AMENDMENT TO WOODMEN HEIGHTS BUSINESS PARK MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR THE PINES AT FOREST MEADOWS FILING NOS. 1, 2, 3, 4, 5 & 6

March 2017

Prepared for:

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Project #08-038

AMENDMENT TO WOODMEN HEIGHTS BUSINESS PARK
MASTER DEVELOPMENT DRAINAGE PLAN AND
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SIGNATURE & DRAINAGE PLAN STATEMENTS

Engineer's Statement
This report and plan for the drainage design of The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6 was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

COLORADO REGISTERED VIRGIL A. SANCHEZ 37160 PROFESSIONAL ENGINEER

Virgil A. Sanchez, P.E. #37160
For and on Behalf of M & S Civil Consultants, Inc.

Developer's Statement
PHI Real Estate Services, LLC, hereby certifies that the drainage facilities for The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6 shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6, guarantee that final drainage design review will absolve PHI Real Estate Services, LLC, and/or their successors and/or assigns future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

BY: Nick Pannunzio DATE: 3/24/17
PRINTED NAME: Nick Pannunzio
TITLE: Nick Pannunzio, President
ADDRESS: PHI Real Estate Services, LLC
200 W. City Center Drive, Suite 200
Pueblo, CO 81003

City of Colorado Springs Statement:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

BY: Anne Bergman DATE: 3-24-17
For The City Engineer

CONDITIONS:

AMENDMENT TO WOODMEN HEIGHTS BUSINESS PARK MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR THE PINES AT FOREST MEADOWS FILING NOS. 1, 2, 3, 4, 5 & 6

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PURPOSE

This document is the Amendment to the Woodmen Heights Business Park Master Development Drainage Plan and Final Drainage Plan for The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6. The purpose of this report is to identify the existing and proposed runoff patterns and peak rates of runoff to identify any drainage improvements needed to safely route stormwater to adequate outfall facilities per the current City of Colorado Springs Drainage Criteria.

The proposed development to be known as The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6 consists of high-density single-family residential, as opposed to the previously approved Final Drainage Report and MDDP "Woodmen Heights Business Park" which had been planned for Multi-Unit Commercial development.

GENERAL LOCATION AND DESCRIPTION

The site is located in Section 5, Township 13 South, Range 65 West of the 6th P.M. in the City of Colorado Springs, El Paso County, Colorado. The development site is bounded on the west by proposed Sand Creek Regional Detention Facility No. 6, and Lot 1, Woodmen Heights Business Park (East Woodmen Self Storage), on the south by East Woodmen Road, on the east by Sand Creek Regional Detention Facility No. 3, and on the north by Forest Meadows Filing No. 1 and No. 6 and Forest Meadows Avenue.

The existing site terrain generally slopes generally from north to southeast and southwest at grades of approximately 2% to 12%. Vegetation primarily consists of native grasses with a few shrubs and trees.

The Pines at Forest Meadows site consists of approximately 38.57 acres. The site is currently zoned "PUD", Planned Unit Development, for the development of high density residential buildings. The previously approved drainage studies, assumed PUD Zoning, however anticipated the construction of retail, commercial, and office buildings, with parking facilities constructed within the onsite CSU easement. The proposed project is to be built completely outside of the CSU easement (along Woodmen Road) thereby reducing the developed area. This reduction in the developed footprint coupled with a decrease in imperviousness of the site, should result in less discharge than what had been previously assumed. In addition, the construction of two onsite Full Spectrum Detention (FSD) ponds will further benefit downstream drainage conveyance facilities by more closely mimicking the pre-development condition in both volume and flow rate.

SOILS

According to the Soil Survey of El Paso County, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service (SCS), the Blakeland soil series (Soil No.'s 8 & 9) are present on-site. Blakeland loamy sand (8) and Blakeland-Fluvaquentic Haplaquolls (9) are designated as a Hydrologic Group "A" soils by the SCS.

CLIMATE

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

FLOODPLAIN STATEMENT

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No's. 08041C0535 F (effective date March 17, 1997, as modified by LOMR 04-08-0779P effective date December 7, 2005) and 08041C0529 F, effective date March 17, 1997, no portion of the site lies within a designated 100-year floodplain.

DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current City of Colorado Springs Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5- year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 100 acres. HGL calculations will be submitted for review with the constructions plans. The drainage analysis for the proposed site will be continued with a layout, grading plan and submittal of a Development Plan / Final Plat. The four step process to minimize adverse impacts of urbanization will be analyzed further in future drainage reports as outlined below.

FOUR STEP PROCESS

Step 1 **Employ Runoff Reduction Practices.** – Approx. 16 Acres of ground within the project is being set aside for Open Space. Roof drains will be directed to side yard swales to minimize direct connection of impervious surfaces.

Step 2 **Implement BMPs that provide a water quality capture volume with slow release.** – Multiple water quality facilities are proposed to provide WQCV.

Step 3 **Stabilize streams.** – The site is not directly adjacent to main brand of the Sand Creek Channel; however it does discharges into smaller up-gradient un-named tributaries. The developed discharge from the site is anticipated to be less that existing and therefore is not anticipated to have negative effects on downstream drainageways. A minor amount of frequent discharge to the downstream tributaries should be of benefit by providing water to existing wetlands vegetation which to provides habitat and functions to stabilize the existing channel banks and channel bed.

Step 4 **Implement site specific and other source control BMPs.** – A final grading and erosion control plans will be submitted for review and approval and will address site specific needs. The proposed project will use silt fence, a vehicle tracking control pad, concrete washout area, inlet protection, check dams, sediment control logs, mulching and reseeding to mitigate the potential for erosion across the site. The temporary sediment basin will be placed adjacent to WQCV.

EROSION CONTROL PLAN

The City of Colorado Springs Drainage Criteria Manual specifies an Erosion Control Plan and associated cost estimate be submitted with the Final Drainage Report. M & S Civil Consultants, Inc. respectfully requests that the Erosion Control Plan and estimate be submitted separately and that erosion control assurances be posted prior to obtaining a grading permit.

EXISTING DRAINAGE CONDITIONS

The Pines at Forest Meadows consists of 38.57 acres and is bounded to the north by Forest Meadows Avenue and to the south by Woodman Road. The site is situated east of Sand Creek and lies within the Sand Creek Drainage Basin. With the exception of a small existing stockpond located at near the southwest corner of the site, the site appears to have been previously overlot graded at some time in the recent past, most likely in conjunction with the creation of the two large regional detention facilities which bookend the site to the east and west. Contour mapping of the property, indicates that a small north-south ridgeline bisects the site directing runoff in the existing condition to low points at the both the southwest or southeast corners of the site. The western half or approximately 18.7 acres of the site slopes to the southwest at grades of approximately 2% to 12%. Runoff produced within this portion of the site, continues south under Woodmen Road via an existing 60" RCP culvert. Similarly, the eastern half of the site or approximately 19.9 acres slopes to the southwest at grades of approximately 2% to 11%. Runoff reaching the low point in the southeast corner of site is collected and conveyed under Woodmen Road via an existing 54" RCP culvert. Both culverts discharge into small un-named tributaries prior to discharging into the main branch of the Sand Creek Channel. Based on the information contained within the Woodmen Road Safety Project B roadway plans, at one time the anticipated peak 100-year design storm capacity of the existing 60" RCP pipe was 300cfs, while the 54" RCP was to be approximately 180cfs. However within the development of the upstream watershed much of the previously intersected runoff has now been diverted to the existing regional ponds, adjacent to the site. From our study of the existing condition an average of 2.16 cfs of runoff per acre is produced within the undeveloped parcel, in the 100-year event. Flows contributing to the existing 60" RCP and 54" RCP (designated by Design Point 1 and Design Point 2) are 32.3 CFS and 37.0 cfs respectively. However, these Design Point flows also take into account runoff contributions from the northern half of Woodmen Road, which are an average runoff of 4.18 cfs per acre. An Existing Drainage Map is included in the appendix of this report. In the proposed condition the peak discharge from the site is anticipated to be less than existing due to the implementation of onsite full spectrum detention and thereby is not anticipated to negatively affect the downstream facilities. It should be noted that maintaining discharge to the two tributaries is encouraged to support the existing wetlands in the area.

PROPOSED DRAINAGE CHARACTERISTICS

Based upon the MDDP prepared by Classic Consulting, in 2004, a portion of the western half of the proposed development was anticipated to drain into the future Sand Creek Detention Facility No. 6. Since that time, several items have necessitated a change in routing of the developed watershed basins, most notably, the wetlands located in the southwest corner of the site. These wetlands once assumed to be filled in and mitigated for, have since been chosen for preservation. With the preservation of the wetlands, the existing 60" culvert constructed with the Woodmen Road Improvements was retained and thus functioned to serve as the outfall for drainage reaching the wetland area.

These changes to the proposed drainage patterns were previously discussed in the approved Woodmen

Heights Business Park MDDP, by M&S Civil, in 2008. The proposed drainage patterns discussed within this MDDP and FDR are similar in nature to the previous approved report however have been refined based upon changes in land use and the implementation of FSD ponds. Specific discussion regarding the proposed onsite drainage patterns associated with this MDDP revision is discussed at length in the following paragraphs.

Wetlands

The wetland area is being preserved within this development per Army Corp of Engineer (ACOE) Nationwide Permit No. 2005 00413, falls inside the proposed drainage basins PK-1. As discussed by the MDDP prepared by Classic Consulting, Inc., in 2004, stormwater quality provisions for the site were initially to be provided in the regional detention facilities, Ponds 3 & 6. However, due to revisions of the drainage code and revised planning, water quality treatment is now being accomplished through two FSD water quality ponds, located along the south boundary of the site. The purpose of the Full Spectrum Detention ponds is to store developed runoff volume and release it over an extended period of time, thus closely mimicking runoff discharge rates similar to when the contributing watershed was undeveloped. By releasing these volumes over longer times it anticipated that the potential for downstream channel erosion and enlargement would be reduced and the pond would provide a single point for the collection of sediment and pollutants.

General

A brief description of each developed drainage basin including planned land usage, anticipated developed runoff rates & drainage patterns is provided in this section of the report. A summary of peak developed runoff for the basins and designated design points are also depicted on the Drainage Map in the appendix of this report. In general, the internal private streets of the development are to be constructed with a 28' mat width, with type 1 - 8" vertical curb and with type 5-6" mountable curb and gutter.

Basins; B, C, E, H, I, J, K, L, M, N, O, P, Q, S, T, U, V, W, X, Y, & Z, AA, BB, CC, DD, EE, GG HH, II & JJ primarily consist of buildings, rooftops, landscaping, driveways, and adjacent private streets. These basins drain from roof tops to side yard landscaped swales and discharge into the adjacent roadway. It is an absolute must that the building units are vertically elevated, and backfilled in a manner that allows for side yard / front yard swales to be constructed to direct drainage around each building to the adjacent streets.

Basins; A & R, are open space, landscaped areas, located along the west boundary of the site. A drainage swale is planned within these basins preventing onsite flows from reaching the property to the west.

Basin; KK1, consists of buildings, rooftops, open space and landscaped areas. The basin will also contain a maintenance road that will allow access to the two on-site FSD ponds from Forest Meadow Drive.

Basins; G, Q, &, FF consist of buildings, rooftops, landscaping, driveways, adjacent private streets, and park open space areas. These three basins are to drain on to the adjacent roadways.

Basins; D, F, & C1, are primarily the roadways themselves that convey the drainage from the adjacent basins to storm sewer collection points.

Basins; PK-1 and KK2 consist of existing open space both outside and within the Colorado Springs Utility Easement. Basins PK-2 and KK2 contain the two proposed Full Spectrum Detention Ponds. A portion of Basin KK3, existing open space, is not tributary to the water quality feature, and will drain into the 54" RCP along Woodmen Road. Basin PK-1is pervious existing open space and is not tributary to the water quality feature, but ensures storm water will continue to be released into the existing wetland area. Runoff reaching

the wetland area discharges flows under Woodmen Road via the 60" RCP as previously planned.

Offsite Basins; OS-1, OS-2, and OS-3 consists of the north half of Woodmen Road along the south boundary of the site. The flows developed within these basins will continue to be conveyed within their natural path along the north side of Woodmen Road where they will combine with discharge from the two FSD ponds, and Basins PK-1 and KK3, at DP15 and DP24.

All of the developed basins in this final drainage report generally drain from north to south, then east to west or west to east, to the water quality ponds at the southwest and southeast corners of the site. Areas located south of the proposed development and FSD ponds disturbed by minor grading activities will be re-vegetated with native grasses. The average rate of runoff per acre for the developed portions of the development are; (Q5=3.58cfs/Acre, and Q100=6.79cfs/Acre) and fall within the range of flows anticipated for this type of development.

Design Point 1 (DP1) flows (Q5=3.0cfs, Q100=6.5cfs), consist of runoff generated by Basin A, 0.31 Acres, (Q5=0.1cfs, Q100=0.8cfs), Basin B, 0.63 Acres, (Q5=2.7cfs, Q100=5.0cfs) and Basin R, 0.37 Acres, (Q5=0.5cfs, Q100=1.4cfs)

Basin Runoff Description
Discussed above under "General" for Basins; A, B & R

Surface Routing
DP1 flows are combined via sheet flow, and concentrated flow and conveyed within a landscaped swale into a CDOT Type C area inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff from DP1 will overtop the area inlet and continue southward to the Full Spectrum Detention Pond No.1.

Pipe Routing/Pipe Capacity
Runoff reaching DP1 is collected by an area inlet and conveyed down-gradient within Pipe 6 (Q5=3.0cfs, Q100=6.5cfs). Runoff conveyed by Pipe 6 will combine with flows conveyed by Pipe 5 (Q5=16.0cfs, Q100=25.0cfs). A total of Q5=18.5cfs, Q100=30.8cfs will be conveyed (via Pipe 7) to the FSD Pond No.1, located in the southwest corner of the site.

Design Point 2 (DP2) flows (Q5=9.8cfs, Q100=18.3cfs), consist of runoff generated by Basin E, 1.96 Acres, (Q5=6.8cfs, Q100=12.5cfs) and Basin F, 0.72 Acres, (Q5=2.4cfs, Q100=4.6cfs).

Basin Runoff Description
Discussed above under "General" for Basins; E & F

Surface Routing
DP2 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 12' at-grade curb inlet. Bypass flows of (Q5=2.2cfs, Q100=7.8cfs) will continue within Red Creek View and Sand Lake Heights to a 12' sump inlet at Design Point 2A.

Clogging Statement
In the event of clogging or inlet failure, runoff will continue within the internal roadways to Design Point 2A.

Pipe Routing/Pipe Capacity
Runoff reaching DP2 is collected by a 12' at-grade inlet and conveyed down-gradient within Pipe 1 (Q5=7.6cfs, Q100=10.5cfs). Runoff conveyed by Pipe 1 combine with flows conveyed by Pipe 2 (Q5=5.9cfs, Q100=9.2cfs). A total of Q5=13.6cfs, Q100=19.7cfs is conveyed within Pipe 3 prior to combining with flows in pipes 4 & 5. Ultimately the collected runoff is discharging into FSD Pond No. 1.

Design Point 2A (DP2A) flows (Q5=2.5cfs, Q100=5.3cfs), consist of runoff generated by Basin C, 0.35 Acres, (Q5=1.5cfs, Q100=2.8cfs), Basin D, 0.20 Acres, (Q5=0.9cfs, Q100=1.6cfs) and Basin G, 0.38 Acres, (Q5=0.1cfs, Q100=0.7cfs)

Basin Runoff Description
Discussed above under "General" for Basins; C, D & G

Surface Routing
DP2A flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 12' sump curb inlet located in a newly constructed alcove adjacent to the existing street section. This existing street section at this location is sloped from north to south as illustrated by the contours on enclosed drainage map.

Clogging Statement
In the event of clogging or inlet failure, the runoff reaching DP2A will overtop the curb and gutter and continue within the adjacent landscape swale to DP1 and FSD Pond 1.

Pipe Routing/Pipe Capacity
Runoff reaching DP2A is collected by a 12' sump inlet and conveyed down-gradient within Pipe 4 (Q5=2.5cfs, Q100=5.3cfs). Runoff conveyed within Pipe 4 combines with flows conveyed in Pipe 3 (Q5=13.6cfs, Q100=19.7cfs). Pipe 5 conveys runoff totaling Q5=16.0cfs, Q100=25.0cfs down-gradient prior to combining with runoff conveyed by Pipe 6. Ultimately the collected runoff is discharged into the aforementioned FSD Pond No 1 at a peak rate of Q5=18.5cfs, Q100=30.8cfs (Pipe 7).

Design Point 3 (DP3) flows (Q5=6.1cfs, Q100=11.4cfs), consist of runoff generated by Basin C1, 0.29 Acres, (Q5=1.3cfs, Q100=2.3cfs), Basin H, 0.45 Acres, (Q5=2.0cfs, Q100=3.6cfs), Basin I, 0.32 Acres, (Q5=0.8cfs, Q100=1.8cfs) and Basin J, 0.45 Acres, (Q5=2.0cfs, Q100=3.6cfs)

Basin Runoff Description
Discussed above under "General" for Basins; C1, H, I & J

Surface Routing
DP3 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 12' at-grade curb inlet. Bypass flows of (Q5=0.6cfs, Q100=5.0cfs) will continue to travel west within Sand Lake Heights to a 12' sump inlet at Design Point 2A. It should be noted that the proposed inlet at DP3 will be constructed within an existing street section. The existing street section at this location is sloped from north to south as illustrated by the contours on the enclosed drainage map.

Clogging Statement
In the event of clogging or inlet failure, the runoff will continue in the roadway curb and gutter and proceed to DP2A.

Pipe Routing/Pipe Capacity
Runoff reaching DP3 is collected by a 12' at-grade inlet and conveyed down-gradient within Pipe 2 (Q5=5.9cfs, Q100=9.2cfs). Flows collected by Pipe 2 will combine with flows in Pipes 3 thru 6 ultimately discharging to FSD Pond No. 1 via Pipe 7.

Design Point 4 & 5 (DP4 & 5) flows (Q5=5.9cfs, Q100=10.7cfs), consist of runoff generated by Basin K, 0.41 Acres, (Q5=1.8cfs, Q100=3.3cfs), Basin L, 0.70 Acres, (Q5=3.1cfs, Q100=5.7cfs) and basin Y, 0.53 Acres, (Q5=2.3cfs, Q100=4.2cfs).

Basin Runoff Description
Discussed above under "General" for Basins; K, L & Y

Surface Routing
Runoff reaching DP4 & 5 is combined via sheet flow, and concentrated flow from curb and gutter. The total flows reaching the two points are collected by two 12' at-grade curb inlets, one on each side of the roadway. Bypass flows of (Q5=0.4cfs, Q100=2.8cfs) for each inlet will continue to travel west along Sand Lake Heights to a 12' at-grade inlet at Design Point 3 and a sump inlet at Design Point 2A. At this location the existing roadway will connect to the proposed roadway and transition from a super-elevated section to a crown at center of the roadway. Due to the uncertainty of the adequacy of the crown in the roadway, inlets have been provided of both sides of the road, either being adequate to capture the total combined runoff.

Clogging Statement
In the event of clogging or inlet failure, the runoff reaching DP-4 and 5 will continue within the roadway curb and gutter section to DP3 & DP2A.

Pipe Routing/Pipe Capacity
The combined flow reaching DP4 & 5 (Q5=5.9cfs, Q100=10.7cfs) is to be collected by a pair of 12' at-grade inlets and conveyed by Pipes 8 and 9, and subsequent downstream pipe systems. Ultimately the collected runoff is discharging into FSD Pond No. 1.

Design Point 6 (DP6) flows (Q5=6.4cfs, Q100=13.9cfs), consist of runoff generated by Basin P, 0.74 Acres, (Q5=3.2cfs, Q100=5.9cfs) and Basin Q, 1.60 Acres, (Q5=2.3cfs, Q100=5.7cfs).

Basin Runoff Description
Discussed above under "General" for Basins; P & Q

Surface Routing
DP6 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 12' at-grade curb inlet. Bypass flows of (Q5=0.6 cfs, Q100=4.8cfs) will travel to a 16' sump inlet at Design Point 7 and a portion of the major event continues to Design Points 4 & 5.

Clogging Statement
In the event of clogging or inlet failure, the runoff will continue within the roadway to Design Points 4 & 5.

Pipe Routing/Pipe Capacity
Runoff reaching DP6 is collected by a 12' at-grade inlet and conveyed down-gradient within Pipe 11 (Q5=5.8cfs, Q100=9.1cfs). Ultimately the collected runoff is discharged into FSD Pond No. 1.

Design Point 7 (DP7) flows (Q5=10.4cfs, Q100=19.0cfs), consist of runoff generated by Basin M, 0.33 Acres, (Q5=1.4cfs, Q100=2.6cfs), Basin N, 0.56 Acres, (Q5=2.5cfs, Q100=4.6cfs), Basin O, 0.73 Acres, (Q5=3.2cfs, Q100=5.8cfs) and Basin Z, 0.94 Acres, (Q5=3.6cfs, Q100=6.5cfs)

Basin Runoff Description
Discussed above under "General" for Basins; M, N, O & Z.

Surface Routing
DP7 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 16' sump curb inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff reaching DP7 will overtop the curb and gutter and continue via an earthen swale into Basin PK1 and DP15.

Pipe Routing/Pipe Capacity
Runoff reaching DP7 is collected by a single 16' inlet and conveyed down-gradient within Pipe 12 (Q5=15.8 cfs, Q100=27.4 cfs) after combining with flows from Pipe 11, ultimately the collected runoff discharges into FSD Pond No. 1.

Design Point 8 (DP8) flows (Q5=2.0cfs, Q100=3.6cfs), consist of runoff generated by Basin S, 0.45 Acres, (Q5=2.0cfs, Q100=3.6cfs).

Basin Runoff Description
Discussed above under "General" for Basin; S

Surface Routing
DP8 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 4' sump curb inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff reaching DP8 will overtop the curb and gutter and continue via an earthen swale into Basin PK2, and FSD Pond No. 1.

Pipe Routing/Pipe Capacity
Runoff reaching DP8 is collected by a 4' sump inlet and conveyed into FSD Pond No. 1 via Pipe 22 (Q5=2.0cfs, Q100=3.6cfs).

Design Point 9 (DP9) flows (Q5=0.8cfs, Q100=1.9cfs), consist of runoff generated by Basin T, 0.32 Acres, (Q5=0.8cfs, Q100=1.9cfs).

Basin Runoff Description
Discussed above under "General" for Basin; T

Surface Routing
DP9 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a CDOT Type C area inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will overtop the curb and gutter and continue via an earthen swale into Basin PK2, and FSD Pond No. 1 .

Pipe Routing/Pipe Capacity
Runoff reaching DP9 is collected by a CDOT Type C area inlet and conveyed down-gradient by Pipe 20 (Q5=0.8cfs, Q100=1.9cfs) prior to combining with Pipe 19 (Q5=26.5cfs, Q100=47.3cfs), and Pipe 21, (Q5=27.1cfs, Q100=48.8cfs) ultimately discharging into FSD Pond No. 1.

Design Point 10 (DP10) flows (Q5=2.0cfs, Q100=3.6cfs), consist of runoff generated by Basin U, 0.46 Acres, (Q5=2.0cfs, Q100=3.6cfs).

Basin Runoff Description
Discussed above under "General" for Basin; U

Surface Routing
DP10 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 4' sump curb inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will overtop the curb and gutter and continue via an earthen swale into Basin PK-1, and the 60" RCP at Design Point 15.

Pipe Routing/Pipe Capacity
Runoff reaching DP10 is collected by a 4' sump inlet and conveyed down-gradient by Pipe 18 (Q5=2.0cfs, Q100=3.6cfs) prior to combining with flows conveyed in Pipe 17 (Q5=24.8cfs, Q100=44.2cfs). Ultimately the collected runoff is discharged into FSD Pond No. 1.

Design Point 11 (DP11) flows (Q5=0.9cfs, Q100=1.9cfs), consist of runoff generated by Basin V, 0.32 Acres, (Q5=0.9cfs, Q100=1.9cfs).

Basin Runoff Description
Discussed above under "General" for Basin; V

Surface Routing
DP11 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a CDOT Type C area inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will overtop the curb and gutter and continue via an earthen swale into Basin PK1, and the 60" RCP at Design Point 15.

Pipe Routing/Pipe Capacity
Runoff reaching DP11 is collected by a CDOT Type C area inlet and conveyed down-gradient within Pipe 16 (Q5=0.9cfs, Q100=1.9cfs) prior to combining with flows conveyed in Pipe 15 (Q5=24.0cfs, Q100=42.5cfs). Ultimately the collected runoff is discharged into FSD Pond No. 1.

Design Point 12 (DP12) flows (Q5=2.0cfs, Q100=3.7cfs), consist of runoff generated by Basin W, 0.46 Acres, (Q5=2.0cfs, Q100=3.7cfs).
Basin Runoff Description
Discussed above under "General" for Basin; W

Surface Routing
DP12 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 4' sump inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will overtop the curb and gutter and continue via an earthen swale into basin PK1, and the 60" RCP at Design Point 15.

Pipe Routing/Pipe Capacity
Runoff reaching DP12 is collected by a 4' sump inlet where it combines with runoff conveyed in Pipe 9 (Q5=5.9cfs, Q100=10.7cfs) before continuing down-gradient within Pipe 10 (Q5=7.5cfs, Q100=13.7cfs). Runoff in Pipe 10 combines with flows in Pipe 12(Q5=15.8cfs, Q100=27.4cfs) and continues down-gradient in Pipe 15(Q5=24.0cfs, Q100=42.5cfs). Ultimately, the collected runoff is discharged into FSD Pond No. 1.

Design Point 14 (DP14) flows (Q5=50.9cfs, Q100=91.0cfs), totals runoff reaching FSD / WQCV Pond 1. It consist of flows generated by Basin PK-2, 1.08 Acres, (Q5=1.3cfs, Q100=4.2cfs), Pipe Runs PR7 (Q5=18.5cfs, Q100=3.08cfs), PR21 (Q5=27.1cfs, Q100=48.8cfs), PR22 (Q5=2.0cfs, Q100=3.6cfs).

Basin Runoff Description
Discussed above under "General" for Basin; PK-2

Pipe Routing/Pipe Capacity
Runoff reaching DP14 is detained within FSD Pond No. 1 . Runoff reaching the pond is discharged thru a modified Type D Water Quality Outlet Structure. The details for the outlet structure, spillway, and rundown are provided in the final construction drawing and are consistent with the recommendations made within the current DCM. Treated runoff leaves the pond via Pipe 23 (Q5=0.6cfs, Q100=11.6cfs).

Clogging Statement
In the event of clogging or inlet failure, the runoff will discharge thru a riprap spillway/rundown to the existing 60" RCP culvert at DP15.

Design Point 15 (DP15) flows (Q5=6.1cfs, Q100=29.4cfs), consist of flows generated by Basins PK-1 6.68 Acres, (Q5=3.1cfs, Q100=11.9cfs), and OS-1 1.35 Acres, (Q5=2.5cfs, Q100=5.7cfs) as well as flows discharged from FSD Pond No. 1 via Pipe 23 (Q5=0.6cfs, Q100=11.6cfs).

Basin Runoff Description
Discussed above under "General" for Basin; PK-1, OS-1.

Surface Routing
Runoff reaching DP15 is generated within Basins PK-1 and OS-1 and discharged by Pipe Run 23. The combined runoff is directed to the existing 54" RCP at the low point (DP15). The estimated runoff reaching this location in the existing condition was Q5=6.1cfs, Q100=29.4cfs.

Design Point 16 (DP16) flows (Q5=5.6cfs, Q100=10.7cfs), consist of runoff generated by Basin GG, 0.76 Acres, (Q5=3.4cfs, Q100=6.1cfs) and Basin FF, 1.19 Acres, (Q5=3.3cfs, Q100=6.6cfs).

Basin Runoff Description
Discussed above under "General" for Basins; GG & FF

Surface Routing
DP16 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 12' sump inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will travel to one of the other inlets in the intersection. In the event the storm system clogs the flow would overtop the curb and gutter and continue via an earthen swale into Basin KK2, and FSD Pond No. 2.

Pipe Routing/Pipe Capacity
Runoff reaching DP16 is collected by a 12' sump inlet and is conveyed down-gradient within Pipe 24 (Q5=5.6cfs, Q100=10.7cfs). Ultimately the collected runoff is discharged into FSD Pond No. 2.

Design Point 17 (DP17) flows (Q5=2.8cfs, Q100=5.1cfs), consist of runoff generated by basin HH, 0.68 Acres, (Q5=2.8cfs, Q100=5.1cfs)

Basin Runoff Description
Discussed above under "General" for Basin; HH

Surface Routing
DP17 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by an 8' sump inlet

Clogging Statement
In the event of clogging or inlet failure, the runoff will travel to one of the other inlets in the intersection. In the event the storm system clogs the flow would overtop the curb and gutter and continue via an earthen swale into Basin KK2, and FSD Pond No. 2.

Pipe Routing/Pipe Capacity
Runoff reaching DP17 is collected by an 8' sump inlet where it combines with runoff conveyed in Pipe 24 and conveyed down-gradient within Pipe 25 (Q5=7.8cfs, Q100=14.8cfs). Ultimately the collected runoff is discharged into FSD Pond No. 2.

Design Point 18 (DP18) flows (Q5=4.2cfs, Q100=7.6cfs), consist of runoff generated by
Basin DD, 0.37 Acres, (Q5=1.6cfs, Q100=3.0cfs) and Basin EE, 0.64 Acres, (Q5=2.7cfs, Q100=5.0cfs).

Basin Runoff Description
Discussed above under "General" for Basins; DD & EE

Surface Routing
DP18 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by an 8' sump inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will travel to one of the other inlets in the intersection. In the event the storm system clogs the flow would overtop the curb and gutter and continue via an earthen swale into Basin KK2, and FSD Pond No. 2.

Pipe Routing/Pipe Capacity
Runoff reaching DP18 is collected by an 8' sump inlet and is conveyed down-gradient within Pipe 27 (Q5=4.2cfs, Q100=7.6cfs), Pipe 29 (Q5=6.4cfs, Q100=11.9cfs), Pipe 31 (Q5=15.8cfs, Q100=29.2cfs), and Pipe 32 (Q5=24.7cfs, Q100=46.1cfs). Ultimately, the collected runoff is discharged into FSD Pond No. 2 .

Design Point 19 (DP19) flows (Q5=2.4cfs, Q100=4.7cfs), consist of runoff generated by Basin CC, 0.30 Acres, (Q5=1.1cfs, Q100=2.2cfs) and Basin II, 0.45 Acres, (Q5=1.6cfs, Q100=3.1cfs).

Basin Runoff Description
Discussed above under "General" for Basins; CC & II

Surface Routing
DP19 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 4' sump inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will travel to one of the other inlets in the intersection. In the event the storm system clogs the flow would overtop the curb and gutter and continue via an earthen swale into Basin KK2, and FSD Pond No. 2.

Pipe Routing/Pipe Capacity
Runoff reaching DP19 is collected by an 8' sump inlet and is conveyed down-gradient within Pipe 28 (Q5=2.4cfs, Q100=4.7cfs), Pipe 29 (Q5=6.4cfs, Q100=11.9cfs), Pipe 31 (Q5=15.8cfs, Q100=29.2cfs), and Pipe 32 (Q5=24.7cfs, Q100=46.1cfs). Ultimately, the collected runoff is discharged into FSD Pond No. 2 .

Design Point 20 (DP20) flows (Q5=9.8cfs, Q100=18.1cfs), consist of runoff generated by Basin AA, 1.49 Acres, (Q5=5.8cfs, Q100=10.6cfs) and Basin BB, 1.02 Acres, (Q5=4.0cfs, Q100=7.3cfs).

Basin Runoff Description
Discussed above under "General" for Basins; AA & BB

Surface Routing
DP20 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 12' sump inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will travel to one of the other inlets in the intersection. In the event the storm system clogs the flow would overtop the curb and gutter and continue via an earthen swale into Basin KK2, and FSD Pond No. 2.

Pipe Routing/Pipe Capacity
Runoff reaching DP20 flows is collected by a 16' sump inlet is conveyed down-gradient within Pipe 30 (Q5=9.8cfs, Q100=18.1cfs), Pipe 31 (Q5=15.8cfs, Q100=29.2cfs), and Pipe 32 (Q5=24.7cfs, Q100=46.1cfs). Ultimately, the collected runoff is discharged into FSD Pond No. 2

Design Point 21 (DP21) flows (Q5=1.6cfs, Q100=2.9cfs), consist of runoff generated by Basin JJ, 0.36 Acres, (Q5=1.6cfs, Q100=2.9cfs)

Basin Runoff Description
Discussed above under "General" for Basin; JJ

Surface Routing
DP21 flows are combined via sheet flow, and concentrated flow from curb and gutter. Flows are collected by a 4' sump inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will travel to one of the other inlets in the intersection. In the event the storm system clogs the flow would overtop the curb and gutter and continue via an earthen swale into Basin KK2, and FSD Pond No. 2.

Pipe Routing/Pipe Capacity
DP21 flows are collected by a 4' sump inlets, conveyed by Pipe 26 (Q5=1.6cfs, Q100=2.9cfs), to combine with Pipe 32 (Q5=24.7cfs, Q100=46.1cfs) to convey flows to the south toward the proposed Full Spectrum Detention Pond 2.

Design Point 22 (DP22) flows (Q5=1.3cfs, Q100=3.8cfs), consist of runoff generated by basin KK1, 1.18 Acres, (Q5=1.3cfs, Q100=3.8cfs)

Basin Runoff Description
Discussed above under "General" for Basin; KK1

Surface Routing
DP22 flows are combined via sheet flow, and concentrated flow. Flows drain to a 12' wide triangular swale at the south end of DP22 and are collected by a CDOT Type C area inlet.

Clogging Statement
In the event of clogging or inlet failure, the runoff will continue south in a swale along Tract E and proceed to Pond 2.

Pipe Routing/Pipe Capacity
DP22 flows are collected by a CDOT Type C area inlet and conveyed within Pipe 33 (Q5=1.3cfs, Q100=3.8cfs) to FSD Pond No. 2.

Design Point 23 (DP23) flows (Q5=26.0cfs, Q100=55.9cfs), totals runoff reaching FSD / WQCV Pond 2. It consist of Pipe Run PR33A (Q5=25.2cfs, Q100=48.5cfs), and Pipe Run PR33B (Q5=3.1cfs, Q100=11.8cfs).

Basin Runoff Description
Discussed above under "General" for Basin; KK2

Pipe Routing/Pipe Capacity
Runoff reaching DP23 is detained within FSD Pond No. 2 . Runoff reaching the pond is discharged thru a modified Type D Water Quality Outlet Structure. The details for the outlet structure, spillway, and rundown are provided in the final construction drawing and are consistent with the recommendations made within the current DCM. Treated runoff leaves the pond via Pipe 34 (Q5=0.3cfs, Q100=8.0cfs).

Clogging Statement
In the event of clogging or inlet failure, the runoff will discharge thru a riprap spillway/rundown to the existing 54" RCP culvert at DP24.

Design Point 24 (DP24) flows (Q5=4.7cfs, Q100=22.0cfs), consist of flows generated by KK3 2.83 Acres, (Q5=1.1cfs, Q100=7.7cfs) and OS-2, 2.05 Acres, (Q5=3.4cfs, Q100=7.8cfs) as well as flows discharged from FSD Pond No. 2 via Pipe 34 (Q5=0.3cfs, Q100=8.0cfs).

Basin Runoff Description
Discussed above under "General" for Basin; OS-2, KK3

Surface Routing
Runoff reaching DP24 is generated by Basins OS-2 and KK3 and Pipe Run 34. The combined runoff is directed to the existing 54" RCP at the low point DP24. The estimated runoff reaching this location in the existing condition was Q5=7.9cfs, Q100=37.0cfs.

WATER QUALITY AND FULL SPECTRUM DETENTION

The water quality capture volume (WQCV) required for the site based on the guidelines as set forth in the City of Colorado Springs Volume II. The final outlet facilities will be designed as part of the final construction drawings for the site. Refer to the Drainage Map for locations of contributing watershed basins for water quality defined areas. Stormwater quality facilities will be privately maintained by the HOA or the Woodmen Heights Metropolitan District.

The proposed detention ponds function to provide full spectrum detention (FSD) for runoff calculated onsite. Per Colorado Revised Statute (CRS) 37-92-602, effective August 5, 2015, the FSD ponds must release or infiltrate at least 97% of all of the runoff from a rainfall event that is less than or equal to a 5 year storm within 72 hours after the event, and in all cases releases or infiltrates at least 99% of the runoff within 120 hours after the end of events greater than a 5 year storm. Pond 1 and Pond 2 have been designed to treat approximately 16.22 acres and 12.88 acres respectively. A pond summary table is presented on the following page.

FSD Pond 1	*WQCV*	*EURV*	*5 Year*	*100 Year*
Maximum Volume Stored (acre-ft)	0.381	1.495	1.316	2.286
Maximum WS Elevation (ft)	6876.29	6879.37	6878.95	6880.92
Peak Inflow (cfs)	12.9	50.0	44.1	91.0
Peak Outflow (cfs)	0.2	0.7	0.6	11.6

FSD Pond 2	*WQCV*	*EURV*	*5 Year*	*100 Year*
Maximum Volume Stored (acre-ft)	0.243	0.911	0.791	1.517
Maximum WS Elevation (ft)	6891.47	6893.46	6893.15	6894.81
Peak Inflow (cfs)	7.5	27.9	24.2	55.9
Peak Outflow (cfs)	0.1	0.4	0.4	8.0

The forebays, trickle channel micropools, outlet structures and outlet pipes have been designed in accordance with the City of Colorado Springs DCM and the UDFCD manual. Sizing of the FSD ponds was accomplishing utilizing the Detention Design-UD-Detention v3.06 workbook. The detention ponds will be private and shall be maintained by the HOA or Woodmen Heights Metropolitan District. In the event the outlet structures or outlet pipes clog the runoff reaching the ponds will be conveyed thru the emergency spillways and outfall into the north side of Woodmen Road, and the 60" RCP on the west side of the site, and a 54" RCP on the east side of the site. **The peak release rate from Pond 1 is; (Q5=0.6 cfs and Q100=11.6 cfs)** and will outfall, via an 18" RCP near the invert of the 60" pipe on the north side of Woodmen Road. **The peak release rate from Pond 2 is; (Q5=0.4 cfs and Q100=8.0 cfs)** and will outfall, via an 18" RCP near the invert of the 54" pipe on the north side of Woodmen Road. Rip rap aprons will be constructed to dissipate energy and prevent local scour at the outlet. It is important to note that the peak flow rates from both ponds are less than those expected to reach the two culverts in the existing condition and thus the development of the property is not anticipated to negatively affect the downstream facilities.

WETLANDS

Basin PK-1contains jurisdictional wetlands that are to be preserved and protected. These wetlands are intended to serve as an amenity to the development and should be void of trash and debris. The discharge of surface storm water is encouraged as long as the conveyance is treated with the removal of hazardous pollutants and sediments. The maintenance of Basin PK-1 will be by the HOA or the Woodmen Heights Metropolitan District.

MAINTENANCE

All drainage collection and conveyance system and drainage facilities will be privately maintained by HOA or the Woodmen Heights Metropolitan District.

CONSTRUCTION COST OPINION

Private Drainage Facilities (NON-Reimbursable)

Item	Description	Quantity		Unit Cost		Cost
1.	18" RCP	1030	LF	$40	/LF	$41,200.00
2.	24" RCP	225	LF	$58	/LF	$13,050.00
3.	36" RCP	298	LF	$100	/LF	$29,800.00
4.	42" RCP	178	LF	$140	/LF	$24,920.00
5.	Full Spectrum Detention Pond	2	EA	$27,500	/EA	$55,000.00
6.	Pond Outlet Structure	2	EA	$12,500	/EA	$25,000.00
7.	At Grade/Sump Inlet L=4'	4	EA	$4,000	/EA	$16,000.00
8.	At Grade/Sump Inlet L=8'	4	EA	$4,500	/EA	$18,000.00
9.	At Grade/Sump Inlet L=12'	7	EA	$5,000	/EA	$35,000.00
10.	Area Inlet	5	EA	$6,000	/EA	$30,000.00
					Total $	**$287,970.00**

DRAINAGE, BRIDGE & POND FEES

This site is in the Sand Creek Drainage Basin. The 2017 Drainage Bridge and Pond fees per the City of Colorado Springs for The Pines at Forest Meadows site are as follows:

Drainage Fees:	38.57	x	$11,154.00	=	$430,209.78
Bridge Fees:	38.57	x	$675.00	=	$26,034.75
Pond Land Fees:	38.57	x	$1,070.00	=	$41,269.90
Pond Facility Fees:	38.57	x	$3,259.00	=	$125,699.63
				Total $	**$623,214.06**

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2017.

SUMMARY

The Forest Meadows South site contains 38+/- acres within the Sand Creek Drainage Basin. The development of the site will require drainage and facilities to accommodate developed flows and meet City of Colorado Springs Drainage Criteria. Full Spectrum Detention /Water Quality ponds are to be constructed based on the tributary developed flows within the site. The proposed drainage facilities will adequately convey, and route runoff from the site ultimately to Sand Creek. The development of The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5, & 6 will not adversely affect the adjacent or downstream properties.

REFERENCES

The sources of information used in the development of this study are listed below:

1. City of Colorado Springs and El Paso County "Drainage Criteria Manual", October 1987, revised November 1991, volumes 1 & 2.

2. Soil Survey for El Paso County, Colorado, U.S. Department of Agriculture, Soil Conservation Service, June 1980.

3. Master Development Drainage Plan for Woodmen Heights Master Plan, Classic Consulting Engineers and Surveyors, LLC, June 2004.

4. Master Development Drainage Plan update for Woodmen Heights and Final Drainage Report for Forest Meadows Filing No. 1 and No. 4, ESI, Inc., February 2006

5. Sand Creek Drainage Basin Planning Study Preliminary Design Report, Kiowa Engineering Corporation, revised March, 1996

6. Woodmen Heights Business Park Master Development Drainage Plan, M&S Civil Consultants, Inc., dated April 2008.

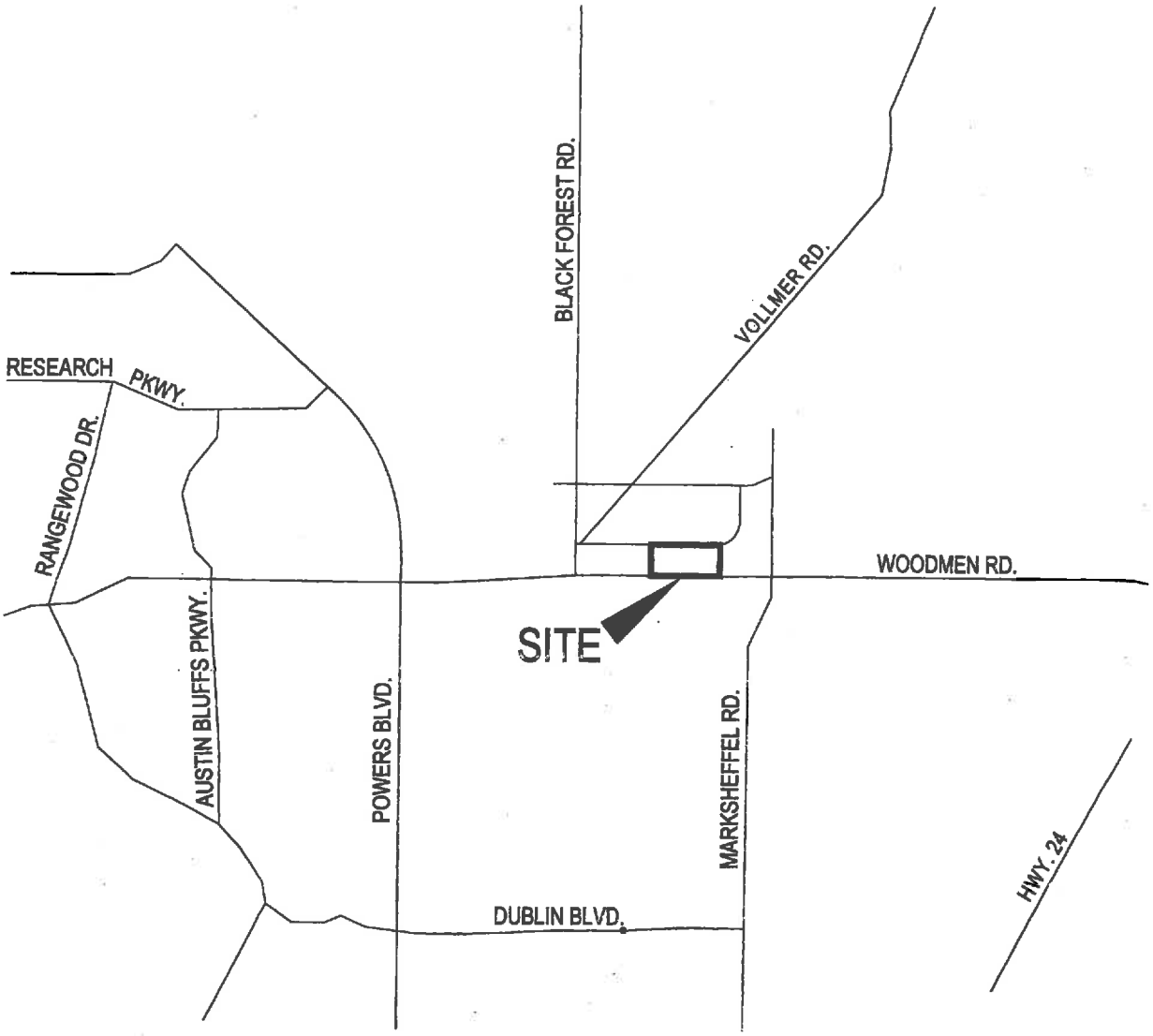
7. Woodmen Heights Business Park Filing No. 1, M&S Civil Consultants, Inc., dated June 2008.

8. Woodmen Heights Business Park Filing No. 1, Lot 1 (E Woodmen Self Storage), M&S Civil Consultants, Inc., dated May 2014.

9. Woodmen Heights Business Park Filing No. 1, Lot 1 – Amendment Letter, M&S Civil Consultants, Inc., dated June 2016.

APPENDIX

VICINITY MAP



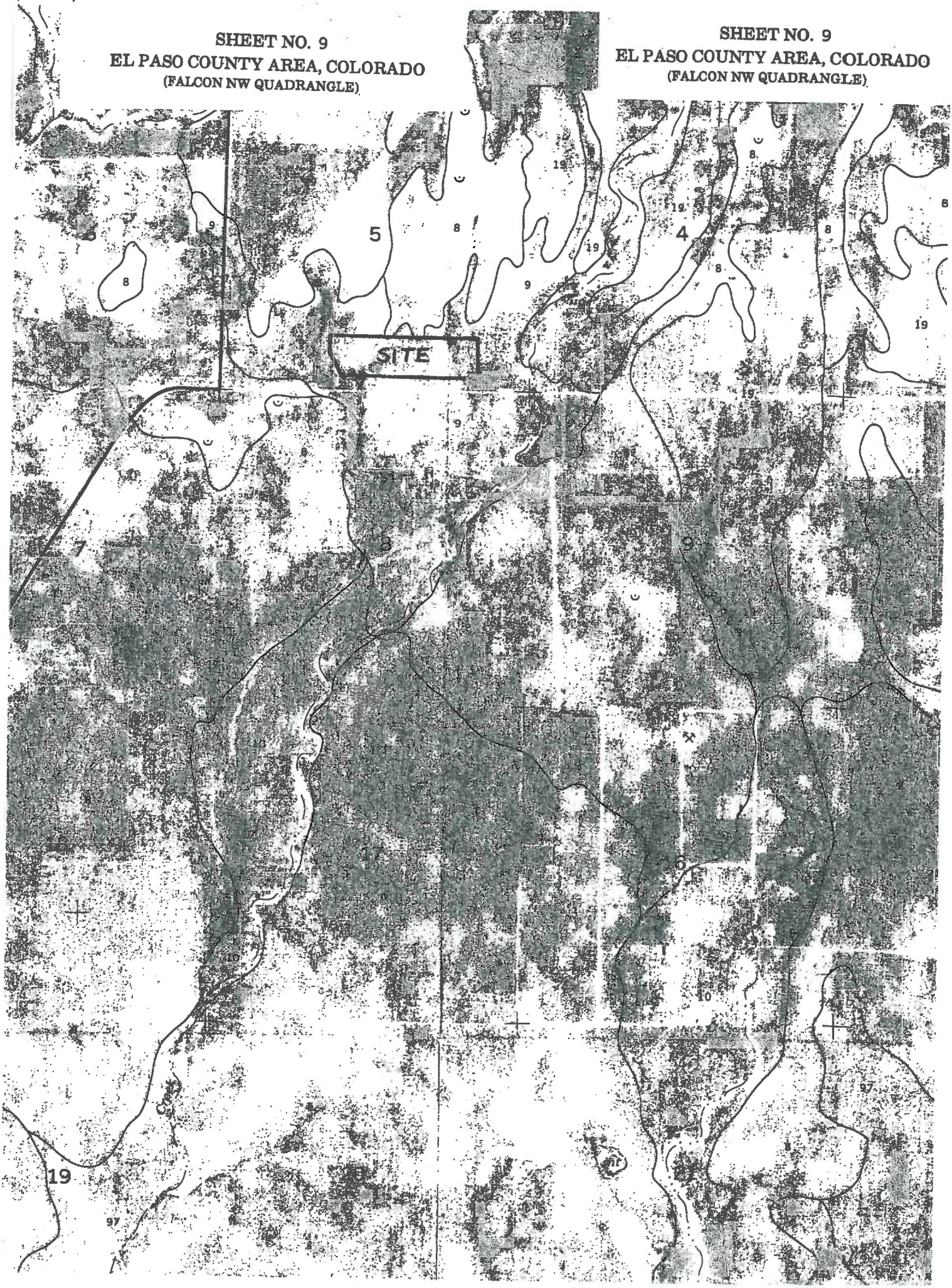
VICINITY MAP

N.T.S.

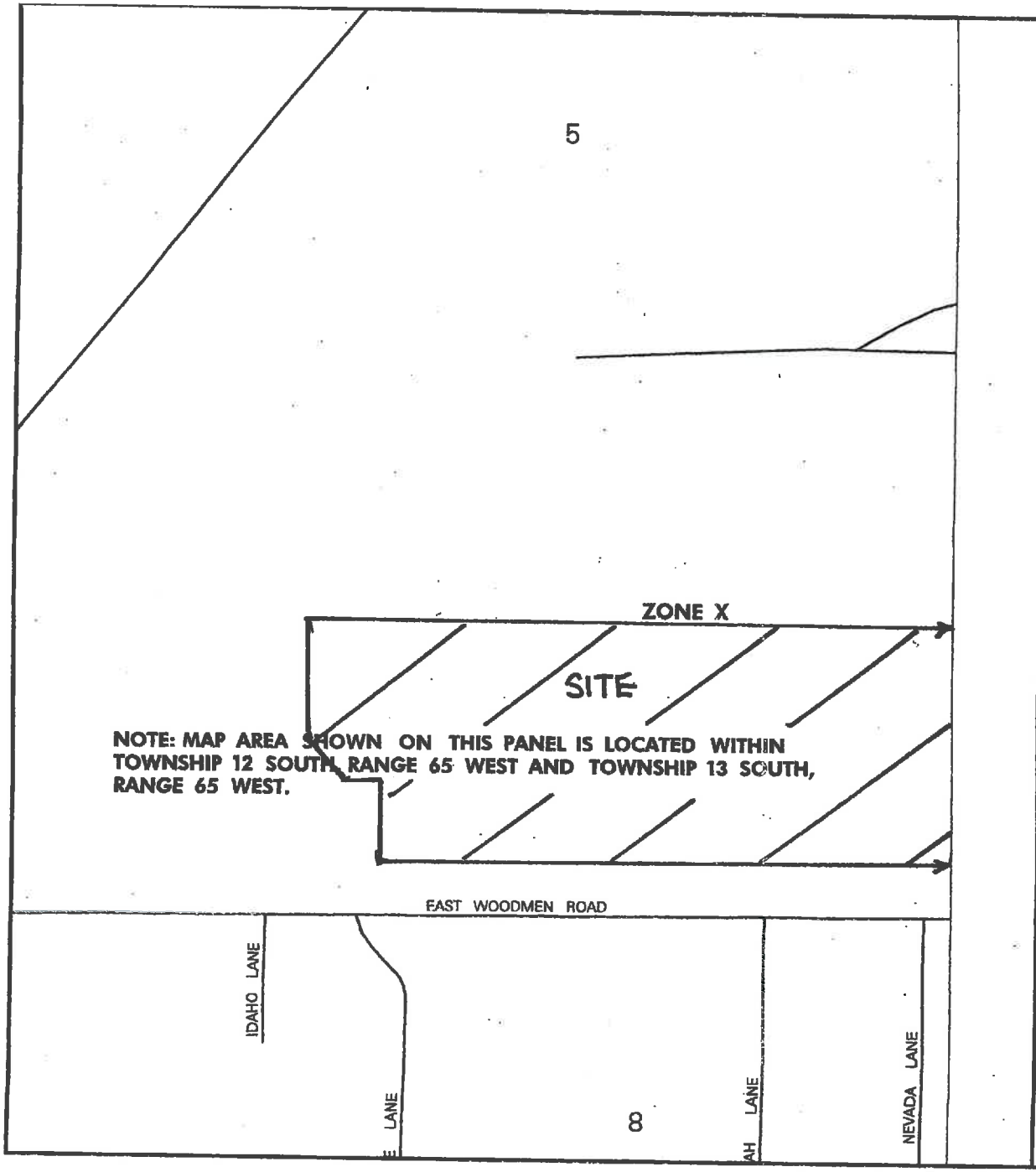
SOILS MAP

SHEET NO. 9
EL PASO COUNTY AREA, COLORADO
(FALCON NW QUADRANGLE)

SHEET NO. 9
EL PASO COUNTY AREA, COLORADO
(FALCON NW QUADRANGLE)



FLOODPLAIN MAP



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 529 OF 1300

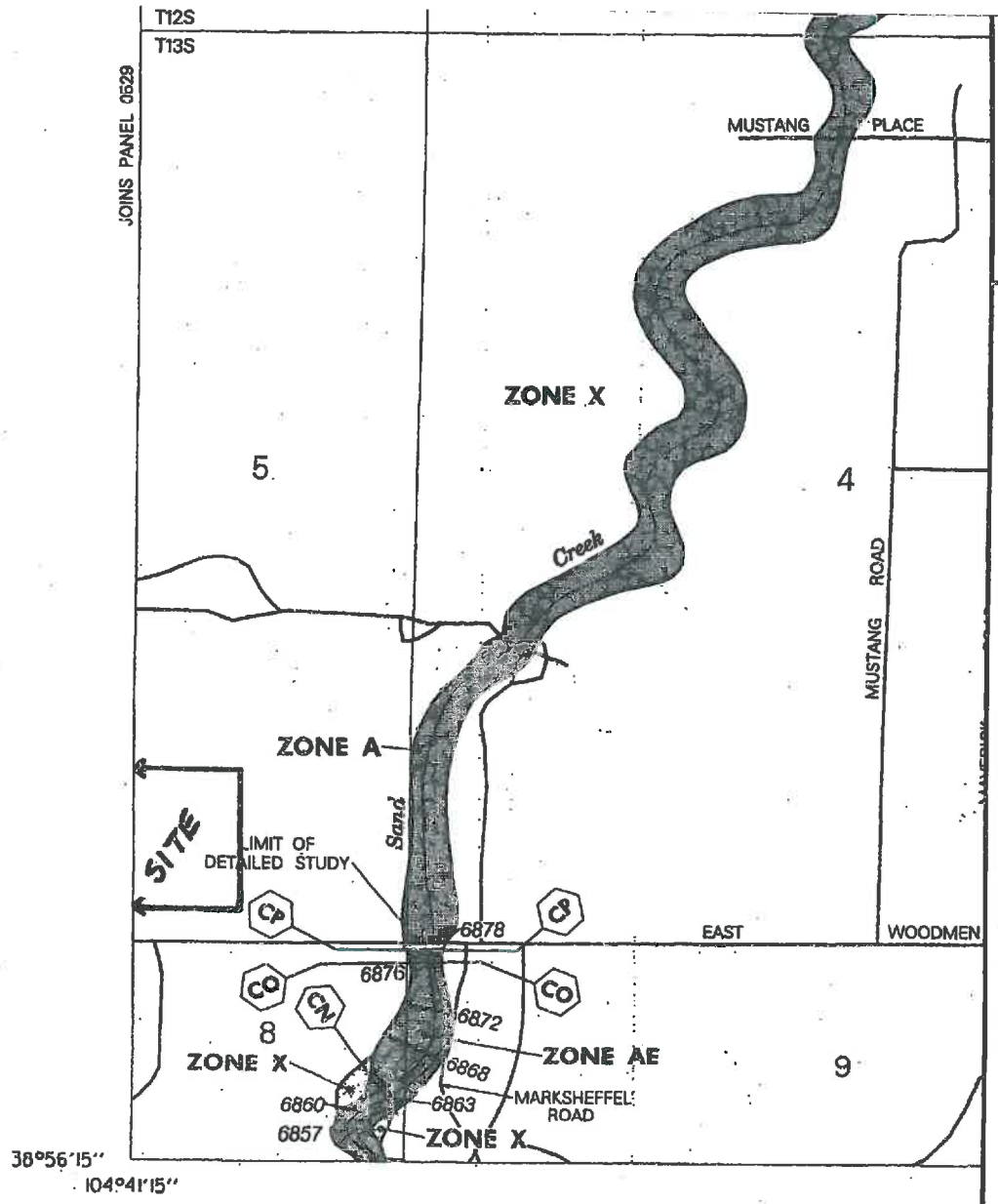
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0529	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0529	F

MAP NUMBER 08041C0529 F

EFFECTIVE DATE: MARCH 17, 1997

Federal Emergency Management Agency



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0535	F

MAP NUMBER 08041C0535 F

EFFECTIVE DATE: MARCH 17, 1997

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)

		STREETS / DEVELOPED					OVERLAND / DEVELOPED					WEIGHTED			
BASIN	TOTAL AREA (Acres)	AREA (Acres)	C_2	C_5	C_{10}	C_{100}	AREA (Acres)	C_2	C_5	C_{10}	C_{100}	C_2	C_5	C_{10}	C_{100}
A	0.31	0.00	0.89	0.90	0.92	0.96	0.31	0.02	0.08	0.15	0.35	0.02	0.08	0.15	0.35
B	0.63	0.58	0.89	0.90	0.92	0.96	0.05	0.02	0.08	0.15	0.35	0.82	0.83	0.86	0.91
C	0.35	0.32	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.82	0.83	0.85	0.91
CI	0.29	0.27	0.89	0.90	0.92	0.96	0.02	0.02	0.08	0.15	0.35	0.83	0.84	0.87	0.92
D	0.20	0.19	0.89	0.90	0.92	0.96	0.01	0.02	0.08	0.15	0.35	0.85	0.86	0.88	0.93
E	1.96	1.76	0.89	0.90	0.92	0.96	0.2	0.02	0.08	0.15	0.35	0.80	0.82	0.84	0.90
F	0.72	0.57	0.89	0.90	0.92	0.96	0.15	0.02	0.08	0.15	0.35	0.71	0.73	0.76	0.83
G	0.38	0.00	0.89	0.90	0.92	0.96	0.38	0.02	0.08	0.15	0.35	0.02	0.08	0.15	0.35
H	0.45	0.42	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.83	0.84	0.87	0.92
I	0.32	0.17	0.89	0.90	0.92	0.96	0.15	0.02	0.08	0.15	0.35	0.49	0.52	0.56	0.68
J	0.45	0.42	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.83	0.85	0.87	0.92
K	0.41	0.38	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.83	0.84	0.86	0.92
L	0.70	0.67	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.85	0.86	0.89	0.93
M	0.33	0.30	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.81	0.82	0.85	0.90
N	0.56	0.54	0.89	0.90	0.92	0.96	0.02	0.02	0.08	0.15	0.35	0.86	0.87	0.89	0.94
O	0.73	0.68	0.89	0.90	0.92	0.96	0.05	0.02	0.08	0.15	0.35	0.83	0.84	0.87	0.92
P	0.74	0.69	0.89	0.90	0.92	0.96	0.05	0.02	0.08	0.15	0.35	0.83	0.84	0.87	0.92
Q	1.60	0.60	0.89	0.90	0.92	0.96	1.00	0.02	0.08	0.15	0.35	0.35	0.39	0.44	0.58
R	0.37	0.12	0.89	0.90	0.92	0.96	0.25	0.02	0.08	0.15	0.35	0.30	0.34	0.40	0.55
S	0.45	0.42	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.83	0.85	0.87	0.92
T	0.32	0.17	0.89	0.90	0.92	0.96	0.15	0.02	0.08	0.15	0.35	0.48	0.51	0.56	0.67
U	0.46	0.42	0.89	0.90	0.92	0.96	0.04	0.02	0.08	0.15	0.35	0.81	0.83	0.85	0.91
V	0.32	0.17	0.89	0.90	0.92	0.96	0.15	0.02	0.08	0.15	0.35	0.49	0.52	0.56	0.68

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)

		STREETS / DEVELOPED					OVERLAND / DEVELOPED					WEIGHTED			
BASIN	TOTAL AREA (Acres)	AREA (Acres)	C_2	C_5	C_{10}	C_{100}	AREA (Acres)	C_2	C_5	C_{10}	C_{100}	C_2	C_5	C_{10}	C_{100}
W	0.46	0.43	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.83	0.85	0.87	0.92
X	0.15	0.08	0.89	0.90	0.92	0.96	0.07	0.02	0.08	0.15	0.35	0.48	0.51	0.56	0.67
Y	0.53	0.48	0.89	0.90	0.92	0.96	0.05	0.02	0.08	0.15	0.35	0.81	0.82	0.85	0.90
Z	0.94	0.89	0.89	0.90	0.92	0.96	0.05	0.02	0.08	0.15	0.35	0.84	0.86	0.88	0.93
PK-1	6.68	0.91	0.89	0.90	0.92	0.96	5.77	0.02	0.08	0.15	0.35	0.14	0.19	0.25	0.43
PK-2	1.06	0.22	0.89	0.90	0.92	0.96	0.86	0.02	0.08	0.15	0.35	0.20	0.25	0.31	0.47
AA	1.49	1.35	0.89	0.90	0.92	0.96	0.14	0.02	0.08	0.15	0.35	0.81	0.82	0.85	0.90
BB	1.02	0.92	0.89	0.90	0.92	0.96	0.10	0.02	0.08	0.15	0.35	0.80	0.82	0.84	0.90
CC	0.30	0.25	0.89	0.90	0.92	0.96	0.06	0.02	0.08	0.15	0.35	0.73	0.75	0.78	0.85
DD	0.37	0.35	0.89	0.90	0.92	0.96	0.03	0.02	0.08	0.15	0.35	0.83	0.85	0.87	0.92
EE	0.64	0.60	0.89	0.90	0.92	0.96	0.04	0.02	0.08	0.15	0.35	0.84	0.85	0.87	0.92
FF	1.19	0.83	0.89	0.90	0.92	0.96	0.36	0.02	0.08	0.15	0.35	0.63	0.65	0.69	0.78
GG	0.76	0.72	0.89	0.90	0.92	0.96	0.04	0.02	0.08	0.15	0.35	0.84	0.86	0.88	0.93
HH	0.68	0.63	0.89	0.90	0.92	0.96	0.05	0.02	0.08	0.15	0.35	0.83	0.84	0.86	0.91
II	0.45	0.33	0.89	0.90	0.92	0.96	0.12	0.02	0.08	0.15	0.35	0.67	0.69	0.72	0.80
JJ	0.36	0.34	0.89	0.90	0.92	0.96	0.01	0.02	0.08	0.15	0.35	0.86	0.87	0.90	0.94
KK1	1.18	0.30	0.89	0.90	0.92	0.96	0.88	0.02	0.08	0.15	0.35	0.24	0.29	0.35	0.51
KK2	4.44	0.60	0.89	0.90	0.92	0.96	3.84	0.02	0.08	0.15	0.35	0.14	0.19	0.25	0.43
KK3	2.83	0.00	0.89	0.90	0.92	0.96	2.83	0.02	0.08	0.15	0.35	0.02	0.08	0.15	0.35
OS-1	1.35	0.65	0.89	0.90	0.92	0.96	0.70	0.02	0.08	0.15	0.35	0.44	0.48	0.52	0.64
OS-2	2.05	0.97	0.89	0.90	0.92	0.96	1.08	0.02	0.08	0.15	0.35	0.43	0.47	0.51	0.64
OS-3	0.34	0.18	0.89	0.90	0.92	0.96	0.16	0.02	0.08	0.15	0.35	0.48	0.51	0.56	0.67

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
PRELIMINARY/FINAL DRAINAGE REPORT
(Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T_t)		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C_5	C_{100}	C_5	Length (ft)	Height (ft)	T_C (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	CHECK (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)
		From DCM Table 5-1															
A	0.31	0.08	0.35	0.08	30	1	7.2	260	3.1%	3.5	1.2	8.4	11.6	4.4	7.4	0.1	0.8
B	0.63	0.83	0.91	0.83	0	0	0.0	120	1.9%	2.8	0.7	5.0	10.7	5.2	8.7	2.7	5.0
C	0.35	0.83	0.91	0.83	20	1	1.3	360	1.9%	2.8	2.2	5.0	12.1	5.2	8.7	1.5	2.6
C1	0.29	0.84	0.92	0.84	0	0	0.0	360	1.9%	2.8	2.2	5.0	12.0	5.2	8.7	1.3	2.3
D	0.20	0.86	0.93	0.86	20	2	1.0	280	2.5%	3.2	1.5	5.0	11.7	5.2	8.7	0.9	1.6
E	1.96	0.82	0.90	0.82	80	2	3.6	760	1.2%	2.2	5.8	9.3	14.7	4.2	7.1	6.8	12.5
F	0.72	0.73	0.83	0.73	20	2	1.5	760	1.2%	2.2	5.8	7.3	14.3	4.6	7.7	2.4	4.6
G	0.38	0.08	0.35	0.08	180	6	17.6	0	1.5%	2.4	0.0	17.6	11.0	3.3	5.5	0.1	0.7
H	0.45	0.84	0.92	0.84	50	2	2.2	170	3.5%	3.7	0.8	5.0	11.2	5.2	8.7	2.0	3.6
I	0.32	0.52	0.68	0.52	50	2	5.0	160	3.5%	3.7	0.7	5.7	11.2	5.0	8.4	0.8	1.8
J	0.45	0.85	0.92	0.85	50	2	2.2	170	3.5%	3.7	0.8	5.0	11.2	5.2	8.7	2.0	3.6
K	0.41	0.84	0.92	0.84	50	2	2.2	180	3.5%	3.7	0.8	5.0	11.3	5.2	8.7	1.8	3.3
L	0.70	0.86	0.93	0.86	50	2	2.0	245	3.5%	3.7	1.1	5.0	11.6	5.2	8.7	3.1	5.7
M	0.33	0.82	0.90	0.82	30	1	1.9	260	3.0%	3.5	1.3	5.0	11.6	5.2	8.7	1.4	2.6
N	0.56	0.87	0.94	0.87	30	1	1.6	260	3.0%	3.5	1.3	5.0	11.6	5.2	8.7	2.5	4.6
O	0.73	0.84	0.92	0.84	80	2	3.2	300	1.5%	2.4	2.0	5.3	12.1	5.1	8.6	3.2	5.8
P	0.74	0.84	0.92	0.84	50	2	2.2	260	3.0%	3.5	1.3	5.0	11.7	5.2	8.7	3.2	5.9
Q	1.60	0.39	0.58	0.39	200	12	10.6	360	1.0%	2.0	3.0	13.6	13.1	3.7	6.1	2.3	5.7
R	0.37	0.34	0.55	0.34	70	2	8.6	150	4.0%	4.0	0.6	9.2	11.2	4.3	7.1	0.5	1.4
S	0.45	0.85	0.92	0.85	50	2	2.2	150	2.5%	3.2	0.8	5.0	11.1	5.2	8.7	2.0	3.6
T	0.32	0.51	0.67	0.51	30	1	4.1	150	2.5%	3.2	0.8	5.0	11.0	5.2	8.7	0.8	1.9
U	0.46	0.83	0.91	0.83	50	2	2.3	150	2.5%	3.2	0.8	5.0	11.1	5.2	8.7	2.0	3.6

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
PRELIMINARY/FINAL DRAINAGE REPORT
(Area Drainage Summary)

From Area Runoff Coefficient Summary				OVERLAND				STREET / CHANNEL FLOW				Time of Travel (T_t)		INTENSITY *		TOTAL FLOWS	
BASIN	AREA TOTAL (Acres)	C_5	C_{100}	C_5	Length (ft)	Height (ft)	T_C (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	CHECK (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)
		From DCM Table 5-1															
V	0.32	0.62	0.68	0.62	30	1	4.1	150	2.5%	3.2	0.8	5.0	11.0	5.2	8.7	0.9	1.9
W	0.46	0.85	0.92	0.85	50	2	2.2	150	2.5%	3.2	0.8	5.0	11.1	5.2	8.7	2.0	3.7
X	0.15	0.51	0.67	0.51	20	1	3.0	120	2.5%	3.2	0.6	5.0	10.8	5.2	8.7	0.4	0.9
Y	0.53	0.82	0.90	0.82	20	1	1.4	504	2.4%	3.1	2.7	5.0	12.9	5.2	8.7	2.3	4.2
Z	0.94	0.86	0.93	0.86	50	2	2.1	740	1.0%	2.0	6.2	8.2	14.4	4.4	7.4	3.6	6.5
PK-1	6.68	0.19	0.43	0.19	180	1	28.3	610	4.5%	4.2	2.4	30.7	14.4	2.4	4.1	3.1	11.9
PK-2	1.08	0.25	0.47	0.25	40	4.5	4.6	184	1.0%	2.0	1.5	6.2	11.2	4.9	8.1	1.3	4.2
AA	1.49	0.82	0.90	0.82	75	2	3.3	550	1.6%	2.5	3.6	6.9	13.5	4.7	7.9	5.8	10.6
BB	1.02	0.82	0.90	0.82	50	1	3.0	550	1.6%	2.5	3.6	6.6	13.3	4.7	8.0	4.0	7.3
CC	0.30	0.75	0.85	0.75	75	1.5	4.6	95	1.0%	2.0	0.8	5.4	10.9	5.1	8.5	1.1	2.2
DD	0.37	0.85	0.92	0.85	50	1	2.7	230	1.0%	2.0	1.9	5.0	11.6	5.2	8.7	1.6	3.0
EE	0.64	0.85	0.92	0.85	50	1	2.7	350	1.0%	2.0	2.9	5.6	12.2	5.0	8.4	2.7	5.0
FF	1.19	0.65	0.78	0.65	170	6.5	7.2	260	1.0%	2.0	2.2	9.3	12.4	4.2	7.1	3.3	6.6
GG	0.76	0.86	0.93	0.86	50	1	2.6	220	1.7%	2.6	1.4	5.0	11.5	5.2	8.7	3.4	6.1
HH	0.68	0.84	0.91	0.84	50	1	2.8	360	1.0%	2.0	3.0	5.8	12.3	4.9	8.3	2.8	5.1
II	0.45	0.69	0.80	0.69	40	1	3.7	210	1.2%	2.2	1.6	5.3	11.4	5.1	8.6	1.6	3.1
JJ	0.36	0.87	0.94	0.87	50	1	2.4	180	2.0%	2.8	1.1	5.0	11.3	5.2	8.7	1.6	2.9
KK1	1.18	0.29	0.51	0.29	50	1	8.7	430	1.0%	2.0	3.6	12.3	12.7	3.8	6.4	1.3	3.8
KK2	4.44	0.19	0.43	0.19	120	1.5	17.7	525	1.7%	2.6	3.4	21.0	13.6	3.7	6.2	3.1	11.8
KK3	2.83	0.08	0.35	0.08	50	10	5.1	350	2.3%	3.0	1.9	7.1	12.2	4.7	7.8	1.1	7.7
OS-1	1.35	0.48	0.64	0.48	100	2	9.5	490	3.2%	3.6	2.3	11.8	13.3	3.9	6.5	2.5	5.7
OS-2	2.05	0.47	0.64	0.47	100	2	9.6	695	1.4%	2.4	4.9	14.5	14.4	3.6	6.0	3.4	7.8
OS-3	0.34	0.51	0.67	0.51	100	4	7.1	115	2.6%	3.2	0.6	7.7	11.2	4.5	7.6	0.8	1.7

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: CMN
Date: 3/7/2017
Checked by: VAS

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
PRELIMINARY/FINAL DRAINAGE REPORT
(Basin Routing Summary)

From Area Runoff Coefficient Summary				OVERLAND				PIPE / CHANNEL FLOW				Time of Travel (T_t)	INTENSITY *		TOTAL FLOWS		
DESIGN POINT	CONTRIBUTING BASINS	CA_5	CA_{100}	C_5	Length (ft)	Height (ft)	T_C (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	COMMENTS
1	A, B, R	0.67	0.88	0.83	30	1	2.2	260	2.1%	3.5	1.2	8.4	4.4	7.4	3.0	6.5	AREA INLET
2	E, F	2.13	2.36	0.82	80	2	3.6	760	1.2%	2.2	5.8	7.3	4.6	7.7	9.8	18.3	12' SUMP INLET
2A	C, D, G	0.49	0.64	0.82	20	1	1.3	360	1.9%	2.8	2.2	5.7	5.0	8.4	2.5	5.3	12' AT GRADE INLET
3	C1, H, I, J	1.17	1.31	0.83	20	1	1.3	360	1.9%	2.8	2.2	5.0	5.2	8.7	6.1	11.4	12' AT GRADE INLET
4, 5	K, L, Y	1.39	1.51	0.82	80	2	3.6	760	1.2%	2.2	5.8	9.3	4.2	7.1	5.9	10.7	12' AT GRADE INLET
6	P, Q	1.24	1.61	0.83	50	2	2.2	170	3.5%	3.7	0.8	5.0	5.2	8.7	6.4	13.9	12' AT GRADE INLET
7	M, N, O, Z	2.18	2.37	0.86	80	2	3.2	300 360	1.8% 3.0%	2.4 3.5	2.0 1.7	6.5	4.8	8.0	10.4	19.0	8' SUMP INLET
8	S	0.38	0.42	0.85								5.0	5.2	8.7	2.0	3.6	4' SUMP INLET
9	T	0.16	0.21	0.51								5.0	5.2	8.7	0.8	1.9	AREA INLET
10	U	0.38	0.42	0.83								5.0	5.2	8.7	2.0	3.6	4' SUMP INLET
11	V	0.17	0.22	0.52								5.0	5.2	8.7	0.9	1.9	AREA INLET
12	W	0.39	0.42	0.85								5.0	5.2	8.7	2.0	3.7	4' SUMP INLET
14	PK-2, PR7, PR21, PR22 (POND 1)	10.40	11.07									6.0	4.9	8.2	50.9	91.0	POND 1
15	X, PK-1, OS-1	2.00	3.86									25.0	2.8	4.6	5.5	17.8	60" RCP CULVERT
	Pond 1 Outlet														0.6	11.6	
	Total														6.1	29.4	

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
PRELIMINARY/FINAL DRAINAGE REPORT
(Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	CONTRIBUTING BASINS	CA_5	CA_{100}	C_5	Length (ft)	Height (ft)	T_C (min)	Length (ft)	Slope (%)	Velocity (fps)	T_t (min)	TOTAL (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)	COMMENTS
16	GG, FF	1.43	1.63					60	5.0%	2.0	0.5	11.5	3.9	6.6	*5.6*	*10.7*	12' SUMP INLET
17	HH	0.57	0.62									5.8	4.9	8.3	*2.8*	*5.1*	8' SUMP INLET
18	DD, EE	0.86	0.94					70	1.0%	2.0	0.6	6.2	4.9	8.1	*4.2*	*7.6*	8' SUMP INLET
19	CC, II	0.54	0.62					260	1.0%	2.0	2.2	7.6	4.5	7.6	*2.4*	*4.7*	4' SUMP INLET
20	AA, BB	2.07	2.27									6.6	4.7	8.0	*9.8*	*18.1*	16' SUMP INLET
21	JJ	0.31	0.33									5.0	5.2	8.7	*1.6*	*2.9*	4' SUMP INLET
22	KK1	0.34	0.59									12.3	3.8	6.4	*1.3*	*3.8*	AREA INLET
23	PR 33A (KK2), PR 33B (POND 2)	6.96	8.92									13.0	3.7	6.3	*26.0*	*55.9*	POND 2
24	KK3, OS-2 Pond 2 Outlet Total	1.19	2.30									14.0	3.6	6.1	*4.3* *0.4* *4.7*	*14.0* *8.0* *22.0*	54" RCP CULVERT

Calculated by: CMN
Date: 3/7/2017
Checked by: VAS

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
PRELIMINARY/FINAL DRAINAGE REPORT
(Storm Sewer Routing Summary)

PIPE	Contributing Pipes/Design Points	Equivalent CA_5	Equivalent CA_{100}	Maximum T_C	Intensity*		Flow	
					I_5	I_{100}	Q_5	Q_{100}
1	DP2	1.65	1.36	7.3	4.6	7.7	7.6	10.5
2	DP3	1.14	1.06	5.0	5.2	8.7	5.9	9.2
3	DP2, DP3	2.79	2.42	6.1	4.9	8.2	13.6	19.7
4	DP2A	0.49	0.64	5.7	5.0	8.4	2.5	5.3
5	PIPE 3, PIPE 4	3.28	3.06	6.1	4.9	8.2	16.0	25.0
6	DP1	0.67	0.88	8.4	4.4	7.4	3.0	6.5
7	PIPE 5, PIPE 6	3.96	3.94	7.0	4.7	7.8	18.5	30.8
8	DP5	0.69	0.75	9.3	4.2	7.1	2.9	5.4
9	DP4, DP 5	1.39	1.51	9.3	4.2	7.1	5.9	10.7
10	PIPE 9, DP 12	1.78	1.93	9.3	4.2	7.1	7.5	13.7
11	DP6	1.12	1.05	5.0	5.2	8.7	5.8	9.1
12	DP6, DP7	3.30	3.42	6.5	4.8	8.0	15.8	27.4
13	NOT USED							
14	NOT USED							
15	PIPE 10, PIPE 12	5.08	5.35	6.7	4.7	7.9	24.0	42.5
16	DP 11	0.17	0.22	5.0	5.2	8.7	0.9	1.9

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
PRELIMINARY/FINAL DRAINAGE REPORT
(Storm Sewer Routing Summary)

PIPE	Contributing Pipes/Design Points	Equivalent CA_5	Equivalent CA_{100}	Maximum T_C	Intensity*		Flow	
					I_5	I_{100}	Q_5	Q_{100}
17	PIPE 16, PIPE 15	5.25	5.57	6.7	4.7	7.9	24.8	44.2
18	DPE 10	0.38	0.42	5.0	5.2	8.7	2.0	3.6
19	PIPE 18, PIPE 17	5.63	5.98	6.8	4.7	7.9	26.5	47.3
20	DP 9	0.16	0.21	5.0	5.2	8.7	0.8	1.9
21	PIPE 19, PIPE 20	5.79	6.20	6.9	4.7	7.9	27.1	48.8
22	DP 8	0.38	0.42	5.0	5.2	8.7	2.0	3.6
23	POND 1 OUTFALL						0.6	11.6
24	DP 16	1.43	1.63	11.5	3.9	6.6	5.6	10.7
25	DP 17, PR24	2.00	2.25	11.5	3.9	6.6	7.8	14.8
26	DP 21	0.31	0.33	5.0	5.2	8.7	1.6	2.9
27	DP 18	0.86	0.94	6.2	4.9	8.1	4.2	7.6
28	DP 19	0.54	0.62	7.6	4.5	7.6	2.4	4.7
29	PR 27, PR 28	1.40	1.55	7.6	4.5	7.6	6.4	11.9
30	DP 20	2.07	2.27	6.6	4.7	8.0	9.8	18.1
31	PR 29, PR 30	3.46	3.82	7.6	4.5	7.6	15.8	29.2
32	PR 25, PR 26, PR 31	5.77	6.40	9.0	4.3	7.2	24.7	46.1
33	DP 22	0.34	0.59	12.3	3.8	6.4	1.3	3.8
33A	PR32, PR33	6.11	7.00	10.0	4.1	6.9	25.2	48.5
33B	BASIN KK2	0.85	1.92	13.6	3.7	6.2	3.1	11.8
34	POND 2 OUTFALL						0.4	8.0

* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point
EX - Existing Design Point
FB- Flow By from Design Point
INT- Intercepted Flow from Design Point

Calculated by: CMN
Date: 3/7/2017
Checked by: VAS

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
EXISTING DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)

			STREETS / DEVELOPED			*OVERLAND / DEVELOPED*			*OVERLAND / UNDEVELOPED*			*WEIGHTED*	
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	C_5	C_{100}	**AREA** *(Acres)*	C_5	C_{100}	**AREA** *(Acres)*	C_5	C_{100}	C_5	C_{100}
EX-A	*177964*	4.09	0.38	0.90	0.96	0.00	0.00	0.00	3.71	0.11	0.38	***0.18***	***0.43***
EX-B	*23764*	0.55	0.00	0.90	0.96	0.00	0.00	0.00	0.55	0.11	0.38	***0.11***	***0.38***
EX-C	*597017*	13.71	0.60	0.90	0.96	0.00	0.00	0.00	13.11	0.11	0.38	***0.14***	***0.41***
EX-D	*865987*	19.88	0.00	0.90	0.96	0.00	0.00	0.00	19.88	0.11	0.38	***0.11***	***0.38***
OS-1	*59085*	1.36	0.65	0.90	0.96	0.00	0.00	0.00	0.71	0.11	0.38	***0.49***	***0.66***
OS-2	*87648*	2.01	0.97	0.90	0.96	0.00	0.00	0.00	1.04	0.11	0.38	***0.49***	***0.66***
OS-3	*16302*	0.37	0.18	0.90	0.96	0.00	0.00	0.00	0.19	0.11	0.38	***0.49***	***0.66***

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
EXISTING DRAINAGE CALCULATIONS
(Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Height** *(ft)*	T_C *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
EX-A	4.09	0.18	0.43	0.18	120	3.0	13.4	550	3.2%	1.8	5.1	18.5	3.2	5.4	*2.4*	*9.5*
EX-B	0.55	0.11	0.38	0.11	100	4.0	11.3	115	6.0%	2.4	0.8	12.1	3.8	6.5	*0.2*	*1.3*
EX-C	13.71	0.14	0.41	0.14	130	3.5	14.2	910	4.3%	2.1	7.3	21.5	3.0	5.0	*5.9*	*27.8*
EX-D	19.88	0.11	0.38	0.11	130	4.0	14.1	865	2.7%	1.6	8.8	22.8	2.9	4.9	*6.3*	*36.6*
OS-1	1.36	0.49	0.66	0.49	100	2.0	8.8	490	3.2%	1.8	4.6	13.3	3.7	6.2	*2.4*	*5.5*
OS-2	2.01	0.49	0.66	0.49	100	2.0	8.7	695	1.4%	1.2	9.8	18.5	3.2	5.4	*3.2*	*7.1*
OS-3	0.37	0.49	0.66	0.49	100	4.0	7.0	115	2.6%	1.6	1.2	8.2	4.4	7.4	*0.8*	*1.8*

Calculated by: CMN
Date: 3/8/2017
Checked by: VAS

THE PINES AT FOREST MEADOWS FIL. NOS. 1-6
EXISTING DRAINAGE CALCULATIONS
(Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length (ft)**	**Height (ft)**	**T_C (min)**	**Length (ft)**	**Slope (%)**	**Velocity (fps)**	**T_t (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**	**COMMENTS**
1	**EX-C, OS-1**	2.64	6.45	*Time of Concentration from Basin EX-C*								21.5	3.0	5.0	*7.9*	*32.3*	60" RCP Culvet Under Woodmen Road
2	**EX-D, OS-2**	3.17	8.88	0.13	140	4	14.7	1300	2.0%	1.4	15.3	30.0	2.5	4.2	*7.9*	*37.0*	54" RCP Culvert Under Woodmen Road
3	**EX-A**	0.75	1.77	*Time of Concentration from Basin EX-A*								18.5	3.2	5.4	*2.4*	*9.5*	
4	**EX-B, OS-3**	0.24	0.45	*Time of Concentration from Basin OS-3*								8.2	4.4	7.4	*1.1*	*3.4*	

Calculated by: CMN
Date: 3/8/2017
Checked by: VAS

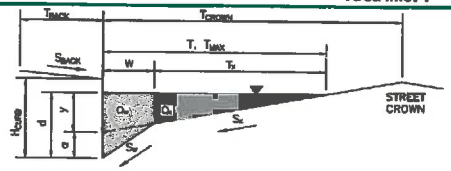
HYDRAULIC CALCULATIONS

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: Area Inlet 1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	12.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	12.00	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} =	0.013	

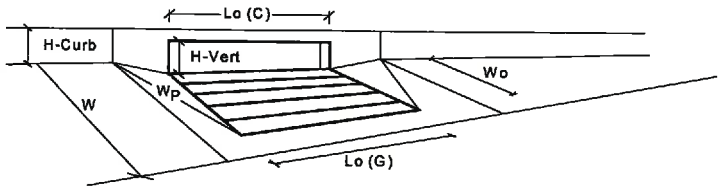
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

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



Design Information (Input)

		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	12.00	12.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	12.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	2.00	2.00	feet
Width of a Unit Grate	W_o =	2.00	2.00	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} =	1.830	1.830	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} =	1.00	1.00	

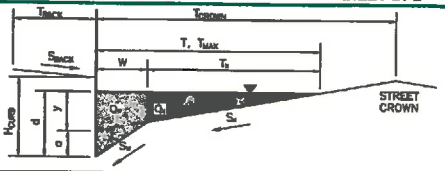
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	10.2	10.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.0	6.5	cfs

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: INLET DP2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_x =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_w =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_o =	0.033	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

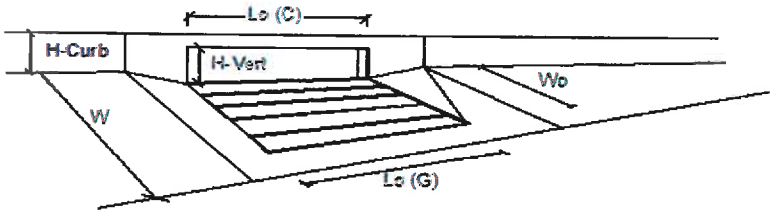
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	13.5	48.7	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



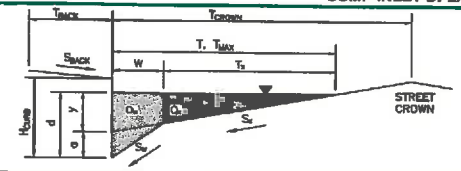
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	12.00	12.00	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 =	7.6	10.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	2.2	7.8	cfs
Capture Percentage = Q_a/Q_o =	C% =	78	57	%

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: SUMP INLET DP2A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_x =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_w =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_o =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.84	2.84	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_o =	0.8	0.8	inches
Gutter Depression (d_o - (W * S_x * 12))	a =	0.63	0.63	inches
Water Depth at Gutter Flowline	d =	3.47	3.47	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	11.0	11.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.205	0.205	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	Q_T =	SUMP	SUMP	cfs
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

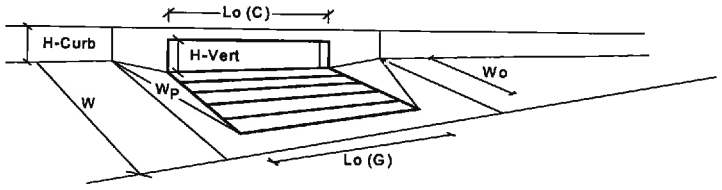
		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	22.4	22.4	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	T_{XTH} =	21.6	21.6	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.105	0.105	
Theoretical Discharge outside the Gutter Section W, carried in Section T_{XTH}	Q_{XTH} =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q_d =	SUMP	SUMP	cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION



Design Information (Input) — Colorado Springs D-10-R

	MINOR	MAJOR	
Type =	Colorado Springs D-10-R		
a_{local} =	4.00	4.00	inches
No =	1	1	
Ponding Depth =	8.0	8.0	inches
	MINOR	MAJOR	☑ Override Depths
L_o (G) =	N/A	N/A	feet
W_o =	N/A	N/A	feet
A_{ratio} =	N/A	N/A	
C_f (G) =	N/A	N/A	
C_w (G) =	N/A	N/A	
C_o (G) =	N/A	N/A	
	MINOR	MAJOR	
L_o (C) =	12.00	12.00	feet
H_{vert} =	8.00	8.00	inches
H_{throat} =	8.00	8.00	inches
Theta =	81.00	81.00	degrees
W_p =	0.83	0.83	feet
C_f (C) =	0.10	0.10	
C_w (C) =	3.60	3.60	
C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)

	MINOR	MAJOR	
d_{Grate} =	N/A	N/A	ft
d_{Curb} =	0.60	0.60	ft
$RF_{Combination}$ =	0.75	0.75	
RF_{Curb} =	0.97	0.97	
RF_{Grate} =	N/A	N/A	

Total Inlet Interception Capacity (assumes clogged condition)

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

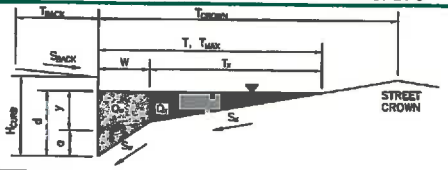
	MINOR	MAJOR	
Q_a =	20.7	20.7	cfs
$Q_{PEAK\ REQUIRED}$ =	5.3	18.1	cfs

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: INLET DP3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_x =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.017	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

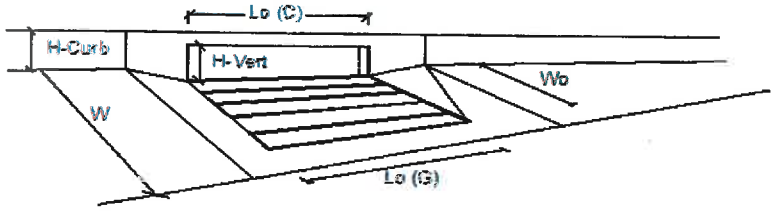
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	9.7	59.1	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



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	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 =	12.00	12.00	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	

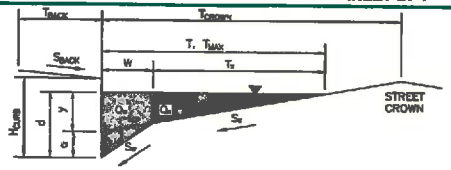
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	5.9	9.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.6	5.0	cfs
Capture Percentage = Q_a/Q_o =	C% =	91	65	%

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: INLET DP4



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

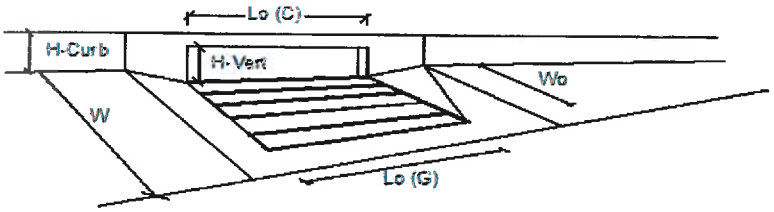
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	8.1	52.2	cfs

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

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

INLET ON A CONTINUOUS GRADE



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	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 =	12.00	12.00	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	

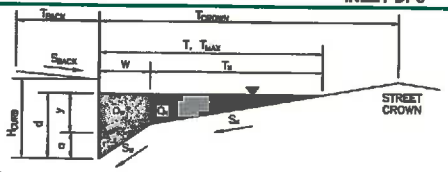
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	5.5	7.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.4	2.8	cfs
Capture Percentage = Q_a/Q_o =	C% =	93	74	%

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: INLET DP5



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

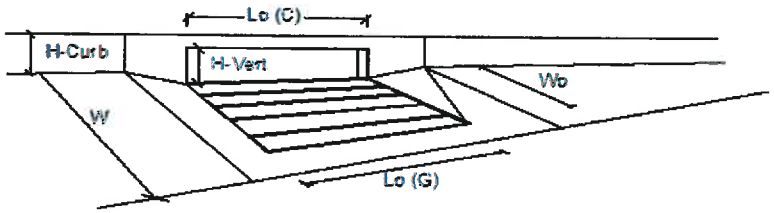
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	8.1	52.2	cfs

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

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

INLET ON A CONTINUOUS GRADE



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	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 =	12.00	12.00	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	

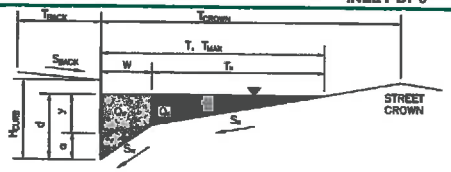
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	5.5	7.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.4	2.8	cfs
Capture Percentage = Q_a/Q_o =	C% =	93	74	%

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: INLET DP6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	14.0	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.0	14.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.4	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

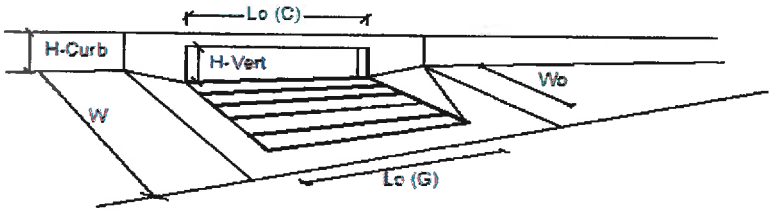
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	8.1	52.2	cfs

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

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

INLET ON A CONTINUOUS GRADE



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	4.0	4.0	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 =	12.00	12.00	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	

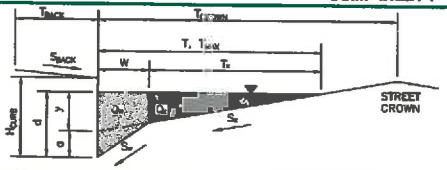
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	Q =	5.8	9.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.6	4.8	cfs
Capture Percentage = Q_a/Q_o =	C% =	91	65	%

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: SUMP INLET 7



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

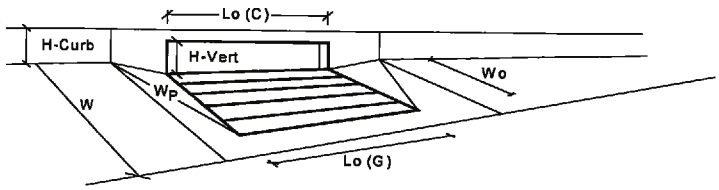
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

MINOR STORM 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



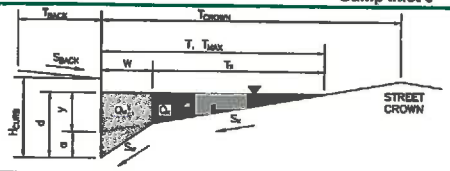
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Colorado Springs D-10-R	Type =	Colorado Springs D-10-R	
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')		a_{local} =	4.00	4.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2
Water Depth at Flowline (outside of local depression)		Ponding Depth =	8.0	8.0 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) =	8.00	8.00 feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00 inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00 inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	0.83	0.83 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} =	0.60	0.60 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.75	0.75
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.89	0.89
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 =	27.1	27.1 cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	11.0	23.8 cfs

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: Sump Inlet 8



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

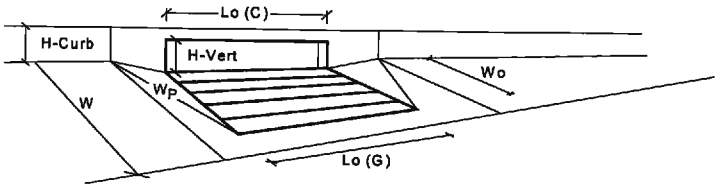
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

MINOR STORM 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



Design Information (Input)

Type of Inlet: Colorado Springs D-10-R

	MINOR	MAJOR	
Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') a_{local} =	4.00	4.00	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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5) Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet) W_p =	0.83	0.83	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} =	0.43	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets $RF_{Combination}$ =	0.85	0.85	
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	

Total Inlet Interception Capacity (assumes clogged condition)

	MINOR	MAJOR	
Q_a =	4.9	4.9	cfs
$Q_{PEAK\ REQUIRED}$ =	2.0	3.6	cfs

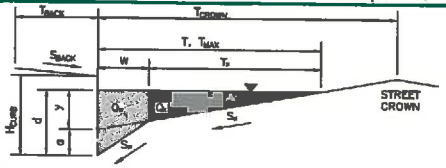
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: Sump Inlet 9



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	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} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	2.83	2.83	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	4.34	4.34	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	9.8	9.8	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.499	0.499	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	Q_T =	SUMP	SUMP	cfs
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

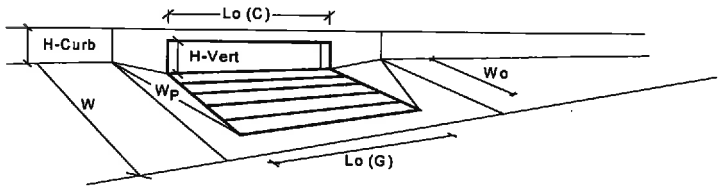
		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	18.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\,TH}$ =	16.7	16.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.318	0.318	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\,TH}$	$Q_{X\,TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d ≥ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	Q_d =	SUMP	SUMP	cfs
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

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

INLET IN A SUMP OR SAG LOCATION



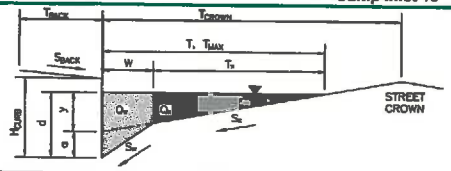
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type C Grate	Type =	CDOT Type C Grate	
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')		a_{local} =	6.00	6.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1
Water Depth at Flowline (outside of 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 =	2.00	2.00 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} =	0.667	0.667 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 =	3.6	3.6 cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.8	1.9 cfs

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: Sump Inlet 10



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

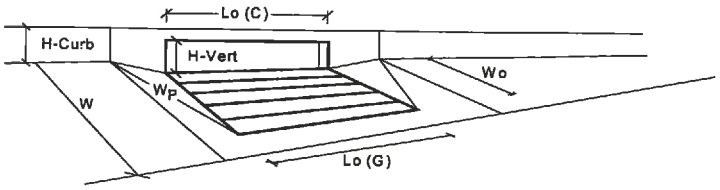
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

MINOR STORM 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



Design Information (Input)

		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	4.00	4.00	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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	0.83	0.83	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} =	0.43	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	0.85	
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	

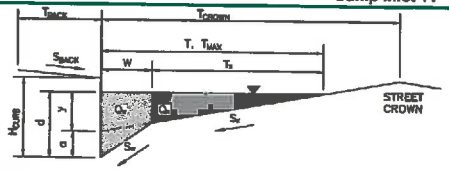
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	4.9	4.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	3.6	cfs

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-3

Inlet ID: Sump Inlet 11



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

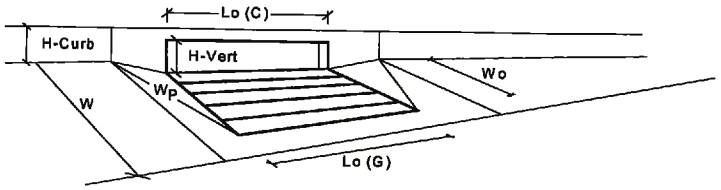
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

MINOR STORM 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



Design Information (Input) — Colorado Springs D-10-R

	MINOR	MAJOR	
Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') a_{local} =	4.00	4.00	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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5) Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet) W_p =	0.83	0.83	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} =	0.43	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets $RF_{Combination}$ =	0.85	0.85	
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	

Total Inlet Interception Capacity (assumes clogged condition)

	MINOR	MAJOR	
Q_a =	4.9	4.9	cfs
$Q_{PEAK\ REQUIRED}$ =	0.9	1.9	cfs

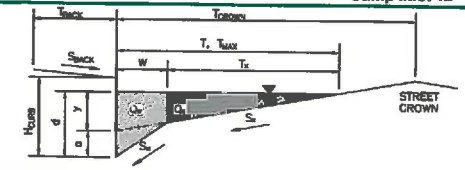
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

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

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

Project: FOREST MEADOWS SOUTH - FILING NOS. 1-6

Inlet ID: Sump Inlet 12



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{EACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{OURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

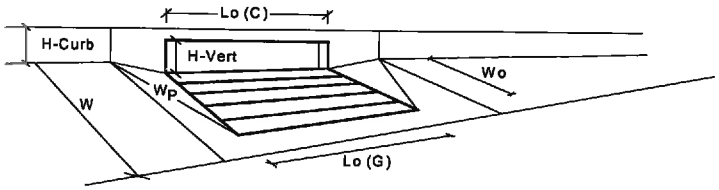
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

MINOR STORM 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



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Colorado Springs D-10-R	Type =	Colorado Springs D-10-R	
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')		a_{local} =	4.00	4.00 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) =	4.00	4.00 feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00 inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00 inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	0.83	0.83 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} =	0.43	0.43 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.85	0.85
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 =	4.9	4.9 cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED}$ =	2.0	3.7 cfs

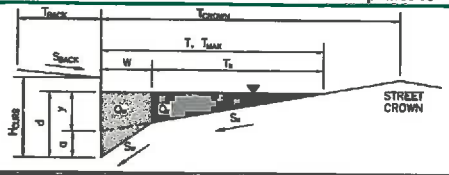
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Sump Inlet 16



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.200	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} =	0.013	

	Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} = 11.8	11.8	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

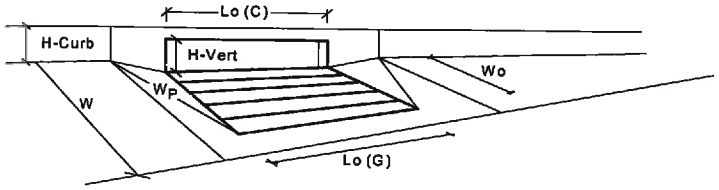
MINOR STORM Allowable Capacity is based on Depth Criterion

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 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	3	3	
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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	0.83	0.83	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} =	0.43	0.43	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} =	0.87	0.87	
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 =	13.8	13.8	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.6	10.7	cfs

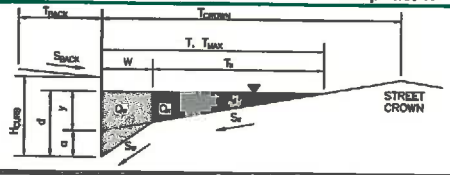
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Sump Inlet 17



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_x =	0.200	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} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

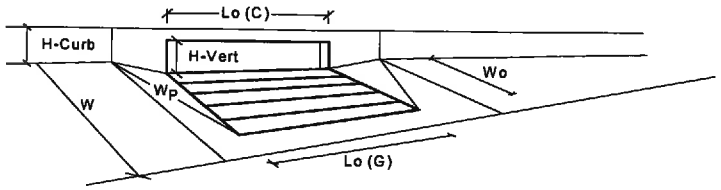
MINOR STORM Allowable Capacity is based on Depth Criterion

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 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	0.83	0.83	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} =	0.43	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	0.61	
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 =	10.5	10.5	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	5.1	cfs

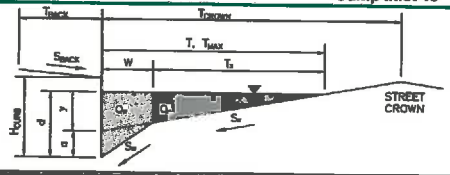
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Sump Inlet 18



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

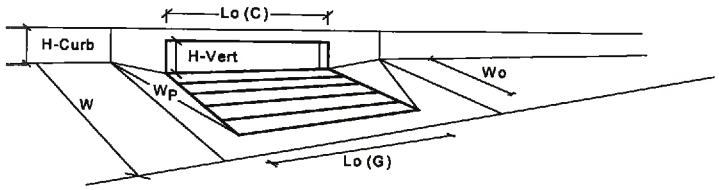
MINOR STORM Allowable Capacity is based on Depth Criterion

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 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Colorado Springs D-10-R	Type =	Colorado Springs D-10-R	
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')		a_{local} =	4.00	4.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	2	2
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) =	4.00	4.00 feet
Height of Vertical Curb Opening in inches		H_{vert} =	8.00	8.00 inches
Height of Curb Orifice Throat in inches		H_{throat} =	8.00	8.00 inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	0.83	0.83 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} =	0.43	0.43 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.61	0.61
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 =	10.5	10.5 cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	4.2	7.6 cfs

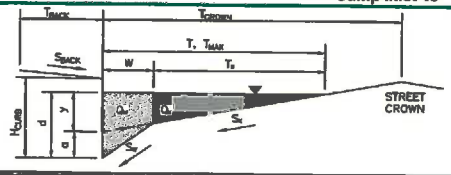
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Sump Inlet 19



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

	Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

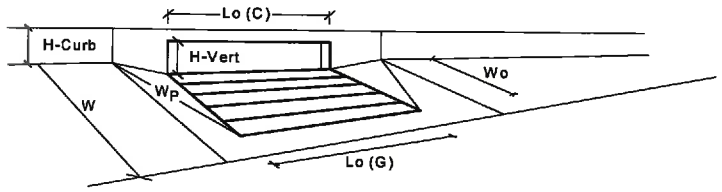
MINOR STORM Allowable Capacity is based on Depth Criterion

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 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	4.00	4.00	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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	0.83	0.83	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} =	0.43	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	0.85	
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 =	4.9	4.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.4	4.7	cfs

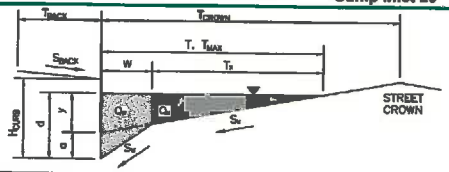
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Sump Inlet 20



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_x =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_w =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_o =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

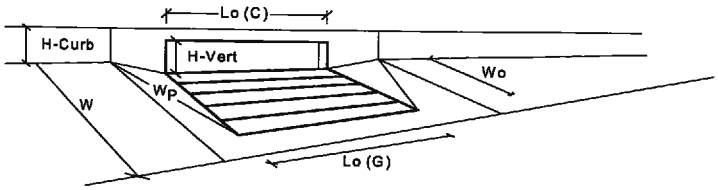
MINOR STORM Allowable Capacity is based on Depth Criterion

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 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Colorado Springs D-10-R	Type =	Colorado Springs D-10-R	
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')		a_{local} =	4.00	4.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	4	4
Water Depth at Flowline (outside of local depression)		Ponding Depth =	7.0	7.0 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) =	4.00	4.00 feet
Height of Vertical Curb Opening in Inches		H_{vert} =	8.00	8.00 inches
Height of Curb Orifice Throat in Inches		H_{throat} =	8.00	8.00 inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	81.00	81.00 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	0.83	0.83 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} =	0.51	0.51 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.66	0.66
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.84	0.84
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 =	**23.6**	**23.6** cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	9.8	18.1 cfs

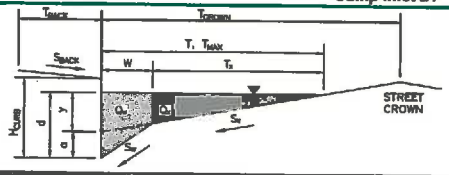
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Sump Inlet 21



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	11.8	ft
Gutter Width	W =	0.83	ft
Street Transverse Slope	S_x =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_w =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_o =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	11.8	11.8	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

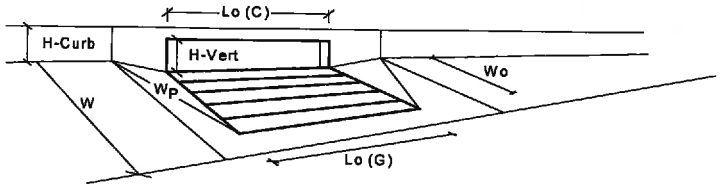
MINOR STORM Allowable Capacity is based on Depth Criterion

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 4.04 Released November 2016



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	4.00	4.00	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) =	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	0.83	0.83	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} =	0.43	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	0.85	
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 =	4.9	4.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.6	2.9	cfs

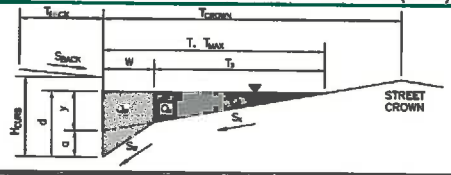
Version 4.04 Released November 2016

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

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

Project: Enter Your Project Name Here

Inlet ID: Area Inlet (DP22)



Gutter Geometry (Enter data in the blue cells)

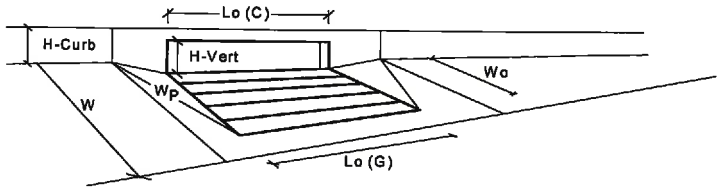
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	12.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	12.00	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} =	0.013	

		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} =	12.0	12.0	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} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.04 Released November 2016



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 'Q-Allow')		a_{local} =	12.00	12.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1
Water Depth at Flowline (outside of local depression)		Ponding Depth =	12.0	12.0 inches
Grate Information			MINOR	MAJOR ☐ Override Depths
Length of a Unit Grate		L_o (G) =	2.00	2.00 feet
Width of a Unit Grate		W_o =	2.00	2.00 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} =	1.830	1.830 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} =	1.00	1.00
			MINOR	MAJOR
Total Inlet Interception Capacity (assumes clogged condition)		Q_a =	10.2	10.2 cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.3	3.8 cfs

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	2.51	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer:	Chase Nemsis
Company:	M&S Civil Consultants
Date:	March 23, 2017
Project:	Pines at Forest Meadows Filings 1, 2, 3, 4, 5, & 6
Location:	North of Woodmen / West of Pond 3

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier:	Pond 1
Receiving Pervious Area Soil Type	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	16.220
Directly Connected Impervious Area (DCIA, acres)	12.080
Unconnected Impervious Area (UIA, acres)	0.000
Receiving Pervious Area (RPA, acres)	4.140
Separate Pervious Area (SPA, acres)	0.000
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	16.220
Directly Connected Impervious Area (DCIA, %)	74.5%
Unconnected Impervious Area (UIA, %)	0.0%
Receiving Pervious Area (RPA, %)	25.5%
Separate Pervious Area (SPA, %)	0.0%
A_R (RPA / UIA)	0.000
I, Check	1.000
f / I for WQCV Event:	3.2
f / I for 10-Year Event:	0.5
f / I for 100-Year Event:	0.4
f / I for Optional User Defined Storm CUHP:	
IRF for WQCV Event:	1.00
IRF for 10-Year Event:	1.00
IRF for 100-Year Event:	1.00
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	74.5%
Effective Imperviousness for WQCV Event:	74.5%
Effective Imperviousness for 10-Year Event:	74.5%
Effective Imperviousness for 100-Year Event:	74.5%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	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%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	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
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	74.5%
Total Site Effective Imperviousness for WQCV Event:	74.5%
Total Site Effective Imperviousness for 10-Year Event:	74.5%
Total Site Effective Imperviousness for 100-Year Event:	74.5%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

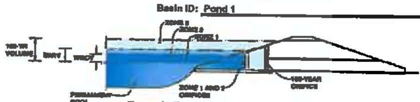
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

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

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	16.22	acres
Watershed Length =	895	ft
Watershed Slope =	0.033	ft/ft
Watershed Imperviousness =	74.60%	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
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	UDFCD Default	
Water Quality Capture Volume (WQCV) =	0.401	acre-feet
Excess Urban Runoff Volume (EURV) =	1.558	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.061	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.374	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.685	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	2.112	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.449	acre-feet
100-yr Runoff Volume (P1 = 2.51 in.) =	2.825	acre-feet
500-yr Runoff Volume (P1 = 3.29 in.) =	3.878	acre-feet
Approximate 2-yr Detention Volume =	1.018	acre-feet
Approximate 5-yr Detention Volume =	1.317	acre-feet
Approximate 10-yr Detention Volume =	1.617	acre-feet
Approximate 25-yr Detention Volume =	1.807	acre-feet
Approximate 50-yr Detention Volume =	1.940	acre-feet
Approximate 100-yr Detention Volume =	2.168	acre-feet

Note: L / W Ratio < 1

L / W Ratio = 0.7

Optional User Input 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.51	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.401	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.157	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.610	acre-feet
Total Detention Basin Volume =	2.168	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)
Micropool	--	0.00	--	--	--	20	0.000	[redacted]	[redacted]
	--	1.00	--	--	--	20	0.000	20	0.000
	--	2.00	--	--	--	7,645	0.173	3,727	0.086
	--	3.00	--	--	--	11,300	0.259	13,225	0.304
	--	4.00	--	--	--	13,834	0.318	25,792	0.592
	--	5.00	--	--	--	16,544	0.380	40,981	0.941
	--	6.00	--	--	--	17,904	0.411	58,205	1.336
	--	7.00	--	--	--	21,933	0.504	78,123	1.793
	--	8.00	--	--	--	24,909	0.572	101,544	2.331
	--	9.00	--	--	--	27,923	0.641	127,960	2.930
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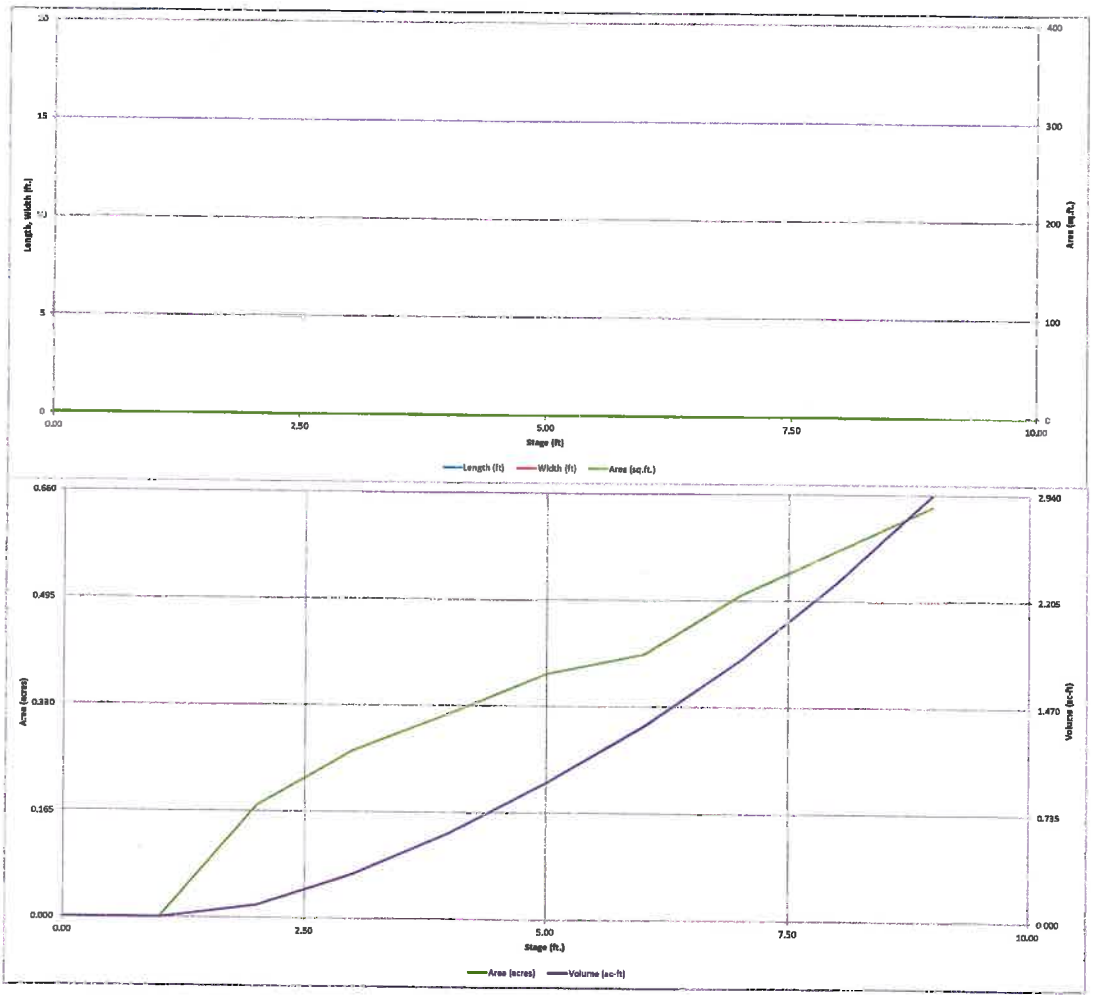
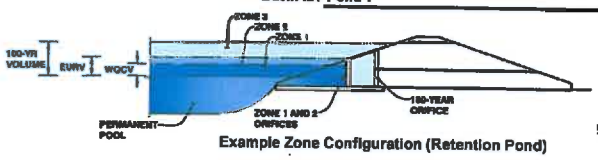
DETENTION BASIN STAGE-STORAGE TABLE BUILDER



Detention Basin Outlet Structure Design

Project: The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.37	0.401	Orifice Plate
Zone 2 (EURV)	6.52	1.157	Orifice Plate
Zone 3 (100-year)	7.71	0.610	Weir&Pipe (Restrict)
		2.168	Total

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 =	6.52	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	25.50	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	2.17	4.35					
Orifice Area (sq. inches)	1.87	1.87	8.25					

	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) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.52	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.91	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 =	7.25	N/A	feet
Over Flow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.13	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	6.30	N/A	ft^2
Overflow Grate Open Area w/ Debris =	3.15	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 =	0.00	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 =	9.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.88	N/A	ft^2
Outlet Orifice Centroid =	0.43	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.57	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	52.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

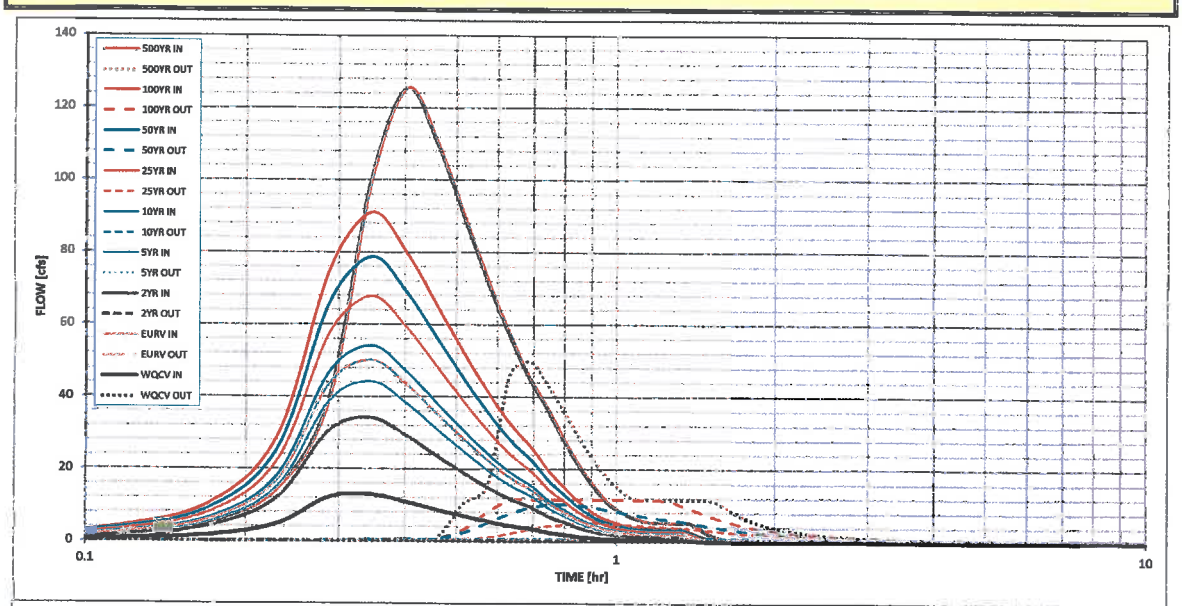
Calculated Parameters for Spillway

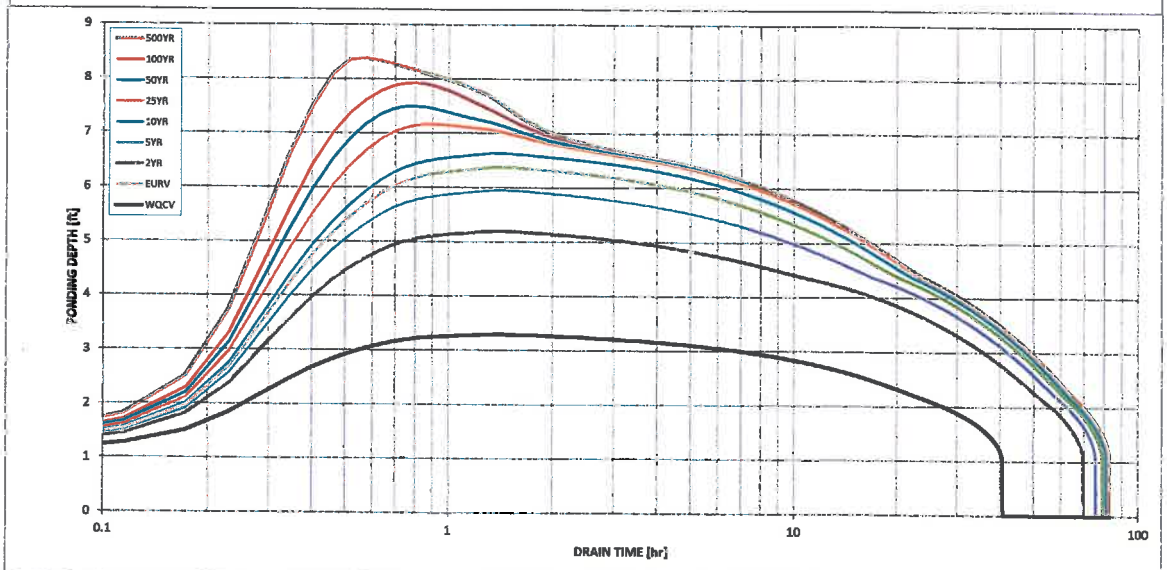
Spillway Design Flow Depth=	0.67	feet
Stage at Top of Freeboard =	9.67	feet
Basin Area at Top of Freeboard =	0.64	acres

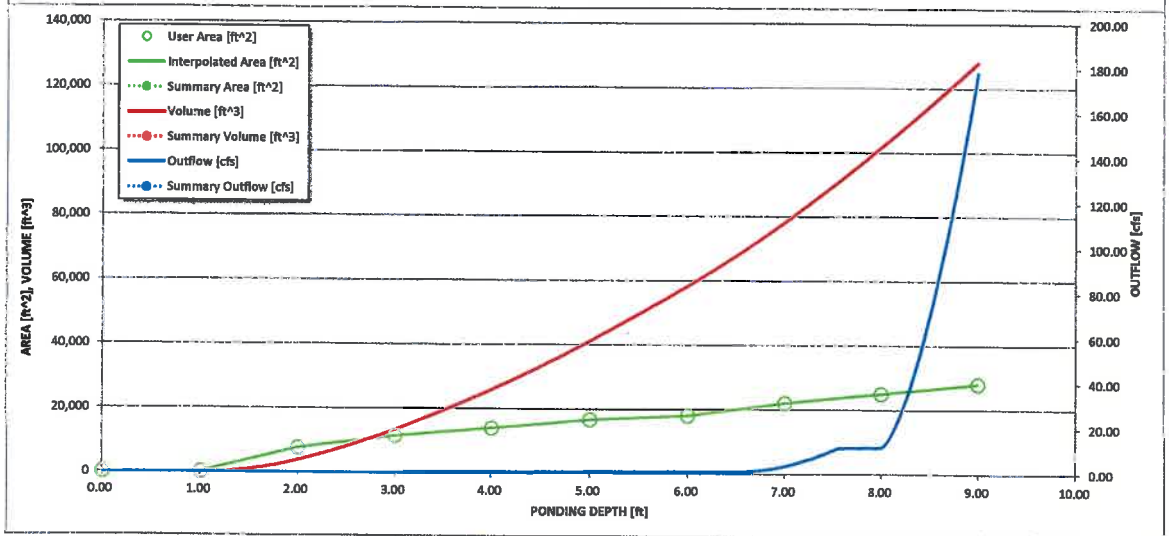
Routed Hydrograph Results

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) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.51	3.29
Calculated Runoff Volume (acre-ft) =	0.401	1.558	1.061	1.374	1.685	2.112	2.449	2.825	3.878
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.401	1.558	1.061	1.373	1.685	2.112	2.449	2.825	3.879
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.24	0.49	0.79	1.43
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.2	0.3	3.8	7.9	12.9	23.2
Peak Inflow Q (cfs) =	12.9	50.0	34.1	44.1	54.1	67.7	78.7	91.0	125.4
Peak Outflow Q (cfs) =	0.2	0.7	0.5	0.6	0.9	5.0	10.3	11.6	49.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.2	2.8	1.3	1.3	0.9	2.1
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.7	1.5	1.7	1.8
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) =	39	72	64	69	73	73	72	70	66
Time to Drain 99% of Inflow Volume (hours) =	40	77	68	74	78	79	79	78	77
Maximum Ponding Depth (ft) =	3.29	6.37	5.20	5.95	6.63	7.16	7.49	7.92	8.38
Area at Maximum Ponding Depth (acres) =	0.28	0.45	0.39	0.41	0.47	0.51	0.54	0.57	0.60
Maximum Volume Stored (acre-ft) =	0.381	1.495	1.014	1.316	1.613	1.870	2.048	2.286	2.553

Detention Basin Outlet Structure Design







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: _____

Storm Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
3.45 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:03:27	0.02	0.08	0.06	0.07	0.09	0.10	0.11	0.13	0.17
Hydrograph Constant	0:06:54	0.73	2.47	1.76	2.21	2.64	3.21	3.63	4.07	5.22
1.450	0:10:21	1.74	6.29	4.39	5.59	6.76	8.33	9.55	10.88	14.49
	0:13:48	4.83	17.24	12.08	15.35	18.53	22.77	26.01	29.55	39.05
	0:17:15	12.13	43.62	30.49	38.79	46.88	57.70	66.02	75.12	99.65
	0:20:42	12.93	50.05	34.14	44.13	54.10	67.74	78.71	90.99	125.39
	0:24:09	10.92	43.35	29.31	38.11	46.95	59.15	68.85	79.75	110.52
	0:27:36	8.77	35.25	23.74	30.95	38.21	48.25	56.19	65.10	90.30
	0:31:03	7.04	28.22	19.02	24.78	30.58	38.60	44.93	52.02	72.10
	0:34:30	5.52	22.27	14.98	19.54	24.14	30.50	35.53	41.17	57.14
	0:37:57	4.38	17.64	11.88	15.49	19.12	24.15	28.11	32.55	45.13
	0:41:24	3.63	14.40	9.74	12.66	15.59	19.62	22.80	26.35	36.41
	0:44:51	2.58	10.50	7.05	9.21	11.39	14.42	16.84	19.57	27.35
	0:48:18	1.95	7.84	5.28	6.88	8.50	10.74	12.50	14.48	20.09
	0:51:45	1.34	5.50	3.68	4.82	5.97	7.57	8.85	10.28	14.37
	0:55:12	0.98	3.96	2.66	3.48	4.30	5.43	6.33	7.33	10.18
	0:58:39	0.76	3.07	2.07	2.69	3.33	4.20	4.89	5.67	7.86
	1:02:06	0.63	2.50	1.68	2.20	2.71	3.42	3.97	4.59	6.35
	1:05:33	0.56	2.21	1.50	1.94	2.38	3.00	3.48	4.02	5.53
	1:09:00	0.54	2.11	1.43	1.86	2.28	2.86	3.32	3.83	5.26
	1:12:27	0.53	2.06	1.40	1.82	2.23	2.79	3.24	3.74	5.13
	1:15:54	0.53	2.06	1.40	1.82	2.23	2.79	3.24	3.74	5.13
	1:19:21	0.53	2.06	1.40	1.82	2.23	2.79	3.24	3.74	5.13
	1:22:48	0.33	1.38	0.92	1.21	1.50	1.91	2.25	2.62	3.71
	1:26:15	0.19	0.81	0.54	0.71	0.88	1.13	1.32	1.53	2.15
	1:29:42	0.11	0.46	0.31	0.41	0.51	0.65	0.76	0.88	1.24
	1:33:09	0.06	0.25	0.17	0.22	0.27	0.35	0.41	0.48	0.67
	1:36:36	0.03	0.12	0.08	0.11	0.13	0.17	0.20	0.24	0.34
	1:40:03	0.01	0.04	0.02	0.03	0.04	0.06	0.07	0.08	0.11
	1:43:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:46:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:50:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:53:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:57:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:00:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:04:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:07:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:11:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:14:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:18:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:21:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:24:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:28:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:31:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:38:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:42:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:49:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:52:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:59:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:02:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:06:18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:09:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:13:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:16:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:23:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:33:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:37:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:47:42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:51:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:54:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:04:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:08:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Weighted Percent Imperviousness of WQ Pond 1				
Contributing Basins	**Area (Acres)**	**C_5**	**Impervious % (I)**	**(Acres)*(I)**
A	0.31	0.08	2	0.63
B	0.63	0.83	92	57.60
C	0.35	0.83	91	32.20
C1	0.29	0.84	93	27.30
D	0.20	0.86	95	19.00
E	1.96	0.82	90	176.00
F	0.72	0.73	79	57.00
G	0.38	0.08	0	0.00
H	0.45	0.84	93	41.70
I	0.32	0.52	54	17.30
J	0.45	0.85	93	42.20
K	0.41	0.84	93	37.98
L	0.70	0.86	96	67.27
M	0.33	0.82	91	29.60
N	0.56	0.87	96	54.15
O	0.73	0.84	93	68.44
P	0.74	0.84	93	68.70
Q	1.60	0.39	38	60.25
R	0.37	0.34	32	11.80
S	0.45	0.85	93	42.40
U	0.46	0.83	91	42.16
V	0.32	0.52	54	17.26
W	0.46	0.85	93	42.77
X	0.15	0.51	53	7.80
Y	0.53	0.82	91	48.00
Z	0.94	0.86	95	89.00
PK-2	1.08	0.25	30	32.47
Totals	**16.22**			**1207.87**
Imperviousness of WQ Pond 1	**74.5**			

Forest Meadows South Filing No. 1-6
DRAINAGE REPORT DRAINAGE CALCULATIONS
(Pond Volume Calculation)

FSD Pond 1

			Storage	
Elevation	SF	CF	AF	Sum
6873.00	0.00			0
6874.00	20.00	10.00	0.00	0.00
6875.00	7,545.00	3,782.50	0.09	0.09
6876.00	11,300.00	9,422.50	0.22	0.30
6877.00	13,834.00	12,567.00	0.29	0.59
6878.00	16,544.00	15,189.00	0.35	0.94
6879.00	17,904.00	17,224.00	0.40	1.34
6880.00	21,933.00	19,918.50	0.46	1.79
6881.00	24,909.00	23,421.00	0.54	2.33
6882.00	27,923.00	26,416.00	0.61	2.94

Total = 127,951 CF

Total = 2.9 Ac-ft

At Elevation 6880.89, the Storage is 2.272 Ac-ft.
#N/A

Calculated by: DLM

Date: 6/21/2016

Checked by:

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	2.51	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer:	Chase Nemsis
Company:	M&S Civil Consultants
Date:	March 23, 2017
Project:	Pines at Forest Meadows Filings 1, 2, 3, 4, 5, & 6
Location:	North of Woodmen / West of Pond 3

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	Pond 2
Receiving Pervious Area Soil Type	Loamy Sand
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	12.880
Directly Connected Impervious Area (DCIA, acres)	7.830
Unconnected Impervious Area (UIA, acres)	0.000
Receiving Pervious Area (RPA, acres)	5.050
Separate Pervious Area (SPA, acres)	0.000
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	12.880
Directly Connected Impervious Area (DCIA, %)	60.8%
Unconnected Impervious Area (UIA, %)	0.0%
Receiving Pervious Area (RPA, %)	39.2%
Separate Pervious Area (SPA, %)	0.0%
A_R (RPA / UIA)	0.000
I_a Check	1.000
f / I for WQCV Event:	3.2
f / I for 10-Year Event:	0.5
f / I for 100-Year Event:	0.4
f / I for Optional User Defined Storm CUHP:	
IRF for WQCV Event:	1.00
IRF for 10-Year Event:	1.00
IRF for 100-Year Event:	1.00
IRF for Optional User Defined Storm CUHP:	
Total Site Imperviousness: I_{total}	60.8%
Effective Imperviousness for WQCV Event:	60.8%
Effective Imperviousness for 10-Year Event:	60.8%
Effective Imperviousness for 100-Year Event:	60.8%
Effective Imperviousness for Optional User Defined Storm CUHP:	

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	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%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	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
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	60.8%
Total Site Effective Imperviousness for WQCV Event:	60.8%
Total Site Effective Imperviousness for 10-Year Event:	60.8%
Total Site Effective Imperviousness for 100-Year Event:	60.8%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

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

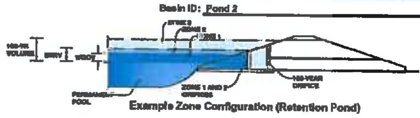
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

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

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6

Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	12.[illegible]	acres
Watershed Length =	[illegible]	ft
Watershed Slope =	0.015	ft/ft
Watershed Imperviousness =	60.80%	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
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	UDFCD Default	
Water Quality Capture Volume (WQCV) =	0.256	acre-feet
Excess Urban Runoff Volume (EURV) =	0.954	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.629	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.829	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.044	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.387	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	1.636	acre-feet
100-yr Runoff Volume (P1 = 2.51 in.) =	1.920	acre-feet
500-yr Runoff Volume (P1 = 3.29 in.) =	2.708	acre-feet
Approximate 2-yr Detention Volume =	0.601	acre-feet
Approximate 5-yr Detention Volume =	0.792	acre-feet
Approximate 10-yr Detention Volume =	0.[illegible]9	acre-feet
Approximate 25-yr Detention Volume =	1.130	acre-feet
Approximate 50-yr Detention Volume =	1.222	acre-feet
Approximate 100-yr Detention Volume =	1.396	acre-feet

Note: L / W Ratio < 1
L / W Ratio = 0.7

Optional User Override 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.51	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.256	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.[illegible]7	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.442	acre-feet
Total Detention Basin Volume =	1.396	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 = 1 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)
Micropool	--	0.00	--	--	--	20	0.000	[illegible]	[illegible]
	--	1.00	--	--	--	20	0.000	20	0.000
	--	2.00	--	--	--	10,544	0.242	5,197	0.119
	--	3.00	--	--	--	13,430	0.308	17,289	0.397
	--	4.00	--	--	--	16,003	0.367	32,005	0.735
	--	5.00	--	--	--	19,191	0.441	49,602	1.139
	--	6.00	--	--	--	21,993	0.505	70,194	1.611
	--	7.00	--	--	--	24,909	0.572	93,645	2.150
	--	8.00	--	--	--	27,891	0.640	120,045	2.756
	--	9.00	--	--	--	30,[illegible]	0.711	149,485	3.432
	--		--	--	--				
	--		--	--	--				
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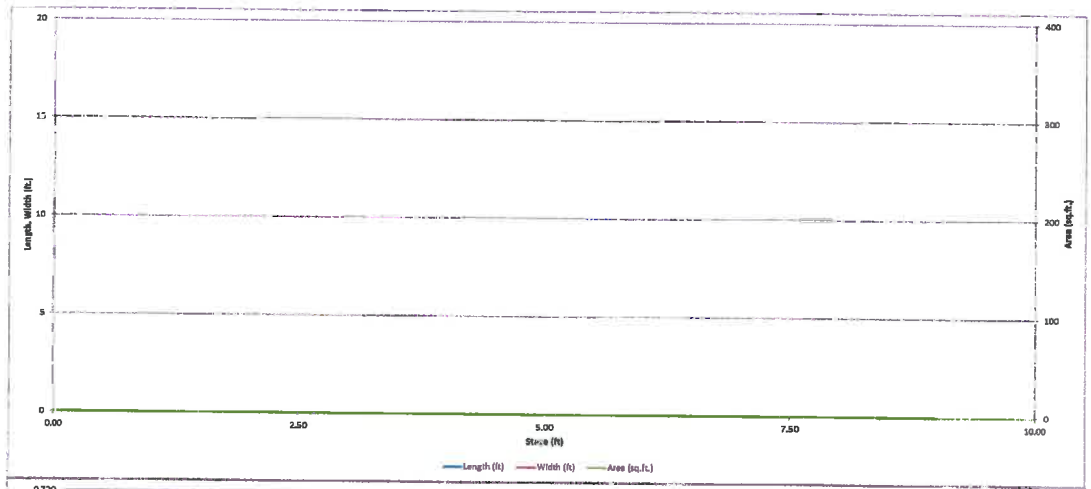
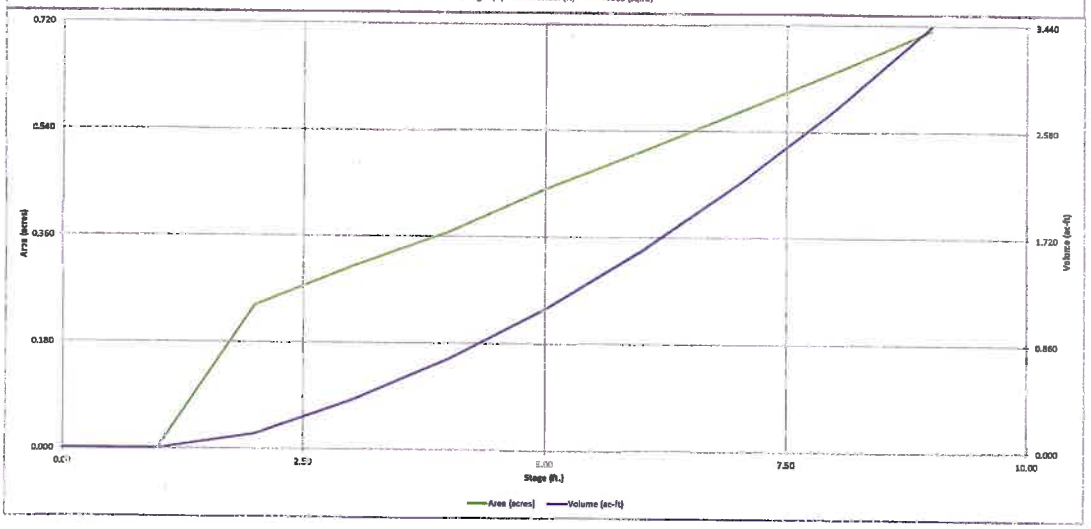
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

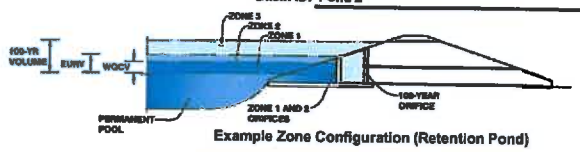




Detention Basin Outlet Structure Design

Project: The Pines at Forest Meadows Filing Nos. 1, 2, 3, 4, 5 & 6

Basin ID: Pond 2



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.256	Orifice Plate
Zone 2 (EURV)	4.57	0.697	Orifice Plate
Zone 3 (100-year)	5.57	0.442	Weir&Pipe (Restrict)
		1.396	Total

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 =	4.57	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	18.00	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	1.50	3.00	4.50				
Orifice Area (sq. inches)	1.20	1.20	6.00	4.00				

	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) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.57	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.91	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 =	5.30	N/A	feet
Over Flow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.15	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	4.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	2.10	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 =	6.60		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.59	N/A	ft^2
Outlet Orifice Centroid =	0.32	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.30	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	19.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

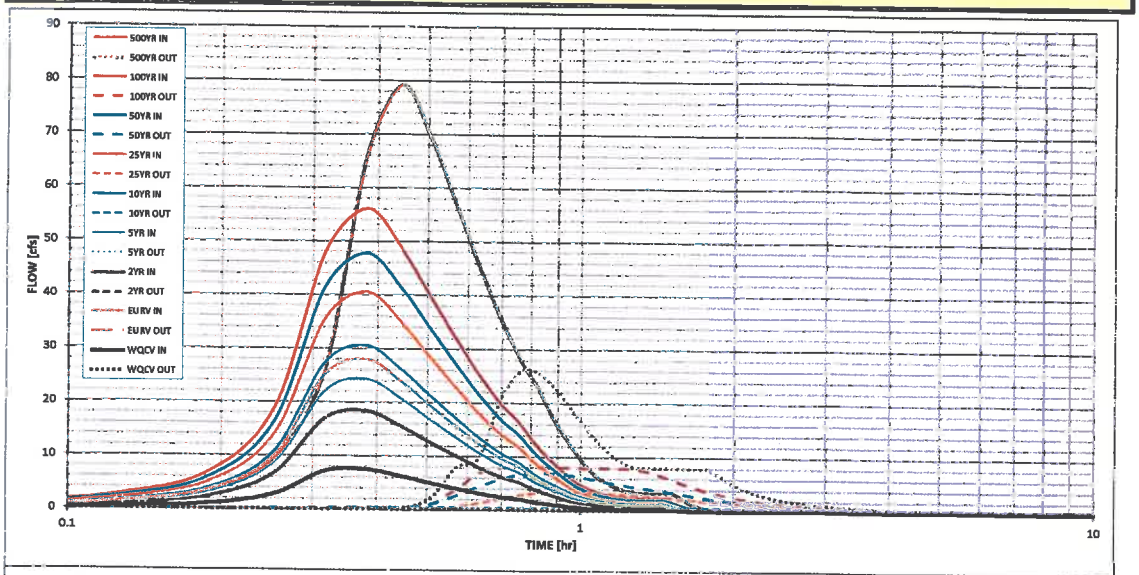
Calculated Parameters for Spillway

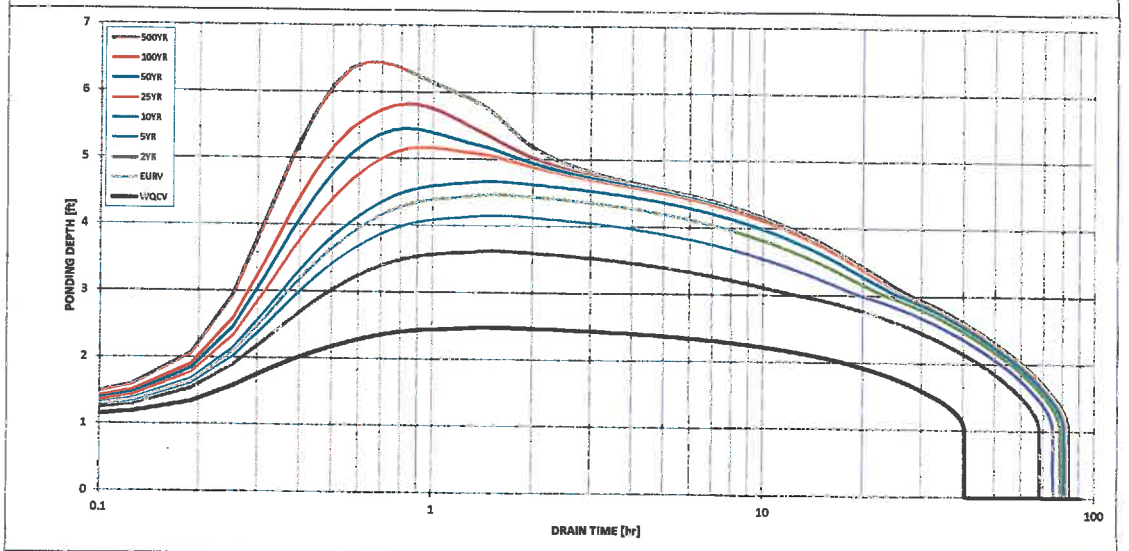
Spillway Design Flow Depth=	0.89	feet
Stage at Top of Freeboard =	7.89	feet
Basin Area at Top of Freeboard =	0.63	acres

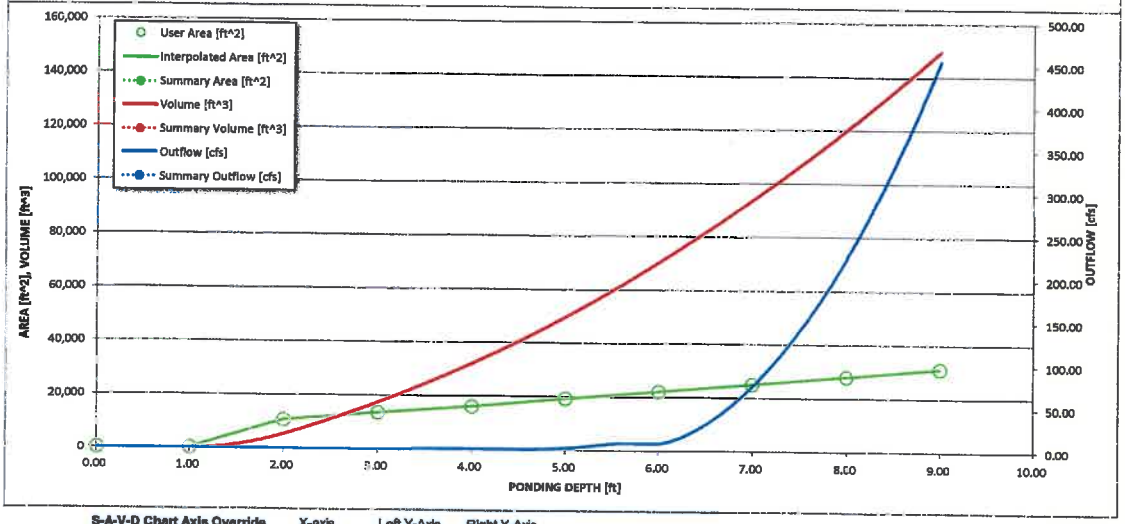
Routed Hydrograph Results

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) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.51	3.29
Calculated Runoff Volume (acre-ft) =	0.256	0.954	0.629	0.829	1.044	1.387	1.635	1.920	2.708
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.256	0.954	0.629	0.829	1.044	1.386	1.635	1.919	2.708
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.20	0.42	0.68	1.23
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.2	2.6	5.4	8.7	15.9
Peak Inflow Q (cfs) =	7.5	27.9	18.4	24.2	30.5	40.5	47.7	55.9	79.1
Peak Outflow Q (cfs) =	0.1	0.4	0.3	0.4	0.6	3.5	6.9	8.0	25.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.7	2.7	1.4	1.3	0.9	1.6
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.7	1.5	1.7	1.8
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) =	38	72	63	69	73	73	71	70	67
Time to Drain 99% of Inflow Volume (hours) =	40	77	66	73	79	79	79	78	77
Maximum Ponding Depth (ft) =	2.47	4.46	3.62	4.15	4.67	5.16	5.45	5.81	6.43
Area at Maximum Ponding Depth (acres) =	0.27	0.40	0.34	0.38	0.42	0.45	0.47	0.49	0.53
Maximum Volume Stored (acre-ft) =	0.243	0.911	0.599	0.791	0.993	1.210	1.339	1.517	1.835

Detention Basin Outlet Structure Design







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: _____

Storm Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
3.80 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:03:48	0.01	0.05	0.03	0.04	0.05	0.07	0.08	0.09	0.12
Hydrograph Constant	0:07:36	0.43	1.45	1.00	1.28	1.58	2.03	2.34	2.69	3.57
1.316	0:11:24	1.02	3.61	2.43	3.16	3.93	5.12	5.97	6.93	9.51
	0:15:12	2.84	9.93	6.71	8.71	10.80	14.06	16.37	18.95	25.84
	0:19:00	7.13	25.05	16.91	21.95	27.27	35.54	41.42	48.00	65.66
	0:22:48	7.51	27.88	18.42	24.24	30.50	40.46	47.69	55.92	79.15
	0:26:36	6.32	23.88	15.65	20.71	26.18	34.95	41.35	48.70	69.33
	0:30:24	5.06	19.33	12.62	16.73	21.20	28.38	33.65	39.69	56.58
	0:34:12	4.06	15.49	10.12	13.41	16.99	22.73	26.93	31.76	45.23
	0:38:00	3.18	12.19	7.95	10.55	13.38	17.93	21.26	25.08	35.78
	0:41:48	2.51	9.65	6.30	8.36	10.60	14.20	15.84	19.86	28.30
	0:45:36	2.10	7.94	5.21	6.89	8.70	11.61	13.73	16.16	22.92
	0:49:24	1.48	5.75	3.75	4.95	6.29	8.45	10.03	11.85	17.00
	0:53:12	1.12	4.29	2.80	3.72	4.71	6.31	7.48	8.83	12.59
	0:57:00	0.77	2.99	1.94	2.58	3.29	4.42	5.26	6.22	8.93
	1:00:48	0.56	2.17	1.41	1.88	2.38	3.19	3.78	4.47	6.37
	1:04:36	0.44	1.68	1.10	1.45	1.84	2.47	2.93	3.46	4.93
	1:08:24	0.36	1.38	0.90	1.20	1.51	2.02	2.39	2.81	3.99
	1:12:12	0.33	1.22	0.80	1.06	1.34	1.78	2.10	2.47	3.50
	1:16:00	0.31	1.17	0.77	1.01	1.28	1.70	2.01	2.36	3.33
	1:19:48	0.31	1.14	0.75	0.99	1.25	1.66	1.96	2.30	3.25
	1:23:36	0.31	1.14	0.75	0.99	1.25	1.66	1.96	2.30	3.25
	1:27:24	0.31	1.14	0.75	0.99	1.25	1.66	1.96	2.30	3.25
	1:31:12	0.19	0.75	0.48	0.64	0.82	1.11	1.32	1.57	2.28
	1:35:00	0.11	0.44	0.28	0.38	0.48	0.65	0.78	0.92	1.33
	1:38:48	0.06	0.25	0.16	0.21	0.27	0.37	0.44	0.53	0.77
	1:42:36	0.03	0.14	0.09	0.12	0.15	0.20	0.24	0.29	0.41
	1:46:24	0.02	0.06	0.04	0.06	0.07	0.10	0.12	0.14	0.21
	1:50:12	0.00	0.02	0.01	0.02	0.02	0.03	0.04	0.05	0.07
	1:54:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:57:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:01:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:05:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:09:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:13:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:16:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:20:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:24:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:28:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:32:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:39:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:43:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:47:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:51:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:54:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:58:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:02:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:06:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:13:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:17:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:21:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:29:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:36:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:48:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:51:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:59:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:03:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:07:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:14:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:18:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:26:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:29:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:33:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Weighted Percent Imperviousness of WQ Pond 2				
Contributing Basins	***Area (Acres)***	C_5	***Impervious % (I)***	***(Acres)*(I)***
AA	1.49	0.82	95	141.92
BB	1.02	0.82	95	96.95
CC	0.30	0.75	90	27.35
DD	0.37	0.85	97	36.22
EE	0.64	0.85	97	62.30
FF	1.19	0.65	84	100.17
GG	0.76	0.86	97	73.76
HH	0.68	0.84	97	65.49
II	0.45	0.69	88	39.64
JJ	0.36	0.87	98	34.85
KK1	1.18	0.29	40	47.07
KK2	4.44	0.19	13	57.69
Totals	***12.88***			***783.41***
Imperviousness of WQ Pond 2	***60.8***			

Forest Meadows South Filing No. 1-6
DRAINAGE REPORT DRAINAGE CALCULATIONS
(Pond Volume Calculation)

FSD Pond 2

Elevation	SF	CF	Storage AF	Storage Sum
6889.00	0.00			0
6890.00	20.00	10.00	0.00	0.00
6891.00	10,544.00	5,282.00	0.12	0.12
6892.00	13,430.00	11,987.00	0.28	0.40
6893.00	16,003.00	14,716.50	0.34	0.73
6894.00	19,191.00	17,597.00	0.40	1.14
6895.00	21,993.00	20,592.00	0.47	1.61
6896.00	24,909.00	23,451.00	0.54	2.15
6897.00	27,891.00	26,400.00	0.61	2.76
6898.00	30,989.00	29,440.00	0.68	3.43

Total = 149,476 CF

Total = 3.4 Ac-ft

#N/A
#N/A

Calculated by: CMN
Date: 2/8/2017
Checked by: VAS

CIVIL CONSULTANTS, INC.

20 BOULDER CRESCENT, STE 110
COLORADO SPRINGS, CO 80903
(719) 955-5485

PROJECT: The Pines At Forest Meadows

DATE: 3/8/17 Sheet 1 of 5

Forebay Volumes for Pond 1

Size of Contributing Area = 16.22 Acres

Min. Forebay Volume = 3% WQCV (UDFC TS EDB-12)

WQCV Pond 1 = 0.379 Acre-ft (UD-Det V3.06)

Total Required Volume = (0.03)(0.379 Acre-ft)$\left(\frac{43560\ CF}{1\ Acre\text{-}ft}\right)$

= 495 CF

Total No. of Forebays = 3 Forebays

Divide Volume based on contributing flow to each forebay.

Q_{100} = (Pipe Run 7) + (Pipe Run 21) + (Pipe Run 22)

= [(30.8) + (48.8) + (3.6)] cfs

= 83.2 cfs

West = 30.8/83.2 = 37%

Middle = 3.6/83.2 = 4%

East = 48.8/83.2 = 59%

Forebay Areas		Maximum Forebay Depth		Dimensions
West	= (0.37)(495 CF)/	1.5 ft	= 122.1 SF	11'x12' = 132 SF
Middle	= (0.04)(495 CF)/	1.0 ft	= 19.8 SF	6'x6' = 36 SF
East	= (0.59)(495 CF)/	1.5 ft	= 194.7 SF	12x17' = 204 SF

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PROJECT: The Pines At Forest Meadows

DATE: 3/8/17 Sheet 2 of 5

Size Notches For The Three Forebays

2% of Contributing 100yr flow

West $Q_{100} = 30.8 \Rightarrow 0.02(30.8) = 0.616$ cfs

Middle $Q_{100} = 3.6 \Rightarrow 0.02(3.6) = 0.072$ cfs

East $Q_{100} = 48.8 \Rightarrow 0.02(48.8) = 0.976$ cfs

Size Notches Using Weir Eqn.

$Q = CLH^{1.5} \Rightarrow L = \frac{Q_{notch}}{CH^{1.5}}$

West Notch

$H = 1.5$ ft

$Q_{notch} = 0.616$ cfs

$L = \frac{0.616}{(3.0)(1.5)^{1.5}}$

$= 0.112\text{ ft}\left(\frac{12\text{ inches}}{1\text{ ft}}\right)$

$L = 1.34"$

Use 1.5" wide

Middle Notch

$H = 1.0$ ft

$Q_{notch} = 0.072$ cfs

$L = \frac{0.072}{(3.0)(1.0)^{1.5}}$

$= 0.024\text{ ft}\left(\frac{12\text{ inches}}{1\text{ ft}}\right)$

$L = 0.28"$

Use Min. of 1" wide or it may clog.

East Notch

$H = 1.5$ ft

$Q_{notch} = 0.976$ cfs

$L = \frac{0.976}{(3.0)(1.5)^{1.5}}$

$= 0.177\text{ ft}\left(\frac{12\text{ inches}}{1\text{ ft}}\right)$

$L = 2.124"$

Use 2.25" Wide

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PROJECT: The Pines at Forest Meadows

DATE: 3/8/17 Sheet 3 of 5

Size Low Flow Trickle Channel

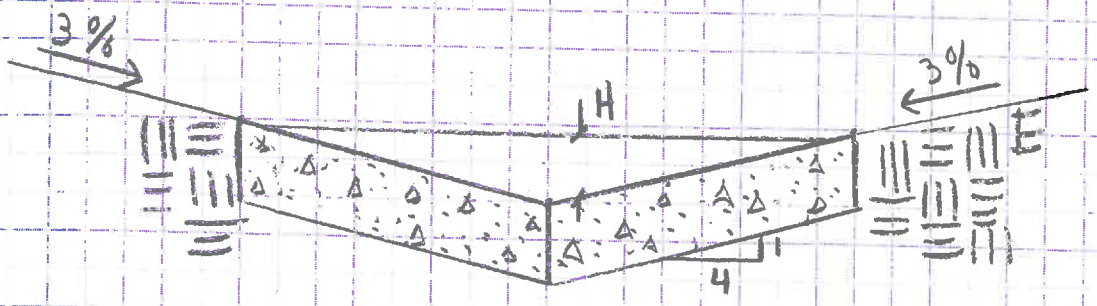
Total Trickle Channel Flow From Forebays

West = 0.616 cfs

Middle = 0.072 cfs

East = 0.976 cfs

Total = 1.66 cfs



Assume 4' wide and 0.5' deep with 0.005 ft/ft longitudinal slope

$Q_{capacity}$ = 3.14 cfs (Flowmaster)

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PROJECT: The Pines At Forest Meadows

DATE: 3/8/17 Sheet 4 of 5

Initial Surcharge Volume

Min. of 0.3% of WQCV and 4" to 12" Deep

$ISV = (0.379 \text{ acre-ft})\left(43560 \frac{ft^2}{Acre}\right)(0.003) = 49.5 \approx 50 \text{ CF Min.}$

Tributary Impervious Area _____ (Acres) = TIA, I = 74.5%, A = 16.22

$TIA = (0.745)(16.22 \text{ Acres}) = 12.1 \text{ Acres}$

Micropool Surface Area

From (SA) determination chart **SA = 55 SF** Figure 1 Depth chart.

$SA \times 12" = (55 ft^2)(1 ft) = 55 \text{ CF}$

To meet minimum of 50 CF a depth of 12" will be used for a micropool with SA = 55

55 CF > 50 CF Min

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PROJECT: The Pines at Forest Meadows

DATE: 3/8/17 Sheet 5 of 5

$Q_{100} = 15.3$ cfs

Eqn. 9-11 (UDFCD Vol. 2 pg 9-68)

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$ where $W = 24"$ conduit $= 2.0$ ft, $Y_t = 0.6$ ft

Eqn 9-12

$$A_t = \frac{Q}{V}, \quad V = 5 \text{ ft/s for non-cohesive} \Rightarrow A_t = \frac{15.3 \text{ ft}^3/\text{s}}{5 \text{ ft/s}} = 3.06 \text{ ft}^2$$

Eqn $\theta = \tan^{-1}\left(\frac{1}{2(\text{Expansion Factor})}\right)$

$$\frac{Q}{D^{2.5}} = \frac{15.3 \text{ cfs}}{(2.0)^{2.5}} = 2.7 \qquad \frac{Y_t}{D} = \frac{0.6}{2.0} = 0.3$$

From Figure 9-35 Expansion Factor (EF) = 3.4

$$\theta = \tan^{-1}\left(\frac{1}{2(3.4)}\right) = 8.37°$$

$$L_p = \left(\frac{1}{2\tan(8.37°)}\right)\left(\frac{3.06 \text{ ft}^2}{0.60 \text{ ft}} - 2.0 \text{ ft}\right) = \boxed{10.5 \text{ ft}}$$

In no case shall L_p be less than 3D. Therefore $3(2.0 \text{ ft}) = 6.0$ ft and 10.5 ft is adequate.

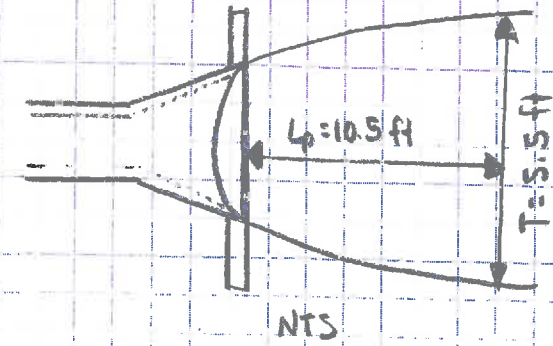
Width of Riprap = T

$T = 2(L_p \tan\theta) + W$

$= 2(10.5\tan(8.37)) + 2.0$

$T = 5.1$ We will use $\boxed{5.5 \text{ ft}}$

Pond 1



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PROJECT: The Pines at Forest Meadows

DATE: 3/7/17 Sheet 1 of 5

Forebay Volumes for Pond 2

Size of Contributing Area = 12.88 Acres

Minimum Forebay Volume = 3% of WQCV (UDFC T5 EDB-12)

WQCV For Pond 2 = 0.243 Acre-ft (UD-Detv3.06)

Total Volume Required = $(0.03)(0.243\ \text{Acre-ft})\left(\frac{43560\ \text{CF}}{1\ \text{Acre-ft}}\right)$

= 318 CF

Total Number of Forebays = 2 Forebays

Divide volume up based on contributing flows to each forebay

Q_{100} = (Pipe Run 33A) + (Pipe Run 33B)

= (48.5 cfs) + (11.8 cfs)

= 60.3 cfs

West Forebay = $\left(\frac{11.8}{60.3}\right)$ = 20%

East Forebay = $\left(\frac{48.3}{60.3}\right)$ = 80%

West Forebay Area = (0.20)(318 CF)

= 63.6 CF / 1.5 ft ← Max Forebay Depth

= 42 SF

Dimensions West

6' x 8' = 48 SF

East Forebay Area = (0.80)(318 CF)

= 254 CF / 1.5 ft ← Max Forebay Depth

= 170 SF

Dimensions East

11' x 16' = 176 SF

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PROJECT: The Pines at Forest Meadows

DATE: 3/7/17 Sheet 2 of 5

Size Notch for West Forebay

2% of Contributing 100 yr flow

$Q_{100} = 15.3$ cfs

$Q_{notch} = (0.02)(15.3\ cfs) = 0.306$ cfs

Size Notch using the Weir Eqn.

$Q = C \times L \times H^{1.5} \Rightarrow L = \frac{Q_{notch}}{C H^{1.5}}$, $H = 1.5$ ft $C = 3.0$

$L = \frac{0.306\ cfs}{(3.0)(1.5)^{1.5}} = 0.056$ ft

$= 0.056\ ft \left(\frac{12\ inches}{1\ ft}\right)$

$= 0.67 \Rightarrow$ Use a minimum of 1" wide or notch will likely just clog.

Size Notch For East Forebay

$Q_{100} = 48.5$ cfs

$Q_{notch} = (0.02)(48.5\ cfs) = 0.97$ cfs

$L = \frac{Q_{notch}}{C H^{1.5}}$, $H = 1.5$ ft $C = 3.0$

$L = \frac{0.97\ cfs}{(3.0)(1.5)^{1.5}} = 0.176$ ft

$= 0.176\ ft \left(\frac{12\ inches}{1\ ft}\right)$

$= 2.11"$

Use 2.25" Notch

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PROJECT: The Pines at Forest Meadows

DATE: 3/7/17 Sheet 3 of 5

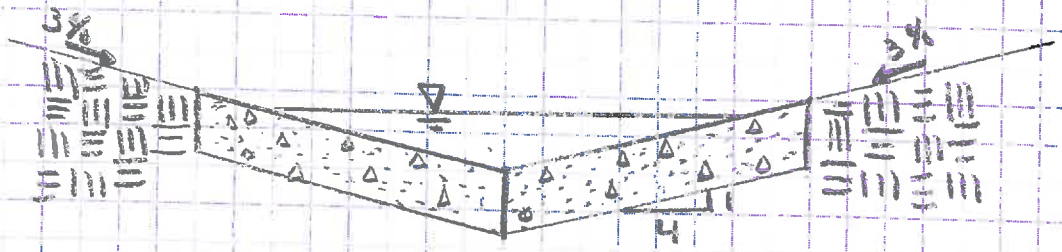
Size Low Flow Trickle Channel

Total Trickle Channel flow from both Forebays

West Forebay = 0.31 cfs

East Forebay = 0.97 cfs

Total = 1.28 cfs



Assume 4' wide and 0.5' deep with 0.005 ft/ft longitudinal slope.

Q capacity = 3.14 cfs (Flowmaster)

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PROJECT: The Pines at Forest Meadows

DATE: 3/7/17 Sheet 4 of 5

Initial Surcharge Volume

Minimum of 0.3% of WQCV and 4" to 12" Deep.

$ISV = (0.243 \text{ ac-ft})\left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right)(0.003) = 31.7 \not\geq 32 \text{ CF min}$

Tributary Impervious Area (Acres) = TIA, I = 60.8 %, A = 12.88

$TIA = (0.608)(12.88) = 7.8 \text{ Acres}$

Micropool Surface Area

From (SA) determination chart [SA = 40 SF] From Figure 1 Determination Chart

$SA \times 12" = (40 \text{ ft}^2)\left(\frac{12}{12} \text{ ft}\right) = 40 \text{ CF}$

[40 CF > 33 CF min]

Initial Surcharge can be 4" to 12" deep. To meet a minimum of 32 CF a depth of 12" will be used for a micropool with SA = 40 SF

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PROJECT: The Pines at Forest Meadows

DATE: 3/7/17 Sheet 5 of 5

Outlet Pad sizing for Pond 2 Outfall Pipe

$Q_{100} = 10$ cfs

Eq. 9-11 (UDFCD Vol. 2 pg. 9-68)

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$

$W = 18"$ conduit $= 1.5$ ft

$Y_t = 0.6$ ft

Eq. 9-12

$$A_t = \frac{Q}{V}, \quad V = 5 \text{ ft/s for non-cohesive} \Rightarrow A_t = \frac{10 \text{ ft}^3/\text{s}}{5 \text{ ft/s}} = 2 \text{ ft}^2$$

Eq. $\theta = \tan^{-1}\left(\frac{1}{2(\text{Expansion Factor})}\right)$

$$\frac{Q}{D^{2.5}} = \frac{10.0}{(1.5)^{2.5}} = 3.63 < 6.0 \qquad \frac{Y_t}{D} = \frac{0.6}{1.5} = 0.4$$

From Figure 9-35 Expansion Factor (EF) = 4

$$\theta = \tan^{-1}\left(\frac{1}{2(4)}\right) = 7.13°$$

$$L_p = \left(\frac{1}{2\tan(7.13°)}\right)\left(\frac{2 \text{ ft}^2}{0.6 \text{ ft}} - 1.5 \text{ ft}\right) = 2.16 \text{ ft},$$

In no case shall L_p be less than 3 D. Therefore $L_p = 3(1.5) = \boxed{4.5 \text{ ft}}$

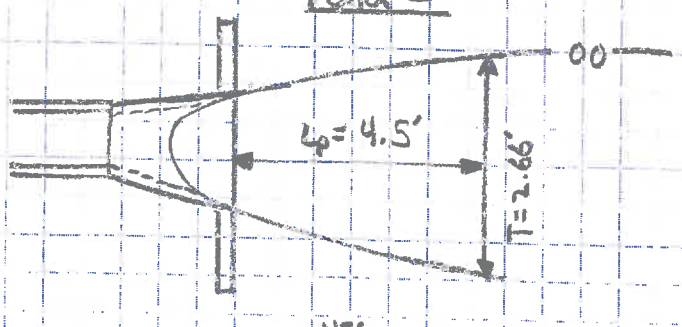
Width of Riprap = T

$$T = 2(L_p \tan\theta) + W$$

$$= 2(4.5 \tan(7.13°)) + 1.5$$

$$T = 2.63 \text{ ft} \approx \boxed{2.66 \text{ ft or } 2' 8"}$$

Pond 2



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PROJECT: The Pines at Forest Meadows

DATE: 3/8/17 sheet 1 of 1

100 yr Spillway Elevation

Pond 1

$Q_{100} = 91.0$ cfs

Length of Spillway = 60 ft

$C = 3.0$

Weir Eqn.

$Q = CLH^{1.5} \Rightarrow H^{3/2} = \frac{Q}{CL}$

$H = \left(\frac{Q}{CL}\right)^{2/3}$

$H = \left(\frac{91.0 \text{ cfs}}{(3.0)(60)}\right)^{2/3} = 0.63$ ft

Pond 1 Emergency Spillway Elev. = 6882.0 ft

Pond 1 100yr Spillway Elev. = 6882.0 + 0.63 = **6882.63 ft**

Pond 2

$Q_{100} = 55.9$ cfs

Length of Spillway = 52 ft

$C = 3.0$

$H = \left(\frac{Q}{CL}\right)^{2/3} = \left(\frac{55.9 \text{ cfs}}{(3.0)(52)}\right)^{2/3}$

$= 0.50$ ft.

Pond 2 Emergency Spillway Elev. = 6896.0

Pond 2 100yr Spillway Elev. = 6896.0 + 0.50 = **6896.50 ft**

Triangular Swale below DP22

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.02500	ft/ft
Left Side Slope	4.00	ft/ft (H:V)
Right Side Slope	4.00	ft/ft (H:V)
Discharge	3.80	ft^3/s

Results

Normal Depth	0.54	ft
Flow Area	1.18	ft^2
Wetted Perimeter	4.48	ft
Hydraulic Radius	0.26	ft
Top Width	4.35	ft
Critical Depth	0.56	ft
Critical Slope	0.02084	ft/ft
Velocity	3.22	ft/s
Velocity Head	0.16	ft
Specific Energy	0.70	ft
Froude Number	1.09	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.54	ft
Critical Depth	0.56	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.02084	ft/ft

DRAINAGE MAP

MDDP FOR THE PINES AT FOREST MEADOWS FILING NOS. 1-6
EXISTING DRAINAGE MAP

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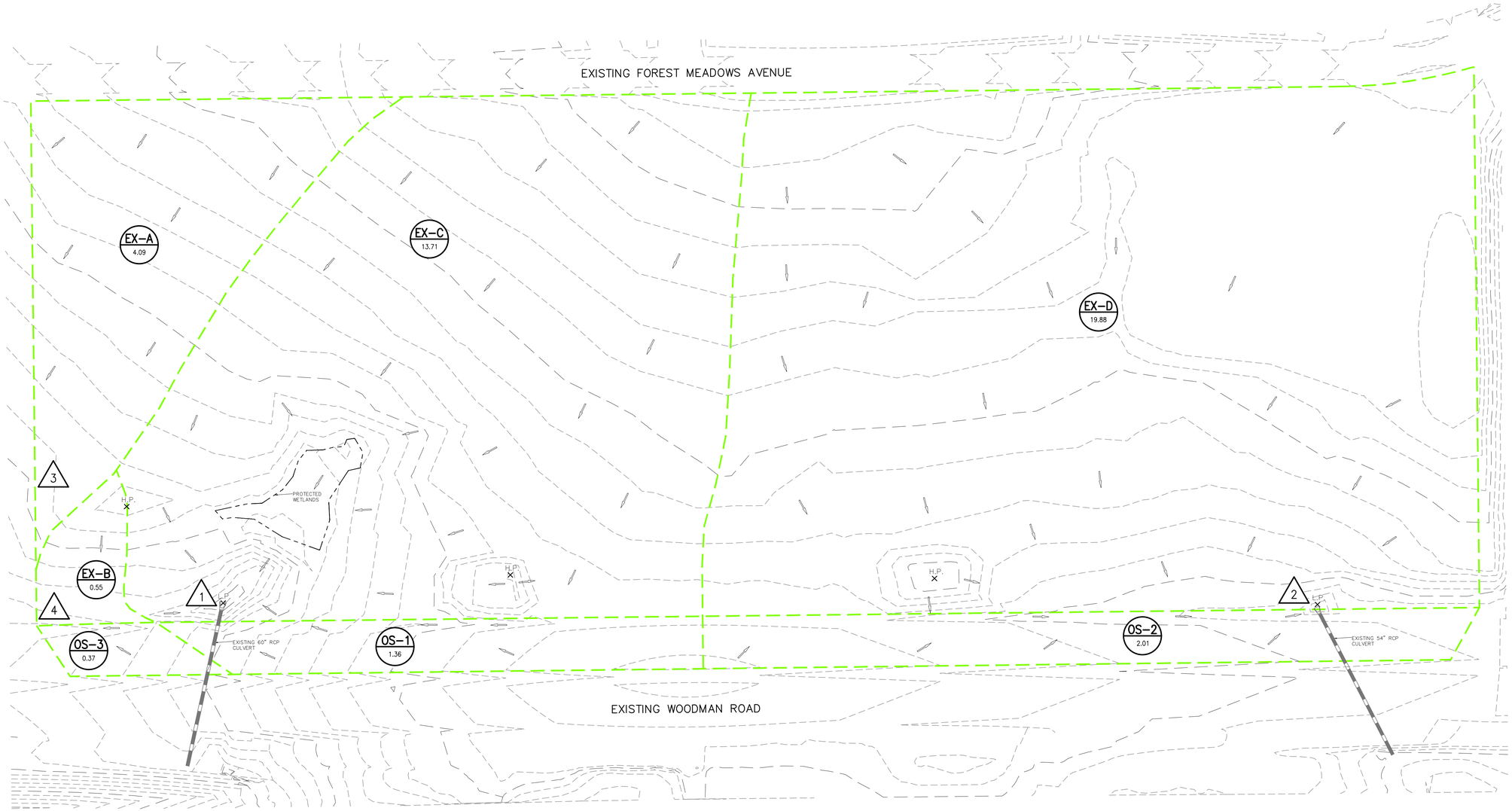

LEGEND

- A / 2.00 — BASIN LABEL / ACREAGE
- 2 — SURFACE DESIGN POINT
- --6920-- — EXISTING CONTOUR
- EXISTING BASIN BOUNDARY
- WETLAND BOUNDARY
- EXISTING STORM SEWER
- EXISTING FLOW DIRECTION ARROW
- H.P. — HIGH POINT
- L.P. — LOW POINT

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
EX-A	4.09	2.4	9.5
EX-B	0.55	0.2	1.3
EX-C	13.71	5.9	27.8
EX-D	19.88	6.3	36.6
OS-1	1.36	2.4	5.5
OS-2	2.01	3.2	7.1
OS-3	0.37	0.8	1.8

EXISTING CONDITIONS AVERAGE (BASINS EX-A TO EX-D)	
Q_5 CFS/ACRE	Q_{100} CFS/ACRE
0.44	2.16
OFFSITE CONDITIONS AVERAGE (BASINS OS-1 TO OS-3)	
Q_5 CFS/ACRE	Q_{100} CFS/ACRE
1.85	4.18

DESIGN POINT SUMMARY			
DESIGN POINT	Q_5	Q_{100}	BASINS
1	7.9	32.3	EX-C, OS-1
2	7.9	37.0	EX-D, OS-2
3	2.4	9.5	EX-A
4	1.1	3.4	EX-B, OS-3

1" = 80'
0 40 80 160
Scale in Feet

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THE PINES AT FOREST MEADOWS-FILS NOS. 1-6
EXISTING DRAINAGE MAP

PROJECT NO. 08-038	SCALE: HORIZONTAL: 1"=80' VERTICAL: N/A	DATE: 3/23/2017	
DESIGNED BY: CN		SHEET 1 OF 1	EDM
DRAWN BY: CN			
CHECKED BY: DM			

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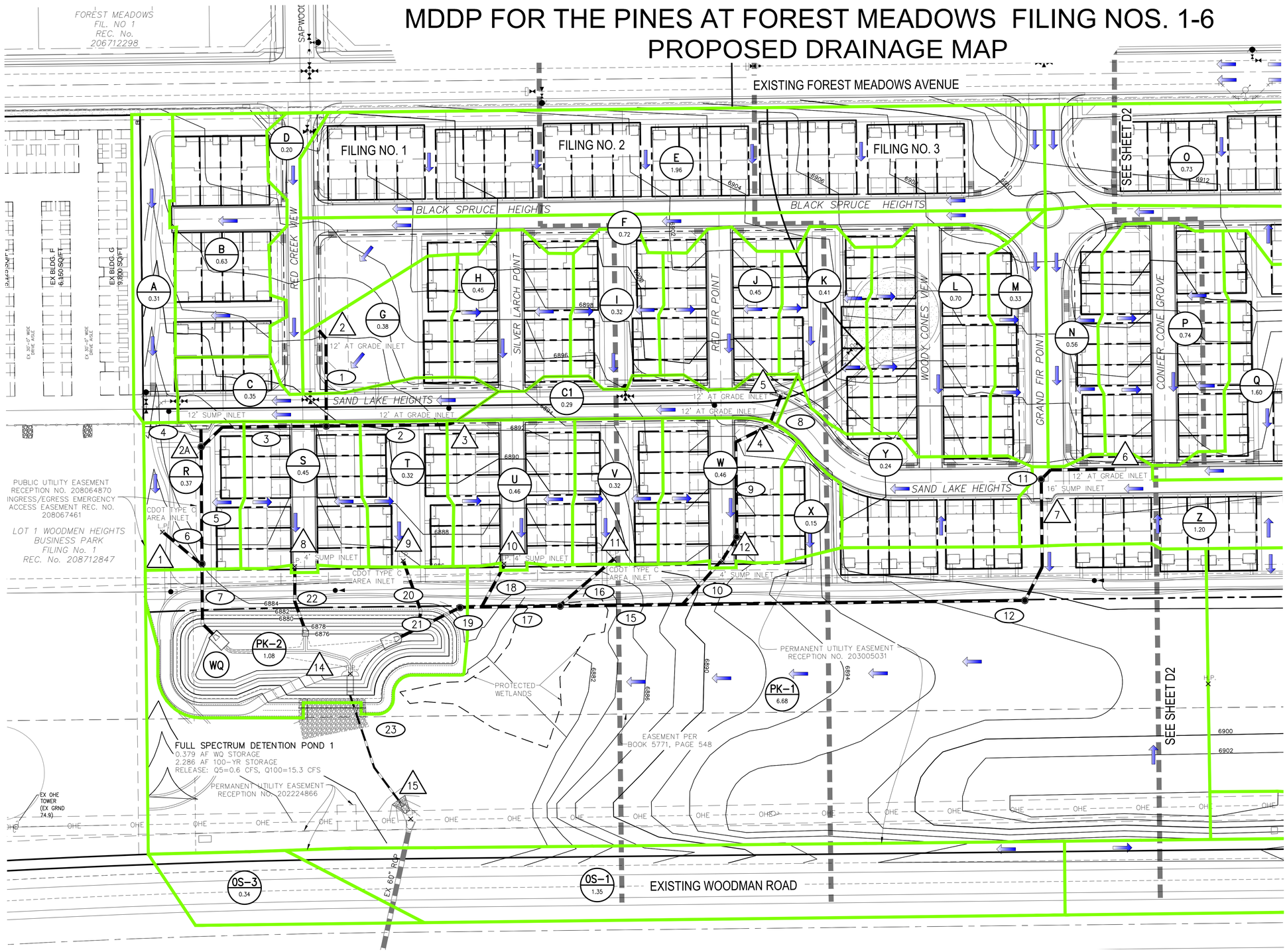
MDDP FOR THE PINES AT FOREST MEADOWS FILING NOS. 1-6
PROPOSED DRAINAGE MAP



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STORM SEWER SUMMARY			
PIPE RUN	Q_5	Q_{100}	PIPE SIZE
1	7.6	10.5	24" RCP
2	5.9	9.2	18" RCP
3	13.6	19.7	36" RCP
4	2.5	5.3	18" RCP
5	16.0	25.0	36" RCP
6	3.0	6.5	18" RCP
7	18.5	30.8	36" RCP
8	2.9	5.4	18" RCP
9	5.9	10.7	18" RCP
10	7.5	13.7	24" RCP
11	5.8	9.1	18" RCP
12	15.8	27.4	18" RCP
13	NOT	USED	
14	NOT	USED	
15	24.0	42.5	36" RCP
16	0.9	1.9	18" RCP
17	24.8	44.2	42" RCP
18	2.0	3.6	18" RCP
19	26.5	47.3	42" RCP
20	0.8	1.9	18" RCP
21	27.1	48.8	42" RCP
22	2.0	3.6	18" RCP
23	0.6	11.6	18" RCP

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A	0.31	0.1	0.8
B	0.63	2.7	5.0
C	0.35	1.5	2.8
C1	0.29	1.3	2.3
D	0.20	0.9	1.6
E	1.96	6.8	12.5
F	0.72	2.4	4.6
G	0.38	0.1	0.7
H	0.45	2.0	3.6
I	0.32	0.8	1.8
J	0.45	2.0	3.6
K	0.41	1.8	3.3
L	0.70	3.1	5.7
M	0.33	1.4	2.6
N	0.56	2.5	4.6
O	0.73	3.2	5.8
P	0.74	3.2	5.9
Q	1.60	2.3	5.7
R	0.37	0.5	1.4
S	0.45	2.0	3.6
T	0.32	0.8	1.9
U	0.46	2.0	3.6
V	0.32	0.9	1.9
W	0.46	2.0	3.7
X	0.15	0.4	0.9
Y	0.53	2.3	4.2
Z	0.94	3.6	6.5
PK-1	6.68	3.1	11.9
PK-2	1.08	1.3	4.2
OS-1	1.35	2.5	5.7
OS-3	0.34	0.8	1.7

DESIGN POINT SUMMARY			
DESIGN POINT	Q_5	Q_{100}	STRUCTURE
1	3.0	6.5	AREA INLET
2	9.8	18.3	12' SUMP INLET
2A	2.5	5.3	12' AT GRADE INLET
3	6.1	11.4	12' AT GRADE INLET
4, 5	5.9	10.7	12' AT GRADE INLET
6	6.4	13.9	12' AT GRADE INLET
7	10.4	19.0	16' SUMP INLET
8	2.0	3.6	4' SUMP INLET
9	0.8	1.9	AREA INLET
10	2.0	3.6	4' SUMP INLET
11	0.9	1.9	AREA INLET
12	2.0	3.7	4' SUMP INLET
14	50.9	91.0	TOTAL POND 1 INFLOW
15	6.1	29.4	60" RCP CULVERT

1" = 50'
0 25 50 100
Scale in Feet

LEGEND

- A / 2.00 — BASIN LABEL / ACREAGE
- 1 — PIPE DESIGN POINT
- 2 — SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- LOT LINE
- WETLAND BOUNDARY
- FILING BOUNDARY
- 6920 — EXISTING CONTOUR
- 6920 — PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- WQ — WATER QUALITY FEATURE/FACILITY
- H.P. — HIGH POINT
- L.P. — LOW POINT

NOTE: ALL STORM AND DRAINAGE STRUCTURES ARE PRIVATE AND ARE TO BE PRIVATELY MAINTAINED

FSD WQCV POND 1 SUMMARY
WQCV EL = 6876.29
WQCV VOLUME = 0.381 AC-FT
EURV EL = 6879.37
EURV VOLUME = 1.495 AC-FT
100 YR VOLUME = 2.286 AC-FT
100 YR INFLOW = 91.0 CFS
100 YR WSE = 6880.92
EMERGENCY SPILLWAY ELEV = 6882.0
100 YR SPILLWAY ELEV =6882.63

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THE PINES AT FOREST MEADOWS-FILS NOS. 1-6

PROPOSED DRAINAGE MAP

PROJECT NO. 08-038	SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A	DATE: 3/23/2017	
DESIGNED BY: VAS		SHEET 1 OF 2	PDM
DRAWN BY: CN			
CHECKED BY: DM			

File: Q:\08038A\WHBP-Brown\dwg\Eng Exhibits\PDP\Brown Filing 1 Drainage Map SHEET 1.dwg Plotstamp: 3/23/2017 1:56 PM

MDDP FOR THE PINES AT FOREST MEADOWS FILING NOS. 1-6
PROPOSED DRAINAGE MAP

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
FOR BURIED UTILITY INFORMATION
48 HRS BEFORE YOU DIG
CALL 1-800-922-1987

STORM SEWER SUMMARY			
PIPE RUN	Q_5	Q_{100}	PIPE SIZE
24	5.6	10.7	24" RCP
25	7.8	14.8	24" RCP
26	1.6	2.9	18" RCP
27	4.2	7.6	18" RCP
28	2.4	4.7	18" RCP
29	6.4	11.9	24" RCP
30	9.8	18.1	36" RCP
31	15.8	29.2	36" RCP
32	24.7	46.1	36" RCP
33	1.3	3.8	18" RCP
33A	25.2	48.5	48" RCP
33B	3.1	11.8	24" RCP
34	0.4	0.8	18" RCP

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
N	0.56	2.5	4.6
O	0.73	3.2	5.8
P	0.74	3.2	5.9
Q	1.60	2.3	5.7
Z	0.94	3.6	6.5
AA	1.49	5.8	10.6
BB	1.02	4.0	7.3
CC	0.30	1.1	2.2
DD	0.37	1.6	3.0
EE	0.64	2.7	5.0
FF	1.19	3.3	6.6
GG	0.76	3.4	6.1
HH	0.68	2.8	5.1
II	0.45	1.6	3.1
JJ	0.36	1.6	2.9
KK1	1.18	1.3	3.8
KK2	4.44	3.1	11.8
KK3	2.83	1.1	7.7
OS-2	2.05	3.4	7.8

DESIGN POINT SUMMARY			
DESIGN POINT	Q_5	Q_{100}	STRUCTURE
7	10.4	19.0	16' SUMP INLET
16	5.6	10.7	12' SUMP INLET
17	2.8	5.1	8' SUMP INLET
18	4.2	7.6	8' SUMP INLET
19	2.4	4.7	4' SUMP INLET
20	9.8	18.1	16' SUMP INLET
21	1.6	2.9	4' SUMP INLET
22	1.3	3.8	AREA INLET
23	26.0	55.9	TOTAL POND 2 INFLOW
24	4.7	22.0	54" RCP CULVERT

LEGEND

- BASIN LABEL / ACREAGE
- PIPE DESIGN POINT
- SURFACE DESIGN POINT
- FLOW DIRECTION
- BASIN BOUNDARY
- LOT LINE
- FILING BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- STORM SEWER PIPE
- CROSSPAN
- INLET
- WATER QUALITY FEATURE/FACILITY
- HIGH POINT
- LOW POINT

NOTE: ALL STORM AND DRAINAGE STRUCTURES ARE PRIVATE AND ARE TO BE PRIVATELY MAINTAINED

FSD WQCV POND 2 SUMMARY

WQCV EL = 6891.47
WQCV VOLUME = 0.243 AC-FT
EURV EL = 6893.46
EURV VOLUME = 0.911 AC-FT
100 YR VOLUME = 1.517 AC-FT
100 YR INFLOW = 55.9 CFS
100 YR WSE = 6894.81
EMERGENCY SPILLWAY ELEV = 6896.00
100 YR SPILLWAY ELEV =6896.50

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

THE PINES AT FOREST MEADOWS-FILS NOS. 1-6
PROPOSED DRAINAGE MAP

PROJECT NO. 08-038
DESIGNED BY: VAS
DRAWN BY: CMN
CHECKED BY: VAS
SCALE: HORIZONTAL: 1"=50' VERTICAL: N/A
DATE: 3/23/2017
SHEET 2 OF 2
PDM

File: O:\08038A\WHBP-Brown\dwg\Eng Exhibits\FDP\Brown Filing 1 Drainage Map SHEET 2 (East).dwg Plotstamp: 3/23/2017 1:41 PM