Runoff Reduction Practices.
The site layout was done to minimize paving and includes park and amenity areas. Site impervious area calculations are shown in the IRF spreadsheet in the Appendix.

Step 2. Implement BMPs That Provide WQCV with Slow Release.
Development of this site includes a full-spectrum detention facility providing WQCV and an outfall structure with a 40-hour drain time.

Step 3. Stabilize Drainageways.
There are no natural drainageways associated with this site. Drainage fees were be paid with the platting of this subdivision. These fees contribute to any necessary channel improvements within the major drainage basin.

Step 4. Implement Site Specific and Other Source Control BMPs.
There is no permanent outside storage associated with this site.

Summary:
The development of the Eldorado Springs apartment site accounts for up-stream off-site flows, on-site flows, and adjacent flows for a solution that can handle these flows and safely discharge them to adequately sized downstream stormwater infrastructure. The grading and drainage of this site is such that less than 1-acre of developed property drains off the site without going through a full-spectrum detention and stormwater quality facility.

DRAINAGE DESIGN CRITERIA

This drainage report was prepared in accordance to the criteria established in the County Drainage Criteria Manual, updated in May 2014.

WestWorks Engineering uses the rational method for drainage basin study areas of less than 90 acres. This methodology is implemented in accordance with the County Drainage Criteria Manual Guidelines.

For the Rational Method, flows are calculated for the 5-year and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the County Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the County Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report. Detention volume is calculated in accordance with the County Drainage Criteria Manual Guidelines.

DRAINAGE FACILITY DESIGN

All inlets, storm drains, culverts, and open channels are sized using the procedures outlined in the City Drainage Criteria Manual. All of the drainage systems, including the streets, are designed to safely route the 5-year and 100-year storm flows. Hydraulic grade line calculations for the proposed storm drain design will be included with the storm drain constructions drawings.

FLOODPLAIN STATEMENT

No portion of this site is within a F.E.M.A. designated floodplain per Flood Insurance Rate Map Community Panel No. 08041C0741 G, effective December 7, 2018.

EROSION CONTROL PLAN

The El Paso County Drainage Criteria Manual specifies that an Erosion Control Plan and associated cost estimate be submitted in conjunction with the Final Drainage Report. WestWorks Engineering respectfully requests the Erosion Control Plan be submitted in conjunction with the Overlot Grading Plan and construction assurances posted prior to obtaining a grading permit.

OPINION OF PROBABLE COST

Private Drainage Facilities (non-reimbursable):

Item	Quantity	Unit Cost	Total Cost
18" RCP Storm Drain	1,549 LF	$65/LF	$100,425
24" RCP Storm Drain	1,041 LF	$78/LF	$ 81,198
30" RCP Storm Drain	376 LF	$97/LF	$ 36,472
5' Type R Inlet	8 EA	$4,000/EA	$ 32,000
10' Type R Inlet	2 EA	$5,500/EA	$ 11,000
15' Type R Inlet	1 EA	$8,000/EA	$ 8,000
20' Type R Inlet	1 EA	$8,000/EA	$ 8,000
CDOT Type C Inlet	5 EA	$3,300/EA	$ 16,500
Storm Manhole	8 EA	$4,600/EA	$ 36,800
Pond Outfall Structure	2 EA	$7,500/EA	$ 15,000
Riprap	33 CY	$75/CY	$ 2,475
		Sub-Total	$347,870
		20% Contingency	$ 69,574
		TOTAL	$417,444

Public Drainage Facilities (non-reimbursable):

Item	Quantity	Unit Cost	Total Cost
24" RCP Storm Drain	20 LF	$84/LF	$ 1,680
30" RCP Storm Drain	11 LF	$94/LF	$ 1,034
36" RCP Storm Drain	146 LF	$124/LF	$ 18,104
48" RCP Storm Drain	1,225 LF	$178/LF	$218,050
15' Type R Inlet	1 EA	$8,000/EA	$ 8,000
20' Type R Inlet	2 EA	$8,000/EA	$ 16,000
Storm Manhole (Type 1)	4 EA	$8,600/EA	$ 34,400
		Sub-Total	$297,268
		20% Contingency	$ 59,454
		TOTAL	$356,722

This opinion of probable cost is made on the basis of experience and qualifications and represents WestWorks Engineering’s best judgment as an experienced and qualified professional firm, familiar with the construction industry. WestWorks Engineering cannot and will not guarantee that actual construction costs will not vary from this opinion of probable cost.

DRAINAGE FEES

The study area is in the Stratton Drainage Basin. The site has already been platted and drainage fees paid at that time.

REFERENCE LIST

"Soil Survey of El Paso County Area, Colorado," prepared by United States Department of Agriculture Soil Conservation Service, issued June 1981

"FIRM Flood Insurance Rate Map," prepared by Federal Emergency Management Agency, effective date March 17, 1997

El Paso County Drainage Criteria Manual, updated May 2014

"Master Drainage Plan Harrison Street- I-25 Vicinity Cheyenne Mountain Ranch", by Hartzell-Pfeiffenberger and Associates, Inc. dated November 15, 1973

"Stratton and Fischer's Canyon Drainage Basin Planning Study, Draft Hydraulic Analysis," by Muller Engineering Co. dated May 31, 1990

"Master Drainage Report for Cheyenne Mountain Center and Final Drainage Report for Cheyenne Mountain Center Filing No. 1 and Cheyenne Meadows Road," by Drexel Barrell, dated October 1985

"Hydrology Report Stratton Drainage Basin Outfall Study," by Drexel Barrell, dated June 1994

"Preliminary and Final Drainage Report and Plan for World Arena Subdivision No. 1," by Obering, Wurth & Associates, August 1994 revised March 1995

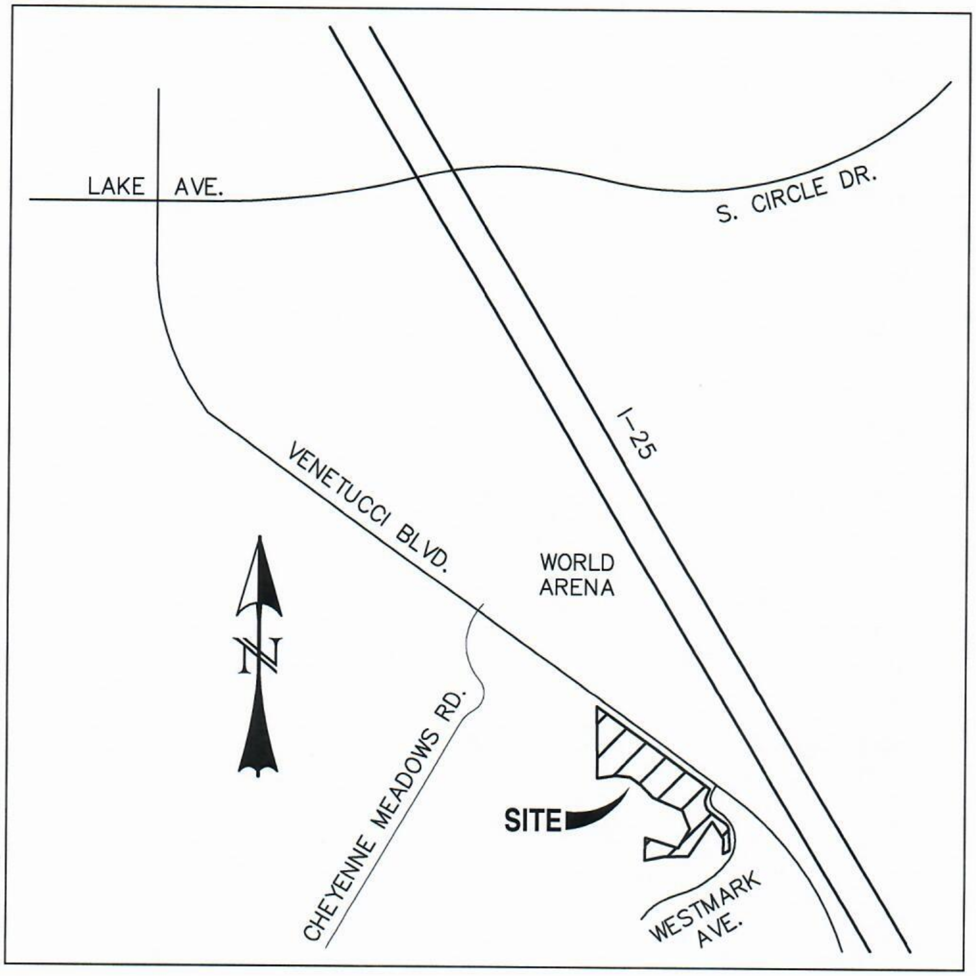
"Final Drainage Report for World Arena Subdivision Filing No. 5, Lot #2," by Matrix Design Group, Inc., April 2008

"Drainage Report for Huckleberry Knoll Subdivision," by Drexel Barrell & Company, dated June 15, 1983

"Roadway Improvement Package and Storm Sewer Package for US Highway 85/87 (Venetucci Boulevard)," by Drexel Barrell including the as-built revisions

"Final Drainage Report for Independence Place at Cheyenne Mountain Filing No. 1," prepared by Classic Consulting Engineers & Surveyors, dated 1/27/2011

APPENDIX



VICINITY MAP

SCALE: N.T.S.

Hydrologic Soil Group—El Paso County Area, Colorado
(ELDORADO SPRINGS)

Map Scale: 1:3,080 if printed on A portrait (8.5" x 11") sheet.

N

0 45 90 180 270 Meters

0 100 200 400 600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
59	Nunn clay loam, 0 to 3 percent slopes	C	0.6	4.0%
82	Schamber-Razor complex, 8 to 50 percent slopes	A	14.7	96.0%
Totals for Area of Interest			**15.3**	**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.

National Flood Hazard Layer FIRMette

38°47'17.89"N

0 250 500 1,000 1,500 2,000 Feet 1:6,000

38°46'49.84"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Effective LOMRs
		Area of Undetermined Flood Hazard *Zone*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/24/2019 at 2:39:54 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

HYDROLOGIC CALCULATIONS

Time of Concentration Calcuations

Sub-Basin	Flowline	L [ft.]	H [ft.]	v [ft/s]	Tc [min.]
A1	overland	1	1.0		0.3
	channel	80	1.0	4	0.3
				Total Tc =	**5**
A2	overland	70	10.0		5.5
	channel	50	1.0	5	0.2
				Total Tc =	**6**
A3	overland	20	0.5		5.2
	channel	60	0.6	4	0.3
				Total Tc =	**6**
A4	overland	10	0.5		2.9
	channel	50	1.5	6	0.1
				Total Tc =	**5**
A5	overland	40	6.0		4.1
	channel	90	2.0	5	0.3
				Total Tc =	**5**

Sub-Basin	Flowline	L [ft.]	H [ft.]	v [ft/s]	Tc [min.]
A6	overland	110	4.0		10.8
	channel	170	12.0	9	0.3
				Total Tc =	**11**
A7	overland	30	2.0		4.6
	channel	130	0.5	2	1.0
				Total Tc =	**6**
A8	overland	140	42.0		6.1
	channel	120	4.0	6	0.3
				Total Tc =	**6**
A9	overland	250	48.0		9.4
	channel	1	1.0	35	0.0
				Total Tc =	**9**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**

Sub-Basin	Flowline	L [ft.]	H [ft.]	v [ft/s]	Tc [min.]
B1	overland	10	0.5		2.9
	channel	30	1.0	6	0.1
				Total Tc =	**5**
B2	overland	70	8.0		5.9
	channel	50	1.0	5	0.2
				Total Tc =	**6**
B3	overland	20	1.0		4.2
	channel	10	0.2	5	0.0
				Total Tc =	**5**
B4	overland	20	1.0		4.2
	channel	160	2.0	4	0.7
				Total Tc =	**5**
B5	overland	70	8.0		5.9
	channel	50	1.0	5	0.2
				Total Tc =	**6**

Project: Eldorado Springs

Job No.: 91807

Engineer: Chad Kuzbek, PE

Date: 5/24/2019

Time of Concentration Calcuations

Sub-Basin	Flowline	L [ft.]	H [ft.]	v [ft/s]	Tc [min.]
B6	overland	20	1.0		4.2
	channel	30	0.5	5	0.1
				Total Tc =	**5**
B7	overland	50	8.0		4.5
	channel	70	1.0	4	0.3
				Total Tc =	**5**
B8	overland	60	14.0		4.3
	channel	60	4.0	9	0.1
				Total Tc =	**5**
B9	overland	40	4.0		4.7
	channel	60	4.0	9	0.1
				Total Tc =	**5**
B10	overland	90	14.0		6.0
	channel	60	5.0	10	0.1
				Total Tc =	**6**

Sub-Basin	Flowline	L [ft.]	H [ft.]	v [ft/s]	Tc [min.]
C1	overland	100	12.0		6.9
	channel	320	3.0	3	1.6
				Total Tc =	**9**
C2	overland	110	10.0		8.0
	channel	630	8.0	4	2.7
				Total Tc =	**11**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**
B11	overland	20	2.0		3.3
	channel	30	1.0	6	0.1
				Total Tc =	**5**

Sub-Basin	Flowline	L [ft.]	H [ft.]	v [ft/s]	Tc [min.]
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**
	overland	1	1.0		0.3
	channel	1	1.0	35	0.0
				Total Tc =	**5**

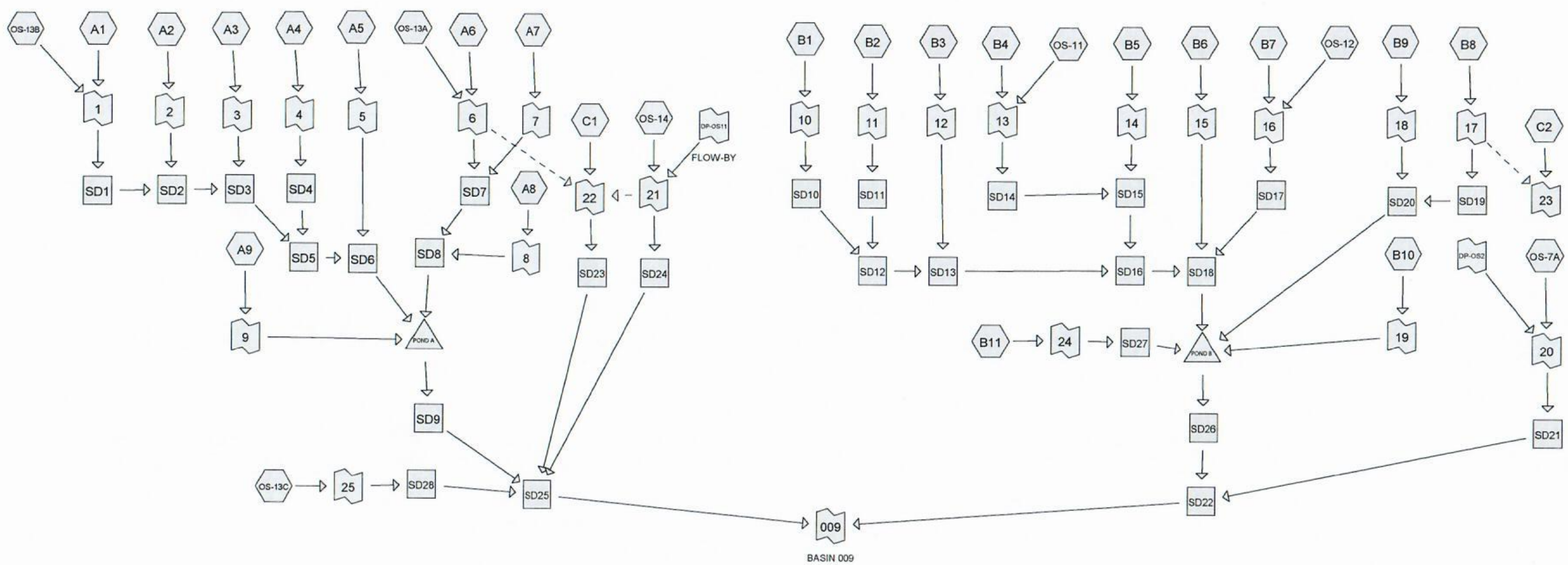
WESTWORKS™ ENGINEERING

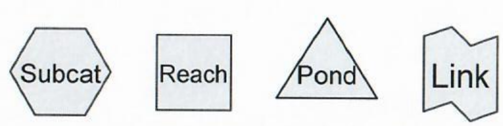
Project: Eldorado Springs

Job No.: 91807

Engineer: Chad Kuzbek, PE

Date: 5/24/2019





Drainage Diagram for 5YR-DEVELOPED
Prepared by WestWorks Engineering 11/6/2019
HydroCAD® 7.00 s/n 002053 © 1986-2003 Applied Microcomputer Systems

Subcatchment A1:

Runoff = 1.33 cfs @ 0.08 hrs, Volume= 0.009 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.100	0.73	ROOFTOPS
0.200	0.96	PAVEMENT
0.300	0.88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment A4:

Runoff = 1.27 cfs @ 0.08 hrs, Volume= 0.009 af, Depth= 0.36"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.100	0.73	ROOFTOP
0.200	0.90	PAVEMENT
0.300	0.84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment A5:

Runoff = 0.95 cfs @ 0.08 hrs, Volume= 0.007 af, Depth= 0.27"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.100	0.08	LANDSCAPE
0.200	0.90	PAVEMENT
0.300	0.63	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B1:

Runoff = 1.73 cfs @ 0.08 hrs, Volume= 0.012 af, Depth= 0.37"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.100	0.73	ROOFTOP
0.300	0.90	PAVEMENT
0.400	0.86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B11:

Runoff = 1.68 cfs @ 0.08 hrs, Volume= 0.012 af, Depth= 0.16"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.400	0.73	ROOFTOP
0.500	0.08	LANDSCAPE
0.900	0.37	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B3:

Runoff = 1.73 cfs @ 0.08 hrs, Volume= 0.012 af, Depth= 0.37"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.100	0.73	ROOFTOP
0.300	0.90	PAVEMENT
0.400	0.86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B4:

Runoff = 3.40 cfs @ 0.08 hrs, Volume= 0.024 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.100	0.08	LANDSCAPE
0.300	0.73	ROOFTOP
0.500	0.90	PAVEMENT
0.900	0.75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B5:

Runoff = 1.51 cfs @ 0.08 hrs, Volume= 0.011 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.050	0.08	LANDSCAPE
0.100	0.73	ROOFTOP
0.250	0.90	PAVEMENT
0.400	0.75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B7:

Runoff = 2.47 cfs @ 0.08 hrs, Volume= 0.018 af, Depth= 0.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.150	0.08	LANDSCAPE
0.100	0.73	ROOFTOP
0.450	0.90	PAVEMENT
0.700	0.70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B8:

Runoff = 1.94 cfs @ 0.08 hrs, Volume= 0.014 af, Depth= 0.24"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.300	0.08	LANDSCAPE
0.400	0.90	PAVEMENT
0.700	0.55	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B9:

Runoff = 0.65 cfs @ 0.08 hrs, Volume= 0.005 af, Depth= 0.28"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.050	0.08	LANDSCAPE
0.050	0.73	ROOFTOP
0.100	0.90	PAVEMENT
0.200	0.65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment OS-7A:

Runoff = 7.04 cfs @ 0.08 hrs, Volume= 0.050 af, Depth= 0.22"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
2.800	0.50	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, FROM FDR**

Reach SD10:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.400 ac, Inflow Depth = 0.37"	for 5-Year event	
Inflow =	1.73 cfs @ 0.08 hrs, Volume=	0.012 af	
Outflow =	1.73 cfs @ 0.08 hrs, Volume=	0.012 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD19:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.700 ac, Inflow Depth = 0.23"	for 5-Year event	
Inflow =	1.60 cfs @ 0.07 hrs, Volume=	0.013 af	
Outflow =	1.60 cfs @ 0.07 hrs, Volume=	0.013 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD20:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.900 ac, Inflow Depth = 0.24"	for 5-Year event	
Inflow =	2.25 cfs @ 0.08 hrs, Volume=	0.018 af	
Outflow =	2.25 cfs @ 0.08 hrs, Volume=	0.018 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD27:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.900 ac, Inflow Depth = 0.16"	for 5-Year event	
Inflow =	1.68 cfs @ 0.08 hrs, Volume=	0.012 af	
Outflow =	1.68 cfs @ 0.08 hrs, Volume=	0.012 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD4:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.300 ac,	Inflow Depth = 0.36"	for 5-Year event	
Inflow =	1.27 cfs @	0.08 hrs, Volume=	0.009 af	
Outflow =	1.27 cfs @	0.08 hrs, Volume=	0.009 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 4:

Inflow Area =	0.300 ac,	Inflow Depth = 0.36"	for 5-Year event	
Inflow =	1.27 cfs @	0.08 hrs, Volume=	0.009 af	
Primary =	1.27 cfs @	0.08 hrs, Volume=	0.009 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 5:

Inflow Area =	0.300 ac,	Inflow Depth = 0.27"	for 5-Year event	
Inflow =	0.95 cfs @	0.08 hrs, Volume=	0.007 af	
Primary =	0.95 cfs @	0.08 hrs, Volume=	0.007 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 10:

Inflow Area =	0.400 ac,	Inflow Depth = 0.37"	for 5-Year event	
Inflow =	1.73 cfs @	0.08 hrs, Volume=	0.012 af	
Primary =	1.73 cfs @	0.08 hrs, Volume=	0.012 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 12:

Inflow Area =	0.400 ac,	Inflow Depth = 0.37"	for 5-Year event	
Inflow =	1.73 cfs @	0.08 hrs, Volume=	0.012 af	
Primary =	1.73 cfs @	0.08 hrs, Volume=	0.012 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 14:

Inflow Area =	0.400 ac,	Inflow Depth = 0.32"	for 5-Year event	
Inflow =	1.51 cfs @	0.08 hrs, Volume=	0.011 af	
Primary =	1.51 cfs @	0.08 hrs, Volume=	0.011 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 17:

Inflow Area =	0.700 ac,	Inflow Depth = 0.24"	for 5-Year event	
Inflow =	1.94 cfs @	0.08 hrs, Volume=	0.014 af	
Primary =	1.60 cfs @	0.07 hrs, Volume=	0.013 af,	Atten= 17%, Lag= 0.0 min
Secondary =	0.34 cfs @	0.08 hrs, Volume=	0.001 af	

Primary outflow = Inflow below 1.60 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 18:

Inflow Area =	0.200 ac,	Inflow Depth = 0.28"	for 5-Year event	
Inflow =	0.65 cfs @	0.08 hrs, Volume=	0.005 af	
Primary =	0.65 cfs @	0.08 hrs, Volume=	0.005 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 24:

Inflow Area =	0.900 ac,	Inflow Depth = 0.16"	for 5-Year event	
Inflow =	1.68 cfs @	0.08 hrs, Volume=	0.012 af	
Primary =	1.68 cfs @	0.08 hrs, Volume=	0.012 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A2:

Runoff = 1.66 cfs @ 0.10 hrs, Volume= 0.014 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.150	0.73	ROOFTOP
0.250	0.90	PAVEMENT
0.400	0.84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A3:

Runoff = 1.62 cfs @ 0.10 hrs, Volume= 0.013 af, Depth= 0.40"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.200	0.73	ROOFTOP
0.200	0.90	PAVEMENT
0.400	0.82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A7:

Runoff = 1.28 cfs @ 0.10 hrs, Volume= 0.011 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.100	0.08	LANDSCAPE
0.100	0.73	ROOFTOP
0.200	0.90	PAVEMENT
0.400	0.65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A8:

Runoff = 0.52 cfs @ 0.10 hrs, Volume= 0.004 af, Depth= 0.17"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.200	0.08	LANDSCAPE
0.100	0.90	PAVEMENT
0.300	0.35	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B10:

Runoff = 0.71 cfs @ 0.10 hrs, Volume= 0.006 af, Depth= 0.12"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.450	0.08	LANDSCAPE
0.150	0.73	ROOFTOP
0.600	0.24	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B2:

Runoff = 1.44 cfs @ 0.10 hrs, Volume= 0.012 af, Depth= 0.36"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.050	0.08	LANDSCAPE
0.150	0.73	ROOFTOP
0.200	0.90	PAVEMENT
0.400	0.73	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B6:

Runoff = 1.90 cfs @ 0.10 hrs, Volume= 0.016 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.050	0.08	LANDSCAPE
0.150	0.73	ROOFTOP
0.300	0.90	PAVEMENT
0.500	0.77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment OS-12:

Runoff = 3.21 cfs @ 0.10 hrs, Volume= 0.027 af, Depth= 0.24"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
1.300	0.50	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FROM FDR**

Subcatchment OS-13A:

Runoff = 1.82 cfs @ 0.10 hrs, Volume= 0.015 af, Depth= 0.11"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.300	0.90	PAVEMENT/ROOF
1.300	0.08	LANDSCAPE
1.600	0.23	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FROM FDR**

Subcatchment OS-13B:

Runoff = 0.37 cfs @ 0.10 hrs, Volume= 0.003 af, Depth= 0.07"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.500	0.15	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment OS-13C:

Runoff = 4.69 cfs @ 0.10 hrs, Volume= 0.039 af, Depth= 0.12"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=6 min, Inten=4.90 in/hr

Area (ac)	C	Description
0.800	0.90	PAVEMENT/ROOF
3.000	0.08	LANDSCAPE
3.800	0.25	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FROM FDR**

Reach SD1:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.800 ac, Inflow Depth = 0.21" for 5-Year event
Inflow = 1.69 cfs @ 0.10 hrs, Volume= 0.014 af
Outflow = 1.69 cfs @ 0.10 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD11:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.400 ac, Inflow Depth = 0.36" for 5-Year event
Inflow = 1.44 cfs @ 0.10 hrs, Volume= 0.012 af
Outflow = 1.44 cfs @ 0.10 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD12:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.800 ac,	Inflow Depth = 0.39"	for 5-Year event	
Inflow =	3.15 cfs @	0.10 hrs, Volume=	0.026 af	
Outflow =	3.15 cfs @	0.10 hrs, Volume=	0.026 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD13:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.200 ac,	Inflow Depth = 0.40"	for 5-Year event	
Inflow =	4.87 cfs @	0.10 hrs, Volume=	0.040 af	
Outflow =	4.87 cfs @	0.10 hrs, Volume=	0.040 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD17:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	2.000 ac,	Inflow Depth = 0.28"	for 5-Year event	
Inflow =	5.64 cfs @	0.10 hrs, Volume=	0.047 af	
Outflow =	5.64 cfs @	0.10 hrs, Volume=	0.047 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD2:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.200 ac,	Inflow Depth = 0.28"	for 5-Year event	
Inflow =	3.34 cfs @	0.10 hrs, Volume=	0.028 af	
Outflow =	3.34 cfs @	0.10 hrs, Volume=	0.028 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD28:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	3.800 ac,	Inflow Depth = 0.12"	for 5-Year event	
Inflow =	4.69 cfs @	0.10 hrs, Volume=	0.039 af	
Outflow =	4.69 cfs @	0.10 hrs, Volume=	0.039 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD3:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.600 ac,	Inflow Depth = 0.31"	for 5-Year event
Inflow =	4.96 cfs @	0.10 hrs, Volume=	0.041 af
Outflow =	4.96 cfs @	0.10 hrs, Volume=	0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD5:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	1.900 ac,	Inflow Depth = 0.32"	for 5-Year event
Inflow =	6.21 cfs @	0.10 hrs, Volume=	0.051 af
Outflow =	6.21 cfs @	0.10 hrs, Volume=	0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD6:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	2.200 ac,	Inflow Depth = 0.32"	for 5-Year event
Inflow =	7.15 cfs @	0.10 hrs, Volume=	0.059 af
Outflow =	7.15 cfs @	0.10 hrs, Volume=	0.059 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 1:

Inflow Area =	0.800 ac,	Inflow Depth = 0.21"	for 5-Year event
Inflow =	1.69 cfs @	0.10 hrs, Volume=	0.014 af
Primary =	1.69 cfs @	0.10 hrs, Volume=	0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 2:

Inflow Area =	0.400 ac,	Inflow Depth = 0.41"	for 5-Year event
Inflow =	1.66 cfs @	0.10 hrs, Volume=	0.014 af
Primary =	1.66 cfs @	0.10 hrs, Volume=	0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 3:

Inflow Area =	0.400 ac,	Inflow Depth = 0.40"	for 5-Year event
Inflow =	1.62 cfs @	0.10 hrs, Volume=	0.013 af
Primary =	1.62 cfs @	0.10 hrs, Volume=	0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 7:

Inflow Area =	0.400 ac,	Inflow Depth = 0.32"	for 5-Year event
Inflow =	1.28 cfs @	0.10 hrs, Volume=	0.011 af
Primary =	1.28 cfs @	0.10 hrs, Volume=	0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 8:

Inflow Area =	0.300 ac,	Inflow Depth = 0.17"	for 5-Year event
Inflow =	0.52 cfs @	0.10 hrs, Volume=	0.004 af
Primary =	0.52 cfs @	0.10 hrs, Volume=	0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 11:

Inflow Area =	0.400 ac,	Inflow Depth = 0.36"	for 5-Year event
Inflow =	1.44 cfs @	0.10 hrs, Volume=	0.012 af
Primary =	1.44 cfs @	0.10 hrs, Volume=	0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 15:

Inflow Area =	0.500 ac,	Inflow Depth = 0.38"	for 5-Year event
Inflow =	1.90 cfs @	0.10 hrs, Volume=	0.016 af
Primary =	1.90 cfs @	0.10 hrs, Volume=	0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 16:

Inflow Area =	2.000 ac,	Inflow Depth = 0.28"	for 5-Year event
Inflow =	5.64 cfs @	0.10 hrs, Volume=	0.047 af
Primary =	5.64 cfs @	0.10 hrs, Volume=	0.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 19:

Inflow Area =	0.600 ac,	Inflow Depth = 0.12"	for 5-Year event	
Inflow =	0.71 cfs @	0.10 hrs, Volume=	0.006 af	
Primary =	0.71 cfs @	0.10 hrs, Volume=	0.006 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 25:

Inflow Area =	3.800 ac,	Inflow Depth = 0.12"	for 5-Year event	
Inflow =	4.69 cfs @	0.10 hrs, Volume=	0.039 af	
Primary =	4.69 cfs @	0.10 hrs, Volume=	0.039 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-11:

Runoff = 7.06 cfs @ 0.12 hrs, Volume= 0.070 af, Depth= 0.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=7 min, Inten=4.66 in/hr

Area (ac)	C	Description
2.800	0.55	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, FROM FDR**

Reach SD14:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.700 ac, Inflow Depth = 0.33" for 5-Year event
Inflow = 10.17 cfs @ 0.12 hrs, Volume= 0.100 af
Outflow = 10.17 cfs @ 0.12 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD15:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.100 ac, Inflow Depth = 0.33" for 5-Year event
Inflow = 11.57 cfs @ 0.12 hrs, Volume= 0.114 af
Outflow = 11.57 cfs @ 0.12 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD16:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.300 ac, Inflow Depth = 0.36" for 5-Year event
Inflow = 16.04 cfs @ 0.11 hrs, Volume= 0.158 af
Outflow = 16.04 cfs @ 0.11 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD18:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	7.800 ac,	Inflow Depth = 0.35"	for 5-Year event
Inflow =	23.18 cfs @	0.11 hrs, Volume=	0.227 af
Outflow =	23.18 cfs @	0.11 hrs, Volume=	0.227 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD26:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	10.200 ac,	Inflow Depth = 0.04"	for 5-Year event
Inflow =	0.16 cfs @	0.23 hrs, Volume=	0.037 af
Outflow =	0.16 cfs @	0.23 hrs, Volume=	0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 13:

Inflow Area =	3.700 ac,	Inflow Depth = 0.33"	for 5-Year event
Inflow =	10.17 cfs @	0.12 hrs, Volume=	0.100 af
Primary =	10.17 cfs @	0.12 hrs, Volume=	0.100 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A9:

Runoff = 0.32 cfs @ 0.15 hrs, Volume= 0.004 af, Depth= 0.10"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=9 min, Inten=4.29 in/hr

Area (ac)	C	Description
0.500	0.15	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Subcatchment C1:

Runoff = 1.27 cfs @ 0.15 hrs, Volume= 0.016 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=9 min, Inten=4.29 in/hr

Area (ac)	C	Description
0.300	0.08	LANDSCAPE
0.300	0.90	PAVEMENT
0.600	0.49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Link 9:

Inflow Area = 0.500 ac, Inflow Depth = 0.10" for 5-Year event
Inflow = 0.32 cfs @ 0.15 hrs, Volume= 0.004 af
Primary = 0.32 cfs @ 0.15 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A6:

Runoff = 2.87 cfs @ 0.18 hrs, Volume= 0.044 af, Depth= 0.48"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=11 min, Inten=3.99 in/hr

Area (ac)	C	Description
0.300	0.08	LANDSCAPE
0.100	0.73	ROOFTOP
0.700	0.90	PAVEMENT
1.100	0.66	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Subcatchment C2:

Runoff = 2.33 cfs @ 0.18 hrs, Volume= 0.036 af, Depth= 0.36"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=11 min, Inten=3.99 in/hr

Area (ac)	C	Description
0.600	0.08	LANDSCAPE
0.600	0.90	PAVEMENT
1.200	0.49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Reach SD7:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.100 ac, Inflow Depth = 0.32" for 5-Year event
Inflow = 5.40 cfs @ 0.18 hrs, Volume= 0.083 af
Outflow = 5.40 cfs @ 0.18 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD8:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.400 ac, Inflow Depth = 0.31" for 5-Year event
Inflow = 5.82 cfs @ 0.18 hrs, Volume= 0.089 af
Outflow = 5.82 cfs @ 0.18 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD9:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	6.100 ac,	Inflow Depth = 0.05"	for 5-Year event	
Inflow =	0.11 cfs @	0.36 hrs, Volume=	0.024 af	
Outflow =	0.11 cfs @	0.36 hrs, Volume=	0.024 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 6:

Inflow Area =	2.700 ac,	Inflow Depth = 0.30"	for 5-Year event	
Inflow =	4.35 cfs @	0.18 hrs, Volume=	0.067 af	
Primary =	4.35 cfs @	0.18 hrs, Volume=	0.067 af,	Atten= 0%, Lag= 0.0 min
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Primary outflow = Inflow below 4.40 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 23:

Inflow Area =	1.200 ac,	Inflow Depth = 0.36"	for 5-Year event	
Inflow =	2.33 cfs @	0.18 hrs, Volume=	0.036 af	
Primary =	2.33 cfs @	0.18 hrs, Volume=	0.036 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD23:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.600 ac,	Inflow Depth = 0.50"	for 5-Year event
Inflow =	0.92 cfs @	0.15 hrs, Volume=	0.025 af
Outflow =	0.92 cfs @	0.15 hrs, Volume=	0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD24:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	78.100 ac,	Inflow Depth = 0.12"	for 5-Year event
Inflow =	28.57 cfs @	0.33 hrs, Volume=	0.781 af
Outflow =	28.57 cfs @	0.33 hrs, Volume=	0.781 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD25:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	88.600 ac,	Inflow Depth = 0.12"	for 5-Year event
Inflow =	32.59 cfs @	0.33 hrs, Volume=	0.920 af
Outflow =	32.59 cfs @	0.33 hrs, Volume=	0.920 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 21:

Inflow Area =	78.100 ac,	Inflow Depth = 0.12"	for 5-Year event
Inflow =	28.57 cfs @	0.33 hrs, Volume=	0.781 af
Primary =	28.57 cfs @	0.33 hrs, Volume=	0.781 af, Atten= 0%, Lag= 0.0 min
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Primary outflow = Inflow below 28.80 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 22:

Inflow Area =	0.600 ac,	Inflow Depth = 0.50"	for 5-Year event
Inflow =	0.92 cfs @	0.15 hrs, Volume=	0.025 af
Primary =	0.92 cfs @	0.15 hrs, Volume=	0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-OS11: FLOW-BY

Inflow Area =	65.500 ac,	Inflow Depth = 0.06"	for 5-Year event	
Inflow =	12.00 cfs @	0.33 hrs, Volume=	0.327 af	
Primary =	12.00 cfs @	0.33 hrs, Volume=	0.327 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

23 Point hydrograph entered manually, To= 0.00 hrs, dt= 0.03 hrs, Area= 65.500 ac, cfs =

0.00	1.10	2.20	3.30	4.40	5.50	6.50	7.60	8.70	9.80
10.90	12.00	10.90	9.80	8.70	7.60	6.50	5.50	4.40	3.30
2.20	1.10	0.00							

Reach SD21:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.800 ac, Inflow Depth = 5.96" for 5-Year event
Inflow = 39.95 cfs @ 0.42 hrs, Volume= 1.390 af
Outflow = 39.95 cfs @ 0.42 hrs, Volume= 1.390 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD22:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.000 ac, Inflow Depth = 1.35" for 5-Year event
Inflow = 40.26 cfs @ 0.42 hrs, Volume= 1.464 af
Outflow = 40.26 cfs @ 0.42 hrs, Volume= 1.464 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 009: BASIN 009

Inflow Area = 101.600 ac, Inflow Depth = 0.29" for 5-Year event
Inflow = 66.86 cfs @ 0.41 hrs, Volume= 2.452 af
Primary = 66.86 cfs @ 0.41 hrs, Volume= 2.452 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 20:

Inflow Area = 2.800 ac, Inflow Depth = 5.96" for 5-Year event
Inflow = 39.95 cfs @ 0.42 hrs, Volume= 1.390 af
Primary = 39.95 cfs @ 0.42 hrs, Volume= 1.390 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

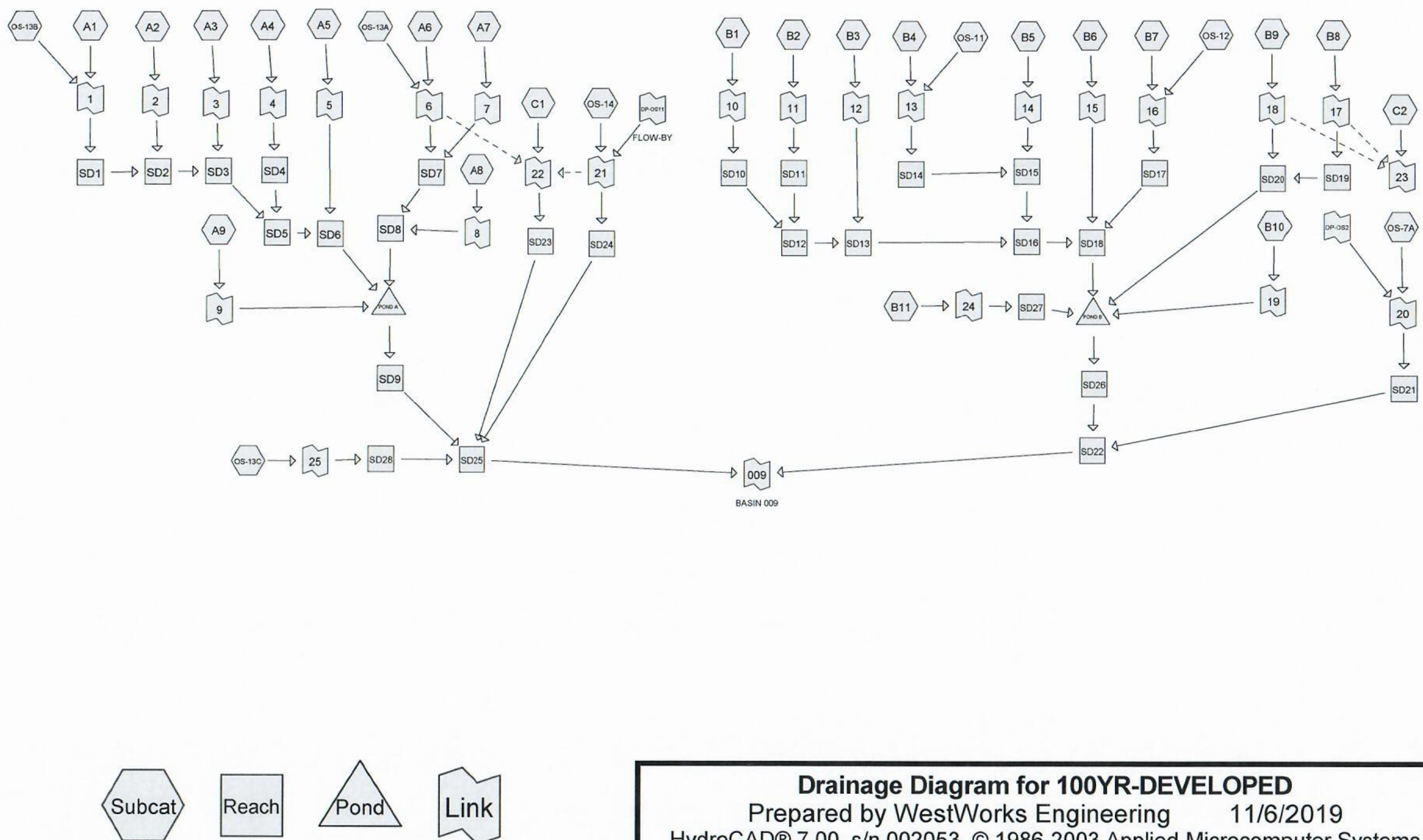
Link DP-OS2:

Inflow = 36.20 cfs @ 0.42 hrs, Volume= 1.257 af
Primary = 36.20 cfs @ 0.42 hrs, Volume= 1.257 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

29 Point hydrograph entered manually, To= 0.00 hrs, dt= 0.03 hrs, Area= 0.000 ac, cfs =

0.00	2.60	5.20	7.80	10.30	12.90	15.50	18.10	20.70	23.30
25.90	28.40	31.00	33.60	36.20	33.60	31.00	28.40	25.90	23.30
20.70	18.10	15.50	12.90	10.30	7.80	5.20	2.60	0.00	



Drainage Diagram for 100YR-DEVELOPED

Prepared by WestWorks Engineering 11/6/2019

HydroCAD® 7.00 s/n 002053 © 1986-2003 Applied Microcomputer Systems

Subcatchment A1:

Runoff = 2.31 cfs @ 0.08 hrs, Volume= 0.016 af, Depth= 0.66"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.100	0.81	ROOFTOPS
0.200	0.96	PAVEMENT
0.300	0.91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment A4:

Runoff = 2.31 cfs @ 0.08 hrs, Volume= 0.016 af, Depth= 0.66"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.100	0.81	ROOFTOP
0.200	0.96	PAVEMENT
0.300	0.91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment A5:

Runoff = 1.93 cfs @ 0.08 hrs, Volume= 0.014 af, Depth= 0.55"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.100	0.35	LANDSCAPE
0.200	0.96	PAVEMENT
0.300	0.76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B1:

Runoff = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af, Depth= 0.66"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.100	0.81	ROOFTOP
0.300	0.96	PAVEMENT
0.400	0.92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B11:

Runoff = 4.18 cfs @ 0.08 hrs, Volume= 0.030 af, Depth= 0.40"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.400	0.81	ROOFTOP
0.500	0.35	LANDSCAPE
0.900	0.55	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B3:

Runoff = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af, Depth= 0.66"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.100	0.81	ROOFTOP
0.300	0.96	PAVEMENT
0.400	0.92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B4:

Runoff = 6.39 cfs @ 0.08 hrs, Volume= 0.045 af, Depth= 0.61"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.100	0.35	LANDSCAPE
0.300	0.81	ROOFTOP
0.500	0.96	PAVEMENT
0.900	0.84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B5:

Runoff = 2.87 cfs @ 0.08 hrs, Volume= 0.020 af, Depth= 0.61"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.050	0.35	LANDSCAPE
0.100	0.81	ROOFTOP
0.250	0.96	PAVEMENT
0.400	0.85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B7:

Runoff = 4.79 cfs @ 0.08 hrs, Volume= 0.034 af, Depth= 0.58"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.150	0.35	LANDSCAPE
0.100	0.81	ROOFTOP
0.450	0.96	PAVEMENT
0.700	0.81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B8:

Runoff = 4.14 cfs @ 0.08 hrs, Volume= 0.029 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.300	0.35	LANDSCAPE
0.400	0.96	PAVEMENT
0.700	0.70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment B9:

Runoff = 1.30 cfs @ 0.08 hrs, Volume= 0.009 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.050	0.35	LANDSCAPE
0.050	0.81	ROOFTOP
0.100	0.96	PAVEMENT
0.200	0.77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment OS-7A:

Runoff = 14.19 cfs @ 0.08 hrs, Volume= 0.101 af, Depth= 0.43"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
2.800	0.60	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, FROM FDR**

Reach SD10:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.400 ac, Inflow Depth = 0.66" for 100-Year event
Inflow = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af
Outflow = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD19:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.700 ac, Inflow Depth = 0.41" for 100-Year event
Inflow = 2.40 cfs @ 0.05 hrs, Volume= 0.024 af
Outflow = 2.40 cfs @ 0.05 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD20:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.900 ac, Inflow Depth = 0.44" for 100-Year event
Inflow = 3.61 cfs @ 0.08 hrs, Volume= 0.033 af
Outflow = 3.61 cfs @ 0.08 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD27:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.900 ac, Inflow Depth = 0.40" for 100-Year event
Inflow = 4.18 cfs @ 0.08 hrs, Volume= 0.030 af
Outflow = 4.18 cfs @ 0.08 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD4:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.300 ac, Inflow Depth = 0.66" for 100-Year event
Inflow = 2.31 cfs @ 0.08 hrs, Volume= 0.016 af
Outflow = 2.31 cfs @ 0.08 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 4:

Inflow Area = 0.300 ac, Inflow Depth = 0.66" for 100-Year event
Inflow = 2.31 cfs @ 0.08 hrs, Volume= 0.016 af
Primary = 2.31 cfs @ 0.08 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 5:

Inflow Area = 0.300 ac, Inflow Depth = 0.55" for 100-Year event
Inflow = 1.93 cfs @ 0.08 hrs, Volume= 0.014 af
Primary = 1.93 cfs @ 0.08 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 10:

Inflow Area = 0.400 ac, Inflow Depth = 0.66" for 100-Year event
Inflow = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af
Primary = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 12:

Inflow Area = 0.400 ac, Inflow Depth = 0.66" for 100-Year event
Inflow = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af
Primary = 3.11 cfs @ 0.08 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 14:

Inflow Area = 0.400 ac, Inflow Depth = 0.61" for 100-Year event
Inflow = 2.87 cfs @ 0.08 hrs, Volume= 0.020 af
Primary = 2.87 cfs @ 0.08 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 17:

Inflow Area =	0.700 ac,	Inflow Depth = 0.51"	for 100-Year event	
Inflow =	4.14 cfs @	0.08 hrs, Volume=	0.029 af	
Primary =	2.40 cfs @	0.05 hrs, Volume=	0.024 af,	Atten= 42%, Lag= 0.0 min
Secondary =	1.74 cfs @	0.08 hrs, Volume=	0.006 af	

Primary outflow = Inflow below 2.40 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 18:

Inflow Area =	0.200 ac,	Inflow Depth = 0.56"	for 100-Year event	
Inflow =	1.30 cfs @	0.08 hrs, Volume=	0.009 af	
Primary =	1.21 cfs @	0.08 hrs, Volume=	0.009 af,	Atten= 7%, Lag= 0.1 min
Secondary =	0.10 cfs @	0.08 hrs, Volume=	0.000 af	

Primary outflow = Inflow below 1.20 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 24:

Inflow Area =	0.900 ac,	Inflow Depth = 0.40"	for 100-Year event	
Inflow =	4.18 cfs @	0.08 hrs, Volume=	0.030 af	
Primary =	4.18 cfs @	0.08 hrs, Volume=	0.030 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A2:

Runoff = 2.98 cfs @ 0.10 hrs, Volume= 0.025 af, Depth= 0.74"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.150	0.81	ROOFTOP
0.250	0.96	PAVEMENT
0.400	0.90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A3:

Runoff = 2.92 cfs @ 0.10 hrs, Volume= 0.024 af, Depth= 0.72"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.200	0.81	ROOFTOP
0.200	0.96	PAVEMENT
0.400	0.88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A7:

Runoff = 2.55 cfs @ 0.10 hrs, Volume= 0.021 af, Depth= 0.63"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.100	0.35	LANDSCAPE
0.100	0.81	ROOFTOP
0.200	0.96	PAVEMENT
0.400	0.77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment A8:

Runoff = 1.37 cfs @ 0.10 hrs, Volume= 0.011 af, Depth= 0.45"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.200	0.35	LANDSCAPE
0.100	0.96	PAVEMENT
0.300	0.55	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B10:

Runoff = 2.34 cfs @ 0.10 hrs, Volume= 0.019 af, Depth= 0.39"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.450	0.35	LANDSCAPE
0.150	0.81	ROOFTOP
0.600	0.47	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B2:

Runoff = 2.75 cfs @ 0.10 hrs, Volume= 0.023 af, Depth= 0.68"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.050	0.35	LANDSCAPE
0.150	0.81	ROOFTOP
0.200	0.96	PAVEMENT
0.400	0.83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment B6:

Runoff = 3.52 cfs @ 0.10 hrs, Volume= 0.029 af, Depth= 0.70"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.050	0.35	LANDSCAPE
0.150	0.81	ROOFTOP
0.300	0.96	PAVEMENT
0.500	0.85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment OS-12:

Runoff = 6.47 cfs @ 0.10 hrs, Volume= 0.053 af, Depth= 0.49"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
1.300	0.60	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FROM FDR**

Subcatchment OS-13A:

Runoff = 6.10 cfs @ 0.10 hrs, Volume= 0.050 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.300	0.96	PAVEMENT/ROOF
1.300	0.35	LANDSCAPE
1.600	0.46	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FROM FDR**

Subcatchment OS-13B:

Runoff = 1.66 cfs @ 0.10 hrs, Volume= 0.014 af, Depth= 0.33"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.500	0.40	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment OS-13C:

Runoff = 15.12 cfs @ 0.10 hrs, Volume= 0.125 af, Depth= 0.39"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
0.800	0.96	PAVEMENT/ROOF
3.000	0.35	LANDSCAPE
3.800	0.48	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FROM FDR**

Subcatchment OS-14:

Runoff = 54.58 cfs @ 0.10 hrs, Volume= 0.451 af, Depth= 0.43"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=6 min, Inten=8.22 in/hr

Area (ac)	C	Description
12.600	0.54	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2					**Direct Entry, FROM FDR**

Reach SD1:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.800 ac, Inflow Depth = 0.49" for 100-Year event
Inflow = 3.94 cfs @ 0.10 hrs, Volume= 0.032 af
Outflow = 3.94 cfs @ 0.10 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD11:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.400 ac, Inflow Depth = 0.68" for 100-Year event
Inflow = 2.75 cfs @ 0.10 hrs, Volume= 0.023 af
Outflow = 2.75 cfs @ 0.10 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD12:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.800 ac, Inflow Depth = 0.72" for 100-Year event
Inflow = 5.82 cfs @ 0.10 hrs, Volume= 0.048 af
Outflow = 5.82 cfs @ 0.10 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD13:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.200 ac, Inflow Depth = 0.73" for 100-Year event
Inflow = 8.90 cfs @ 0.10 hrs, Volume= 0.073 af
Outflow = 8.90 cfs @ 0.10 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD17:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.000 ac, Inflow Depth = 0.55" for 100-Year event
Inflow = 11.19 cfs @ 0.10 hrs, Volume= 0.092 af
Outflow = 11.19 cfs @ 0.10 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD2:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.200 ac, Inflow Depth = 0.57" for 100-Year event
Inflow = 6.91 cfs @ 0.10 hrs, Volume= 0.057 af
Outflow = 6.91 cfs @ 0.10 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD28:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.800 ac, Inflow Depth = 0.39" for 100-Year event
Inflow = 15.12 cfs @ 0.10 hrs, Volume= 0.125 af
Outflow = 15.12 cfs @ 0.10 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD3:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.600 ac, Inflow Depth = 0.61" for 100-Year event
Inflow = 9.83 cfs @ 0.10 hrs, Volume= 0.081 af
Outflow = 9.83 cfs @ 0.10 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD5:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.900 ac, Inflow Depth = 0.63" for 100-Year event
Inflow = 12.10 cfs @ 0.10 hrs, Volume= 0.100 af
Outflow = 12.10 cfs @ 0.10 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD6:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.200 ac, Inflow Depth = 0.63" for 100-Year event
Inflow = 14.01 cfs @ 0.10 hrs, Volume= 0.115 af
Outflow = 14.01 cfs @ 0.10 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 1:

Inflow Area = 0.800 ac, Inflow Depth = 0.49" for 100-Year event
Inflow = 3.94 cfs @ 0.10 hrs, Volume= 0.032 af
Primary = 3.94 cfs @ 0.10 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 2:

Inflow Area = 0.400 ac, Inflow Depth = 0.74" for 100-Year event
Inflow = 2.98 cfs @ 0.10 hrs, Volume= 0.025 af
Primary = 2.98 cfs @ 0.10 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 3:

Inflow Area = 0.400 ac, Inflow Depth = 0.72" for 100-Year event
Inflow = 2.92 cfs @ 0.10 hrs, Volume= 0.024 af
Primary = 2.92 cfs @ 0.10 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 7:

Inflow Area = 0.400 ac, Inflow Depth = 0.63" for 100-Year event
Inflow = 2.55 cfs @ 0.10 hrs, Volume= 0.021 af
Primary = 2.55 cfs @ 0.10 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 8:

Inflow Area = 0.300 ac, Inflow Depth = 0.45" for 100-Year event
Inflow = 1.37 cfs @ 0.10 hrs, Volume= 0.011 af
Primary = 1.37 cfs @ 0.10 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 11:

Inflow Area = 0.400 ac, Inflow Depth = 0.68" for 100-Year event
Inflow = 2.75 cfs @ 0.10 hrs, Volume= 0.023 af
Primary = 2.75 cfs @ 0.10 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 15:

Inflow Area =	0.500 ac,	Inflow Depth = 0.70"	for 100-Year event	
Inflow =	3.52 cfs @	0.10 hrs, Volume=	0.029 af	
Primary =	3.52 cfs @	0.10 hrs, Volume=	0.029 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 16:

Inflow Area =	2.000 ac,	Inflow Depth = 0.55"	for 100-Year event	
Inflow =	11.19 cfs @	0.10 hrs, Volume=	0.092 af	
Primary =	11.19 cfs @	0.10 hrs, Volume=	0.092 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 19:

Inflow Area =	0.600 ac,	Inflow Depth = 0.39"	for 100-Year event	
Inflow =	2.34 cfs @	0.10 hrs, Volume=	0.019 af	
Primary =	2.34 cfs @	0.10 hrs, Volume=	0.019 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 25:

Inflow Area =	3.800 ac,	Inflow Depth = 0.39"	for 100-Year event	
Inflow =	15.12 cfs @	0.10 hrs, Volume=	0.125 af	
Primary =	15.12 cfs @	0.10 hrs, Volume=	0.125 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-11:

Runoff = 13.79 cfs @ 0.12 hrs, Volume= 0.136 af, Depth= 0.58"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=7 min, Inten=7.83 in/hr

Area (ac)	C	Description
2.800	0.64	FROM FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry, FROM FDR**

Reach SD14:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.700 ac, Inflow Depth = 0.63" for 100-Year event
Inflow = 19.66 cfs @ 0.12 hrs, Volume= 0.194 af
Outflow = 19.66 cfs @ 0.12 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD15:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.100 ac, Inflow Depth = 0.64" for 100-Year event
Inflow = 22.31 cfs @ 0.12 hrs, Volume= 0.220 af
Outflow = 22.31 cfs @ 0.12 hrs, Volume= 0.220 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD16:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.300 ac, Inflow Depth = 0.68" for 100-Year event
Inflow = 30.50 cfs @ 0.11 hrs, Volume= 0.301 af
Outflow = 30.50 cfs @ 0.11 hrs, Volume= 0.301 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD18:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	7.800 ac,	Inflow Depth = 0.67"	for 100-Year event	
Inflow =	44.43 cfs @	0.11 hrs, Volume=	0.436 af	
Outflow =	44.43 cfs @	0.11 hrs, Volume=	0.436 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD26:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	10.200 ac,	Inflow Depth = 0.09"	for 100-Year event	
Inflow =	0.32 cfs @	0.23 hrs, Volume=	0.074 af	
Outflow =	0.32 cfs @	0.23 hrs, Volume=	0.074 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 13:

Inflow Area =	3.700 ac,	Inflow Depth = 0.63"	for 100-Year event	
Inflow =	19.66 cfs @	0.12 hrs, Volume=	0.194 af	
Primary =	19.66 cfs @	0.12 hrs, Volume=	0.194 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A9:

Runoff = 1.82 cfs @ 0.15 hrs, Volume= 0.023 af, Depth= 0.54"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=9 min, Inten=7.20 in/hr

Area (ac)	C	Description
0.500	0.50	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Subcatchment C1:

Runoff = 2.83 cfs @ 0.15 hrs, Volume= 0.035 af, Depth= 0.70"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=9 min, Inten=7.20 in/hr

Area (ac)	C	Description
0.300	0.35	LANDSCAPE
0.300	0.96	PAVEMENT
0.600	0.65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Link 9:

Inflow Area = 0.500 ac, Inflow Depth = 0.54" for 100-Year event
Inflow = 1.82 cfs @ 0.15 hrs, Volume= 0.023 af
Primary = 1.82 cfs @ 0.15 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A6:

Runoff = 5.70 cfs @ 0.18 hrs, Volume= 0.088 af, Depth= 0.96"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=11 min, Inten=6.69 in/hr

Area (ac)	C	Description
0.300	0.35	LANDSCAPE
0.100	0.81	ROOFTOP
0.700	0.96	PAVEMENT
1.100	0.78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Subcatchment C2:

Runoff = 5.18 cfs @ 0.18 hrs, Volume= 0.080 af, Depth= 0.80"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=11 min, Inten=6.69 in/hr

Area (ac)	C	Description
0.600	0.35	LANDSCAPE
0.600	0.96	PAVEMENT
1.200	0.65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Reach SD7:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.100 ac, Inflow Depth = 0.74" for 100-Year event
Inflow = 11.28 cfs @ 0.14 hrs, Volume= 0.190 af
Outflow = 11.28 cfs @ 0.14 hrs, Volume= 0.190 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD8:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.400 ac, Inflow Depth = 0.73" for 100-Year event
Inflow = 12.39 cfs @ 0.14 hrs, Volume= 0.207 af
Outflow = 12.39 cfs @ 0.14 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD9:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	6.100 ac,	Inflow Depth = 0.15"	for 100-Year event	
Inflow =	1.83 cfs @	0.32 hrs, Volume=	0.074 af	
Outflow =	1.83 cfs @	0.32 hrs, Volume=	0.074 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 6:

Inflow Area =	2.700 ac,	Inflow Depth = 0.72"	for 100-Year event	
Inflow =	10.65 cfs @	0.18 hrs, Volume=	0.163 af	
Primary =	9.20 cfs @	0.14 hrs, Volume=	0.159 af,	Atten= 14%, Lag= 0.0 min
Secondary =	1.45 cfs @	0.18 hrs, Volume=	0.004 af	

Primary outflow = Inflow below 9.20 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 23:

Inflow Area =	1.200 ac,	Inflow Depth = 0.89"	for 100-Year event	
Inflow =	6.07 cfs @	0.18 hrs, Volume=	0.089 af	
Primary =	6.07 cfs @	0.18 hrs, Volume=	0.089 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD23:

[40] Hint: Not Described (Outflow=Inflow)

```
Inflow Area =      0.600 ac,  Inflow Depth =  5.92"   for  100-Year event
Inflow      =     14.15 cfs @   0.15 hrs,  Volume=        0.296 af
Outflow     =     14.15 cfs @   0.15 hrs,  Volume=        0.296 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD24:

[40] Hint: Not Described (Outflow=Inflow)

```
Inflow Area =     78.100 ac,  Inflow Depth =  0.27"   for  100-Year event
Inflow      =     46.90 cfs @   0.10 hrs,  Volume=        1.741 af
Outflow     =     46.90 cfs @   0.10 hrs,  Volume=        1.741 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD25:

[40] Hint: Not Described (Outflow=Inflow)

```
Inflow Area =     88.600 ac,  Inflow Depth =  0.34"   for  100-Year event
Inflow      =     72.52 cfs @   0.33 hrs,  Volume=        2.528 af
Outflow     =     72.52 cfs @   0.33 hrs,  Volume=        2.528 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 21:

```
Inflow Area =     78.100 ac,  Inflow Depth =  0.30"   for  100-Year event
Inflow      =     59.01 cfs @   0.15 hrs,  Volume=        1.981 af
Primary     =     46.90 cfs @   0.10 hrs,  Volume=        1.741 af,  Atten= 21%,  Lag= 0.0 min
Secondary   =     12.11 cfs @   0.15 hrs,  Volume=        0.240 af
```

Primary outflow = Inflow below 46.90 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 22:

```
Inflow Area =      0.600 ac,  Inflow Depth =  5.92"   for  100-Year event
Inflow      =     14.15 cfs @   0.15 hrs,  Volume=        0.296 af
Primary     =     14.15 cfs @   0.15 hrs,  Volume=        0.296 af,  Atten= 0%,  Lag= 0.0 min
```

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-OS11: FLOW-BY

Inflow Area =	65.500 ac,	Inflow Depth = 0.27"	for 100-Year event	
Inflow =	54.10 cfs @	0.33 hrs, Volume=	1.475 af	
Primary =	23.40 cfs @	0.15 hrs, Volume=	1.000 af,	Atten= 57%, Lag= 0.0 min
Secondary =	30.70 cfs @	0.33 hrs, Volume=	0.475 af	

Primary outflow = Inflow below 23.40 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

23 Point hydrograph entered manually, To= 0.00 hrs, dt= 0.03 hrs, Area= 65.500 ac, cfs =

0.00	4.90	9.80	14.80	19.70	24.60	29.50	34.40	39.30	44.30
49.20	54.10	49.20	44.30	39.30	34.40	29.50	24.60	19.70	14.80
9.80	4.90	0.00							

Reach SD21:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.800 ac, Inflow Depth = 14.86" for 100-Year event
Inflow = 99.65 cfs @ 0.42 hrs, Volume= 3.466 af
Outflow = 99.65 cfs @ 0.42 hrs, Volume= 3.466 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Reach SD22:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 13.000 ac, Inflow Depth = 3.68" for 100-Year event
Inflow = 104.88 cfs @ 0.42 hrs, Volume= 3.983 af
Outflow = 104.88 cfs @ 0.42 hrs, Volume= 3.983 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 009: BASIN 009

Inflow Area = 101.600 ac, Inflow Depth = 0.79" for 100-Year event
Inflow = 171.59 cfs @ 0.42 hrs, Volume= 6.715 af
Primary = 171.59 cfs @ 0.42 hrs, Volume= 6.715 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link 20:

Inflow Area = 2.800 ac, Inflow Depth = 14.86" for 100-Year event
Inflow = 99.65 cfs @ 0.42 hrs, Volume= 3.466 af
Primary = 99.65 cfs @ 0.42 hrs, Volume= 3.466 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-OS2:

Inflow = 92.10 cfs @ 0.42 hrs, Volume= 3.197 af
Primary = 92.10 cfs @ 0.42 hrs, Volume= 3.197 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

29 Point hydrograph entered manually, To= 0.00 hrs, dt= 0.03 hrs, Area= 0.000 ac, cfs =

0.00	6.60	13.20	19.70	26.30	32.90	39.50	46.10	52.60	59.20
65.80	72.40	78.90	85.50	92.10	85.50	78.90	72.40	65.80	59.20
52.60	46.10	39.50	32.90	26.30	19.70	13.20	6.60	0.00	

HYDRAULIC CALCULATIONS

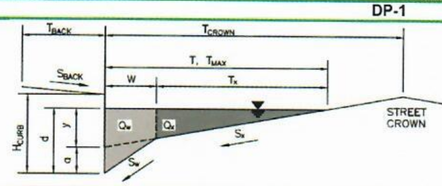
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-1



Gutter Geometry (Enter data in the blue cells)

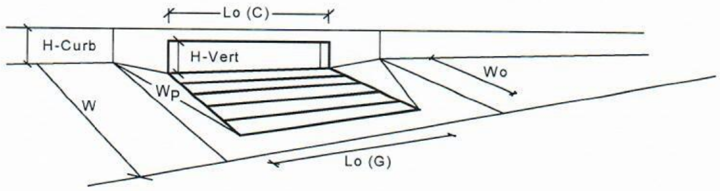
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override 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	
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_o (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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	4.0	cfs

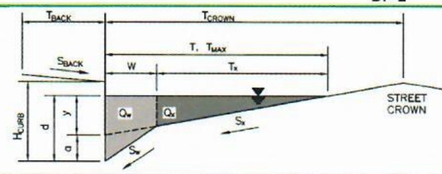
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-2



Gutter Geometry (Enter data in the blue cells)

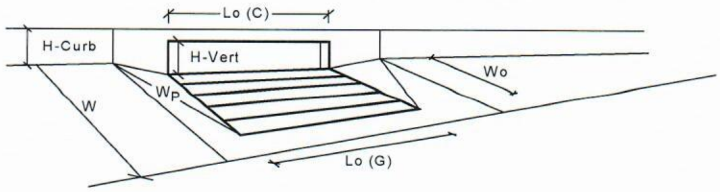
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	Override 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	
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_o (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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	3.0	cfs

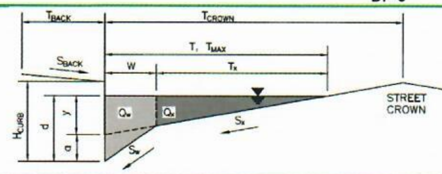
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-3



Gutter Geometry (Enter data in the blue cells)

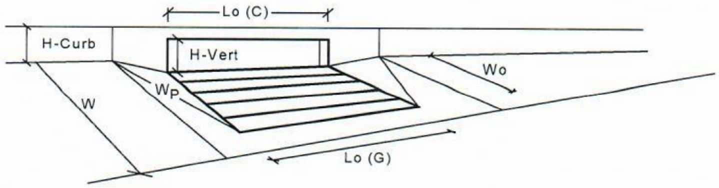
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	3.00	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



		MINOR	MAJOR	
Design Information (Input) CDOT Type C Grate				
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	6.00	6.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.635	0.635	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.95	0.95	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	4.2	4.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	3.0	cfs

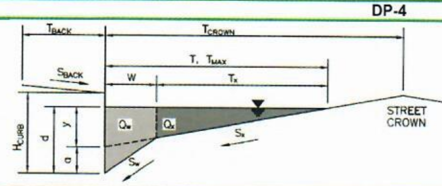
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-4



Gutter Geometry (Enter data in the blue cells)

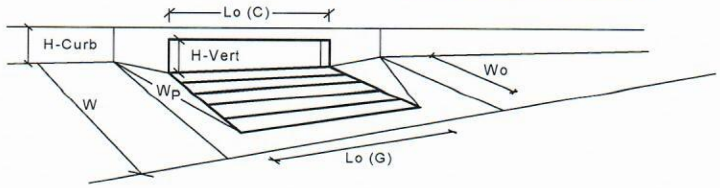
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override 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	
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_o (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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

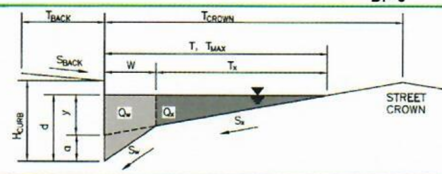
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-5



Gutter Geometry (Enter data in the blue cells)

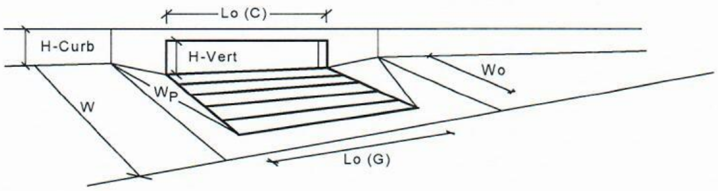
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override 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	
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_o (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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

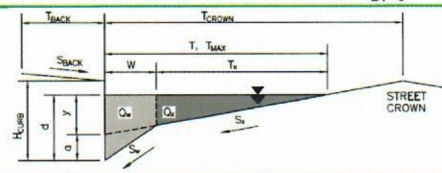
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-6



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	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_O =	0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

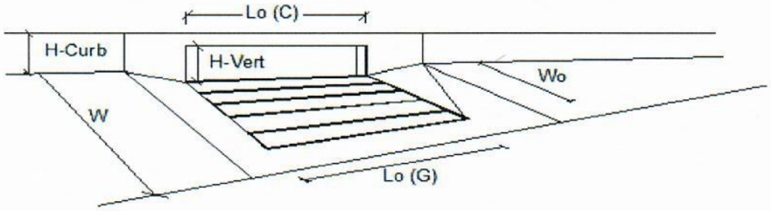
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**23.7**	**50.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
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 =**	**4.4**	**9.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**86**	**%**

Dropdown selection: CDOT Type R Curb Opening

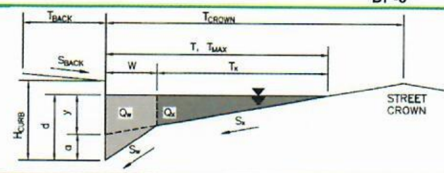
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-8



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	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_O =	0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

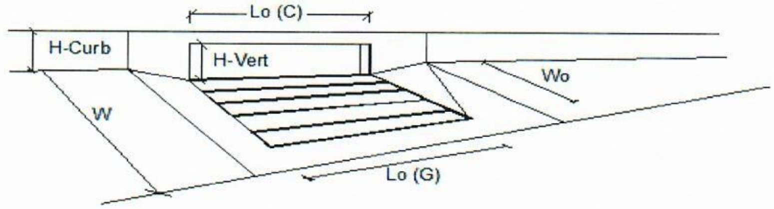
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	26.0	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**23.7**	**50.4**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	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	
Total Inlet Interception Capacity	**Q =**	**0.5**	**1.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**94**	**%**

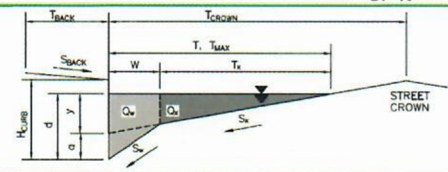
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-10



Gutter Geometry (Enter data in the blue cells)

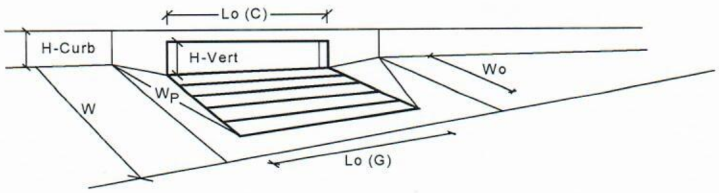
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	3.00	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type C Grate)	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	6.00	6.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.635	0.635	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.95	0.95	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**4.2**	**4.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	3.1	cfs

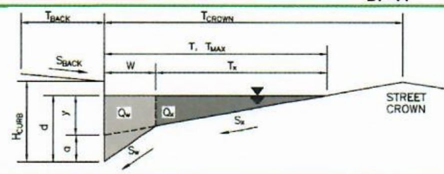
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-11



Gutter Geometry (Enter data in the blue cells)

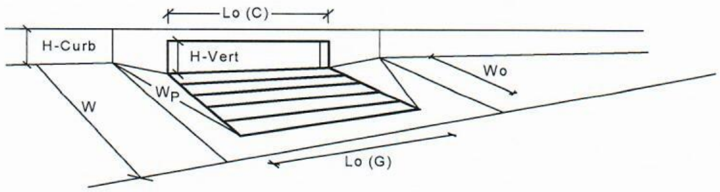
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	Override 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	
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_o (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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	3.0	cfs

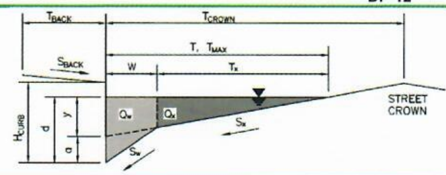
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-12



Gutter Geometry (Enter data in the blue cells)

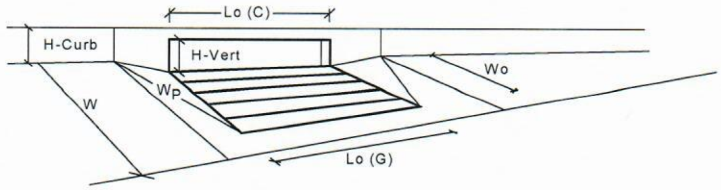
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	3.00	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type C Grate	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	6.00	6.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.635	0.635	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.95	0.95	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**4.2**	**4.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	3.0	cfs

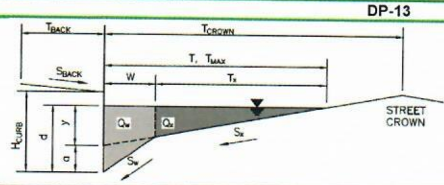
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-13



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

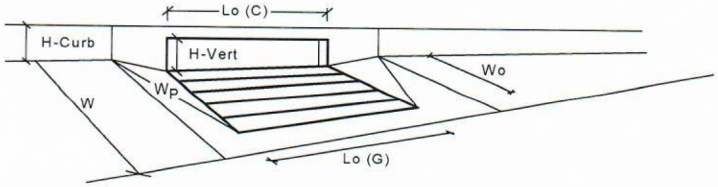
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Check boxes are not applicable in SUMP conditions				

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening	MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.3	inches
Grate Information		MINOR	MAJOR	Override 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	
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_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

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} =	0.33	0.44	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.69	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.86	
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 =	12.5	20.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	10.0	20.0	cfs

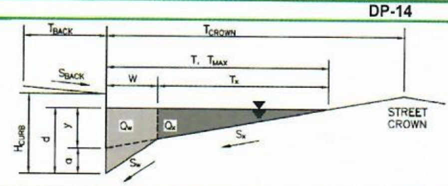
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-14



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

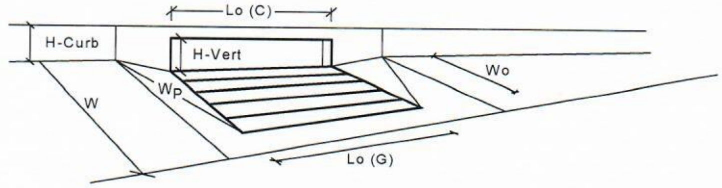
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	Override 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	
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_o (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	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_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.5	3.0	cfs

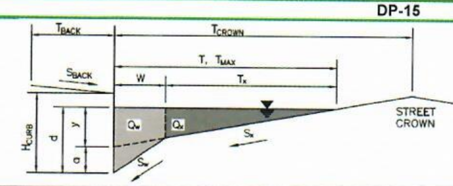
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-15



Gutter Geometry (Enter data in the blue cells)

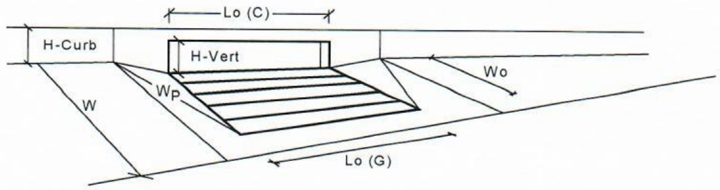
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	3.00	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions				

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type C Grate)	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	6.00	6.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.70	0.70	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.635	0.635	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.95	0.95	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**4.2**	**4.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	4.0	cfs

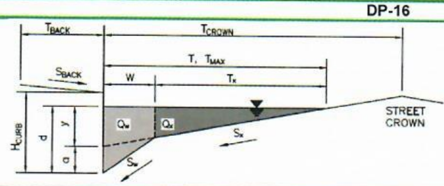
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-16



Gutter Geometry (Enter data in the blue cells)

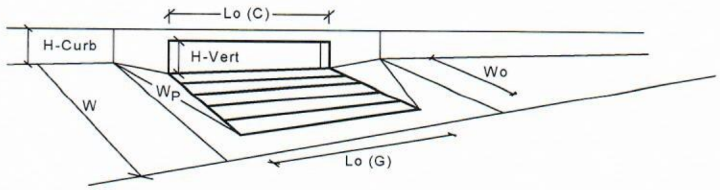
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	3.00	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	24.0	24.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	Override 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	
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_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	3.00	3.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
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} =	0.25	0.25	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.57	0.57	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.93	0.93	
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 =	**6.1**	**6.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm		$Q_{PEAK\ REQUIRED}$ =	5.6	11.0	cfs

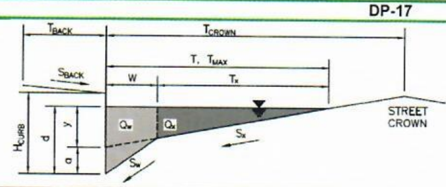
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-17



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	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_O =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

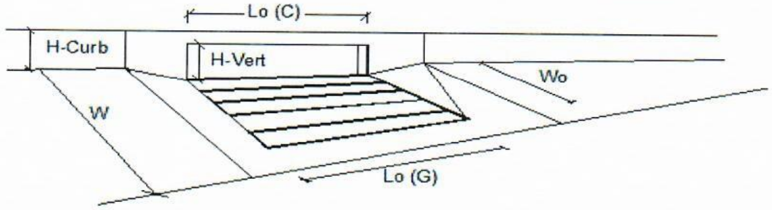
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**12.6**	**12.6**	cfs

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	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 =**	**2.0**	**3.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**96**	**%**

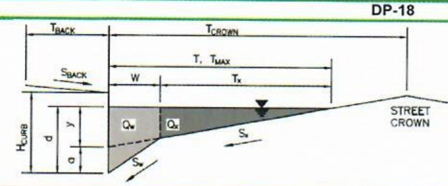
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-18



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	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_O =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

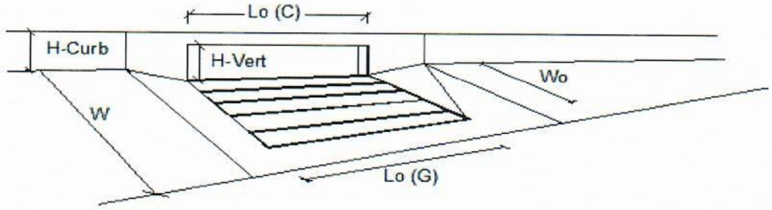
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**12.6**	**12.6**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
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	
Total Inlet Interception Capacity	Q =	0.7	1.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.1	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	94	%

Input selection: CDOT Type R Curb Opening

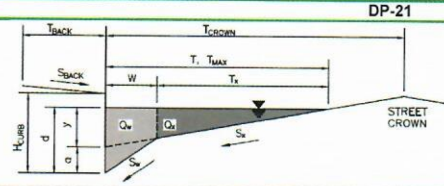
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-21



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	34.0	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_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	22.0	34.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

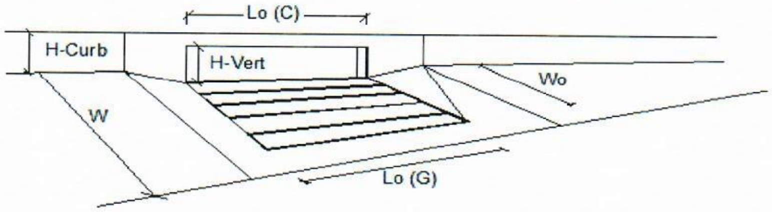
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**22.5**	**59.1**	**cfs**

WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	20.00	20.00	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: WARNING: Q > ALLOWABLE Q FOR MINOR STORM'			MINOR	MAJOR	
Total Inlet Interception Capacity		Q =	**28.8**	**46.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q_b =	**0.2**	**12.1**	**cfs**
Capture Percentage = Q_a/Q_o =		C% =	**99**	**79**	**%**

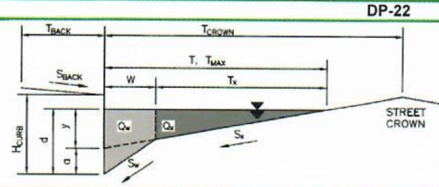
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: ELDORADO SPRINGS

Inlet ID: DP-22



Gutter Geometry (Enter data in the blue cells)

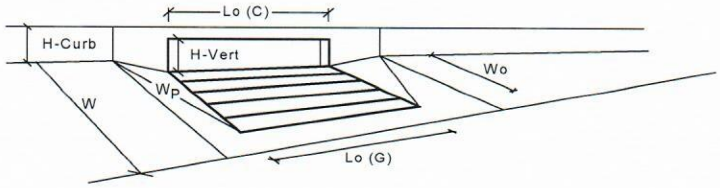
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	34.0	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_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	22.0	34.0	ft
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		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	8.2	inches
Grate Information			MINOR	MAJOR	☑ Override 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	
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_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
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	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

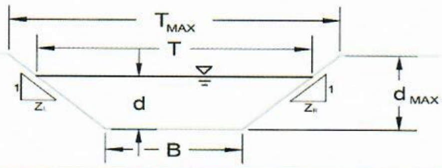
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.52	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.79	0.90	
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	21.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	14.0	cfs

Version 4.05 Released March 2017

AREA INLET IN A SWALE

ELDORADO SPRINGS
DP-25



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0100	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ Non-Cohesive
- ◉ Cohesive
- ○ Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	8.00	8.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.50	1.50	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	26.6	26.6	cfs
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	1.33	1.33	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	5.0	15.0	cfs
Water Depth	d =	0.71	1.08	feet

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

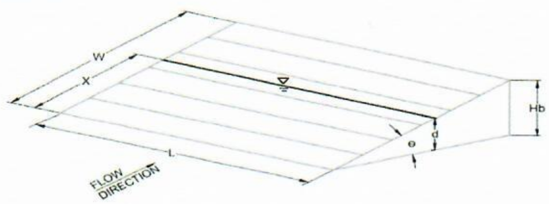
Version 4.05 Released March 2017

AREA INLET IN A SWALE

ELDORADO SPRINGS
DP-25

Inlet Design Information (Input)

Type of Inlet: CDOT Type C (Depressed) — Inlet Type = CDOT Type C (Depressed)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.84	
Orifice Coefficient	C_o =	0.56	
Weir Coefficient	C_w =	1.81	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.71	2.08	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**18.6**	**20.5**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	cfs
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	%

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

STORMWATER FACILITY CALCULATIONS

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	10-Year Event	1.75	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	

Max Intensity for Optional User Defined Storm: 2.51496

Designer: Chad Kuzbek, PE
Company: WestWorks Engineering
Date: November 5, 2019
Project: EL DORADO SPRINGS
Location: POND A

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	A1	A2	A3	A4	A5	A6	A7	A8	A9	OS-13A	OS-13B			
Receiving Pervious Area Soil Type	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.300	0.400	0.400	0.300	0.300	1.100	0.400	0.300	0.500	1.600	0.500			
Directly Connected Impervious Area (DCIA, acres)	0.300	0.400	0.400	0.300	0.200	0.800	0.300	0.100	0.000	0.300	0.100			
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
Separate Pervious Area (SPA, acres)	0.000	0.000	0.000	0.000	0.100	0.300	0.100	0.200	0.500	1.300	0.400			
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	V	V	V	V	V	V	V	V	V	V	V			
												MISSING INPUT	MISSING INPUT	MISSING INPUT

CALCULATED RESULTS (OUTPUT)

	A1	A2	A3	A4	A5	A6	A7	A8	A9	OS-13A	OS-13B			
Total Calculated Area (ac, check against input)	0.300	0.400	0.400	0.300	0.300	1.100	0.400	0.300	0.500	1.600	0.500			
Directly Connected Impervious Area (DCIA, %)	100.0%	100.0%	100.0%	100.0%	66.7%	72.7%	75.0%	33.3%	0.0%	18.8%	20.0%			
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Separate Pervious Area (SPA, %)	0.0%	0.0%	0.0%	0.0%	33.3%	27.3%	25.0%	66.7%	100.0%	81.3%	80.0%			
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			
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			
f / I for WQCV Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4			
f / I for 10-Year Event:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
f / I for 100-Year Event:	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
f / I for Optional User Defined Storm CUHP:	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12			
IRF for WQCV Event:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
IRF for 10-Year Event:	1.00	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	1.00			
IRF for Optional User Defined Storm CUHP:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Total Site Imperviousness: I_{total}	100.0%	100.0%	100.0%	100.0%	66.7%	72.7%	75.0%	33.3%	0.0%	18.8%	20.0%			
Effective Imperviousness for WQCV Event:	100.0%	100.0%	100.0%	100.0%	66.7%	72.7%	75.0%	33.3%	0.0%	18.8%	20.0%			
Effective Imperviousness for 10-Year Event:	100.0%	100.0%	100.0%	100.0%	66.7%	72.7%	75.0%	33.3%	0.0%	18.8%	20.0%			
Effective Imperviousness for 100-Year Event:	100.0%	100.0%	100.0%	100.0%	66.7%	72.7%	75.0%	33.3%	0.0%	18.8%	20.0%			
Effective Imperviousness for Optional User Defined Storm CUHP:	100.0%	100.0%	100.0%	100.0%	66.7%	72.7%	75.0%	33.3%	0.0%	18.8%	20.0%			

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

	A1	A2	A3	A4	A5	A6	A7	A8	A9	OS-13A	OS-13B			
WQCV Event CREDIT: Reduce Detention By:	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
10-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	N/A	0.1%	0.2%			
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	N/A	0.0%	0.1%			
User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

Total Site Imperviousness:	52.5%
Total Site Effective Imperviousness for WQCV Event:	52.5%
Total Site Effective Imperviousness for 10-Year Event:	52.5%
Total Site Effective Imperviousness for 100-Year Event:	52.5%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	52.5%

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

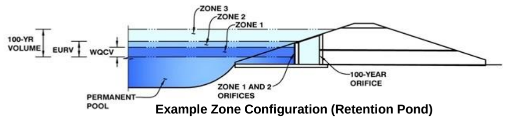
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: ELDORADO SPRINGS

Basin ID: POND A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	6.10	acres
Watershed Length =	840	ft
Watershed Length to Centroid =	400	ft
Watershed Slope =	0.060	ft/ft
Watershed Imperviousness =	52.50%	percent
Percentage Hydrologic Soil Group A =	90.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	10.0%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.108	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.367	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.272	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.359	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.429	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.556	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.661	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.799	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.095	acre-feet		inches
Approximate 2-yr Detention Volume =	0.244	acre-feet		
Approximate 5-yr Detention Volume =	0.325	acre-feet		
Approximate 10-yr Detention Volume =	0.393	acre-feet		
Approximate 25-yr Detention Volume =	0.473	acre-feet		
Approximate 50-yr Detention Volume =	0.522	acre-feet		
Approximate 100-yr Detention Volume =	0.586	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.108	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.259	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.218	acre-feet
Total Detention Basin Volume =	0.586	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 = ft

Stage - Storage Description	Stage (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	--	--	--	2,400	0.055		
	--	2.00	--	--	--	3,650	0.084	6,050	0.139
	--	4.00	--	--	--	5,740	0.132	15,440	0.354
	--	6.00	--	--	--	8,060	0.185	29,240	0.671
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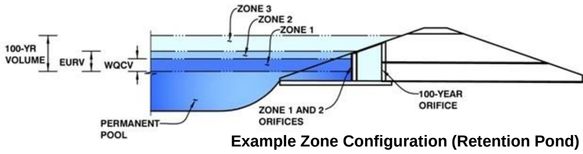
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **ELDORADO SPRINGS**

Basin ID: **POND A**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.63	0.108	Orifice Plate
Zone 2 (EURV)	4.10	0.259	Orifice Plate
Zone 3 (100-year)	5.53	0.218	Weir&Pipe (Restrict)
Total (all zones)		0.586	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.10	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.75	3.30					
Orifice Area (sq. inches)	0.79	0.79	0.99					

	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)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.50	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	38.30	N/A	
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	4.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.29	N/A	ft^2
Outlet Orifice Centroid =	0.20	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.98	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.75	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	15.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.45	feet
Stage at Top of Freeboard =	7.20	feet
Basin Area at Top of Freeboard =	0.19	acres
Basin Volume at Top of Freeboard =	0.67	acre-ft

Routed Hydrograph Results

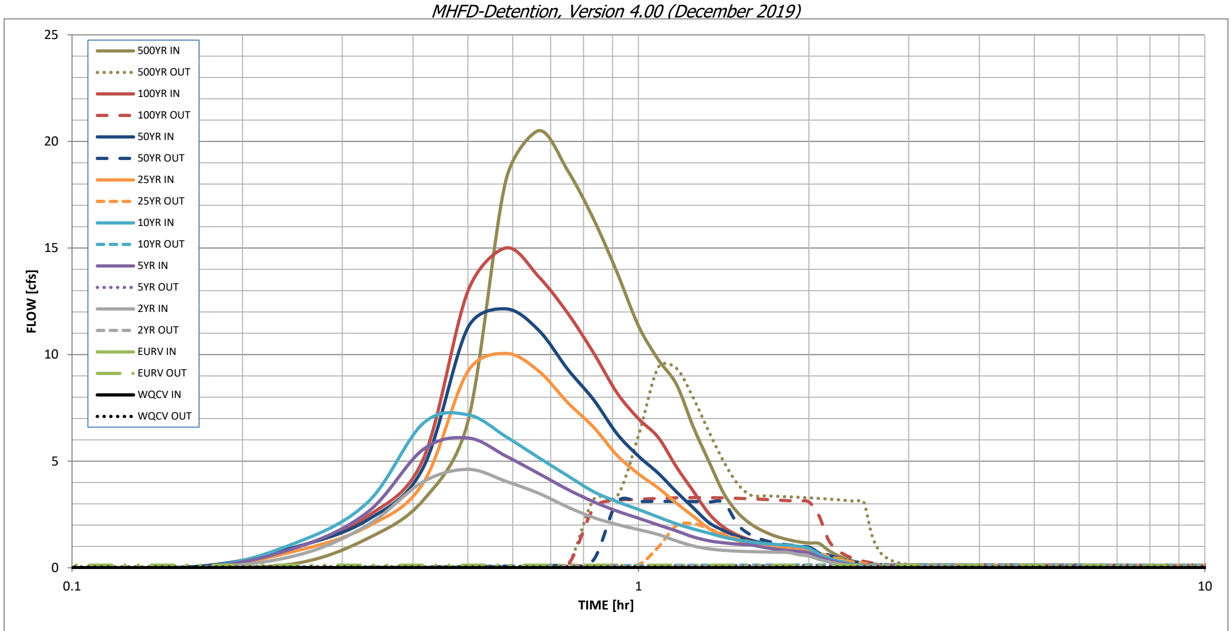
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

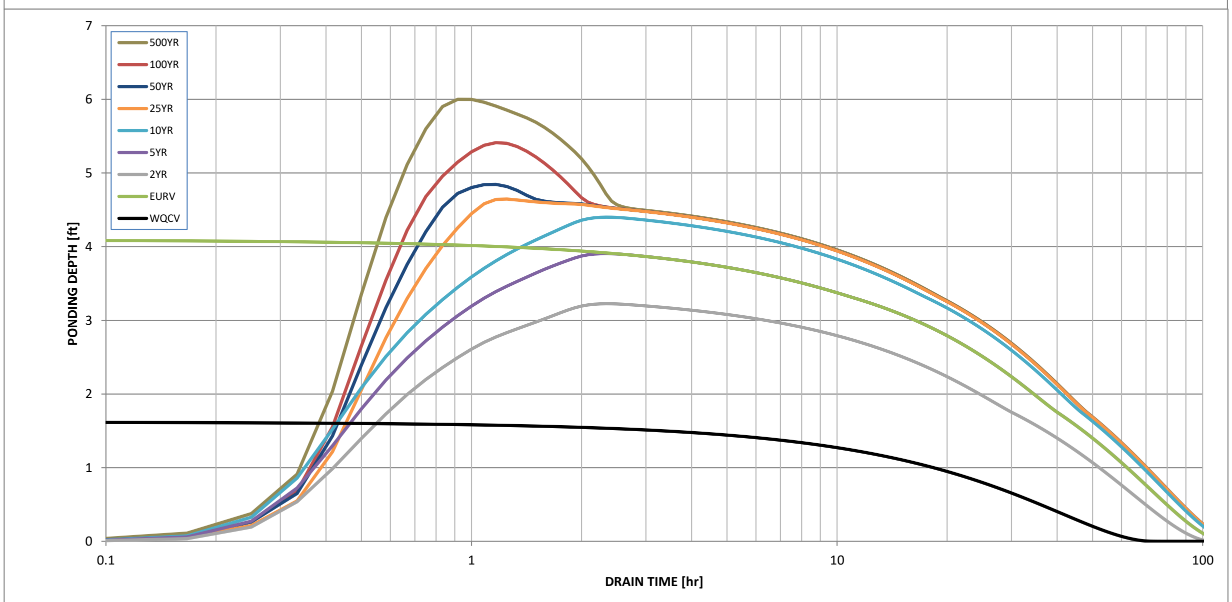
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.108	0.367	0.272	0.359	0.429	0.556	0.661	0.799	1.095
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.272	0.359	0.429	0.556	0.661	0.799	1.095
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.1	0.2	2.1	3.4	5.0	8.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.35	0.56	0.83	1.40
Peak Inflow Q (cfs) =	N/A	N/A	4.6	6.1	7.2	10.1	12.1	15.0	20.5
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.1	2.1	3.1	3.3	9.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.8	1.0	0.9	0.7	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.3	0.3	0.3
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	61	94	88	95	99	97	95	92	86
Time to Drain 99% of Inflow Volume (hours) =	**66**	104	96	104	109	109	108	106	103
Maximum Ponding Depth (ft) =	1.62	4.10	3.23	3.91	4.40	4.65	4.85	5.41	6.00
Area at Maximum Ponding Depth (acres) =	0.08	0.13	0.11	0.13	0.14	0.15	0.15	0.17	0.19
Maximum Volume Stored (acre-ft) =	0.108	0.368	0.259	0.341	0.409	0.444	0.475	0.567	0.671

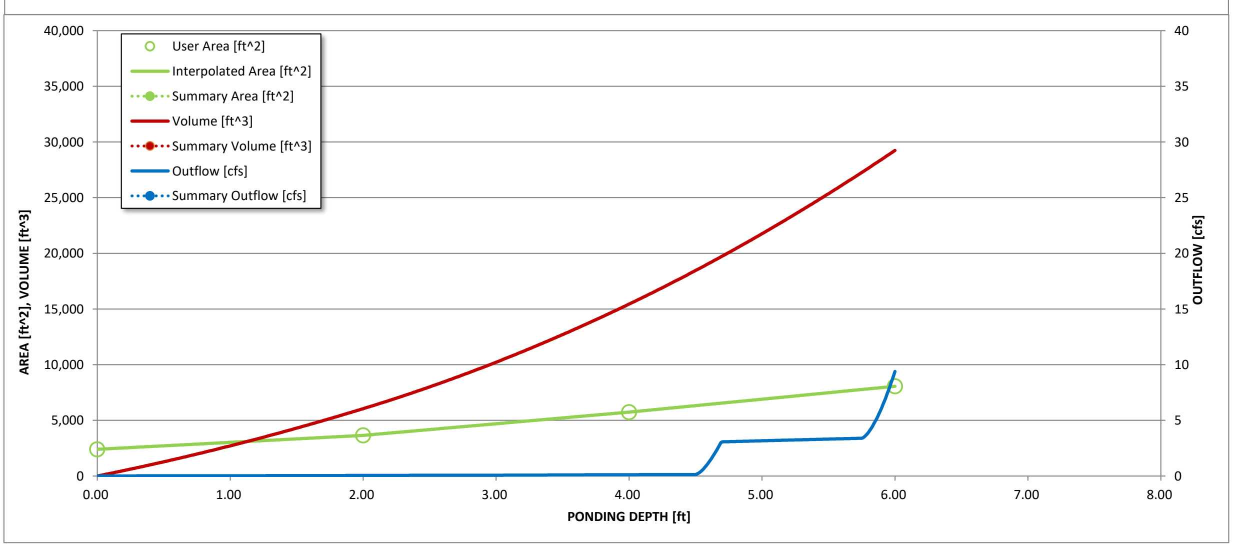
Update the pond design to meet Senate Bill 15-212 criteria for time to drain 97% of all of the runoff for rainfall events less than or equal to a 5-year storm within 72 hours. Keep in mind that WQCV drain time for EDB should also be around 40 hrs.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Simple Broad-crested Weir Flow Calculator

POND A

FOREBAY NOTCH

Inputs

Weir length, l	.17
Headwater height, h	1.3
Weir coefficient, Cw?	3.2

Results

Flow, Q	0.81

Notes

Weir Equation

$q = cw * l * h^{1.5}$

Pond POND A:

Inflow Area = 6.100 ac, Inflow Depth = 0.35" for 5-Year event
Inflow = 11.85 cfs @ 0.18 hrs, Volume= 0.180 af
Outflow = 0.13 cfs @ 0.36 hrs, Volume= 0.029 af, Atten= 99%, Lag= 10.9 min
Primary = 0.13 cfs @ 0.36 hrs, Volume= 0.029 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 5,860.74' @ 0.36 hrs Surf.Area= 0.116 ac Storage= 0.177 af
Plug-Flow detention time= 88.8 min calculated for 0.029 af (16% of inflow)
Center-of-Mass det. time= 83.2 min (92.3 - 9.0)

#	Invert	Avail.Storage	Storage Description
1	5,859.00'	0.652 af	**Custom Stage Data (Prismatic)** Listed below

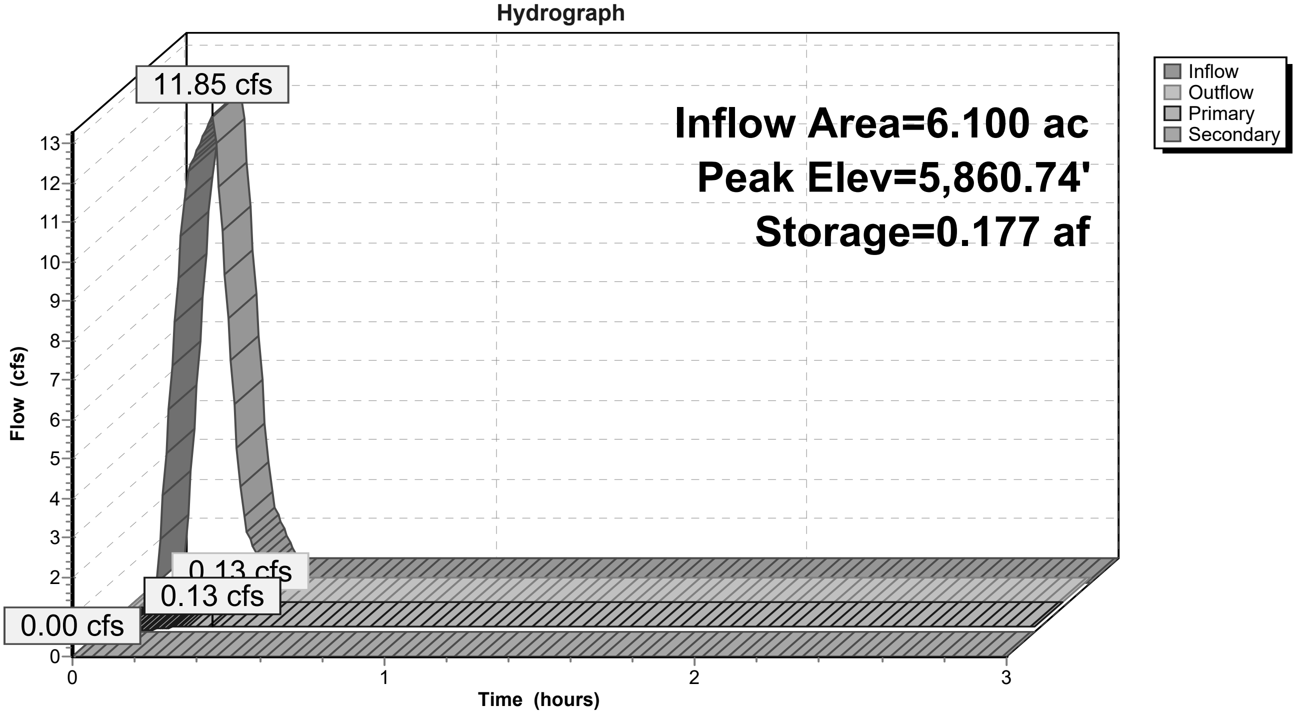
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,859.00	0.074	0.000	0.000
5,860.00	0.103	0.089	0.089
5,862.00	0.137	0.240	0.329
5,863.00	0.162	0.150	0.478
5,864.00	0.185	0.173	0.652

#	Routing	Invert	Outlet Devices
1	Primary	5,856.50'	**6.8" x 120.0' long OUTLET W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 5,854.29' S= 0.0184 '/' n= 0.013 Cc= 0.900
2	Device 1	5,859.00'	**1.4" Vert. WQ ORIFICE** C= 0.600
3	Device 1	5,860.10'	**1.4" Vert. WQ ORIFICE** C= 0.600
4	Device 1	5,860.25'	**1.2" Vert. WQ ORIFICE** C= 0.600
5	Device 1	5,861.25'	**4.00' x 4.00' Horiz. OUTFALL BOX PER EPC** Limited to weir flow C= 0.600
6	Secondary	5,862.50'	**15.0' long x 10.4' breadth EMERGENCY OVERFLOW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.51 2.57 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.13 cfs @ 0.36 hrs HW=5,860.74' (Free Discharge)
└─**1=OUTLET W/ RESTRICTOR PLATE** (Passes 0.13 cfs of 1.59 cfs potential flow)
  ├─**2=WQ ORIFICE** (Orifice Controls 0.07 cfs @ 6.2 fps)
  ├─**3=WQ ORIFICE** (Orifice Controls 0.04 cfs @ 3.7 fps)
  ├─**4=WQ ORIFICE** (Orifice Controls 0.03 cfs @ 3.2 fps)
  └─**5=OUTFALL BOX PER EPC** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5,859.00' (Free Discharge)
└─**6=EMERGENCY OVERFLOW** (Controls 0.00 cfs)

Pond POND A:


Hydrograph
11.85 cfs
Inflow Area=6.100 ac
Peak Elev=5,860.74'
Storage=0.177 af
0.13 cfs
0.13 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Time (hours)
0
1
2
3

Pond POND A:

Inflow Area = 6.100 ac, Inflow Depth = 0.83" for 100-Year event
Inflow = 26.30 cfs @ 0.15 hrs, Volume= 0.423 af
Outflow = 1.81 cfs @ 0.32 hrs, Volume= 0.203 af, Atten= 93%, Lag= 10.1 min
Primary = 1.81 cfs @ 0.32 hrs, Volume= 0.203 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 5,862.45' @ 0.32 hrs Surf.Area= 0.148 ac Storage= 0.396 af
Plug-Flow detention time= 50.3 min calculated for 0.203 af (48% of inflow)
Center-of-Mass det. time= 46.9 min (55.9 - 9.0)

#	Invert	Avail.Storage	Storage Description
1	5,859.00'	0.652 af	**Custom Stage Data (Prismatic)**Listed below

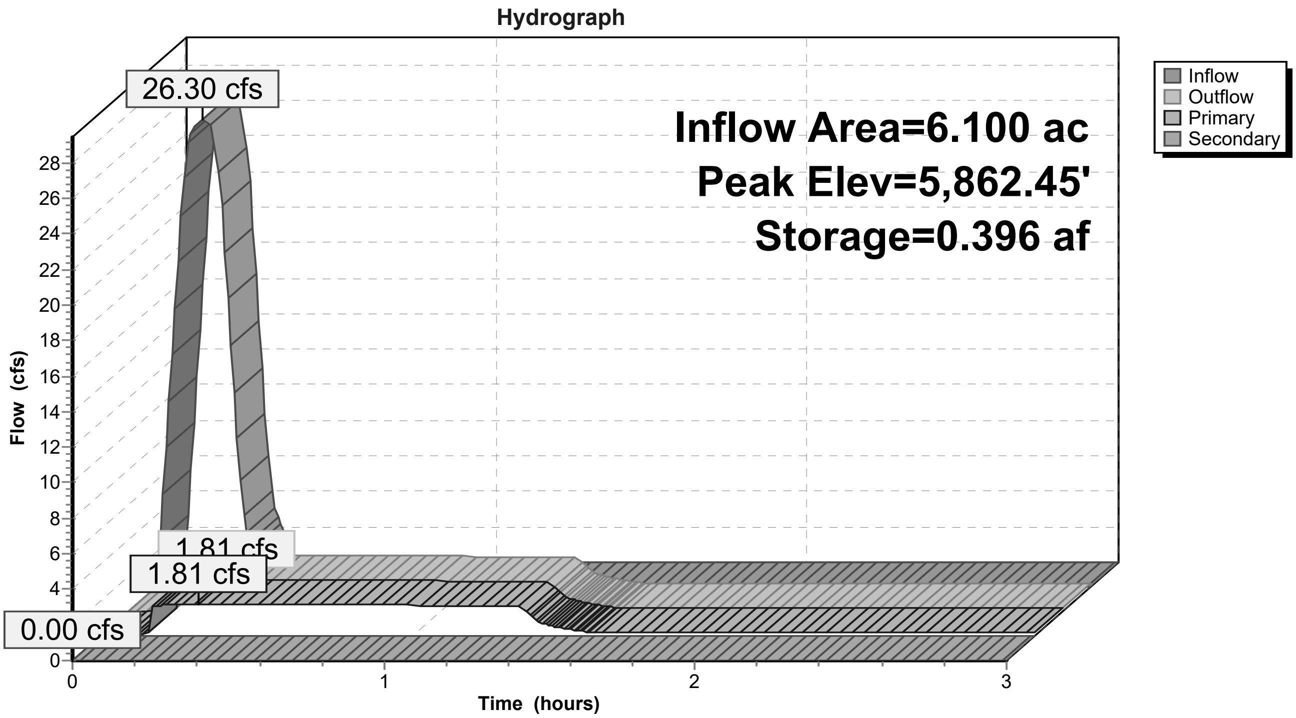
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,859.00	0.074	0.000	0.000
5,860.00	0.103	0.089	0.089
5,862.00	0.137	0.240	0.329
5,863.00	0.162	0.150	0.478
5,864.00	0.185	0.173	0.652

#	Routing	Invert	Outlet Devices
1	Primary	5,856.50'	**6.8" x 120.0' long OUTLET W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 5,854.29' S= 0.0184 '/' n= 0.013 Cc= 0.900
2	Device 1	5,859.00'	**1.4" Vert. WQ ORIFICE** C= 0.600
3	Device 1	5,860.10'	**1.4" Vert. WQ ORIFICE** C= 0.600
4	Device 1	5,860.25'	**1.2" Vert. WQ ORIFICE** C= 0.600
5	Device 1	5,861.25'	**4.00' x 4.00' Horiz. OUTFALL BOX PER EPC** Limited to weir flow C= 0.600
6	Secondary	5,862.50'	**15.0' long x 10.4' breadth EMERGENCY OVERFLOW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.51 2.57 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.81 cfs @ 0.32 hrs HW=5,862.45' (Free Discharge)
└─**1=OUTLET W/ RESTRICTOR PLATE** (Barrel Controls 1.81 cfs @ 7.2 fps)
  ├─**2=WQ ORIFICE** (Passes < 0.09 cfs potential flow)
  ├─**3=WQ ORIFICE** (Passes < 0.08 cfs potential flow)
  ├─**4=WQ ORIFICE** (Passes < 0.06 cfs potential flow)
  └─**5=OUTFALL BOX PER EPC** (Passes < 68.95 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5,859.00' (Free Discharge)
└─**6=EMERGENCY OVERFLOW** (Controls 0.00 cfs)

Pond POND A:


Hydrograph
26.30 cfs
1.81 cfs
1.81 cfs
0.00 cfs
Inflow Area=6.100 ac
Peak Elev=5,862.45'
Storage=0.396 af
Inflow
Outflow
Primary
Secondary
Flow (cfs)
0
4
6
8
10
12
14
16
18
20
22
24
26
28
Time (hours)
0
1
2
3

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	10-Year Event	1.75	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer:	Chad Kuzbek, PE
Company:	WestWorks Engineering
Date:	November 5, 2019
Project:	ELDORADO SPRINGS
Location:	POND B

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	OS-11	OS-12	B11	
Receiving Pervious Area Soil Type	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam	Clay Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.400	0.400	0.400	0.900	0.400	0.500	0.700	0.700	0.200	0.600	2.800	1.300	0.900	
Directly Connected Impervious Area (DCIA, acres)	0.400	0.350	0.400	0.800	0.350	0.450	0.550	0.400	0.150	0.150	0.800	0.300	0.400	
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Separate Pervious Area (SPA, acres)	0.000	0.050	0.000	0.100	0.050	0.050	0.150	0.300	0.050	0.450	2.000	1.000	0.500	
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	V	V	V	V	V	V	V	V	V	V	V	V	V	

MISSING INPUT

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.400	0.400	0.400	0.900	0.400	0.500	0.700	0.700	0.200	0.600	2.800	1.300	0.900	
Directly Connected Impervious Area (DCIA, %)	100.0%	87.5%	100.0%	88.9%	87.5%	90.0%	78.6%	57.1%	75.0%	25.0%	28.6%	23.1%	44.4%	
Unconnected Impervious Area (UIA, %)	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%	
Receiving Pervious 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%	
Separate Pervious Area (SPA, %)	0.0%	12.5%	0.0%	11.1%	12.5%	10.0%	21.4%	42.9%	25.0%	75.0%	71.4%	76.9%	55.6%	
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	
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	
f / I for WQCV Event:	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
f / I for 10-Year Event:	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
f / I for 100-Year Event:	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
f / I for Optional User Defined Storm CUHP:	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	
IRF for WQCV Event:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
IRF for 10-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	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	1.00	1.00	1.00	
IRF for Optional User Defined Storm CUHP:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Total Site Imperviousness: I_{total}	100.0%	87.5%	100.0%	88.9%	87.5%	90.0%	78.6%	57.1%	75.0%	25.0%	28.6%	23.1%	44.4%	
Effective Imperviousness for WQCV Event:	100.0%	87.5%	100.0%	88.9%	87.5%	90.0%	78.6%	57.1%	75.0%	25.0%	28.6%	23.1%	44.4%	
Effective Imperviousness for 10-Year Event:	100.0%	87.5%	100.0%	88.9%	87.5%	90.0%	78.6%	57.1%	75.0%	25.0%	28.6%	23.1%	44.4%	
Effective Imperviousness for 100-Year Event:	100.0%	87.5%	100.0%	88.9%	87.5%	90.0%	78.6%	57.1%	75.0%	25.0%	28.6%	23.1%	44.4%	
Effective Imperviousness for Optional User Defined Storm CUHP:	100.0%	87.5%	100.0%	88.9%	87.5%	90.0%	78.6%	57.1%	75.0%	25.0%	28.6%	23.1%	44.4%	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	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	
10-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.1%	0.0%	
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	
User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Total Site Imperviousness:	53.9%
Total Site Effective Imperviousness for WQCV Event:	53.9%
Total Site Effective Imperviousness for 10-Year Event:	53.9%
Total Site Effective Imperviousness for 100-Year Event:	53.9%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	53.9%

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

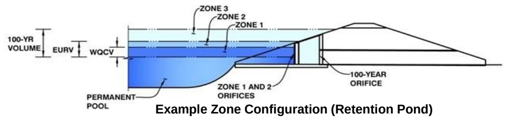
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Eldorado Springs

Basin ID: Pond B



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**			
Watershed Area =	10.20	acres		
Watershed Length =	840	ft		
Watershed Length to Centroid =	400	ft		
Watershed Slope =	0.060	ft/ft		
Watershed Imperviousness =	53.90%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.185	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.647	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.460	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.610	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.729	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.907	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.081	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.300	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.775	acre-feet		inches
Approximate 2-yr Detention Volume =	0.418	acre-feet		
Approximate 5-yr Detention Volume =	0.549	acre-feet		
Approximate 10-yr Detention Volume =	0.667	acre-feet		
Approximate 25-yr Detention Volume =	0.813	acre-feet		
Approximate 50-yr Detention Volume =	0.903	acre-feet		
Approximate 100-yr Detention Volume =	1.009	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.185	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.463	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.362	acre-feet
Total Detention Basin Volume =	1.009	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 = ft

Stage - Storage Description	Stage (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	--	--	--	5,400	0.124		
	--	1.00	--	--	--	6,320	0.145	5,860	0.135
	--	3.00	--	--	--	8,320	0.191	20,500	0.471
	--	5.00	--	--	--	10,410	0.239	39,230	0.901
	--	6.00	--	--	--	11,700	0.269	50,285	1.154
	--	7.00	--	--	--	12,570	0.289	62,420	1.433
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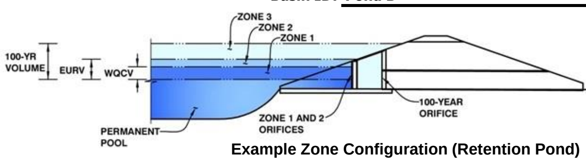
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: **Eldorado Springs**
Basin ID: **Pond B**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.34	0.185	Orifice Plate
Zone 2 (EURV)	3.88	0.463	Orifice Plate
Zone 3 (100-year)	5.45	0.362	Weir&Pipe (Restrict)
Total (all zones)		1.009	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.88	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	15.50	inches
Orifice Plate: Orifice Area per Row =	1.48	sq. inches (diameter = 1-3/8 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.028E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.29	2.59					
Orifice Area (sq. inches)	1.48	1.48	1.48					

	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)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.50	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	26.47	N/A	
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	5.20		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.42	N/A	ft^2
Outlet Orifice Centroid =	0.25	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.13	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	15.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.66	feet
Stage at Top of Freeboard =	7.16	feet
Basin Area at Top of Freeboard =	0.29	acres
Basin Volume at Top of Freeboard =	1.43	acre-ft

Routed Hydrograph Results

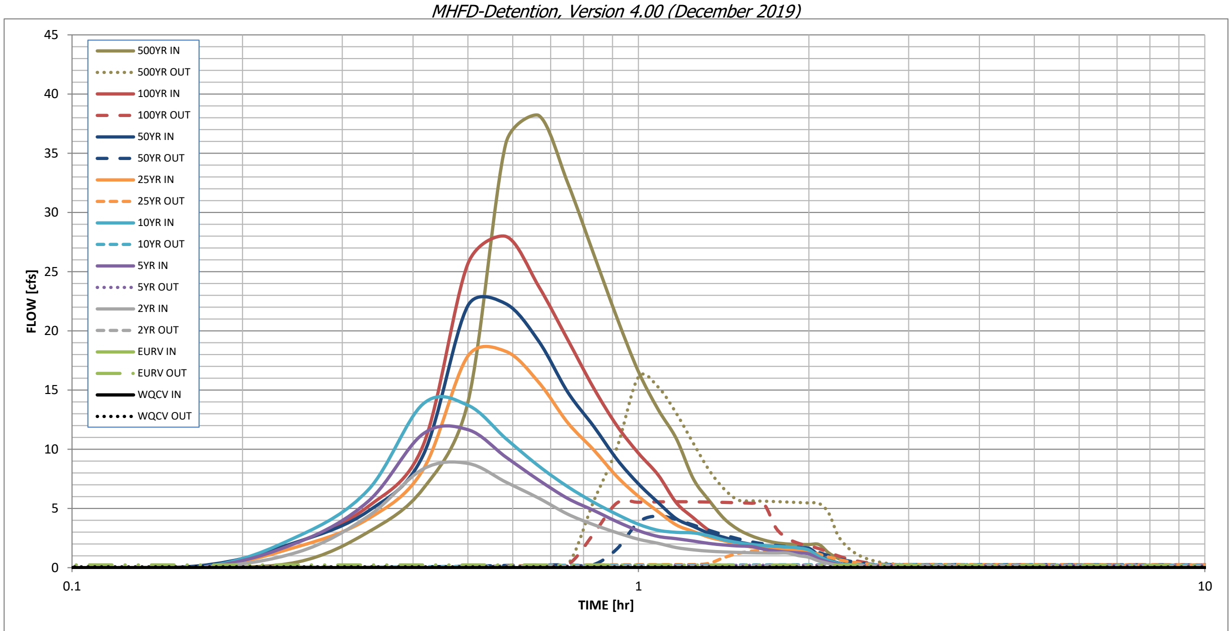
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

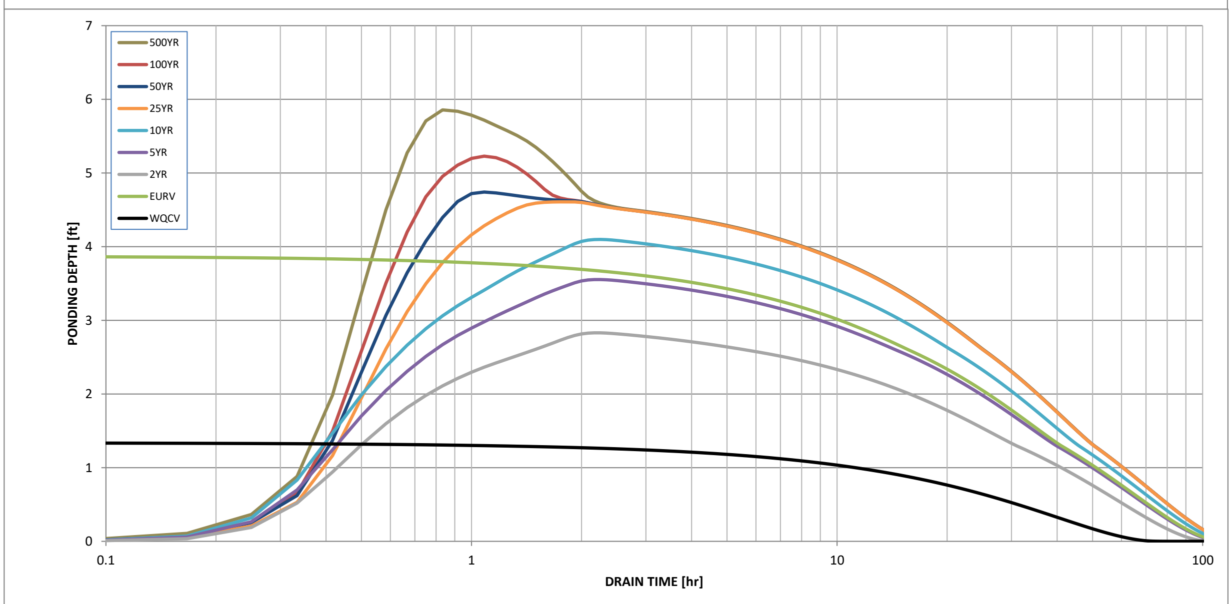
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.185	0.647	0.460	0.610	0.729	0.907	1.081	1.300	1.775
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.460	0.610	0.729	0.907	1.081	1.300	1.775
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.7	5.2	8.4	14.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.26	0.51	0.82	1.45
Peak Inflow Q (cfs) =	N/A	N/A	8.8	11.7	13.8	18.3	22.3	28.0	38.2
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.2	1.5	4.4	5.6	16.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.8	0.6	0.8	0.7	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.4	0.5	0.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	63	91	85	91	95	96	94	91	85
Time to Drain 99% of Inflow Volume (hours) =	**68**	101	94	101	105	108	107	105	102
Maximum Ponding Depth (ft) =	1.34	3.88	2.83	3.55	4.10	4.61	4.74	5.23	5.86
Area at Maximum Ponding Depth (acres) =	0.15	0.21	0.19	0.20	0.22	0.23	0.23	0.25	0.26
Maximum Volume Stored (acre-ft) =	0.185	0.648	0.438	0.579	0.693	0.807	0.839	0.954	1.114

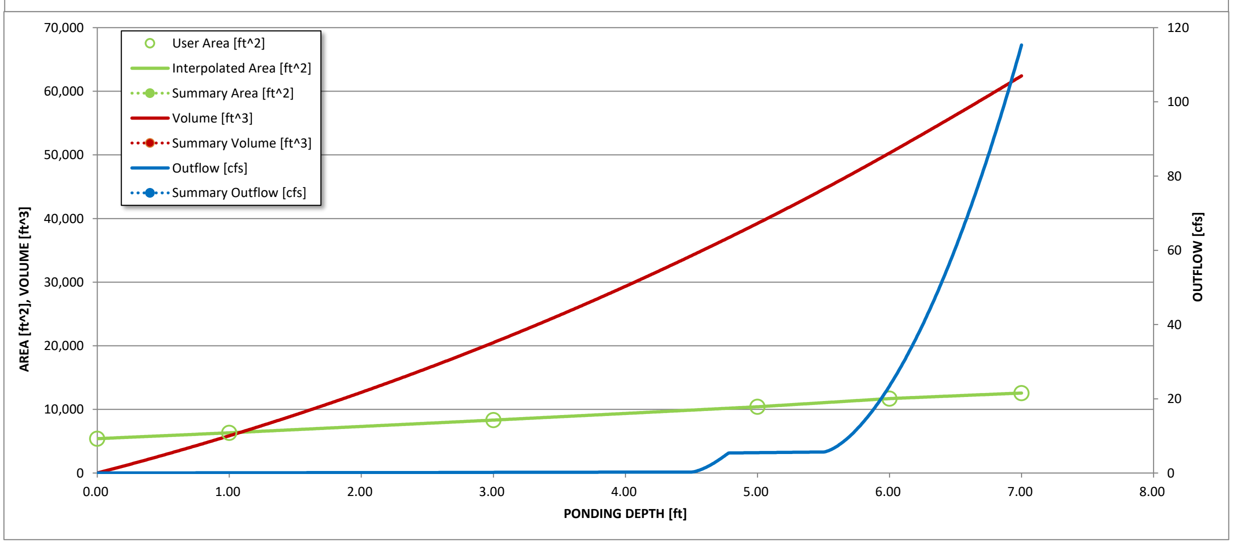
Update the pond design to meet Senate Bill 15-212 criteria for time to drain 97% of all of the runoff for rainfall events less than or equal to a 5-year storm within 72 hours. Keep in mind that WQCV drain time for EDB should also be around 40 hrs.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Simple Broad-crested Weir Flow Calculator

POND B

FOREBAY NOTCH - STM-05

Inputs

Weir length, l	.25
Headwater height, h	2
Weir coefficient, Cw?	3.3

Results

Flow, Q	2.33

Notes

Weir Equation

$q = cw * l * h^{1.5}$

Simple Broad-crested Weir Flow Calculator

POND B

FOREBAY NOTCH - STM-07

Inputs

Weir length, l	.08
Headwater height, h	1
Weir coefficient, Cw?	3.3

Results

Flow, Q	0.26

Notes

Weir Equation

$q = cw * l * h^{1.5}$

Pond POND B:

Inflow Area = 10.200 ac, Inflow Depth = 0.32" for 5-Year event
Inflow = 27.52 cfs @ 0.11 hrs, Volume= 0.270 af
Outflow = 0.10 cfs @ 0.24 hrs, Volume= 0.024 af, Atten= 100%, Lag= 7.5 min
Primary = 0.10 cfs @ 0.24 hrs, Volume= 0.024 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 5,856.80' @ 0.24 hrs Surf.Area= 0.163 ac Storage= 0.269 af
Plug-Flow detention time= 90.2 min calculated for 0.024 af (9% of inflow)
Center-of-Mass det. time= 85.6 min (92.0 - 6.4)

#	Invert	Avail.Storage	Storage Description
1	5,855.00'	1.164 af	**Custom Stage Data (Prismatic)**Listed below

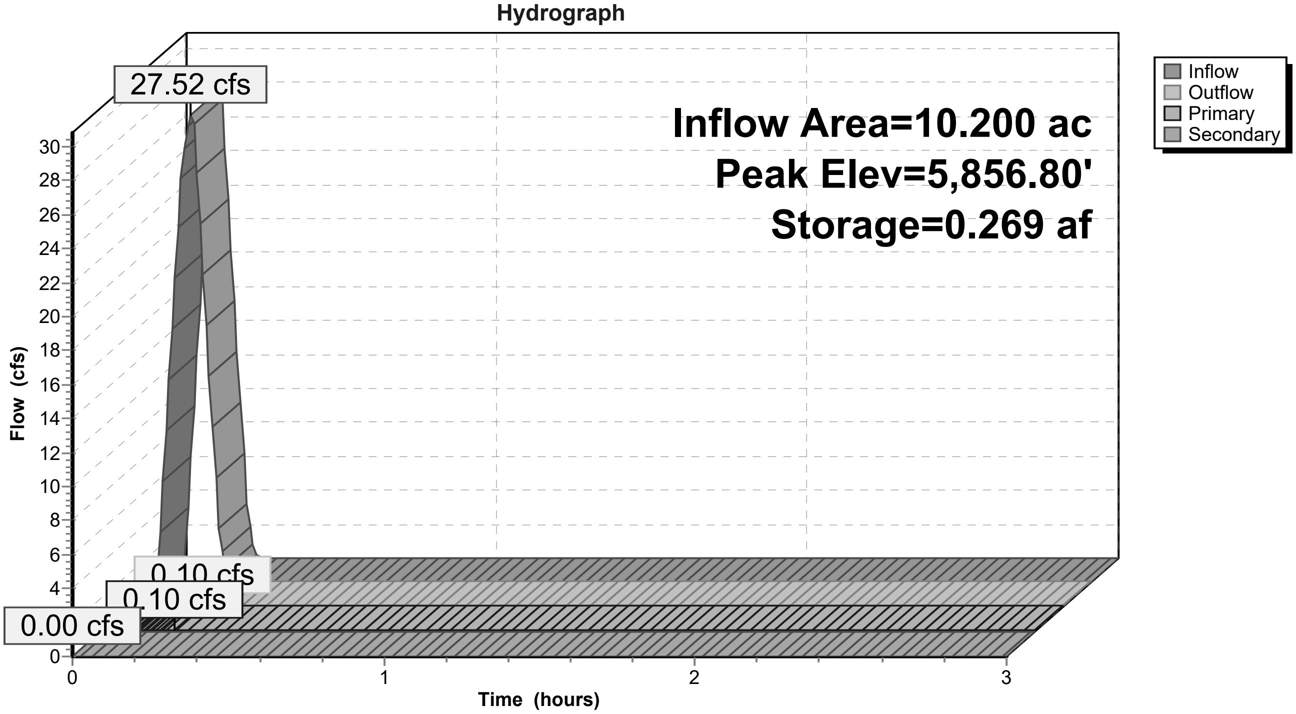
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,855.00	0.124	0.000	0.000
5,856.00	0.145	0.134	0.134
5,858.00	0.191	0.336	0.470
5,860.00	0.239	0.430	0.900
5,861.00	0.289	0.264	1.164

#	Routing	Invert	Outlet Devices
1	Primary	5,852.50'	**8.8" x 38.0' long OUTLET W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 5,851.67' S= 0.0218 '/' n= 0.013 Cc= 0.900
2	Device 1	5,855.00'	**1.4" Vert. WQ ORIFICE** C= 0.600
3	Device 1	5,856.30'	**1.4" Vert. WQ ORIFICE** C= 0.600
4	Device 1	5,857.60'	**1.4" Vert. WQ ORIFICE** C= 0.600
5	Device 1	5,859.50'	**4.00' x 4.00' Horiz. EPC OUTFALL BOX** Limited to weir flow C= 0.600
6	Secondary	5,859.50'	**15.0' long x 6.0' breadth EMERGENCY OVERFLOW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.10 cfs @ 0.24 hrs HW=5,856.80' (Free Discharge)
└─**1=OUTLET W/ RESTRICTOR PLATE** (Passes 0.10 cfs of 3.91 cfs potential flow)
  ├─**2=WQ ORIFICE** (Orifice Controls 0.07 cfs @ 6.4 fps)
  ├─**3=WQ ORIFICE** (Orifice Controls 0.03 cfs @ 3.2 fps)
  ├─**4=WQ ORIFICE** (Controls 0.00 cfs)
  └─**5=EPC OUTFALL BOX** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5,855.00' (Free Discharge)
└─**6=EMERGENCY OVERFLOW** (Controls 0.00 cfs)

Pond POND B:


Hydrograph
27.52 cfs
0.10 cfs
0.10 cfs
0.00 cfs
Inflow Area=10.200 ac
Peak Elev=5,856.80'
Storage=0.269 af
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
30
28
26
24
22
20
18
16
14
12
10
8
6
4
0

Pond POND B:

Inflow Area =	10.200 ac,	Inflow Depth = 0.66"	for 100-Year event	
Inflow =	56.88 cfs @	0.11 hrs, Volume=	0.563 af	
Outflow =	0.21 cfs @	0.23 hrs, Volume=	0.049 af,	Atten= 100%, Lag= 7.5 min
Primary =	0.21 cfs @	0.23 hrs, Volume=	0.049 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 5,858.42' @ 0.23 hrs Surf.Area= 0.201 ac Storage= 0.561 af
Plug-Flow detention time= 90.5 min calculated for 0.049 af (9% of inflow)
Center-of-Mass det. time= 85.9 min (92.3 - 6.4)

#	Invert	Avail.Storage	Storage Description
1	5,855.00'	1.164 af	**Custom Stage Data (Prismatic)** Listed below

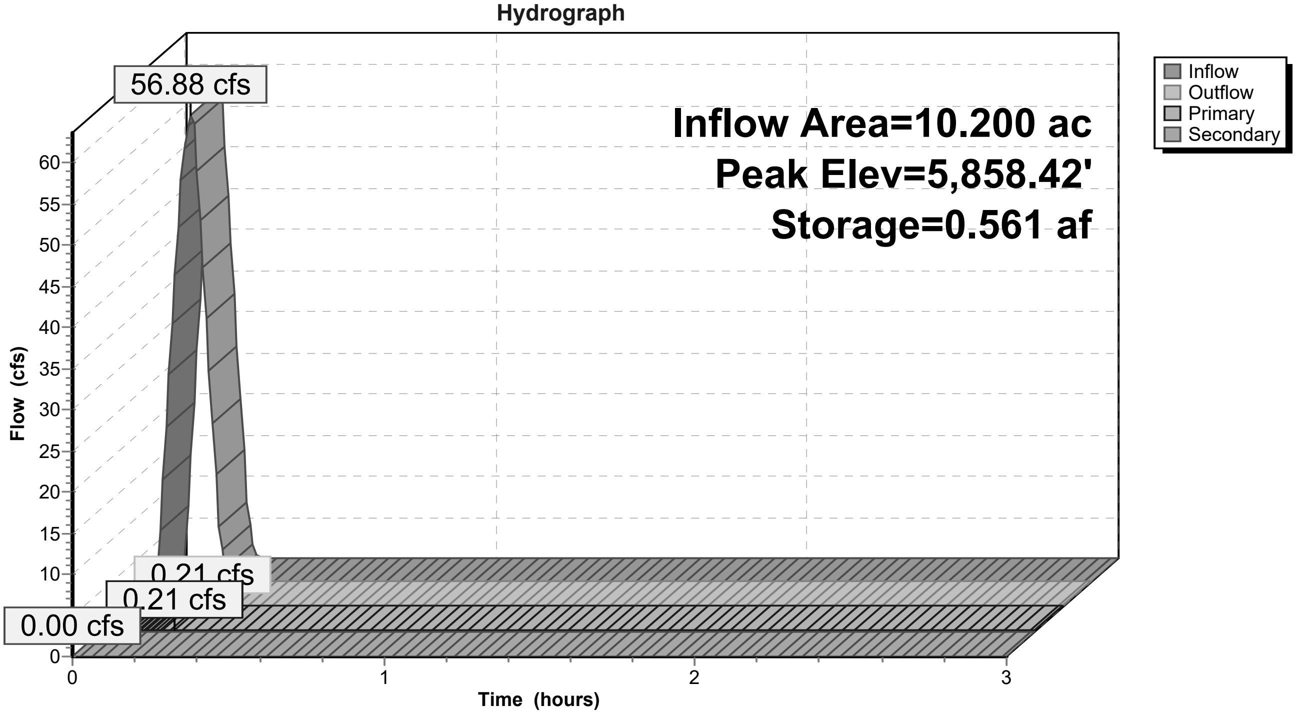
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
5,855.00	0.124	0.000	0.000
5,856.00	0.145	0.134	0.134
5,858.00	0.191	0.336	0.470
5,860.00	0.239	0.430	0.900
5,861.00	0.289	0.264	1.164

#	Routing	Invert	Outlet Devices
1	Primary	5,852.50'	**8.8" x 38.0' long OUTLET W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 5,851.67' S= 0.0218 '/' n= 0.013 Cc= 0.900
2	Device 1	5,855.00'	**1.4" Vert. WQ ORIFICE** C= 0.600
3	Device 1	5,856.30'	**1.4" Vert. WQ ORIFICE** C= 0.600
4	Device 1	5,857.60'	**1.4" Vert. WQ ORIFICE** C= 0.600
5	Device 1	5,859.50'	**4.00' x 4.00' Horiz. EPC OUTFALL BOX** Limited to weir flow C= 0.600
6	Secondary	5,859.50'	**15.0' long x 6.0' breadth EMERGENCY OVERFLOW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.21 cfs @ 0.23 hrs HW=5,858.42' (Free Discharge)
1=OUTLET W/ RESTRICTOR PLATE (Passes 0.21 cfs of 4.57 cfs potential flow)
2=WQ ORIFICE (Orifice Controls 0.09 cfs @ 8.8 fps)
3=WQ ORIFICE (Orifice Controls 0.07 cfs @ 6.9 fps)
4=WQ ORIFICE (Orifice Controls 0.04 cfs @ 4.2 fps)
5=EPC OUTFALL BOX (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5,855.00' (Free Discharge)
6=EMERGENCY OVERFLOW (Controls 0.00 cfs)

Pond POND B:


Hydrograph
56.88 cfs
Inflow Area=10.200 ac
Peak Elev=5,858.42'
Storage=0.561 af
0.21 cfs
0.21 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
5
10
15
20
25
30
35
40
45
50
55
60
0
1
2
3

Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected   Worksheet Protected

Stormwater Facility Name: **ELDORADO SPRINGS - POND A**

Facility Location & Jurisdiction: **EL PASO COUNTY**

User Input: Watershed Characteristics

Watershed Slope =	0.070	ft/ft
Watershed Length =	840	ft
Watershed Area =	6.10	acres
Watershed Imperviousness =	52.5%	percent
Percentage Hydrologic Soil Group A =	90.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	10.0%	percent

Location for 1-hr Rainfall Depths (use dropdown):

User Input

WQCV Treatment Method = Extended Detention

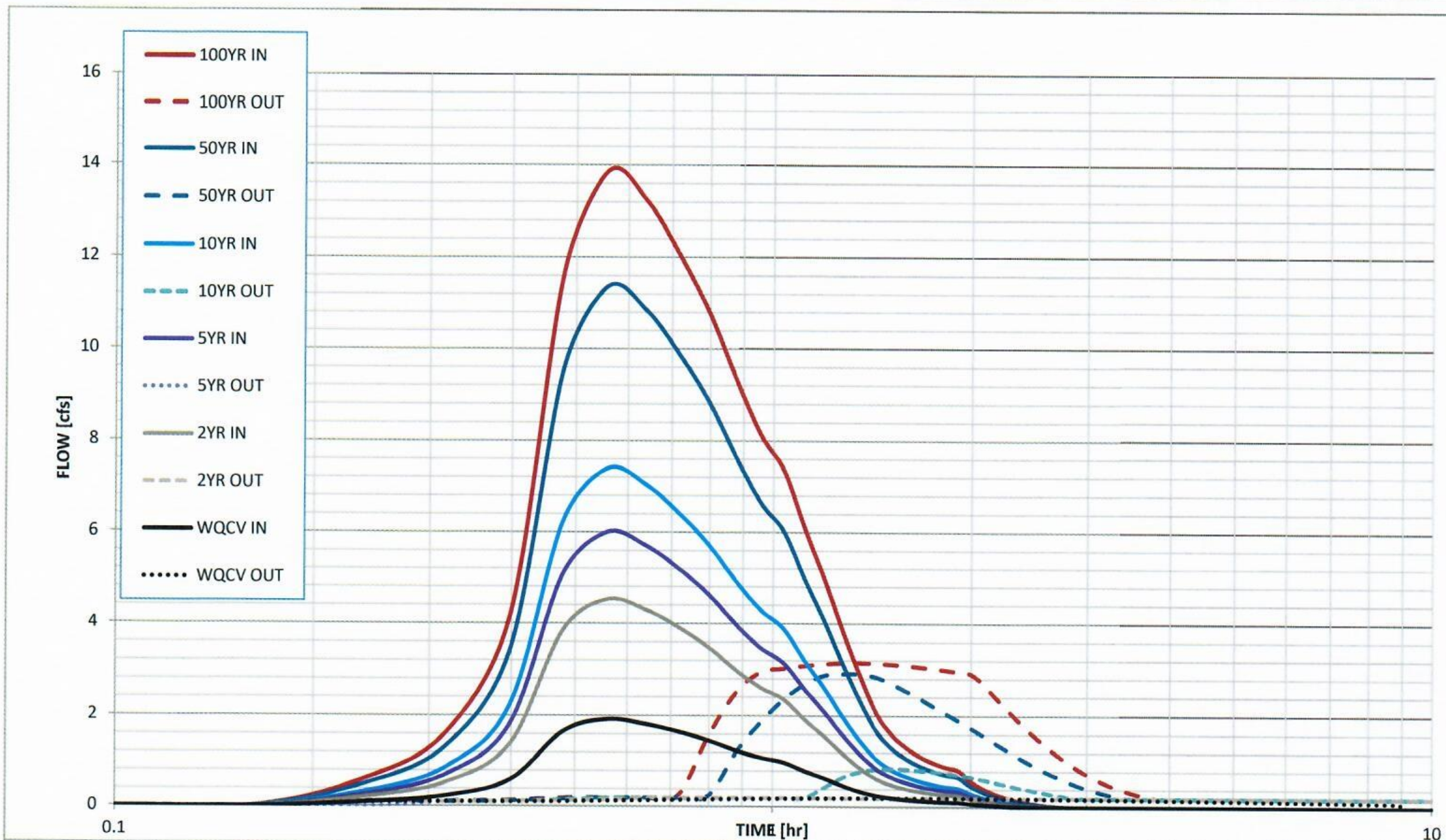
User Defined Stage [ft]	User Defined Area [ft^2]	User Defined Stage [ft]	User Defined Discharge [cfs]
0.00	3,230	0.00	0.10
1.00	4,490	1.00	0.20
3.00	5,950	3.00	0.20
4.00	7,070	4.00	2.90
4.70	7,800	4.70	3.20

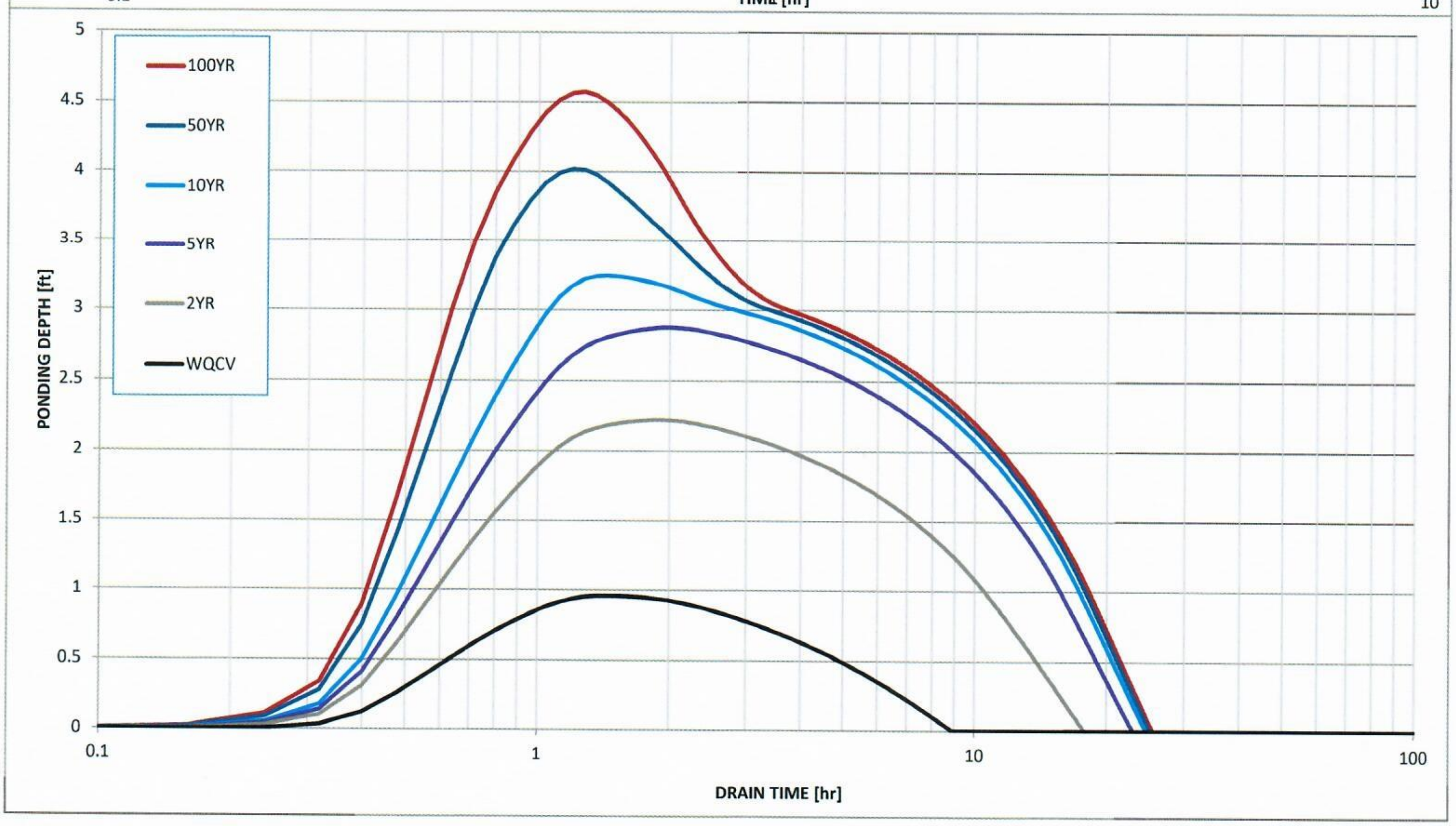
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.108	0.259	0.344	0.425	0.656	0.802	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.108	0.258	0.344	0.424	0.656	0.802	acre-ft
Time to Drain 97% of Inflow Volume =	8.5	17.0	**21.9**	23.2	23.1	23.1	hours
Time to Drain 99% of Inflow Volume =	8.8	17.6	22.6	24.2	24.5	**24.7**	hours
Maximum Ponding Depth =	0.96	2.22	2.88	3.25	4.02	4.57	ft
Maximum Ponded Area =	0.10	0.12	0.13	0.14	0.16	**0.18**	acres
Maximum Volume Stored =	0.084	0.227	0.311	0.362	0.481	0.574	acre-ft

Stormwater Detention and Infiltration Design Data Sheet





Stormwater Detention and Infiltration Design Data Sheet

Workbook Protected   Worksheet Protected

Stormwater Facility Name: **ELDORADO SPRINGS - POND B**

Facility Location & Jurisdiction: **EL PASO COUNTY**

User Input: Watershed Characteristics

Watershed Slope =	0.060	ft/ft
Watershed Length =	840	ft
Watershed Area =	10.20	acres
Watershed Imperviousness =	53.9%	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

Location for 1-hr Rainfall Depths (use dropdown):

User Input

WQCV Treatment Method = Extended Detention

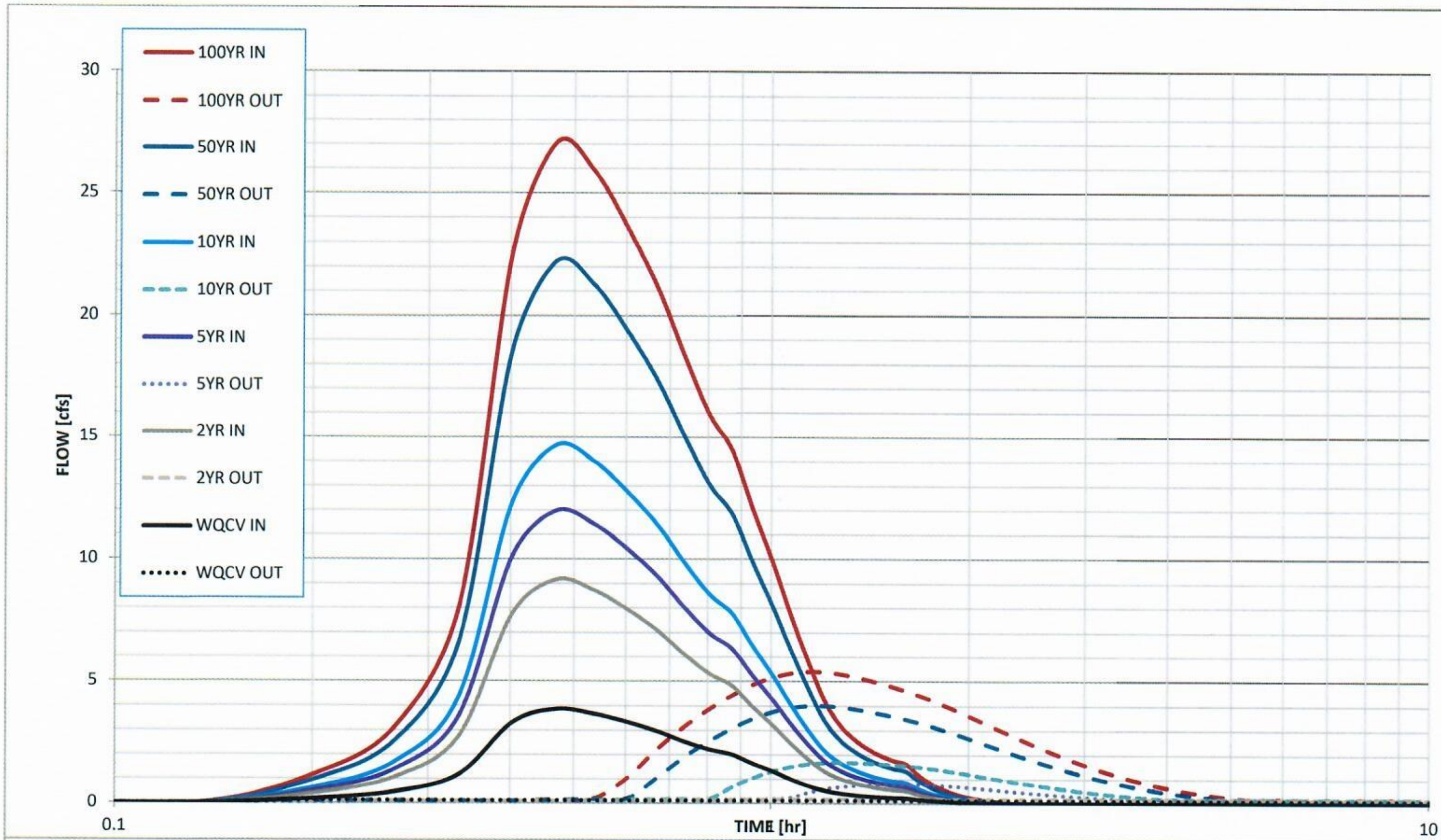
User Defined Stage [ft]	**User Defined** Area [ft^2]	**User Defined** Stage [ft]	**User Defined** Discharge [cfs]
0.00	5,400	0.00	0.10
1.00	6,320	1.00	0.10
3.00	8,320	3.00	0.20
5.00	10,410	5.00	4.50
5.50	11,100	5.50	5.60
7.00	12,570	7.00	10.00

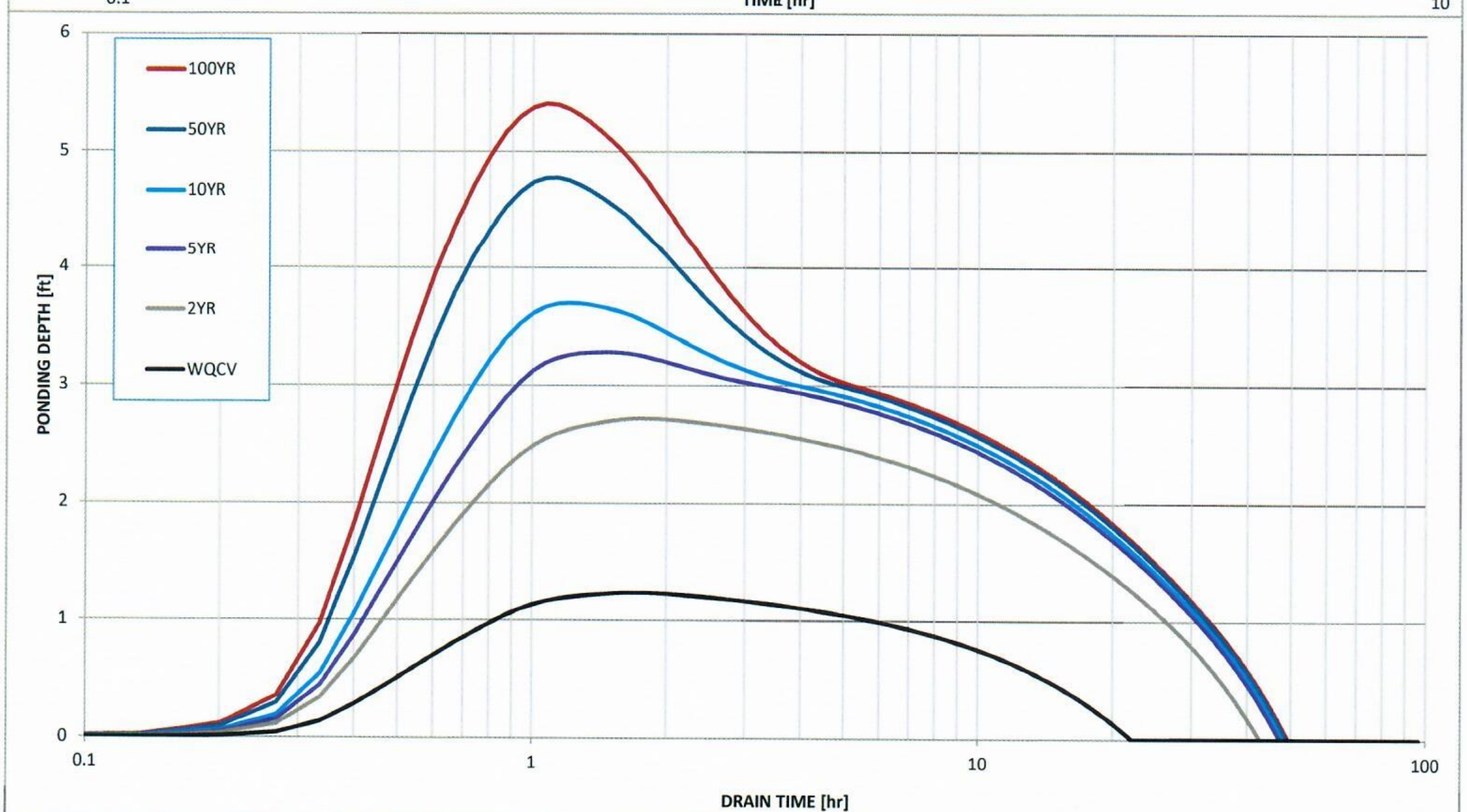
After completing and printing this worksheet to a pdf, go to:
https://maperture.digitaldataservices.com/gvh/?viewer=cswdif
create a new stormwater facility, and
attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =	WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	1.19	1.50	1.75	2.25	2.52	in
Calculated Runoff Volume =	0.185	0.443	0.581	0.713	1.085	1.324	acre-ft
OPTIONAL Override Runoff Volume =							acre-ft
Inflow Hydrograph Volume =	0.184	0.442	0.580	0.712	1.084	1.323	acre-ft
Time to Drain 97% of Inflow Volume =	21.5	41.2	**45.3**	45.5	45.1	44.6	hours
Time to Drain 99% of Inflow Volume =	21.9	42.2	46.7	47.2	47.7	**47.7**	hours
Maximum Ponding Depth =	1.23	2.72	3.28	3.70	4.78	5.41	ft
Maximum Ponded Area =	0.15	0.18	0.20	0.21	0.23	**0.25**	acres
Maximum Volume Stored =	0.169	0.417	0.525	0.609	0.846	1.000	acre-ft

Stormwater Detention and Infiltration Design Data Sheet

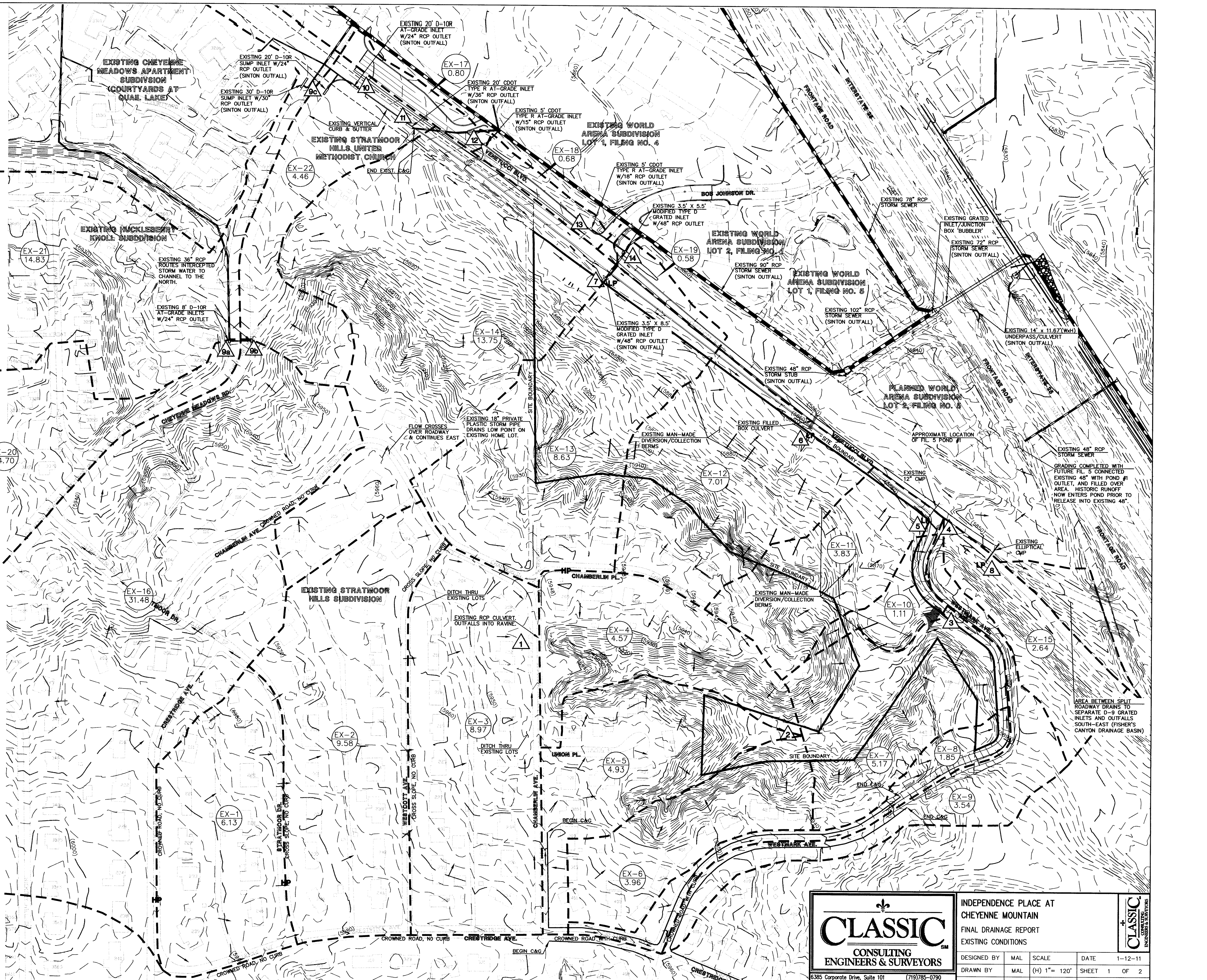




PREVIOUS DRAINAGE STUDY MAPS

BASIN RUNOFF SUMMARY		
BASIN	Q5 (CFS)	Q100 (CFS)
EX-1	9.9	24.3
EX-2	15.3	37.3
EX-3	16.9	41.3
EX-4	8.4	20.6
EX-5	8.3	20.4
EX-6	7.6	16.5
EX-7	10.6	24.5
EX-8	4.0	8.6
EX-9	5.9	13.8
EX-10	1.8	4.6
EX-11	7.1	16.7
EX-12	10.4	25.3
EX-13	14.6	33.8
EX-14	24.2	54.9
EX-15	4.4	10.6
EX-16	47.8	102.0
EX-17	3.1	6.0
EX-18	2.2	4.5
EX-19	1.4	3.2
EX-20	22.3	47.6
EX-21	35.8	75.3
EX-22	9.7	20.3

DESIGN POINT SUMMARY			
DESIGN POINT	Q5 (CFS)	Q100 (CFS)	INLET SIZE
1	25.0	61.1	RCP CULVERT
2	38.2	92.1	SURFACE
3	45.2	107.9	ONTO WESTMARK
4	49.6	118.3	ONTO VENETUCCI
5	7.1	16.7	12" CMP
6	10.4	25.3	FILLED IN BOX
7	30.5	83.9	GRATED INLET
8	52.1	124.2	ELLIPTICAL CMP
9a	22.3	47.6	8' A.G. INLET
9b	47.8	102.0	8' A.G. INLET
9c	85.3	186.7	20' & 30' SUMPS
10	28.3	129.7	20' A.G. INLET
11	12.0	54.1	20' A.G. INLET
12	3.1	6.0	5' A.G. INLET
13	3.4	8.2	5' A.G. INLET
14	1.4	3.2	GRATED INLET



N

120 60 0 120 240

SCALE: 1" = 120'

CLASSIC CONSULTING ENGINEERS & SURVEYORS

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Colorado Springs, Colorado 80919 (719)785-0799(Fax)

INDEPENDENCE PLACE AT CHEYENNE MOUNTAIN

FINAL DRAINAGE REPORT

EXISTING CONDITIONS

DESIGNED BY MAL	SCALE	DATE	1-12-11
DRAWN BY MAL	(H) 1"= 120'	SHEET 1 OF 2	
CHECKED BY	(V) 1"= N/A	JOB NO.	2320.00

X:\2320000\DRAWINGS\DEVELOPMENT\FDR-Existing Map.dwg, 1/27/2011 8:35:00 AM, \\classicnet\CCES105C

DRAINAGE MAPS

LEGEND

EXISTING	(E)
PROPOSED	(P)
FUTURE	(F)
CURB AND GUTTER	C&G
EASEMENT	ESMT
RIGHT-OF-WAY	ROW
BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
EASEMENT	
(E) CONTOUR, INDEX	6940
(E) CONTOUR	
(P) CONTOUR, INDEX	6940
(P) CONTOUR	
(E) STORM SEWER, INLET, MH	
(P) STORM SEWER, INLET, MH	

DRAINAGE LEGEND

BASIN IDENTIFIER / BASIN AREA [AC]	X / X.XX
SURFACE DESIGN POINT IDENTIFIER	#
STORM DRAIN DESIGN POINT IDENTIFIER	#
DRAINAGE BASIN BOUNDARY	

DRAINAGE BASIN

BASIN	Q_5 [CFS]	Q_{100} [CFS]
A1	1	2
A2	2	3
A3	2	3
A4	1	2
A5	1	2
A6	3	6
A7	1	3
A8	0.5	1
A9	0.3	2
OS–13A	2	6
OS–13B	0.4	2
OS–13C	5	15
OS–14	25	55
B1	2	3
B2	1	3
B3	2	3
B4	3	6
B5	2	3
B6	2	4
B7	2	5
B8	2	4
B9	0.7	1
B10	1	2
B11	2	4
OS–7A	7	14
OS–11	7	14
OS–12	3	6
C1	1	3
C2	2	5

FSD EDB WQ POND A

DESCRIPTION	5_{YR}	100_{YR}	UNITS
INFLOW (*1)	12	25	[CFS]
OUTFLOW	0.1	2	[CFS]
WATER SURFACE ELEV.	5,860.8	5,862.4	[FT]
OVERFLOW WEIR ELEV.	5,863.7	5,863.7	[FT]
STORAGE VOLUME	0.18	0.39	[AF]

*1 – INFLOW AREA = 10.2 AC

FSD EDB WQ POND B

DESCRIPTION	5_{YR}	100_{YR}	UNITS
INFLOW (*2)	28	54	[CFS]
OUTFLOW	0.2	0.3	[CFS]
WATER SURFACE ELEV.	5,856.8	5,858.3	[FT]
OVERFLOW WEIR ELEV.	5,860.5	5,860.5	[FT]
STORAGE VOLUME	0.27	0.53	[AF]

*2 – INFLOW AREA = 6.1 AC

DESIGN POINT

DESIGN POINT	Q_5 [CFS]	Q_{100} [CFS]	DESCRIPTION
1	2	4	(P) 5' TYPE R CURB INLET IN SUMP [PRIVATE]
2	2	3	(P) 5' TYPE R CURB INLET IN SUMP [PRIVATE]
3	2	3	(P) CDOT TYPE C GRATE INLET IN SUMP [PRIVATE]
4	1	2	(P) 5' TYPE R CURB INLET IN SUMP [PRIVATE]
5	1	2	(P) 5' TYPE R CURB INLET IN SUMP [PRIVATE]
6	4	11	(P) 15' TYPE R CURB INLET AT GRADE [PRIVATE]
7	1	3	(P) AREA AND LANDSCAPE DRAINS [PRIVATE]
8	0.5	1	(P) 5' TYPE R CURB INLET AT GRADE [PRIVATE]
9	0.3	2	SHEET FLOW INTO POND A
10	2	3	(P) CDOT TYPE C GRATE INLET IN SUMP [PRIVATE]
11	1	3	(P) 5' TYPE R CURB INLET IN SUMP [PRIVATE]
12	2	3	(P) CDOT TYPE C GRATE INLET IN SUMP [PRIVATE]
13	10	20	(P) 20' TYPE R CURB INLET IN SUMP [PRIVATE]
14	2	3	(P) 5' TYPE R CURB INLET IN SUMP [PRIVATE]
15	2	4	(P) CDOT TYPE C GRATE INLET IN SUMP [PRIVATE]
16	6	11	(P) 10' TYPE R CURB INLET IN SUMP [PRIVATE]
17	2	4	(P) 10' TYPE R CURB INLET AT GRADE [PRIVATE]
18	0.7	1	(P) 5' TYPE R CURB INLET AT GRADE [PRIVATE]
19	1	2	SHEET FLOW INTO POND B
20	40	100	(P) 48" RCP CULVERT [PUBLIC]
21	29	59	(P) 2 X 20' TYPE R CURB INLETS AT GRADE [PUBLIC]
22	1	14	(P) 15' TYPE R CURB INLET IN SUMP [PUBLIC]
23	1	6	STREET FLOW IN VENETUCCI BLVD
24	2	4	(P) SERIES OF LANDSCAPE DRAINS
25	5	15	(P) CDOT TYPE C GRATE INLET IN SUMP [PRIVATE]
OS2	36	92	(E) FLOW IN DRAINAGE WAY
OS11	12	54	(E) FLOW–BY FROM MULTIPLE INLETS
009	67	172	(P) TOTAL FLOW TO HISTORIC BOX CULVERT UNDER VENETUCCI
SD1	2	4	(P) 18" RCP STORM DRAIN [PRIVATE]
SD2	3	7	(P) 18" RCP STORM DRAIN [PRIVATE]
SD3	5	10	(P) 18" RCP STORM DRAIN [PRIVATE]
SD4	1	2	(P) 18" RCP STORM DRAIN [PRIVATE]
SD5	6	12	(P) 18" RCP STORM DRAIN [PRIVATE]
SD6	7	14	(P) 18" RCP STORM DRAIN [PRIVATE]
SD7	5	11	(P) 24" RCP STORM DRAIN [PRIVATE]
SD8	6	12	(P) 24" RCP STORM DRAIN [PRIVATE]
SD9	0.1	2	(P) 18" RCP STORM DRAIN [PRIVATE]
SD10	2	3	(P) 18" RCP STORM DRAIN [PRIVATE]
SD11	1	3	(P) 18" RCP STORM DRAIN [PRIVATE]
SD12	3	6	(P) 18" RCP STORM DRAIN [PRIVATE]
SD13	5	9	(P) 18" RCP STORM DRAIN [PRIVATE]
SD14	10	20	(P) 24" RCP STORM DRAIN [PRIVATE]
SD15	12	22	(P) 24" RCP STORM DRAIN [PRIVATE]
SD16	16	31	(P) 24" RCP STORM DRAIN [PRIVATE]
SD17	6	11	(P) 18" RCP STORM DRAIN [PRIVATE]
SD18	23	44	(P) 30" RCP STORM DRAIN [PRIVATE]
SD19	1	2	(P) 18" RCP STORM DRAIN [PRIVATE]
SD20	2	4	(P) 18" RCP STORM DRAIN [PRIVATE]
SD21	40	100	(P) 48" RCP STORM DRAIN [PUBLIC]
SD22	40	105	(P) 48" RCP STORM DRAIN [PUBLIC]
SD23	1	14	(P) 24" RCP STORM DRAIN [PUBLIC]
SD24	29	47	(P) 36" RCP STORM DRAIN [PUBLIC]
SD25	33	73	(E) 48" RCP STORM DRAIN [PUBLIC]
SD26	0.2	0.3	(P) 18" RCP STORM DRAIN [PRIVATE]
SD27	2	4	(P) 12" HDPE STORM DRAIN [PRIVATE]
SD28	5	15	(P) 24" RCP STORM DRAIN [PRIVATE]

REV.	DESCRIPTION	DATE
1	ADDRESS AGENCY COMMENTS	02/05/20

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1023 W. COLORADO COLORADO SPRINGS, CO 80904 (719) 685-1670

ELDORADO SPRINGS

DRAINAGE MAP DEVELOPED CONDITIONS

DRAWN BY: CDK	
SCALE: 1"=100'	DATE: 02/05/20
JOB NUMBER	SHEET
91807	1 OF 1