FINAL DRAINAGE REPORT
FOR
URBAN LANDING
FILING NO. 1

December 2024

Prepared for:
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Job No. 1308.01
PCD File No. SFXXX

FINAL DRAINAGE REPORT FOR
URBAN LANDING FILING NO. 1

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

_____ _____

Marc A. Whorton Colorado P.E. #37155 Date

OWNER'S/DEVELOPER'S STATEMENT:
I, the owner/developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: CLASSIC COMPANIES

By: _____

Title: _____

Address: 2138 Flying Horse Club Drive

Colorado Springs, CO 80921

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

_____ _____

Joshua Palmer, P.E. Date
County Engineer / ECM Administrator

Conditions:

CLASSIC CONSULTING ENGINEERS & SURVEYORS

FINAL DRAINAGE REPORT FOR
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PURPOSE

The intent of the owner/developer is to develop the Urban Landing Property. The purpose of this Final Drainage Report is to identify all drainage features and facilities and to estimate peak rates of stormwater runoff, from on-site and off-site sources. Also, the purpose is to outline the necessary improvements to safely route developed storm water runoff to adequate outfall facilities. The drainage improvements proposed in this report represent the 'to be constructed' drainage systems and detention pond.

GENERAL DESCRIPTION

Urban Landing Filing No. 1 is 6.57 acres, as located in a portion of section 36, township 11 south, range 67 west of the sixth principal meridian. The site is bounded on the north by Spanish Bit Dr., to the south by existing undeveloped property owned by a church, to the east by an existing rural residential 5-ac. lot and to the west by Struthers Road. The site is within the Jackson Creek drainage basin. The proposed use is single family residential (detached) with a total of 49 units, private roads, open space and detention/SWQ pond. Public roadway access will be from Spanish Bit Dr.

The average soil condition reflects Hydrologic Group "B" (Peyton-Pring complex, Pring coarse sandy loam and a small portion of Brussett loam) as determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

This property is located in the Jackson Creek drainage basin. Existing conditions across this property are mainly native grasses and yucca with a natural ravine traversing the site draining from northeast to southwest. Existing slopes range from 2% to 12% across the site. The entire property generally drains in a southwesterly direction towards the existing lowpoint on the

property at the southeast corner of Spanish Bit Dr. and Struthers Road. Spanish Bit Dr. is currently constructed as a rural local roadway with sideroad ditches. This public road is paved up to the Big R access to the north and then gravel east of that intersection. Along with the development of the Big R, rip-rap was installed along the north side of the roadway to facilitate drainage along that side of the road down to the intersection with Struthers Road. The Big R development also constructed a detention/SWQ facility on the northeast corner of the intersection. The outfall for this pond is dual 36" RCP culverts under Spanish Bit Dr. that daylight into an informal holding basin that is partially rip-rapped on the proposed development property. These flows are then conveyed westerly under Struthers Road in an existing 6'x4' CBC. Struthers Road to the south of this intersection (approx. 350 LF) drains north towards this intersection. The east side of the roadway drains around the corner into Spanish Bit Dr. and then immediately down a paved rundown into this existing holding basin.

East of this property exists the Chaparral Hills 5-ac. rural residential neighborhood. A significant portion of this off-site development is tributary to the existing natural ravine on the property. This off-site flow enters the property as sheet flow at the northeast corner from Lot 26, Chaparral Hills Subd. This large off-site basin has been accounted for in both the pre-developed and developed drainage calculations.

The following descriptions represent the existing on and off-site basins and design points affecting this property: (Reference the Pre-development Drainage Map in the Appendix)

Design Point E1 (Q_5 = 5 cfs, Q_{100} = 22 cfs) consists of the 12.8-acre off-site tributary area from Basin OS-1. As mentioned earlier, this area is developed as large lot rural residential (5-ac. lots) sheet flowing towards the northeast corner of the property. These off-site flows then enter the property and travel within the natural ravine towards Struthers Road and the existing 6'x4' CBC.

Design Point E2 (Q_5 = 0.5 cfs, Q_{100} = 3.3 cfs) consists of the off-site tributary area from Basin OS-3 (0.49 ac.) and the on-site Basin EX-2 (1.3 ac.). Basin OS-3 is also currently developed as large lot rural residential. These minor off-site flows then enter the property within Basin EX-2 as sheet flow. The combined sheet flows continue to sheet flow off-site into the undeveloped church property within Basin OS-4.

Design Point E3 (Q_5 = 2 cfs, Q_{100} = 8 cfs) consists of the sheet flow from Design Point E2 combining with the sheet flow of Basin OS-4 (2.1 ac.). These sheet flows then enter Struthers Road, travel as C&G flow in a northerly direction towards Spanish Bit Dr. The flows then turn the corner and are conveyed down the paved rundown within the property.

Design Point E4 (Q_5 = 7 cfs, Q_{100} = 31 cfs) consists of the off-site flows described above along with the major portion of the property within Basin EX-1 (5.8 ac.). These flows represent the total combined runoff from both on-site and off-site tributary area across this property except those coming from the existing dual 36" RCP culverts under Spanish Bit Dr.

PROPOSED DRAINAGE CONDITIONS

Development within the proposed subdivision is planned for urban residential with associated curb, gutter, sidewalk and paved private streets. Overlot grading is anticipated for the majority of the development along with installation of urban services provided through the Donala Water and Sanitation District. Proposed impervious areas will sheet flow across yards and landscape areas to slow runoff and increase time of concentration. This will minimize the effects of impervious areas. At design points where developed flows are greater than in the existing condition, detention facilities will be proposed providing an Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume with an outlet control device. Frequent and infrequent inflows are released at rates approximating undeveloped conditions. This concept provides some mitigation of increased runoff volume by releasing a portion of the increased

runoff at a low rate over an extended period of time, up to 72 hours. This means that frequent storms, smaller than the 2-year event, will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainage ways. Also, by incorporating an outlet structure that limits the 100-year runoff to the undeveloped condition rate, the discharge hydrograph for storms between the 2-year and the 100-year event will approximate the hydrograph for the undeveloped conditions and will help effectively mitigate the effects of development. Prior to development within this property, a final drainage report and construction plans will be required detailing the requirements and specifics of proposed facilities.

Due to current drainage criteria, detention/stormwater quality facilities are proposed. The following are design points for developed conditions with descriptions of the individual basin areas and proposed storm systems:

Design Point 1 (Q_5 = 5 cfs, Q_{100} = 23 cfs) consists of off-site sheet flows from Basin OS-1 (12.8 ac.) east of the site and the minor developed flows from Basin A (0.10 ac.). These combined flows will be collected by a proposed private 30" RCP (Pipe Run 1) within a drainage tract maintained by the HOA and routed further downstream.

Design Point 2 (Q_5 = 1.5 cfs, Q_{100} = 3.2 cfs) consists of the minor off-site sheet flows from Basin OS-2A (0.13 ac.) and developed flows from Basin B (0.75 ac.). These combined flows will be collected by a proposed 5' Type R sump inlet within the private roadway. A proposed private 18" RCP (Pipe Run 2) will then route the collected flows downstream towards Design Point 3. **Design Point 3 (Q_5 = 0.6 cfs, Q_{100} = 1.1 cfs)** consists of the minor developed flows from Basin C (0.18 ac.). A proposed 5' Type R sump inlet will collect the flows and then combine with the upstream flows from Design Point 2. A proposed private 18" RCP (Pipe Run 3) will then route the collected flows towards the proposed private 30" RCP within the private roadway tract. Emergency overflow for this sump condition will pond up 12" and then spill around the corner down Spanish Bit Dr. The

combined flows at this point **(Pipe Run 4 - Q_5 = 6 cfs, Q_{100} = 26 cfs)** are then routed via the private 30" RCP storm system further south within the private road.

Design Point 4 (Q_5 = 1.4 cfs, Q_{100} = 4.8 cfs) consists of the off-site sheet flows from Basin OS-2B (1.5 ac.) and developed flows from Basin D2 (0.58 ac.). These combined flows will be collected by a proposed 2'x2' area drain behind the curb with a max. ponding of 18" before spilling into the private road. A proposed private 18" RCP will then route the collected flows towards Design Point 5.

Design Point 5 (Q_5 = 1.3 cfs, Q_{100} = 2.5 cfs) consists of the minor developed flows from Basin D1 (0.55 ac.). These flows will be collected by a proposed 5' Type R sump inlet within the private roadway. The flows combine with the flows collected from Design Point 4 and are routed via a proposed private 24" RCP **(Pipe Run 6 - Q_5 = 2 cfs, Q_{100} = 7 cfs)** towards Design Point 6. These flows are then combined with the upstream collected flows from Pipe Run 4 and routed in a westerly direction in a private 30" RCP **(Pipe Run 7 - Q_5 = 8 cfs, Q_{100} = 31 cfs).**

Design Point 6 (Q_5 = 1.0 cfs, Q_{100} = 2.0 cfs) consists of the minor developed flows from Basin E (0.31 ac.). These flows will be collected by a proposed 5' Type R sump inlet within the private roadway and routed downstream via a private 18" RCP (Pipe Run 8). The flows then combine with the upstream flows and are routed further west via a proposed private 30" RCP **(Pipe Run 9 Q_5 = 9 cfs, Q_{100} = 32 cfs)** towards Design Point 7. Emergency overflow for this sump condition will pond up 8" and then spill around the corner westerly down Urban Landing View.

Design Point 7 (Q_5 = 0.6 cfs, Q_{100} = 1.8 cfs) consists of the developed sheet flows from Basin F (0.60 ac.). These flows will be collected by a proposed 2'x2' area drain within the open space area and routed downstream via a private 18" RCP (Pipe Run 10). The collected flows then combine with the upstream flows and are routed via a proposed private 30" RCP **(Pipe Run 11 - Q_5 = 9 cfs, Q_{100} = 33 cfs)** towards Design Point 8. The emergency overflow for this lowpoint will

pond up a max. 18" and then spill over the sidewalk and head south within the open space tract towards Design Point 8.

Design Point 8 (Q_5 = 1.8 cfs, Q_{100} = 3.5 cfs) consists of the developed flows from Basin H (0.77 ac.). These flows will be collected by a proposed 5' Type R sump inlet within the private roadway. The collected flows then combine with the upstream flows and are then routed via a proposed private 30" RCP **(Pipe Run 13 - Q_5 = 10 cfs, Q_{100} = 35 cfs)** towards the proposed on-site pond.

Design Point 9 (Q_5 = 2.3 cfs, Q_{100} = 5.1 cfs) consists of off-site sheet flows from Basin OS-3A (0.37 ac.) and developed flows from Basin I (1.3 ac.). The combined flows will be collected by a proposed 5' Type R sump inlet within the private roadway. These collected flows also combine with the upstream flows and are then routed via the proposed private 30" RCP **(Pipe Run 15 - Q_5 = 12 cfs, Q_{100} = 39 cfs)** within a storm esmt. towards the on-site pond. Emergency overflow for this sump condition will pond up 9" and then spill over the high point to the west, around the corner and then down Spanish Bit Dr.

Design Point 10 (Q_5 = 0.4 cfs, Q_{100} = 1.3 cfs) consists of the developed flows from Basin OS-3B (0.04 ac.) and Basin J1 (0.44 ac.) that are routed via a proposed grass lined swale (2.0% min.) within the open space Tract C towards a proposed 2'x2' area drain and then routed via a private 18" RCP (Pipe Run 16) towards the proposed pond. The emergency overflow for this lowpoint will be max. ponding of 24" and then spill over the highpoint to the west and directly into the pond. **Basin J2** (0.59 ac.) **(Q_5 = 0.5 cfs, Q_{100} = 1.9 cfs)** consists of developed flows that sheet flow directly into the proposed pond.

Design Point 11 (Q_5 = 12 cfs, Q_{100} = 40 cfs) represents the total flows entering the pond from the proposed 30" RCP pipe system (Pipe Run 17). A concrete forebay will be installed at this outlet into the pond. (Reference the UD-BMP Spreadsheet in the Appendix for forebay sizing details)

Design Point 12 (Q_5 = 1.7 cfs, Q_{100} = 3.2 cfs) consists of developed flows from Basin G (0.66 ac.) that sheet flow into the southerly curb line of Spanish Bit Dr. and then travel as curb and gutter flow towards the proposed 10' Type R at-grade inlet. This facility collects 100% of both the 5-yr. and 100-yr. developed flows at this location. A private 18" RCP (Pipe Run 18) will then convey these flows directly into the pond. Based on the UD-BMP ver. 3.07 spreadsheet, these minimal flows do not require a concrete forebay. However, a 4'x6' concrete forebay will be constructed as represented as **Design Point 13 (Q_5 = 1.7 cfs, Q_{100} = 3.2 cfs)** with an 18" wide concrete trickle channel conveying the flows to the mircropool and outlet structure.

Design Point 14 (Q_5 = 1.9 cfs, Q_{100} = 5.7 cfs) consists of off-site sheet flows from Basin OS-4 (2.1 ac.) representing the undeveloped church property to the south and a portion of Struthers Road and Basin K (0.17 ac.) that represents a small portion of the south side of Spanish Bit Dr. These flows will continue to travel as curb and gutter flow towards the lowpoint in Spanish Bit on the south side of the road. At this location a proposed 5' Type R sump inlet will be installed to completely collect both the 5-yr. and 100-yr. flows. These collected flows are then routed via an 18" RCP that will connect directly into the existing 36" RCP culvert under Spanish Bit. Dr. **Basin K** (0.17 ac.) **(Q_5 = 0.5 cfs, Q_{100} = 1.0 cfs)** developed flows are unable to be routed to the on-site pond. However, as allowed by the ECM Appendix I.7.1.C.1.a, this small basin qualifies for an exclusion. **Basin L** (0.16 ac.) **(Q_5 = 0.1 cfs, Q_{100} = 0.5 cfs)** consists of the area of the existing holding basin and also qualifies for the exclusion above. These existing flows continue to directly enter the existing 6'x4' CBC under Struthers Road.

The final drainage report for the adjacent commercial development north of Spanish Bit Dr., "Preliminary & Final Drainage Report for Cathedral Rock Commons Commercial", prepared by JPS Engineering, approved April 2023 describes the current developed flows being released through the dual 36" RCP pipes under Spanish Bit Dr. (Q_5 = 31.2 cfs, Q_{100} = 73.9 cfs) These flows combined with the proposed pond release (Q_5 = 4.5 cfs, Q_{100} = 31 cfs) are all tributary to the existing 6'x4' CBC under Struthers Road. This public facility seems to be in good condition and

has capacity to convey 219 cfs. (See Appendix) Thus, this public facility and holding basin will continue to be adequate to convey all the developed flows in this area under Struthers Road.

The following is a comparison of Pre-development Flows vs. the Developed Flows from the Urban Landing property tributary to the existing 6'x4' CBC under Struthers Road:

Pre-Developed Flows: **Q_5 = 7 cfs, Q_{100} = 31 cfs**
(As determined at DP-E4)

Developed Flows: **Q_5 = 3.8 cfs, Q_{100} = 29.4 cfs**
(As determined by Pond 1 release)

Thus, the storm water release from the proposed site is at or below the calculated historic flow quantities. This development does not impact any downstream facility or property to an extent greater than that which currently exists in the 'pre-developed' conditions. All drainage facilities within this report were sized according to the El Paso County Drainage Criteria Manuals and the full-spectrum storm water quality requirements.

DETENTION FACILITIES / STORMWATER QUALITY

Final design of this recommended facility that include planning for water quality management of storm water runoff features will be provided with the site Construction Drawings submitted along with the Final Plat. Storm water quality measures will be utilized in order to reduce the amount of sediment, debris and pollutants that are allowed to be released downstream. These features include a Full Spectrum Extended Detention Basin. Site Planning and design techniques should limit impervious area, minimize directly impervious area, lengthen time of travel and increase infiltration in order to decrease the rate and volume of stormwater runoff. Facilities that require detention will provide an Excess Urban Runoff Volume (EURV) in the lower portion of the facility storage volume that will release the more frequent storms at a slower rate to help minimize the effects of development of this property.

Total Inflow to Pond 1 equals (Q_5 = 14 cfs, Q_{100} = 43 cfs) and represents the total area and developed flows tributary to the proposed on-site detention/SWQ pond. The **total tributary area is 21.67 ac. with a 27.4% weighted imperviousness.** (See Appendix)

The proposed Pond 1 will provide detention and stormwater quality for nearly the entire property, including the off-site basins tributary to this site as described above. The total anticipated developed flows entering this facility are as follows:
(See Appendix for MHFD-Detention pond design sheets)

<u>Pond 1</u> (Full Spectrum EDB)

Total Tributary Acreage: 21.67 ac.

Total Site Impervious tributary to Pond 1: 27.4%

0.258 Ac.-ft. WQCV required

0.347 Ac.-ft. EURV required with 4:1 max. slopes

0.757 Ac.-ft. 100-yr. required storage

1.362 Ac.-ft. required total

Total Peak In-flow: Q_5 = 14 cfs, Q_{100} = 43 cfs

Pond Peak Design Release: Q_5 = 3.8 cfs, Q_{100} = 29.4 cfs

Release per Pre-development Conditions (Design Point E4): Q_5 = 7 cfs, Q_{100} = 31 cfs

This proposed detention facility will be private with maintenance of all private drainage facilities outside the public Right-of-Way including the pond by the Urban Landing HOA. All drainage facilities within the public Right of Way to be public with maintenance by El Paso County.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, as revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. Individual basin design used for detention/SWQ basin sizing was calculated using the Rational Method. Runoff Coefficients are based on the imperviousness of the particular land use and the hydrologic soil type in accordance with Table 6-6. The average rainfall intensity, by recurrence interval found in the Intensity-Duration-Frequency (IDF) curves in Figure 6-5. Mile High Flood District (MHFD)-Detention spreadsheet Ver. 4.06 used for Preliminary Detention/SWQ design. (See Appendix)

The City of Colorado Springs/El Paso County DCM requires the Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls. The Four Step Process pertains to management of smaller, frequently occurring storm events, as opposed to larger storms for which drainage and flood control infrastructure are sized. Implementation of these four steps helps to achieve storm water permit requirements.

This site adheres to this **Four Step Process** as follows:

1. **Employ Runoff Reduction Practices:** Proposed urban lot impervious areas (roof tops, patios, etc.) will sheet flow across landscaped yards and through open space areas to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets or detention facilities. This will minimize directly connected impervious areas within the project site.

2. **Stabilize Drainageways:** The existing natural drainageway on-site will be overlot graded and urbanized with the proposed residential development. Within this development,

private urban street sections will be constructed along with buried storm systems to handle the developed runoff per County standards. After developed flows utilize the runoff reduction practices through the yards and open spaces, developed flows will travel via curb and gutter within the private streets and eventually private storm systems. These collected flows are then routed directly to the proposed on-site extended detention basin (full-spectrum facility).

3. **Provide Water Quality Capture Volume (WQCV):** Runoff from this development will be treated through capture and slow release of the WQCV and excess urban runoff volume (EURV) in the proposed Full-Spectrum permanent Extended Detention Basin designed per current El Paso County drainage criteria. The small basins that are not able to be captured and routed to a permanent extended detention basin (K and L) qualify for an exclusion ECM Appendix I.7.1.C.1.a – 20% exclusion less than 1 acre.

4. **Consider need for Industrial and Commercial BMPs**: No industrial uses are proposed within this development. However, a site-specific storm water quality and erosion control plan and narrative will be submitted along with the grading and erosion control plan. Details such as site-specific sediment and erosion control construction BMP's will be detailed in this plan and narrative to protect receiving waters. BMP's will be constructed and maintained as the development has been graded and erosion control methods employed.

FLOODPLAIN STATEMENT

No portion of this site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Numbers 08041C0286G and 0841C0287G, effective date, December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES

This site lies entirely within the Jackson Creek Drainage Basin (FOMO4400) boundaries.

The following are anticipated drainage and bridge fees using the following impervious acreage method approved by El Paso County.

Urban Landing Filing No. 1 has a total area of 6.58 acres with the following different land uses proposed:

2.54 Ac.	Open Space Tracts (Tracts A-D)
4.04 Ac.	Urban Lots (Single Family lots incl. private road tract)
6.58 Ac.	**Total**

The percent imperviousness for this subdivision is calculated as follows:

Fees for Open Space Tracts

(Per El Paso County Percent Impervious Chart: 7**%**)

2.54 Ac. x 7% = **0.18 Impervious Ac.**

Fees for 0.138 Ac. lots (Urban lots 6,000 SF lot size or less)

(Per El Paso County Percent Impervious Chart: 53**%**)

4.04 Ac. x 53% = **2.14 Impervious Ac.**

Total Impervious Acreage:	**2.32 Imp. Ac.** (Drainage Fees)
Total Impervious Acreage:	**2.32 Imp. Ac.** (Bridge Fees)

However, per the ECM Appendix L 3.10.4.a, this development requests a reduction of drainage fees based on proposed construction of the on-site full-spectrum detention/stormwater quality facility (Pond 1) as shown in the PDR. This request seems to meet all 6 criteria within the above section of the ECM (See below):

1. No downstream regional system in place yet
2. Pond 1 is less than 15-ac.-ft. in volume
3. This facility is NOT a part of the regional plan
4. The outlet is designed to release as full spectrum
5. El Paso County approves the Pond design
6. Urban Landing Metro. District will own and maintain the proposed pond

This reduction is based on the Engineers Estimate found in the FAE and described below:

CONSTRUCTION COST OPINION

Private Full-Spectrum Detention Facility (Pond 1)

ITEM	DESCRIPTION	QUANTITY	UNIT COST	COST
1.	Forebay Structures	1 EA	$ 35,000.00	$ 35,000.00
2.	Concrete Outlet Structure	1 EA	$ 20,000.00	$ 20,000.00
3.	Concrete Trickle Channel	100 LF	$ 60.00/LF	$ 6,000.00
4.	Rip-Rap Spillway	110 CY	$ 76/CY	$ 8,360.00
5.	Outlet pipe (24" RCP)	55 LF	$ 98/CY	$ 5,390.00
SUB-TOTAL				$ 74,750.00
10% ENGINEERING				$ 7,475.00
5% CONTINGENCY				$ 3,737.50
TOTAL				**$ 85,962.50**

The following calculations are based on the 2024 Jackson Creek drainage/bridge fees:

ESTIMATED FEE TOTALS:

Drainage Fees

$ 9,829 x 2.32 Impervious Ac.	=	$ 22,803.28
(50% Reduction for Pond 1 construction costs)		$ (42,981.25)
		$ 20,177.97 (Credit)

Bridge Fees

No Bridge Fees within this basin

SUMMARY

The proposed Urban Landing property development is within the Jackson Creek Drainage Basin. The points of storm water release from the proposed site are required to be at or below the calculated historic flow quantities. This development does not impact any downstream facility or property to an extent greater than that which currently exists in the 'historic' conditions. All drainage facilities within this report were sized according to the El Paso County Drainage Criteria Manuals and the full-spectrum storm water quality requirements.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

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REFERENCES

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

2. El Paso County Engineering Criteria Manual, adopted December 23, 2004, revised December 13, 2016 and Published in 2018. Online content updated October 14, 2020.

3. "Urban Storm Drainage Criteria Manual Volume 1, 2 & 3" Urban Drainage and Flood Control District, dated January 2016.

4. "Big R - Retail Center Final Drainage Report", M&S Civil Consultants, Inc., dated March 2012

5. "Preliminary & Final Drainage Report for Cathedral Rock Commons Commercial", JPS Engineering, approved April, 2023.

6. "Drainage Report for Chaparral Hills", Colorado Engineering, Inc., dated 1971

APPENDIX

VICINITY MAP

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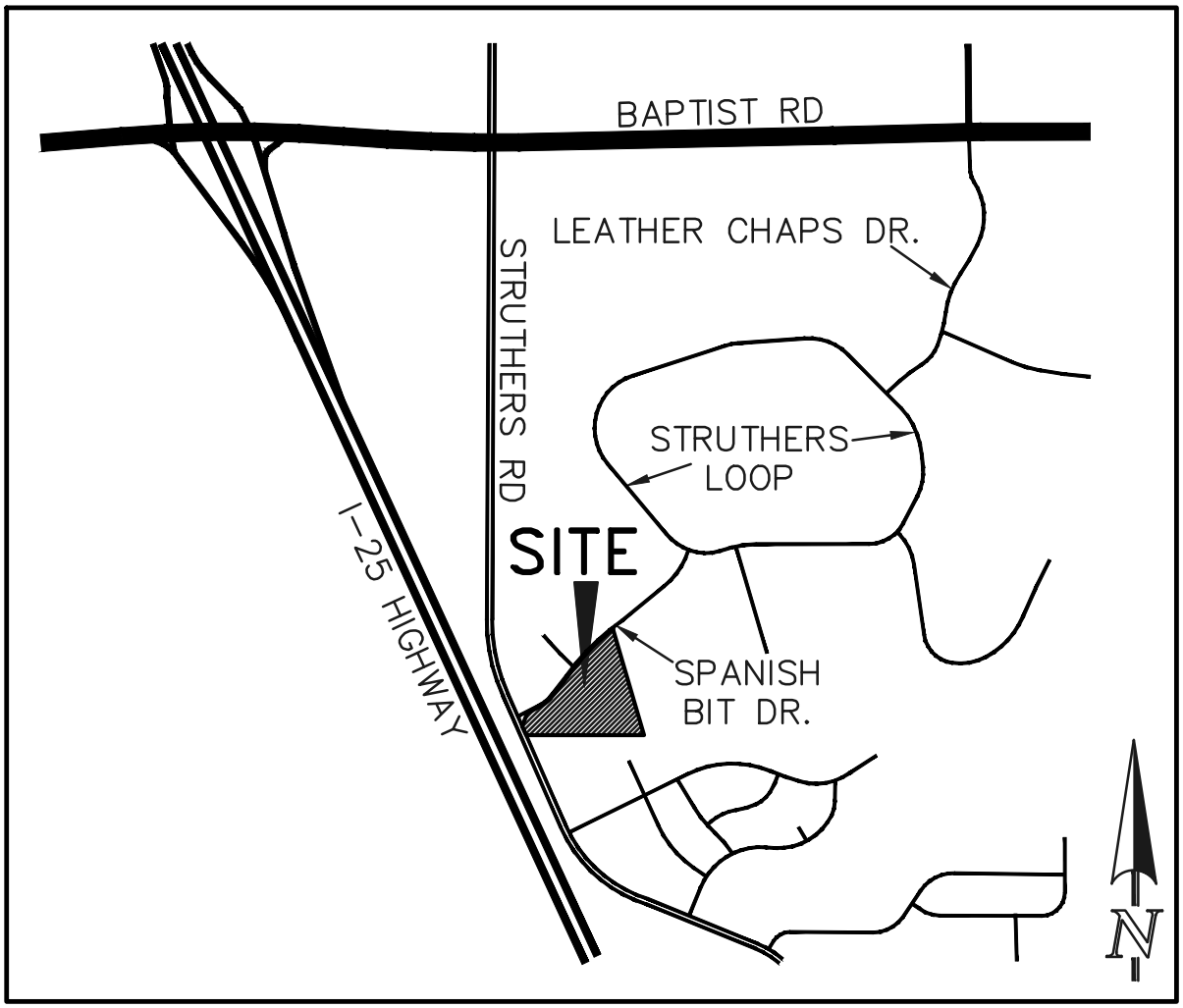

VICINITY MAP

N.T.S.

SOILS MAP (S.C.S SURVEY)

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Map Scale: 1:7,670 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	11.5	4.2%
45	Kutch clay loam, 5 to 20 percent slopes	0.5	0.2%
68	Peyton-Pring complex, 3 to 8 percent slopes	97.4	36.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	64.4	23.8%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	0.7	0.2%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	96.5	35.6%
Totals for Area of Interest		**270.9**	**100.0%**

El Paso County Area, Colorado

14—Brussett loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367j
Elevation: 7,200 to 7,500 feet
Frost-free period: 115 to 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brussett and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brussett

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

A - 0 to 8 inches: loam
BA - 8 to 12 inches: loam
Bt - 12 to 26 inches: clay loam
Bk - 26 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

El Paso County Area, Colorado

68—Peyton-Pring complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369f
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

El Paso County Area, Colorado

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

F.E.M.A. MAP

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

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

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The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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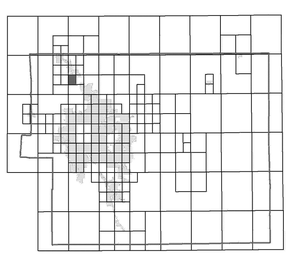
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

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

El Paso County Vertical Datum Offset Table

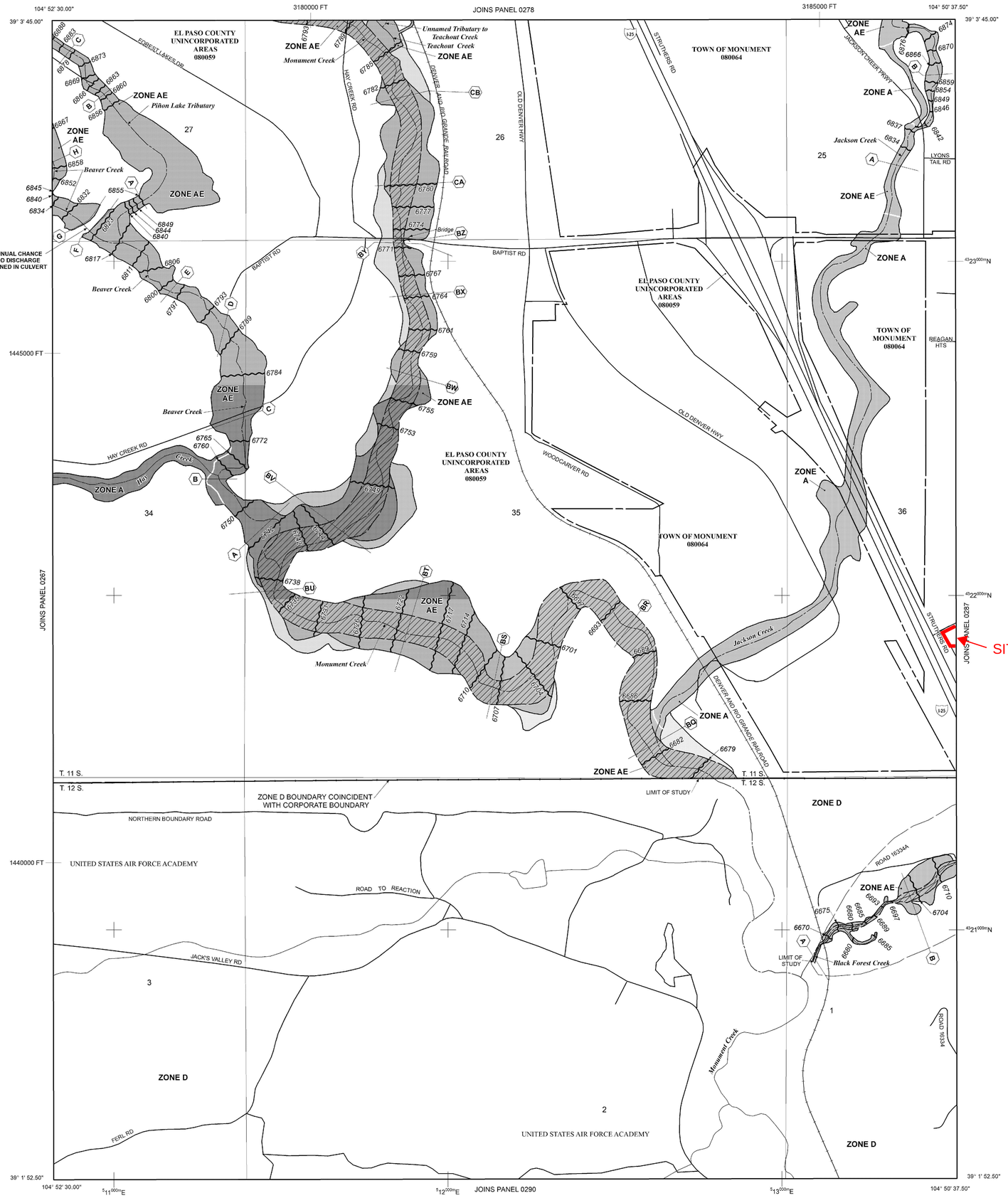
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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

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



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0286G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 286 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0286	G
MONUMENT, TOWN OF	080064	0286	G

Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0286G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

NOTES TO USERS

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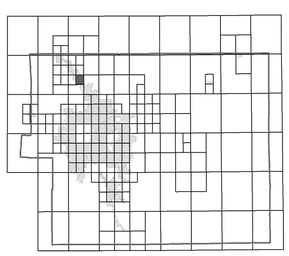
Panel Location Map



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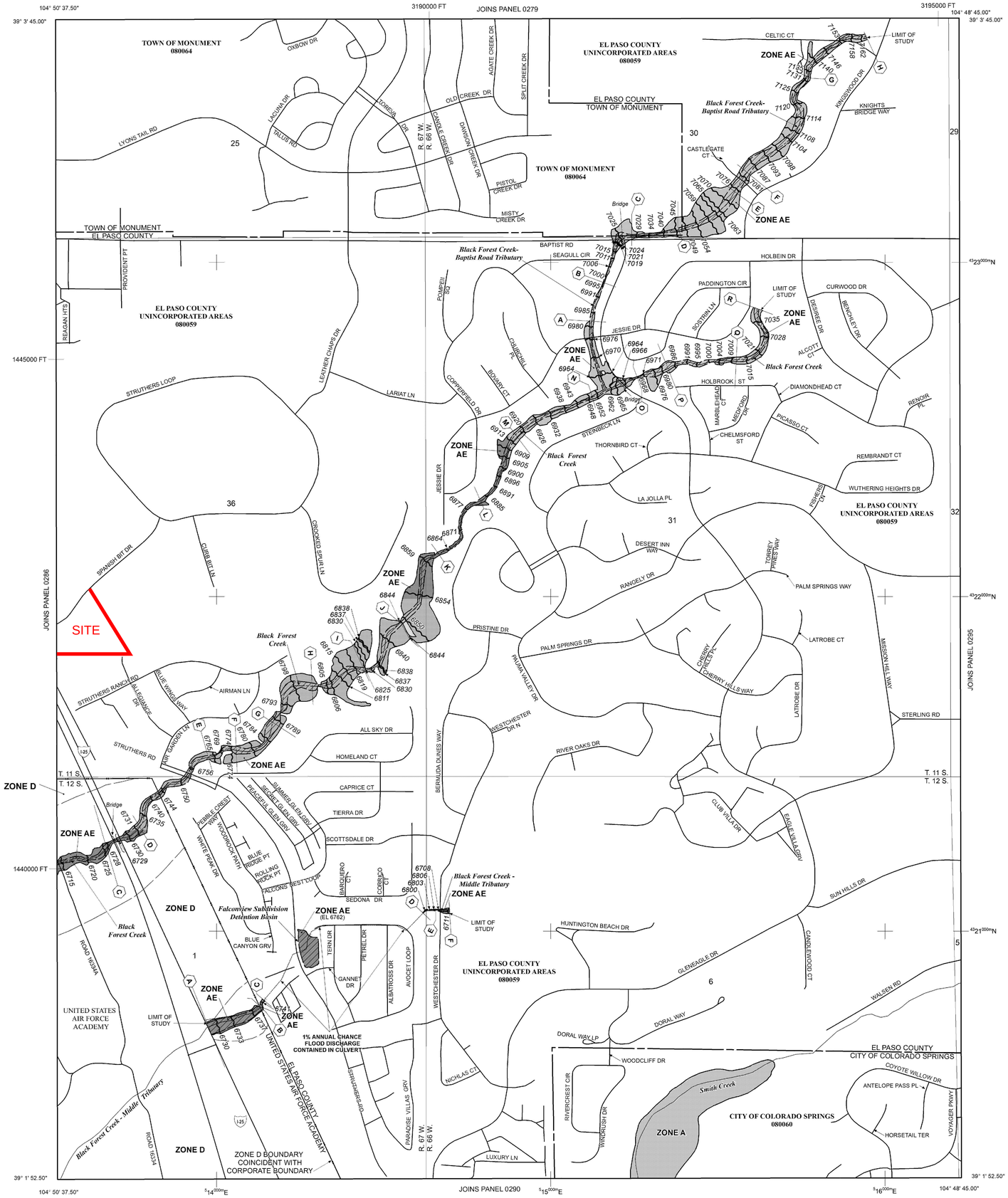

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D Boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97° 07' 30.00"
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4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13

6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0287G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 287 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0287	G
EL PASO COUNTY	080059	0287	G
MONUMENT, TOWN OF	080064	0287	G

Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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MAP NUMBER
08041C0287G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC / STORMWATER QUALITY CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

For Colorado Springs and much of the Fountain Creek watershed, the 1-hour depths are fairly uniform and are summarized in Table 6-2. Depending on the location of the project, rainfall depths may be calculated using the described method and the NOAA Atlas maps shown in Figures 6-6 through 6-17.

Table 6-2. Rainfall Depths for Colorado Springs

Return Period	1-Hour Depth	6-Hour Depth	24-Hour Depth
2	1.19	1.70	2.10
5	1.50	2.10	2.70
10	1.75	2.40	3.20
25	2.00	2.90	3.60
50	2.25	3.20	4.20
100	2.52	3.50	4.60

Where Z= 6,840 ft/100

These depths can be applied to the design storms or converted to intensities (inches/hour) for the Rational Method as described below. However, as the basin area increases, it is unlikely that the reported point rainfalls will occur uniformly over the entire basin. To account for this characteristic of rain storms an adjustment factor, the Depth Area Reduction Factor (DARF) is applied. This adjustment to rainfall depth and its effect on design storms is also described below. The UDFCD UD-Rain spreadsheet, available on UDFCD's website, also provides tools to calculate point rainfall depths and Intensity-Duration-Frequency curves[2] and should produce similar depth calculation results.

2.2 Design Storms

Design storms are used as input into rainfall/runoff models and provide a representation of the typical temporal distribution of rainfall events when the creation or routing of runoff hydrographs is required. It has long been observed that rainstorms in the Front Range of Colorado tend to occur as either short-duration, high-intensity, localized, convective thunderstorms (cloud bursts) or longer-duration, lower-intensity, broader, frontal (general) storms. The significance of these two types of events is primarily determined by the size of the drainage basin being studied. Thunderstorms can create high rates of runoff within a relatively small area, quickly, but their influence may not be significant very far downstream. Frontal storms may not create high rates of runoff within smaller drainage basins due to their lower intensity, but tend to produce larger flood flows that can be hazardous over a broader area and extend further downstream.

- **Thunderstorms**: Based on the extensive evaluation of rain storms completed in the Carlton study (Carlton 2011), it was determined that typical thunderstorms have a duration of about 2 hours. The study evaluated over 300,000 storm cells using gage-adjusted NEXRAD data, collected over a 14-year period (1994 to 2008). Storms lasting longer than 3 hours were rarely found. Therefore, the results of the Carlton study have been used to define the shorter duration design storms.

  To determine the temporal distribution of thunderstorms, 22 gage-adjusted NEXRAD storm cells were studied in detail. Through a process described in a technical memorandum prepared by the City of Colorado Springs (City of Colorado Springs 2012), the results of this analysis were interpreted and normalized to the 1-hour rainfall depth to create the distribution shown in Table 6-3 with a 5 minute time interval for drainage basins up to 1 square mile in size. This distribution represents the rainfall

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

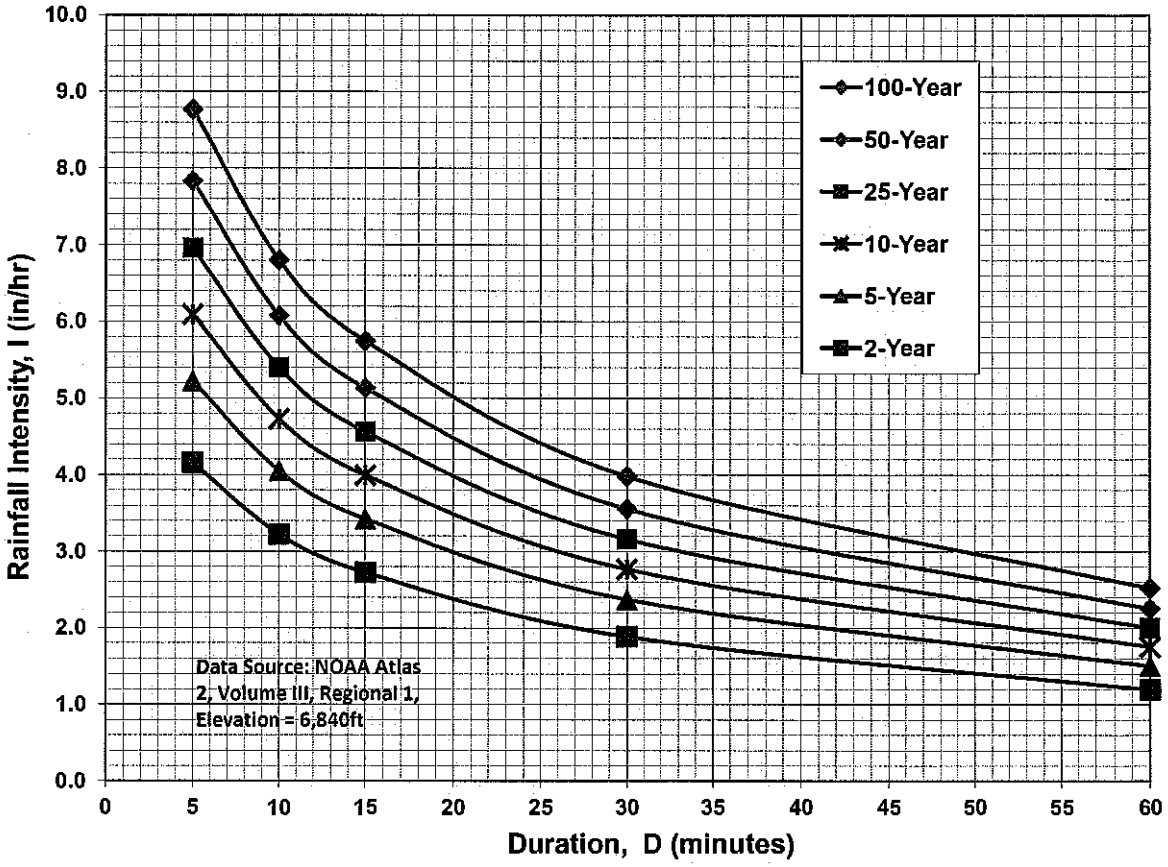
One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

Table 6-10. NRCS Curve Numbers for Frontal Storms & Thunderstorms for Developed Conditions (ARCII)

Fully Developed Urban Areas (vegetation established)[1]	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	-----	-----	---	68	79	86	89
Fair condition (grass cover 50% to 75%)	-----	-----	---	49	69	79	84
Good condition (grass cover > 75%)	-----	-----	---	39	61	74	80
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way	-----	-----	---	98	98	98	98
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	-----	-----	---	98	98	98	98
Paved; open ditches (including right-of-way)	-----	-----	---	83	89	92	93
Gravel (including right-of-way)	-----	-----	---	76	85	89	91
Dirt (including right-of-way)	-----	-----	---	72	82	87	89
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	-----	-----	---	63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	-----	-----	---	96	96	96	96
Urban districts:							
Commercial and business	-----	-----	85	89	92	94	95
Industrial	-----	-----	72	81	88	91	93
Residential districts by average lot size:							
1/8 acre or less (town houses)	-----	-----	65	77	85	90	92
1/4 acre	-----	-----	38	61	75	83	87
1/3 acre	-----	-----	30	57	72	81	86
1/2 acre	-----	-----	25	54	70	80	85
1 acre	-----	-----	20	51	68	79	84
2 acres	-----	-----	12	46	65	77	82
Developing Urban Areas[1]	**Treatment[2]**	**Hydrologic Condition[3]**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Newly graded areas (pervious areas only, no vegetation)	-----	-----	---	77	86	91	94
Cultivated Agricultural Lands[1]	**Treatment**	**Hydrologic Condition**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Fallow	Bare soil	-----	---	77	86	91	94
	Crop residue cover (CR)	Poor	---	76	85	90	93
		Good	---	74	83	88	90
Row crops	Straight row (SR)	Poor	---	72	81	88	91
		Good	---	67	78	85	89
	SR + CR	Poor	---	71	80	87	90
		Good	---	64	75	82	85
	Contoured (C)	Poor	---	70	79	84	88
		Good	---	65	75	82	86
	C + CR	Poor	---	69	78	83	87
		Good	---	64	74	81	85
	Contoured & terraced (C&T)	Poor	---	66	74	80	82
		Good	---	62	71	78	81
	C&T+ CR	Poor	---	65	73	79	81
		Good	---	61	70	77	80
Small grain	SR	Poor	---	65	76	84	88
		Good	---	63	75	83	87
	SR + CR	Poor	---	64	75	83	86
		Good	---	60	72	80	84
	C	Poor	---	63	74	82	85
		Good	---	61	73	81	84
	C + CR Poor	Poor	---	62	73	81	84
		Good	---	60	72	80	83
	C&T	Poor	---	61	72	79	82
		Good	---	59	70	78	81
	C&T+ CR	Poor	---	60	71	78	81
		Good	---	58	69	77	80

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

JOB NAME: *URBAN LANDING - PRELIMINARY PLAN*
JOB NUMBER: *1308.01*
DATE: *08/30/24*
CALCULATED BY: *MAW*

PRE-DEVELOPMENT BASIN RUNOFF COEFFICIENT SUMMARY

		C VALUE DCM TABLE 6-6						C VALUE DCM TABLE 6-6						WEIGHTED "C" VALUE			WEIGHTED CA			WEIGHTED IMP.
BASIN	TOTAL AREA (AC)	LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)	PERCENT
EX-1	5.80	UNDEV.	2.0%	5.30	0.03	0.09	0.36	PAVED ROAD	100.0%	0.50	0.89	0.90	0.96	0.10	0.16	0.41	0.60	0.93	2.39	10.4%
EX-2	1.30	UNDEV.	2.0%	1.30	0.03	0.09	0.36			0.00	0.02	0.08	0.35	0.03	0.09	0.36	0.04	0.12	0.47	2.0%
OS-1	12.80	RES. 5 AC.	7.0%	12.00	0.05	0.12	0.39	GRAVEL ROAD	80.0%	0.80	0.57	0.59	0.7	0.08	0.15	0.41	1.06	1.91	5.24	11.6%
OS-2	1.50	RES. 5 AC.	7.0%	1.50	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.08	0.18	0.59	7.0%
OS-3	0.49	RES. 5 AC.	7.0%	0.49	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.02	0.06	0.19	7.0%
OS-4	2.10	UNDEV.	2.0%	1.68	0.03	0.09	0.36	PAVED ROAD	100.0%	0.42	0.89	0.90	0.96	0.20	0.25	0.48	0.42	0.53	1.01	21.6%

JOB NAME:	***URBAN LANDING - PRELIMINARY PLAN***
JOB NUMBER:	***1308.01***
DATE:	***07/31/03***
CALC'D BY:	***MAW***

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$$t_c = \frac{L}{180} + 10$$

*For buried riprap, select C_v value based on type of vegetative cover.

PRE-DEVELOPMENT BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
EX-1	0.60	0.93	2.39	0.16	300	10	19.8	520	2.0%	1.4	6.1	25.9	2.16	2.70	4.54	1.3	**3**	**11**
EX-2	0.04	0.12	0.47	0.09	300	10	21.2					21.2	2.40	3.00	5.04	0.1	**0.4**	**2.4**
OS-1	1.06	1.91	5.24	0.15	300	9	20.7	530	2.5%	1.1	8.0	28.7	2.04	2.55	4.28	2	**5**	**22**
OS-2	0.08	0.18	0.59	0.12	250	8	19.1					19.1	2.53	3.16	5.31	0.2	**0.6**	**3**
OS-3	0.02	0.06	0.19	0.12	240	8	18.4					18.4	2.57	3.21	5.39	0.1	**0.2**	**1.0**
OS-4	0.42	0.53	1.01	0.25	300	9	18.5	320	1.0%	2.0	2.7	21.1	2.41	3.01	5.05	1.0	**1.6**	**5**

JOB NAME: ***URBAN LANDING - PRELIMINARY PLAN***
JOB NUMBER: ***1308.01***
DATE: ***08/30/24***
CALCULATED BY: ***MAW***

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

PRE-DEVELOPMENT SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Facility/ Inlet Size*
					I(5)	I(100)	Q(5)	Q(100)	
E1	OS-1	1.91	5.24	28.7	2.55	4.28	5	22	EXIST. NATURAL SWALE
E2	OS-3, EX-2	0.18	0.66	21.2	3.00	5.04	0.5	3.3	SHEET FLOW OFF-SITE
E3	OS-4, Flows from DP E2	0.71	1.67	23.9	2.82	4.73	2	8	EXIST. ASPHALT RUNDOWN
E4	EX-1, OS-2, Flows from E1	3.02	8.21	35.7	2.22	3.73	7	31	EXIST. 6'X4' CBC AT STRUTHERS

JOB NAME: *URBAN LANDING FILING NO. 1 - FDR*
JOB NUMBER: *1308.01*
DATE: *12/23/24*
CALCULATED BY: *MAW*

BASIN RUNOFF COEFFICIENT SUMMARY

		C VALUE DCM TABLE 6-6						C VALUE DCM TABLE 6-6						WEIGHTED "C" VALUE			WEIGHTED CA			WEIGHTED IMP.
BASIN	TOTAL AREA (AC)	LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)	PERCENT
OS-1	12.80	RES. 5 AC,	7.0%	12.00	0.05	0.12	0.39	GRAVEL RD.	80.0%	0.80	0.57	0.59	0.70	0.08	0.15	0.41	1.06	1.91	5.24	11.6%
OS-2A	0.13	RES. 5 AC.	7.0%	0.13	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.01	0.02	0.05	7.0%
OS-2B	1.50	RES. 5 AC.	7.0%	1.50	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.08	0.18	0.59	7.0%
OS-3A	0.37	RES. 5 AC.	7.0%	0.37	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.02	0.04	0.14	7.0%
OS-3B	0.04	RES. 5 AC.	7.0%	0.04	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.00	0.00	0.02	7.0%
OS-4	2.10	UNDEV.	2.0%	1.68	0.03	0.09	0.36	PAVED RD.	100.0%	0.42	0.89	0.90	0.96	0.20	0.25	0.48	0.42	0.53	1.01	21.6%
A	0.10	RES. 1/8 AC.	65.0%	0.10	0.41	0.45	0.59			0.00	0.18	0.25	0.47	0.41	0.45	0.59	0.04	0.05	0.06	65.0%
B	0.75	RES. 1/8 AC.	65.0%	0.45	0.41	0.45	0.59	PAVED RD.	100.0%	0.30	0.89	0.90	0.96	0.60	0.63	0.74	0.45	0.47	0.55	79.0%
C	0.18	RES. 1/8 AC.	65.0%	0.11	0.41	0.45	0.59	PAVED RD.	100.0%	0.07	0.89	0.90	0.96	0.60	0.63	0.73	0.11	0.11	0.13	78.6%
D1	0.55	RES. 1/8 AC.	65.0%	0.35	0.41	0.45	0.59	PAVED RD.	100.0%	0.20	0.89	0.90	0.96	0.58	0.61	0.72	0.32	0.34	0.40	77.7%
D2	0.58	RES. 1/8 AC.	65.0%	0.58	0.41	0.45	0.59	PAVED RD.	100.0%	0.00	0.89	0.90	0.96	0.41	0.45	0.59	0.24	0.26	0.34	65.0%
E	0.31	RES. 1/8 AC.	65.0%	0.19	0.41	0.45	0.59	PAVED RD.	100.0%	0.12	0.89	0.90	0.96	0.60	0.62	0.73	0.18	0.19	0.23	78.5%
F	0.60	RES. 1/8 AC.	65.0%	0.25	0.41	0.45	0.59	OPEN SPACE	7.0%	0.35	0.05	0.12	0.39	0.20	0.26	0.47	0.12	0.15	0.28	31.2%
G	0.66	RES. 1/8 AC.	65.0%	0.35	0.41	0.45	0.59	PAVED RD.	100.0%	0.31	0.89	0.90	0.96	0.64	0.66	0.76	0.42	0.44	0.50	81.4%
H	0.77	RES. 1/8 AC.	65.0%	0.52	0.41	0.45	0.59	PAVED RD.	100.0%	0.25	0.89	0.90	0.96	0.57	0.60	0.71	0.44	0.46	0.55	76.4%
I	1.30	RES. 1/8 AC.	65.0%	1.05	0.41	0.45	0.59	PAVED RD.	100.0%	0.25	0.89	0.90	0.96	0.50	0.54	0.66	0.65	0.70	0.86	71.7%
J1	0.44	RES. 1/8 AC.	65.0%	0.15	0.41	0.45	0.59	OPEN SPACE	7.0%	0.29	0.05	0.12	0.39	0.17	0.23	0.46	0.08	0.10	0.20	26.8%
J2	0.59	RES. 1/8 AC.	65.0%	0.17	0.41	0.45	0.59	OPEN SPACE	7.0%	0.42	0.05	0.12	0.39	0.15	0.22	0.45	0.09	0.13	0.26	23.7%
K	0.17	RES. 1/8 AC.	65.0%	0.10	0.41	0.45	0.59	PAVED RD.	100.0%	0.07	0.89	0.90	0.96	0.61	0.64	0.74	0.10	0.11	0.13	79.4%
L	0.16	OPEN SPACE	13.0%	0.16	0.07	0.16	0.41			0.00	0.89	0.90	0.96	0.07	0.16	0.41	0.01	0.03	0.07	13.0%

TOTAL AREA TRIBUTARY TO POND 1	**21.67**	**27.4%**
DP-11	21.01	25.2%
DP-13	0.66	81.4%

JOB NAME:	***URBAN LANDING FILING NO. 1 - FDR***
JOB NUMBER:	***1308.01***
DATE:	***04/23/24***
CALC'D BY:	***MAW***

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$t_c = \frac{L}{180} + 10$

*For buried riprap, select C_v value based on type of vegetative cover.

BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
OS-1	1.06	1.91	5.24	0.15	300	9	20.7	530	2.5%	1.1	8.0	28.7	2.04	2.55	4.28	2	**5**	**22**
OS-2A	0.01	0.02	0.05	0.08	100	3	12.8					12.8	3.00	3.76	6.31	0.02	**0.06**	**0.32**
OS-2B	0.08	0.18	0.59	0.12	250	8	19.1					19.1	2.53	3.16	5.31	0.2	**0.6**	**3.1**
OS-3A	0.02	0.04	0.14	0.12	240	8	18.4					18.4	2.57	3.21	5.39	0.0	**0.1**	**0.8**
OS-3B	0.00	0.00	0.02	0.12	55	3	7.5					7.5	3.64	4.56	7.66	0.01	**0.02**	**0.12**
OS-4	0.42	0.53	1.01	0.25	300	9	18.5	320	1.0%	2.0	2.7	21.2	2.40	3.00	5.04	1.0	**1.6**	**5.1**
A	0.04	0.05	0.06	0.08	50	1.5	9.1					9.1	3.41	4.28	7.18	0.1	**0.2**	**0.4**
B	0.45	0.47	0.55	0.08	80	1.6	13.1	150	2.0%	2.8	0.9	14.0	2.90	3.63	6.09	1.3	**1.7**	**3.4**
C	0.11	0.11	0.13				5.0					5.0	4.12	5.17	8.68	0.4	**0.6**	**1.1**
D1	0.32	0.34	0.40	0.25	100	2	12.2	100	2.0%	2.1	0.8	13.0	2.98	3.74	6.27	1.0	**1.3**	**2.5**
D2	0.24	0.26	0.34	0.25	100	2	12.2					12.2	3.06	3.83	6.43	0.7	**1.0**	**2.2**
E	0.18	0.19	0.23				5.0					5.0	4.12	5.17	8.68	0.8	**1.0**	**2.0**
F	0.12	0.15	0.28	0.25	100	2	12.2					12.2	3.06	3.83	6.43	0.4	**0.6**	**1.8**
G	0.42	0.44	0.50	0.25	100	2	12.2					12.2	3.06	3.83	6.43	1.3	**1.7**	**3.2**
H	0.44	0.46	0.55	0.25	80	1.6	10.9	225	2.5%	3.2	1.2	12.1	3.07	3.84	6.45	1.3	**1.8**	**3.5**

JOB NAME:	*URBAN LANDING FILING NO. 1 - FDR*
JOB NUMBER:	*1308.01*
DATE:	*04/23/24*
CALC'D BY:	*MAW*

Return Period	1-Hour Depth
2	1.19
5	1.50
10	1.75
25	2.00
50	2.25
100	2.52

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad V = C_v S_w^{0.5} \qquad \text{Tc=L/V}$$

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)* $t_c = \frac{L}{180} + 10$	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

*For buried riprap, select C_v value based on type of vegetative cover.

BASIN RUNOFF SUMMARY

BASIN	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
I	0.65	0.70	0.86	0.25	80	1.6	10.9	450	3.0%	3.5	2.2	13.1	2.97	3.73	6.25	1.9	**2.6**	**5.4**
J1	0.08	0.10	0.20	0.25	100	2.5	11.3	420	2.5%	2.4	3.0	14.3	2.87	3.59	6.03	0.2	**0.4**	**1.2**
J2	0.09	0.13	0.26	0.25	60	2	8.0	120	2.0%	2.1	0.9	8.9	3.43	4.30	7.22	0.3	**0.5**	**1.9**
K	0.10	0.11	0.13	0.25	30	0.6	6.7	85	1.5%	2.4	0.6	7.3	3.68	4.61	7.74	0.4	**0.5**	**1.0**
L	0.01	0.03	0.07	0.25	80	3.2	8.7					8.7	3.46	4.34	7.29	0.0	**0.1**	**0.5**

JOB NAME: *URBAN LANDING FILING NO. 1 - FDR*
JOB NUMBER: *1308.01*
DATE: *12/23/24*
CALCULATED BY: *MAW*

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Facility/ Inlet Size*
					I(5)	I(100)	Q(5)	Q(100)	
1	OS-1, A	1.96	5.30	28.7	2.55	4.28	**5**	**23**	PROP. 30" RCP
2	OS-2A, B	0.49	0.60	19.4	3.13	5.26	**1.5**	**3.2**	5' TYPE R SUMP INLET
3	C	0.11	0.13	5.0	5.17	8.68	**0.6**	**1.1**	5' TYPE R SUMP INLET
4	OS-2B, D2	0.44	0.93	19.8	3.10	5.21	**1.4**	**4.8**	AREA DRAIN
5	D1	0.34	0.40	13.0	3.74	6.27	**1.3**	**2.5**	5' TYPE R SUMP INLET
6	E	0.19	0.23	5.0	5.17	8.68	**1.0**	**2.0**	5' TYPE R SUMP INLET
7	F	0.15	0.28	12.2	3.83	6.43	**0.6**	**1.8**	AREA DRAIN
8	H	0.46	0.55	12.1	3.84	6.45	**1.8**	**3.5**	5' TYPE R SUMP INLET
9	OS-3A, I	0.74	1.00	20.6	3.05	5.11	**2.3**	**5.1**	5' TYPE R SUMP INLET
10	OS-3B, J1	0.11	0.22	14.3	3.59	6.03	**0.4**	**1.3**	AREA DRAIN
11	**30" RCP INFLOW TO POND 1**	4.99	9.64	30.0	2.48	4.17	**12**	**40**	**30" RCP OUTFALL**

JOB NAME:	*URBAN LANDING FILING NO. 1 - FDR*
JOB NUMBER:	*1308.01*
DATE:	*12/23/24*
CALCULATED BY:	*MAW*

*ALL STORM SEWER TO BE PRIVATE UNLESS OTHERWISE NOTED

SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Facility/ Inlet Size*
12	G	0.44	0.50	12.2	3.83	6.43	**1.7**	**3.2**	10' TYPE R AT-GRADE INLET
13	Collected Flows at DP-12	0.44	0.50	12.5	3.79	6.37	**1.7**	**3.2**	4'x6' CONC. FOREBAY
14	OS-4, K	0.64	1.13	21.2	3.00	5.04	**1.9**	**5.7**	5' TYPE R SUMP INLET
	TOTAL INFLOW INTO POND (INCL. BASIN J2)	**5.56**	**10.41**	**30.0**	2.48	4.17	**14**	**43**	**POND 1**

JOB NAME: *URBAN LANDING FILING NO. 1 - FDR*
JOB NUMBER: *1308.01*
DATE: *12/23/24*
CALCULATED BY: *MAW*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM SLOPE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.
PIPES ARE TO BE PRIVATE UNLESS OTHERWISE NOTED.
PRIVATE STORM MATERIALS TO BE RCP OR DOUBLE WALL POLYPROPYLENE (DWPP) TO BE SELECTED BY CONTRACTOR

PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
1	DP-1	1.96	5.30	28.7	2.55	4.28	5	23	PROP. 30" RCP
2	DP-2	0.49	0.60	19.4	3.13	5.26	1.5	3.2	PROP. 18" RCP
3	DP-3	0.11	0.13	5.0	5.17	8.68	0.6	1.1	PROP. 18" RCP
4	PR-1, PR-2, PR-3	2.56	6.04	29.2	2.52	4.24	6	26	PROP. 30" RCP
5	DP-4	0.44	0.93	19.8	3.10	5.21	1.4	4.8	PROP. 18" RCP
6	PR-5, DP-5	0.78	1.33	19.8	3.10	5.21	2	7	PROP. 24" RCP
7	PR-4, PR-6	3.34	7.36	29.2	2.52	4.24	8	31	PROP. 30" RCP
8	DP-6	0.19	0.23	5.0	5.17	8.68	1.0	2.0	PROP. 18" RCP
9	PR-7, PR-8	3.53	7.59	29.5	2.51	4.21	9	32	PROP. 30" RCP
10	DP-7	0.15	0.28	12.2	3.83	6.43	0.6	1.8	PROP. 18" RCP
11	PR-9, PR-10	3.68	7.87	29.7	2.50	4.19	9	33	PROP. 30" RCP
12	DP-8	0.46	0.55	12.1	3.84	6.45	1.8	3.5	PROP. 18" RCP

JOB NAME: *URBAN LANDING FILING NO. 1 - FDR*
JOB NUMBER: *1308.01*
DATE: *12/23/24*
CALCULATED BY: *MAW*

* PIPES ARE LISTED AT MAXIMUM SIZE REQUIRED TO ACCOMMODATE Q100 FLOWS AT MINIMUM SLOPE.
REFER TO INDIVIDUAL PIPE SHEETS FOR HYDRAULIC INFORMATION.
PIPES ARE TO BE PRIVATE UNLESS OTHERWISE NOTED.
PRIVATE STORM MATERIALS TO BE RCP OR DOUBLE WALL POLYPROPYLENE (DWPP) TO BE SELECTED BY CONTRACTOR

PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		
					I(5)	I(100)	Q(5)	Q(100)	Pipe Size*
13	PR-11, PR-12	4.14	8.42	29.8	2.49	4.18	10	35	PROP. 30" RCP
14	DP-9	0.74	1.00	20.6	3.05	5.11	2.3	5.1	PROP. 18" RCP
15	PR-13, PR-14	4.89	9.42	30.0	2.48	4.17	12	39	PROP. 30" RCP
16	DP-10	0.11	0.22	14.3	3.59	6.03	0.4	1.3	PROP. 18" RCP
17	**PR-15, PR-16**	**4.99**	**9.64**	**30.0**	**2.48**	**4.17**	**12**	**40**	**PROP. 30" RCP**
18	DP-12 Pick-up	0.44	0.50	12.2	3.83	6.43	1.7	3.2	PROP. 18" RCP

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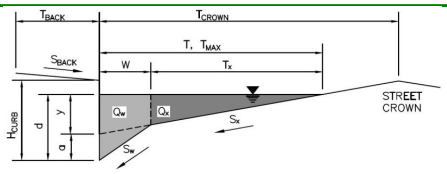
ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

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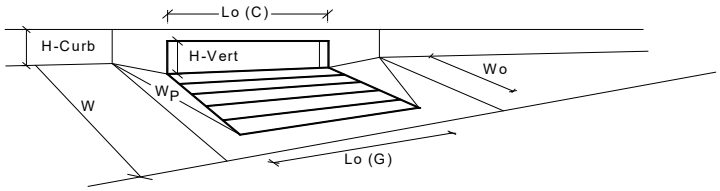

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**5.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.5	3.2	cfs

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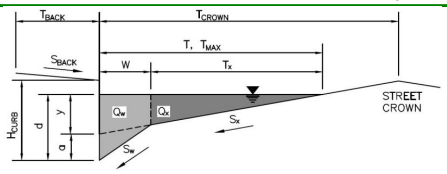
ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	1.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

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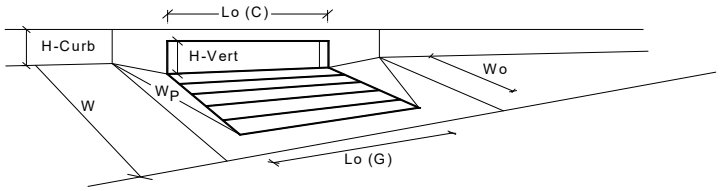

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.1	cfs

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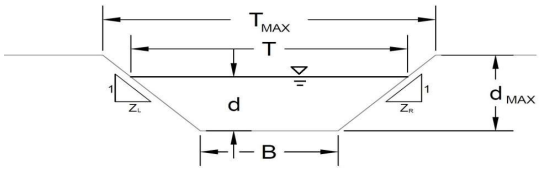
AREA INLET IN A SWALE

URBAN LANDING FILING NO. 1 - FDR

DP-4



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

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	C	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	1.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	7.00	7.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.00	1.00	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	5.9	5.9	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	1.00	1.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	1.4	4.8	cfs
Water Depth	d =	0.78	0.98	feet

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

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AREA INLET IN A SWALE

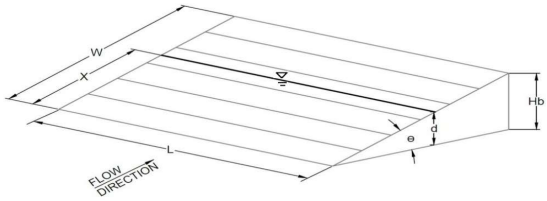
URBAN LANDING FILING NO. 1 - FDR

DP-4

Inlet Design Information (Input)

Type of Inlet: User-Defined

Inlet Type = User-Defined



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	2.00	feet
Length of Grate	L =	2.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	N/A	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.78	0.98	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.3**	**7.1**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

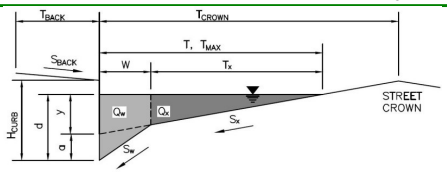
Version 4.05 Released March 2017

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

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-5



Gutter Geometry (Enter data in the blue cells)

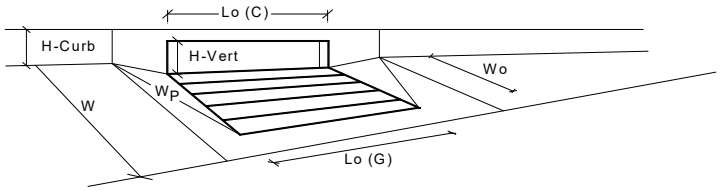
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**5.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.3	2.5	cfs

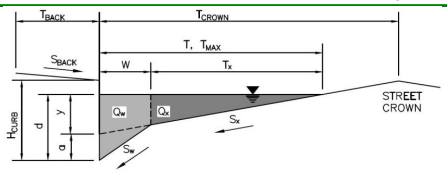
Version 4.05 Released March 2017

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

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-6



Gutter Geometry (Enter data in the blue cells)

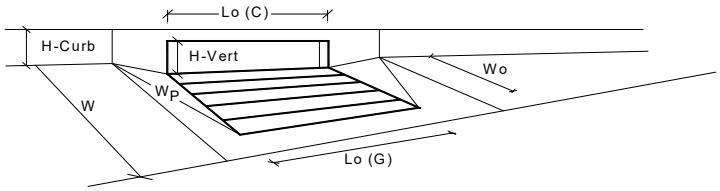
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	1.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



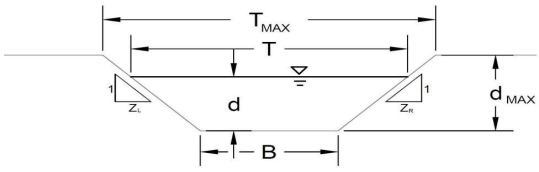
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

Version 4.05 Released March 2017

AREA INLET IN A SWALE

URBAN LANDING FILING NO. 1 - FDR

DP-7



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

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	C	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	2.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

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

Choose One:
- Non-Cohesive
- Cohesive
- Paved

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	8.00	8.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.00	1.00	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	9.7	9.7	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	1.00	1.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.6	1.8	cfs
Water Depth	d =	0.59	0.73	feet

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

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AREA INLET IN A SWALE

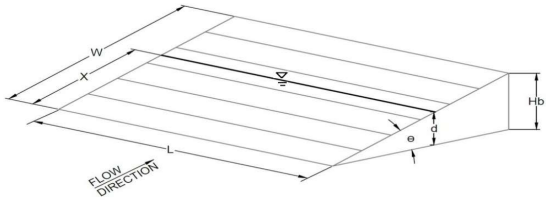
URBAN LANDING FILING NO. 1 - FDR

DP-7

Inlet Design Information (Input)

Type of Inlet: User-Defined

Inlet Type = User-Defined



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	2.00	feet
Length of Grate	L =	2.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	N/A	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.59	0.73	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.5**	**6.2**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

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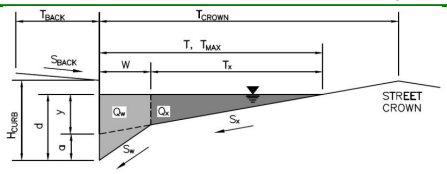
ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-8



Gutter Geometry (Enter data in the blue cells)

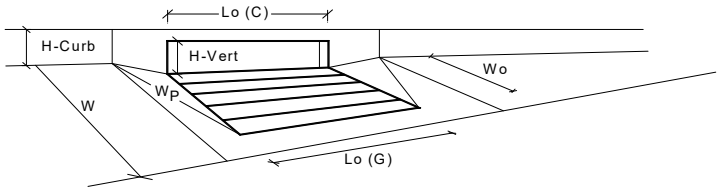
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	1.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.42	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.9**	**5.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.8	3.5	cfs

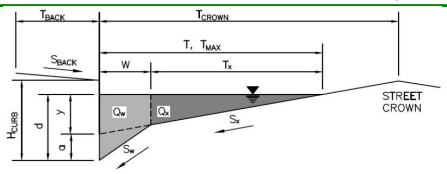
Version 4.05 Released March 2017

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

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-9



Gutter Geometry (Enter data in the blue cells)

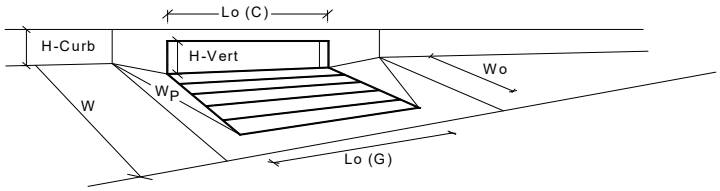
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	11.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	13.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	13.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



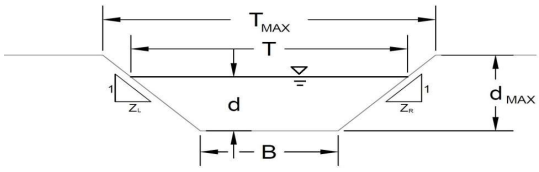
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**5.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.3	5.1	cfs

Version 4.05 Released March 2017

AREA INLET IN A SWALE

URBAN LANDING FILING NO. 1 - FDR

DP-10



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

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E	C	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	1.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

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

Choose One:
- (•) **Non-Cohesive**
- ( ) **Cohesive**
- ( ) **Paved**

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	7.00	7.00	feet
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	1.00	1.00	feet

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	5.9	5.9	cfs
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	1.00	1.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	0.4	1.3	cfs
Water Depth	d =	0.59	0.77	feet

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

Version 4.05 Released March 2017

AREA INLET IN A SWALE

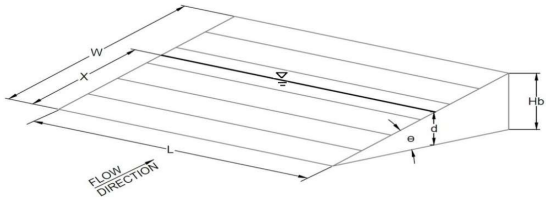
URBAN LANDING FILING NO. 1 - FDR

DP-10

Inlet Design Information (Input)

Type of Inlet: User-Defined

Inlet Type = User-Defined



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	2.00	feet
Length of Grate	L =	2.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	N/A	
Orifice Coefficient	C_o =	0.64	
Weir Coefficient	C_w =	2.05	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.59	0.77	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.5**	**6.3**	**cfs**
	Bypassed Flow, Q_b =	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

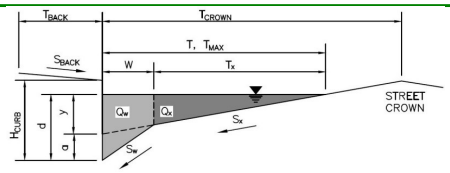
Version 4.05 Released March 2017

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

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-12



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.0	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} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	21.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.050	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.0	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.2**	**32.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

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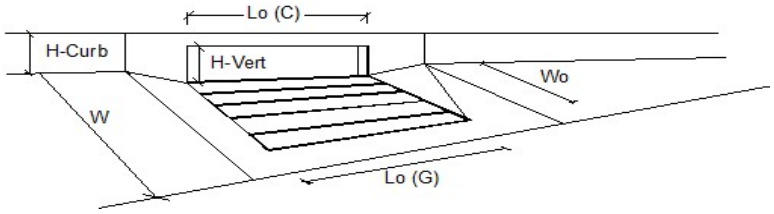


Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.7**	**3.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

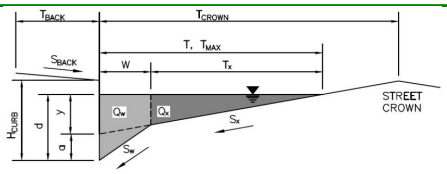
Version 4.05 Released March 2017

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

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

Project: URBAN LANDING FILING NO. 1 - FDR

Inlet ID: DP-14



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	9.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	19.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	13.0	19.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

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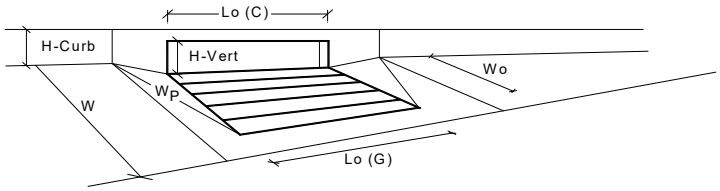


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.6	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.22	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.59	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**2.9**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	5.7	cfs

Exist. 6'x4' Conc. Box Culvert under Struthers Road

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

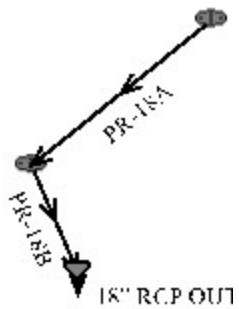
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	48.0 in
Height	4.0 ft
Bottom Width	6.00 ft
Discharge	219.05 cfs

Results	
Flow Area	24.0 ft²
Wetted Perimeter	20.0 ft
Hydraulic Radius	14.4 in
Top Width	6.00 ft
Critical Depth	41.5 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	9.13 ft/s
Velocity Head	1.29 ft
Specific Energy	5.29 ft
Froude Number	0.805
Discharge Full	219.05 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	48.0 in
Critical Depth	41.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

18" RCP STORM OUTFALL
100-YR. HGL MAP



100-yr. HGL Calculations (18” RCP Storm Outfall)

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 0.42
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6773.40

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevati	Total Known	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Leng	Gutter Veloci

	on (ft)	Flow (cfs)							th (ft)	ty (fps)
18" RCP OUTFALL	7200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-18B	6774.50	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-18A	6775.50	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
18" RCP OUTFALL	0.00	0.00	0.00	0.00	0.00	1.67	1.92	0.29	3.20	
PR-18B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	
PR-18A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Manning s n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
PR-18B	31.08	6767.36	1.0	6767.67	0.013	0.03	1.00	CIRCULAR	18.00 in	18.00 in
PR-18A	98.43	6768.14	2.4	6770.50	0.013	1.06	1.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
PR-18B	10.53	5.96	8.17	4.10	6.81	5.23	1.42	Pressurized	3.20	31.08	
PR-18A	16.32	9.23	8.17	4.10	5.40	7.17	2.22	Pressurized	3.20	98.43	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
PR-18B	3.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-18A	3.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

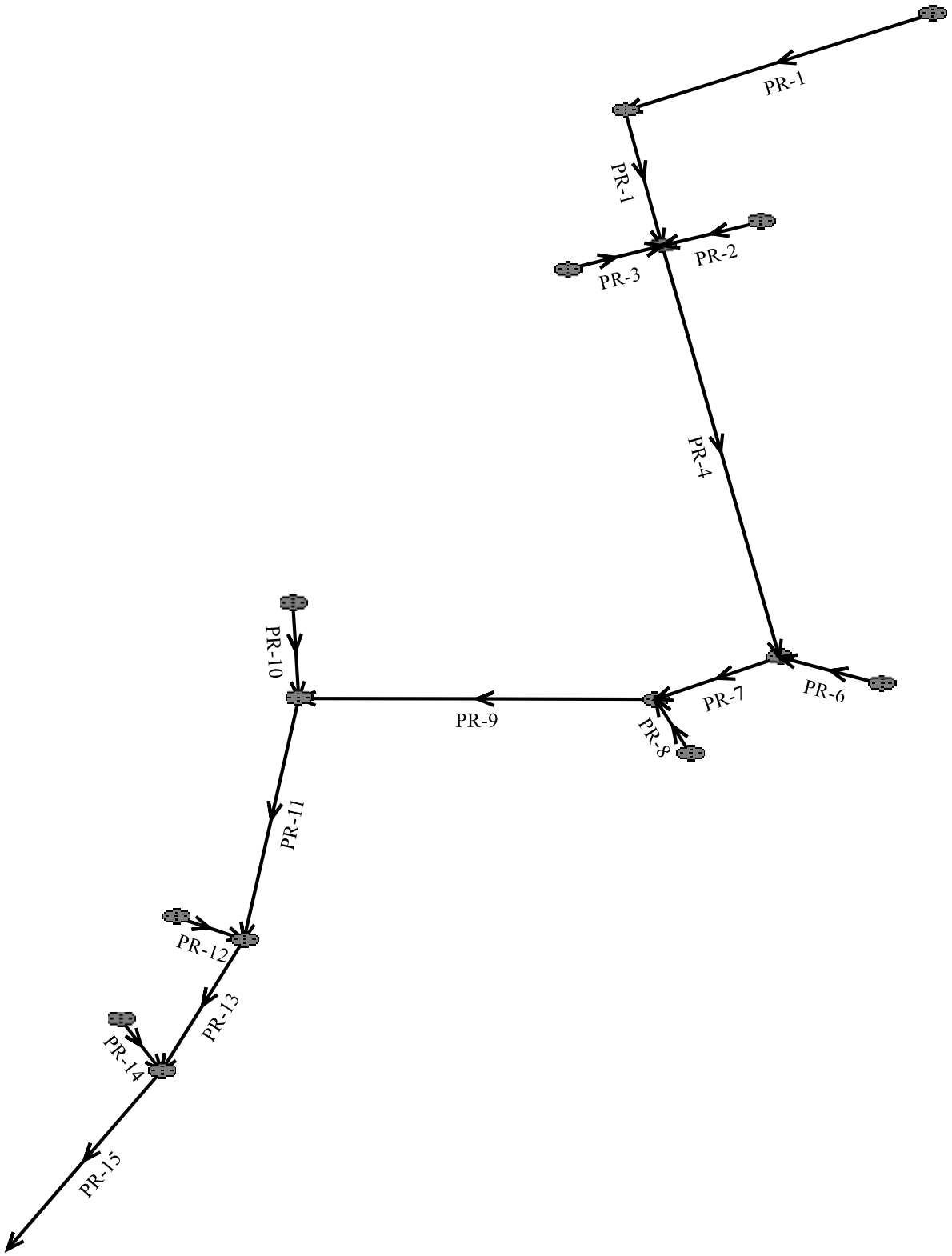
- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6773.40

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
PR-18B	6767.36	6767.67	0.00	0.00	6773.40	6773.43	6773.45	0.03	6773.48
PR-18A	6768.14	6770.50	0.05	0.00	6773.48	6773.57	6773.53	0.09	6773.62

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.


PR-1
PR-1
PR-2
PR-3
PR-4
PR-10
PR-9
PR-8
PR-7
PR-6
PR-11
PR-12
PR-13
PR-14
PR-15

100-yr. HGL Calculations (30” RCP Storm Outfall)

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in): 0.42
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6773.40

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	**Ground Elevation (ft)**	**Total Known Flow (cfs)**	**Local Contribution (cfs)**	**Drainage Area (Ac.)**	**Runoff Coefficient**	**5yr Coefficient**	**Overland Length (ft)**	**Overland Slope (%)**	**Gutter Length (ft)**	**Gutter Velocity (fps)**
30" RCP OUTFALL	7200.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-17	6774.00	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-15	6776.90	39.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-13	6776.56	35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-11	6778.72	33.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-9	6785.20	32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-8	6785.11	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-7	6785.04	31.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-4	6786.50	26.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-2	6786.80	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-1	6787.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-1	6786.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-3	6786.50	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-6	6785.40	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-5	6784.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PR-10	6777.40	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-12	6776.46	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-14	6776.80	5.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PR-16	6778.90	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	**Overland Time (min)**	**Gutter Time (min)**	**Basin Tc (min)**	**Intensity (in/hr)**	**Local Contrib (cfs)**	**Coeff. Area**	**Intensity (in/hr)**	**Manhole Tc (min)**	**Peak Flow (cfs)**	**Comment**
30" RCP OUTFALL	0.00	0.00	0.00	0.00	0.00	20.45	1.96	0.02	40.00	
PR-17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.00	
PR-15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	39.00	
PR-13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00	
PR-11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.00	
PR-9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	
PR-8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	
PR-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.00	
PR-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.00	
PR-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.20	
PR-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.00	
PR-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.00	Surface Water Present (Upstream)

PR-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.10	
PR-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	
PR-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.80	
PR-10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	
PR-12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	
PR-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	
PR-16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.30	Surface Water Present (Downstream)

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	**Sewer Length (ft)**	**Downstream Invert (ft)**	**Slope (%)**	**Upstream Invert (ft)**	**Mannings n**	**Bend Loss**	**Lateral Loss**	**Cross Section**	**Rise (ft or in)**	**Span (ft or in)**
PR-17	11.00	6768.75	2.7	6769.05	0.013	0.03	1.00	CIRCULAR	30.00 in	30.00 in
PR-15	91.57	6769.55	1.5	6770.92	0.013	0.31	1.00	CIRCULAR	30.00 in	30.00 in
PR-13	49.16	6771.42	1.5	6772.16	0.013	0.05	1.00	CIRCULAR	30.00 in	30.00 in
PR-11	69.45	6772.66	1.5	6773.70	0.013	0.05	1.00	CIRCULAR	30.00 in	30.00 in
PR-9	164.87	6774.20	1.2	6776.18	0.013	1.06	1.00	CIRCULAR	30.00 in	30.00 in
PR-8	11.92	6778.90	5.0	6779.50	0.013	0.83	0.00	CIRCULAR	18.00 in	18.00 in
PR-7	20.25	6776.49	2.0	6776.89	0.013	0.08	1.00	CIRCULAR	30.00 in	30.00 in
PR-4	259.93	6777.19	1.0	6779.79	0.013	1.32	1.00	CIRCULAR	30.00 in	30.00 in
PR-2	21.17	6783.01	1.0	6783.22	0.013	1.32	0.00	CIRCULAR	18.00 in	18.00 in
PR-1	46.35	6780.08	1.5	6780.78	0.013	0.05	1.00	CIRCULAR	30.00 in	30.00 in

PR-1	140.10	6781.08	3.3	6785.75	0.013	0.63	1.00	CIRCULAR	30.00 in	30.00 in
PR-3	19.17	6782.72	1.0	6782.91	0.013	1.32	0.00	CIRCULAR	18.00 in	18.00 in
PR-6	23.12	6779.41	3.0	6780.10	0.013	0.08	0.00	CIRCULAR	24.00 in	24.00 in
PR-5	10.52	6780.30	2.0	6780.51	0.013	0.20	0.00	CIRCULAR	18.00 in	18.00 in
PR-10	14.56	6775.20	1.3	6775.39	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
PR-12	6.92	6773.66	2.0	6773.80	0.013	1.32	0.00	CIRCULAR	18.00 in	18.00 in
PR-14	4.20	6772.42	5.0	6772.63	0.013	1.06	0.00	CIRCULAR	18.00 in	18.00 in
PR-16	44.21	6770.55	4.0	6772.32	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
PR-17	67.58	13.77	25.55	8.98	16.61	14.34	2.39	Pressurized	40.00	11.00	
PR-15	50.37	10.26	25.28	8.84	19.82	11.33	1.66	Pressurized	39.00	91.57	
PR-13	50.37	10.26	24.11	8.28	18.40	11.09	1.72	Pressurized	35.00	49.16	
PR-11	50.37	10.26	23.46	8.01	17.71	10.94	1.74	Supercritical Jump	33.00	65.68	
PR-9	45.05	9.18	23.12	7.88	18.68	9.96	1.52	Supercritical Jump	32.00	37.87	
PR-8	23.55	13.33	6.40	3.55	3.55	8.12	3.15	Supercritical	2.00	0.00	
PR-7	58.16	11.85	22.76	7.76	15.58	12.04	2.09	Supercritical	31.00	0.00	
PR-4	41.13	8.38	20.85	7.14	17.31	8.86	1.43	Supercritical Jump	26.00	110.92	

PR-2	10.53	5.96	8.17	4.10	6.81	5.23	1.42	Supercritical	3.20	0.00	
PR-1	50.37	10.26	19.58	6.78	14.23	10.03	1.84	Supercritical	23.00	0.00	
PR-1	75.09	15.30	19.58	6.78	11.39	13.45	2.82	Supercritical	23.00	0.00	
PR-3	10.53	5.96	4.70	3.00	3.93	3.86	1.42	Supercritical	1.10	0.00	
PR-6	39.29	12.51	11.26	4.83	6.86	9.45	2.60	Supercritical	7.00	0.00	
PR-5	14.88	8.42	10.10	4.70	7.03	7.51	2.00	Supercritical	4.80	0.00	
PR-10	12.03	6.81	6.06	3.45	4.71	4.89	1.63	Supercritical Jump	1.80	10.18	
PR-12	14.90	8.43	8.56	4.22	5.94	6.89	2.02	Pressurized	3.50	6.92	
PR-14	23.55	13.33	10.43	4.80	5.69	10.64	3.20	Pressurized	5.10	4.20	
PR-16	21.07	11.92	5.12	3.14	3.03	6.61	2.79	Pressurized	1.30	44.21	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
PR-17	40.00	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	
PR-15	39.00	CIRCULAR	30.00 in	30.00 in	30.00 in	30.00 in	30.00 in	30.00 in	4.91	
PR-13	35.00	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	

PR-11	33.00	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	
PR-9	32.00	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	
PR-8	2.00	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-7	31.00	CIRCULAR	30.00 in	30.00 in	24.00 in	24.00 in	30.00 in	30.00 in	4.91	
PR-4	26.00	CIRCULAR	30.00 in	30.00 in	27.00 in	27.00 in	30.00 in	30.00 in	4.91	
PR-2	3.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-1	23.00	CIRCULAR	30.00 in	30.00 in	24.00 in	24.00 in	30.00 in	30.00 in	4.91	
PR-1	23.00	CIRCULAR	30.00 in	30.00 in	21.00 in	21.00 in	30.00 in	30.00 in	4.91	
PR-3	1.10	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-6	7.00	CIRCULAR	24.00 in	24.00 in	18.00 in	18.00 in	24.00 in	24.00 in	3.14	
PR-5	4.80	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-10	1.80	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-12	3.50	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-14	5.10	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
PR-16	1.30	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6773.40

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
PR-17	6768.75	6769.05	0.00	0.00	6773.40	6773.50	6774.43	0.10	6774.54
PR-15	6769.55	6770.92	0.30	0.05	6773.91	6774.73	6774.89	0.82	6775.71
PR-13	6771.42	6772.16	0.04	0.19	6775.15	6775.51	6775.94	0.36	6776.30
PR-11	6772.66	6773.70	0.04	0.09	6775.72	6776.13	6776.42	0.42	6776.85
PR-9	6774.20	6776.18	0.70	0.04	6776.93	6778.11	6777.59	1.49	6779.07
PR-8	6778.90	6779.50	0.02	0.00	6779.20	6780.03	6780.22	0.00	6780.23
PR-7	6776.49	6776.89	0.05	0.04	6778.20	6779.41	6780.03	0.00	6780.03
PR-4	6777.19	6779.79	0.58	0.18	6780.36	6781.53	6780.79	1.53	6782.32
PR-2	6783.01	6783.22	0.07	0.00	6783.58	6783.90	6784.00	0.16	6784.16
PR-1	6780.08	6780.78	0.02	0.09	6781.64	6782.41	6782.83	0.29	6783.12
PR-1	6781.08	6785.75	0.21	0.00	6782.63	6787.38	6784.84	3.26	6788.09
PR-3	6782.72	6782.91	0.01	0.00	6783.05	6783.30	6783.28	0.16	6783.44
PR-6	6779.41	6780.10	0.01	0.00	6779.98	6781.04	6781.36	0.04	6781.40
PR-5	6780.30	6780.51	0.02	0.00	6781.06	6781.55	6781.76	0.00	6781.76
PR-10	6775.20	6775.39	0.00	0.00	6776.83	6776.83	6776.85	0.00	6776.85
PR-12	6773.66	6773.80	0.08	0.00	6776.32	6776.33	6776.38	0.01	6776.39
PR-14	6772.42	6772.63	0.14	0.00	6775.72	6775.73	6775.85	0.01	6775.86

PR-16	6770.55	6772.32	0.00	0.00	6774.53	6774.54	6774.54	0.01	6774.55

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: MARC A. WHORTON, P.E.
Company: CLASSIC CONSULTING
Date: December 3, 2024
Project: URBAN LANDING FILING NO. 1 - FDR
Location: POND 1 (30" RCP OUTFALL - DP-11)

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 25.2 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.252

C) Contributing Watershed Area — Area = 21.010 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = 0.42 in

E) Design Concept (Select EURV when also designing for flood control)
Choose One
- ○ Water Quality Capture Volume (WQCV)
- ◉ Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$) — V_{DESIGN} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$) — $V_{DESIGN\ OTHER}$ = 0.232 ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired) — $V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = 0 %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = 100 %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = 0 %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = 0.537 ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired) — $EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio
(A basin length to width ratio of at least 2:1 will improve TSS reduction.) — L : W = 2.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.007 ac-ft

B) Actual Forebay Volume — V_F = 0.007 ac-ft

C) Forebay Depth
(D_F = 18 inch maximum) — D_F = 18.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 40.00 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$) — Q_F = 0.80 cfs

E) Forebay Discharge Design
Choose One
- ○ Berm With Pipe
- ◉ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = 5.2 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: MARC A. WHORTON, P.E.
Company: CLASSIC CONSULTING
Date: December 3, 2024
Project: URBAN LANDING FILING NO. 1 - FDR
Location: POND 1 (30" RCP OUTFALL - DP-11)

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 107 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 1.25 inches
E) Total Outlet Area	A_{ot} = 4.47 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 6 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 30 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 53.5 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 153 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	*Aluminum Amico-Klemp SR Series with Cross Rods 2" O.C.*
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 215 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 4.5 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 82 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: MARC A. WHORTON, P.E.
Company: CLASSIC CONSULTING
Date: December 3, 2024
Project: URBAN LANDING FILING NO. 1 - FDR
Location: POND 1 (30" RCP OUTFALL - DP-11)

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

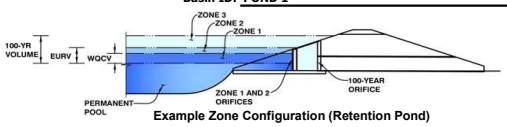
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: URBAN LANDING FILING NO. 1 - FDR

Basin ID: POND 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	21.67	acres
Watershed Length =	1,500	ft
Watershed Length to Centroid =	750	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	27.40%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.258	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.605	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.620	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.032	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.414	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.002	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.440	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.029	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.1 in.) =	4.087	acre-feet	3.10	inches
Approximate 2-yr Detention Volume =	0.429	acre-feet		
Approximate 5-yr Detention Volume =	0.618	acre-feet		
Approximate 10-yr Detention Volume =	0.920	acre-feet		
Approximate 25-yr Detention Volume =	1.082	acre-feet		
Approximate 50-yr Detention Volume =	1.141	acre-feet		
Approximate 100-yr Detention Volume =	1.362	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.258	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.347	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.757	acre-feet
Total Detention Basin Volume =	1.362	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

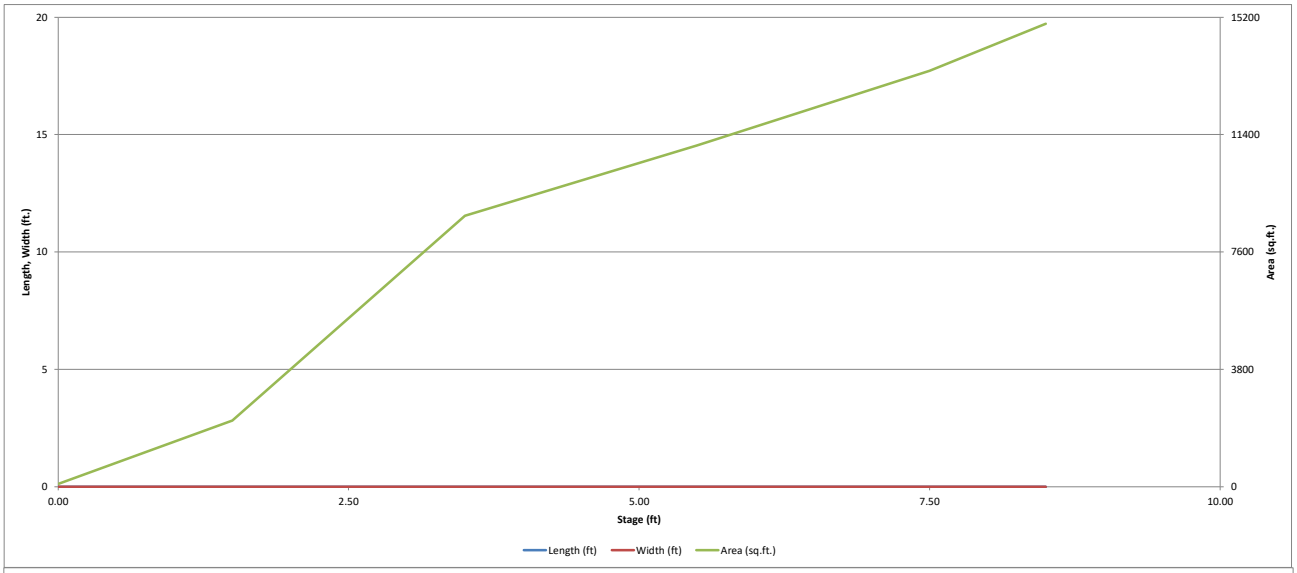
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

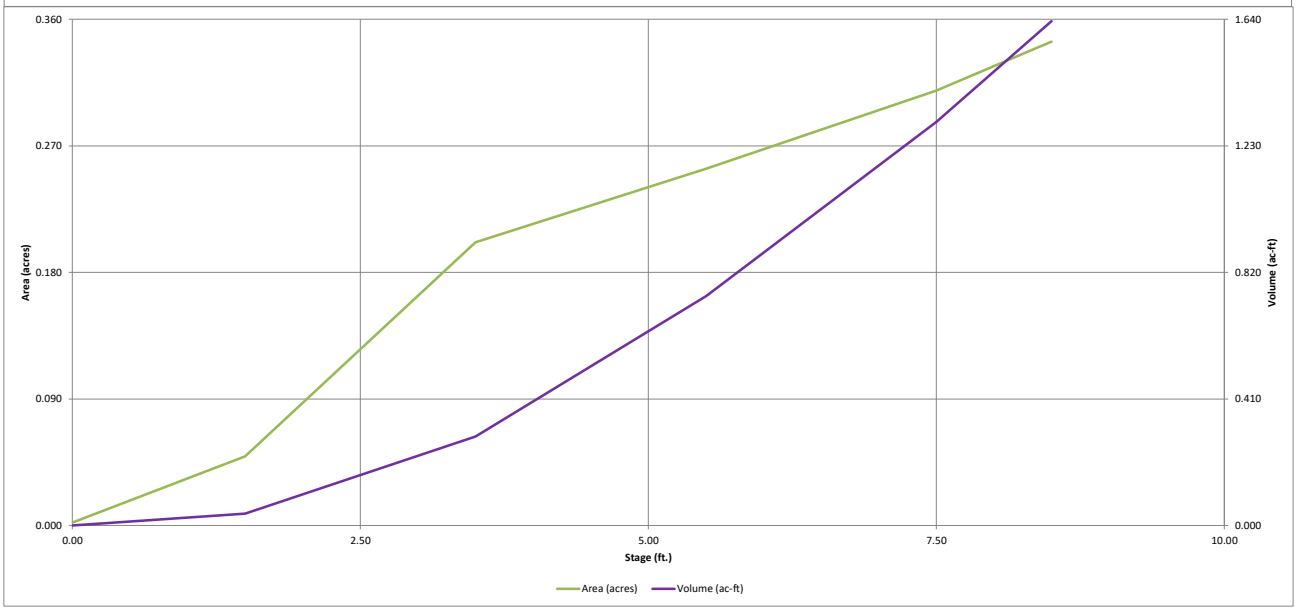
Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	90	0.002		
68	--	1.50	--	--	--	2,143	0.049	1,675	0.038
70	--	3.50	--	--	--	8,773	0.201	12,591	0.289
72	--	5.50	--	--	--	11,058	0.254	32,422	0.744
74	--	7.50	--	--	--	13,471	0.309	56,951	1.307
75	--	8.50	--	--	--	14,994	0.344	71,183	1.634

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)



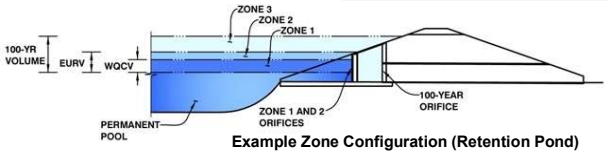


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: URBAN LANDING FILING NO. 1 - FDR

Basin ID: POND 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.35	0.258	Orifice Plate
Zone 2 (EURV)	4.94	0.347	Orifice Plate
Zone 3 (100-year)	7.68	0.757	Weir&Pipe (Restrict)
Total (all zones)		1.362	

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

Underdrain Orifice Invert Depth = [ ] ft (distance below the filtration media surface)

Underdrain Orifice Diameter = [ ] inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = [ ] ft^2

Underdrain Orifice Centroid = [ ] 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)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 5.00 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 20.00 inches

Orifice Plate: Orifice Area per Row = N/A sq. 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	1.70	3.40					
Orifice Area (sq. inches)	0.99	1.76	1.76					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

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

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.00	N/A	feet
Overflow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.31	N/A	
Overflow Grate Open Area w/o Debris =	22.96	N/A	ft^2
Overflow Grate Open Area w/ Debris =	11.48	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 =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	24.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	3.14	N/A	ft^2
Outlet Orifice Centroid =	1.00	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 7.00 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 20.00 feet

Spillway End Slopes = 3.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.70 feet

Stage at Top of Freeboard = 8.70 feet

Basin Area at Top of Freeboard = 0.34 acres

Basin Volume at Top of Freeboard = 1.63 acre-ft

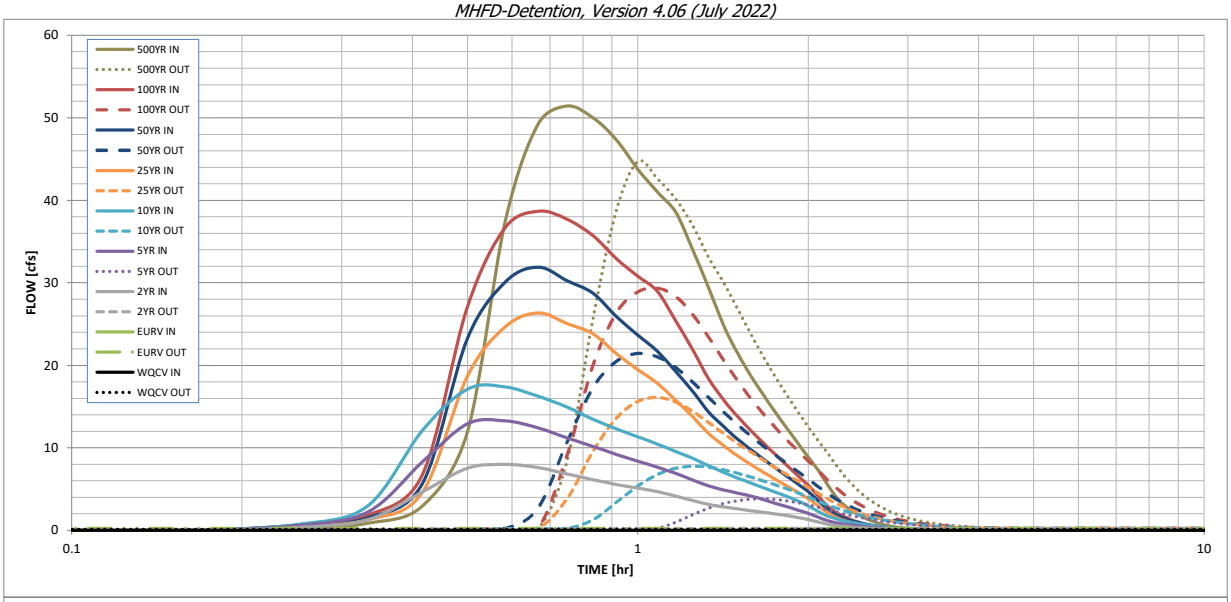
Routed Hydrograph Results

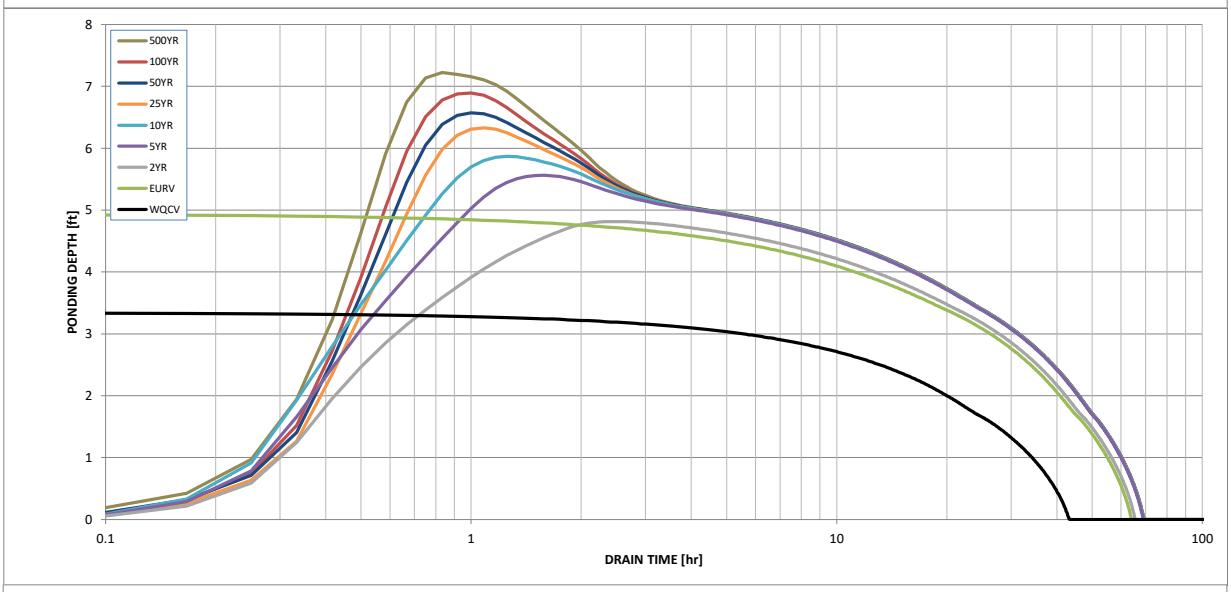
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

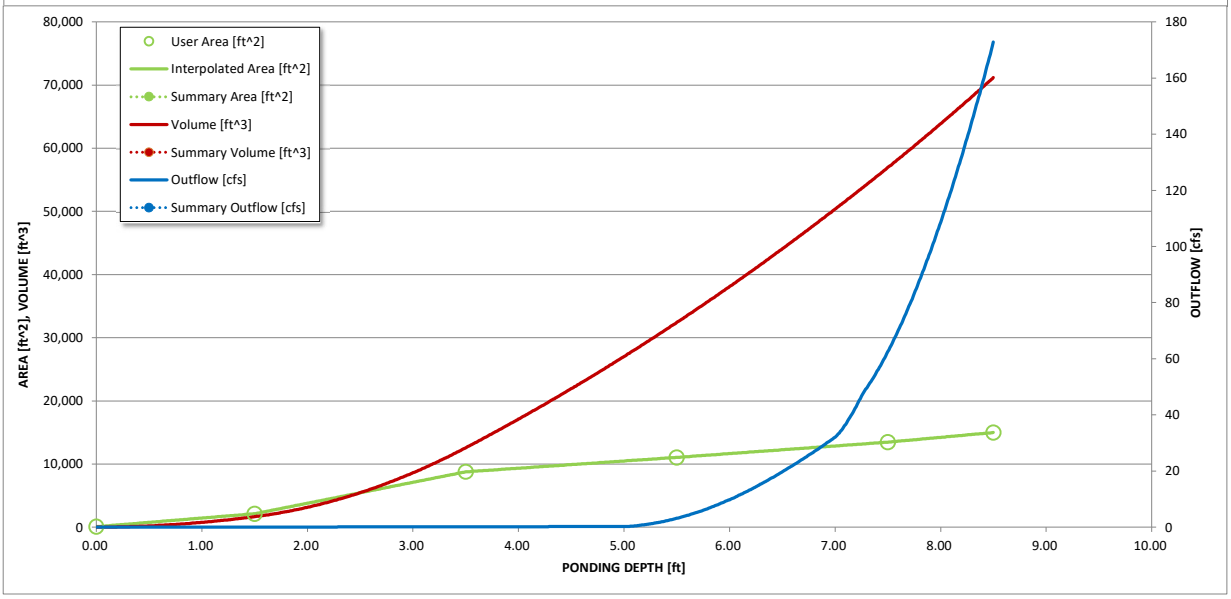
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.10
CUHP Runoff Volume (acre-ft) =	0.258	0.605	0.620	1.032	1.414	2.002	2.440	3.029	4.087
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.620	1.032	1.414	2.002	2.440	3.029	4.087
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	2.5	7.1	10.7	18.8	23.6	29.8	40.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		7.0				31.0	
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.32	0.49	0.87	1.09	1.43	1.88
Peak Inflow Q (cfs) =	N/A	N/A	8.0	13.3	17.4	26.4	31.9	38.7	51.4
Peak Outflow Q (cfs) =	0.1	0.3	0.2	3.8	7.8	16.1	21.4	29.4	44.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	0.9	0.9	0.9	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.3	0.7	0.9	1.3	1.6
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	55	56	56	52	48	46	43	40
Time to Drain 99% of Inflow Volume (hours) =	**41**	60	61	63	62	59	58	56	53
Maximum Ponding Depth (ft) =	3.35	4.94	4.81	5.56	5.87	6.33	6.57	6.90	7.22
Area at Maximum Ponding Depth (acres) =	0.19	0.24	0.24	0.26	0.26	0.28	0.28	0.29	0.30
Maximum Volume Stored (acre-ft) =	0.260	0.606	0.575	0.760	0.837	0.965	1.032	1.124	1.222

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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:

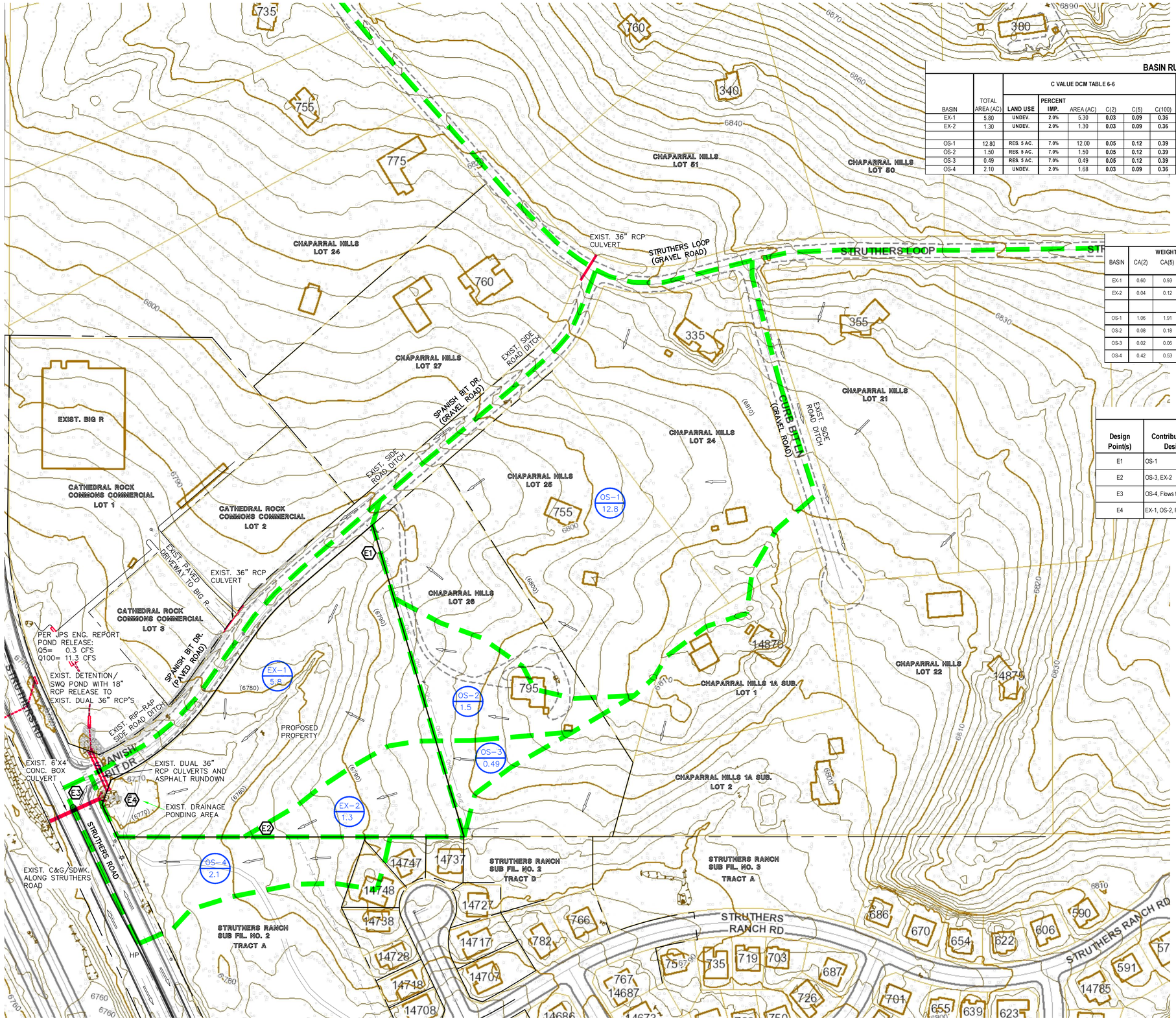
Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.13
	0:15:00	0.00	0.00	0.35	0.58	0.72	0.49	0.62	0.60	0.87
	0:20:00	0.00	0.00	1.29	2.21	2.97	1.29	1.53	1.84	2.97
	0:25:00	0.00	0.00	4.67	8.30	12.13	4.63	5.66	6.74	11.94
	0:30:00	0.00	0.00	7.55	12.91	17.12	18.71	23.28	27.10	37.48
	0:35:00	0.00	0.00	7.98	13.27	17.39	24.66	30.09	36.69	49.24
	0:40:00	0.00	0.00	7.62	12.42	16.25	26.36	31.90	38.69	51.43
	0:45:00	0.00	0.00	6.83	11.20	14.95	25.05	30.25	37.71	50.01
	0:50:00	0.00	0.00	6.14	10.18	13.47	23.82	28.75	35.71	47.33
	0:55:00	0.00	0.00	5.56	9.20	12.30	21.42	25.90	32.92	43.76
	1:00:00	0.00	0.00	5.11	8.40	11.35	19.49	23.67	30.79	40.99
	1:05:00	0.00	0.00	4.69	7.64	10.45	17.80	21.69	28.95	38.56
	1:10:00	0.00	0.00	4.14	6.91	9.56	15.76	19.25	25.39	33.97
	1:15:00	0.00	0.00	3.61	6.11	8.72	13.76	16.84	21.87	29.45
	1:20:00	0.00	0.00	3.16	5.41	7.83	11.76	14.38	18.39	24.88
	1:25:00	0.00	0.00	2.84	4.91	7.03	10.28	12.59	15.83	21.48
	1:30:00	0.00	0.00	2.60	4.52	6.35	9.03	11.07	13.81	18.74
	1:35:00	0.00	0.00	2.39	4.17	5.73	7.98	9.79	12.12	16.41
	1:40:00	0.00	0.00	2.19	3.72	5.17	7.04	8.63	10.59	14.32
	1:45:00	0.00	0.00	1.99	3.29	4.63	6.19	7.58	9.19	12.39
	1:50:00	0.00	0.00	1.80	2.87	4.12	5.38	6.57	7.87	10.58
	1:55:00	0.00	0.00	1.55	2.46	3.57	4.61	5.61	6.62	8.87
	2:00:00	0.00	0.00	1.31	2.06	2.96	3.86	4.70	5.47	7.29
	2:05:00	0.00	0.00	1.02	1.59	2.28	2.97	3.59	4.15	5.48
	2:10:00	0.00	0.00	0.76	1.18	1.73	2.14	2.57	2.93	3.91
	2:15:00	0.00	0.00	0.57	0.90	1.37	1.52	1.87	2.11	2.87
	2:20:00	0.00	0.00	0.46	0.72	1.11	1.13	1.40	1.55	2.15
	2:25:00	0.00	0.00	0.37	0.58	0.91	0.85	1.07	1.14	1.60
	2:30:00	0.00	0.00	0.30	0.48	0.73	0.65	0.82	0.84	1.18
	2:35:00	0.00	0.00	0.25	0.38	0.59	0.50	0.63	0.60	0.86
	2:40:00	0.00	0.00	0.20	0.31	0.46	0.38	0.48	0.43	0.61
	2:45:00	0.00	0.00	0.16	0.24	0.36	0.29	0.36	0.30	0.44
	2:50:00	0.00	0.00	0.13	0.19	0.28	0.22	0.28	0.24	0.34
	2:55:00	0.00	0.00	0.10	0.15	0.22	0.17	0.22	0.19	0.27
	3:00:00	0.00	0.00	0.08	0.11	0.17	0.14	0.17	0.15	0.21
	3:05:00	0.00	0.00	0.06	0.09	0.13	0.11	0.13	0.12	0.17
	3:10:00	0.00	0.00	0.05	0.06	0.10	0.08	0.10	0.09	0.12
	3:15:00	0.00	0.00	0.03	0.04	0.07	0.06	0.07	0.06	0.09
	3:20:00	0.00	0.00	0.02	0.03	0.05	0.04	0.05	0.04	0.06
	3:25:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.03
	3:30:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	3:35:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DRAINAGE MAPS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS



BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	C VALUE DCM TABLE 6-6 LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	C VALUE DCM TABLE 6-6 LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	WEIGHTED "C" VALUE C(2)	C(5)	C(100)	WEIGHTED CA CA(2)	CA(5)	CA(100)	WEIGHTED IMP. PERCENT
EX-1	5.80	UNDEV.	2.0%	5.30	0.03	0.09	0.36	PAVED ROAD	100.0%	0.50	0.89	0.90	0.96	0.10	0.16	0.41	0.60	0.93	2.39	10.4%
EX-2	1.30	UNDEV.	2.0%	1.30	0.03	0.09	0.36			0.00	0.02	0.08	0.35	0.03	0.09	0.36	0.04	0.12	0.47	2.0%
OS-1	12.80	RES. 5 AC.	7.0%	12.00	0.05	0.12	0.39	GRAVEL ROAD	80.0%	0.80	0.57	0.59	0.7	0.08	0.15	0.41	1.06	1.91	5.24	11.6%
OS-2	1.50	RES. 5 AC.	7.0%	1.50	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.08	0.18	0.59	7.0%
OS-3	0.49	RES. 5 AC.	7.0%	0.49	0.05	0.12	0.39			0.00	0.02	0.08	0.35	0.05	0.12	0.39	0.02	0.06	0.19	7.0%
OS-4	2.10	UNDEV.	2.0%	1.68	0.03	0.09	0.36	PAVED ROAD	100.0%	0.42	0.89	0.90	0.96	0.20	0.25	0.48	0.42	0.53	1.01	21.6%

BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
EX-1	0.60	0.93	2.39	0.16	300	10	19.8	520	2.0%	1.4	6.1	25.9	2.16	2.70	4.54	1.3	3	11
EX-2	0.04	0.12	0.47	0.09	300	10	21.2					21.2	2.40	3.00	5.04	0.1	0.4	2.4
OS-1	1.06	1.91	5.24	0.15	300	9	20.7	530	2.5%	1.1	8.0	28.7	2.04	2.55	4.28	2	5	22
OS-2	0.08	0.18	0.59	0.12	250	8	19.1					19.1	2.53	3.16	5.31	0.2	0.6	3
OS-3	0.02	0.06	0.19	0.12	240	8	18.4					18.4	2.57	3.21	5.39	0.1	0.2	1.0
OS-4	0.42	0.53	1.01	0.25	300	9	18.5	320	1.0%	2.0	2.7	21.1	2.41	3.01	5.05	1.0	1.6	5

SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility/ Inlet Size*
E1	OS-1	1.91	5.24	28.7	2.55	4.28	5	22	EXIST. NATURAL SWALE
E2	OS-3, EX-2	0.18	0.66	21.2	3.00	5.04	0.5	3.3	SHEET FLOW OFF-SITE
E3	OS-4, Flows from DP E2	0.71	1.67	23.9	2.82	4.73	2	8	EXIST. ASPHALT RUNDOWN
E4	EX-1, OS-2, Flows from E1	3.02	8.21	35.7	2.22	3.73	7	31	EXIST. 6'X4' CBC AT STRUTHERS

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	(6910)
BASIN BOUNDARY	
DESIGN POINT	E1
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
EXISTING STORM SEWER	

N

100 50 0 100 200

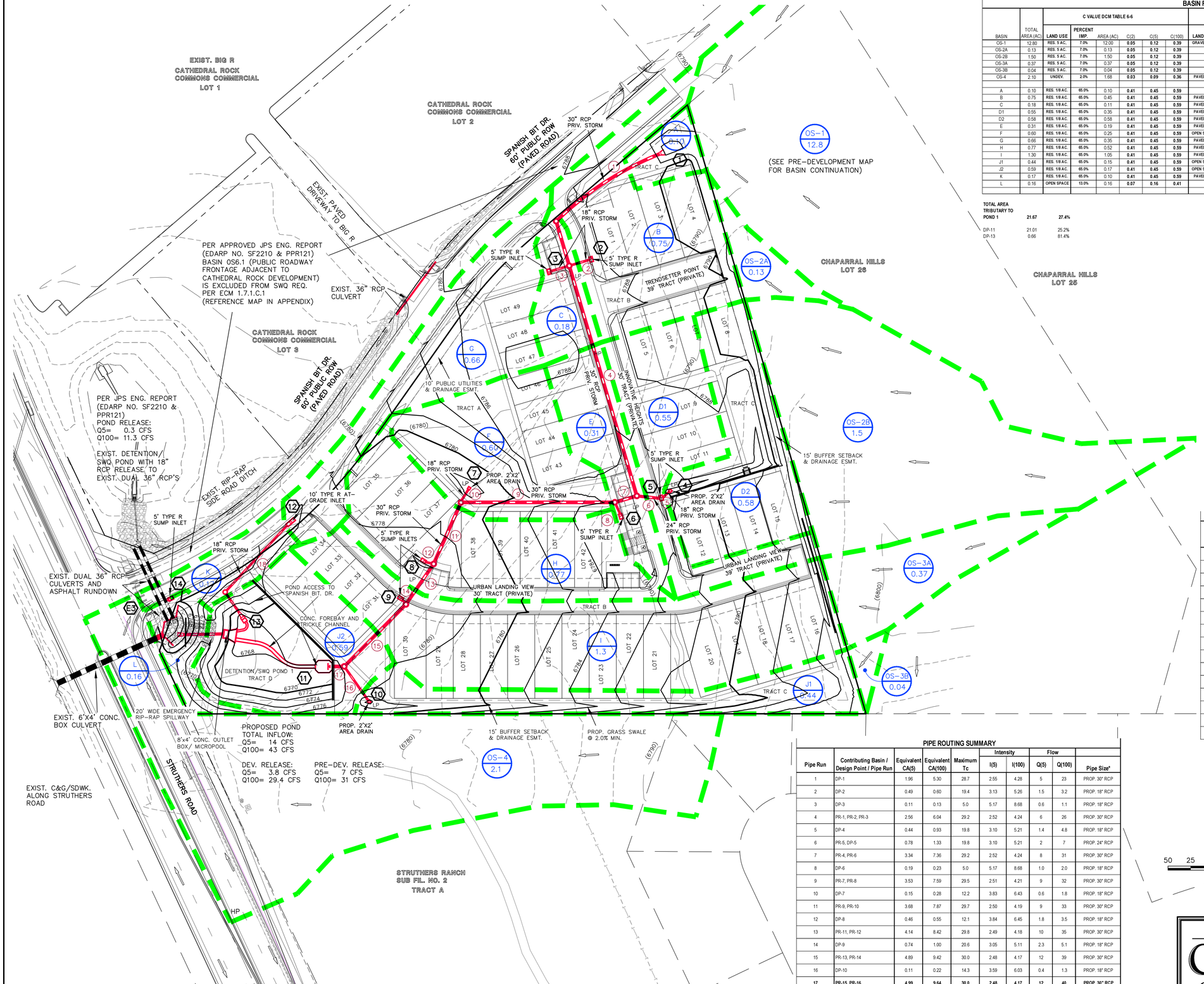
SCALE: 1" = 100'

CLASSIC CONSULTING SM
619 N. Cascade Avenue, Suite 200 (719)785-0790
Colorado Springs, Colorado 80903 (719)785-0799 (Fax)

URBAN LANDING
FILING NO. 1
FINAL DRAINAGE REPORT
PRE-DEVELOPMENT MAP

CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE		DATE	12/4/24
DRAWN BY	MAW	(H) 1"= 100'		SHEET	1 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	1308.01



BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	C VALUE DCM TABLE 6-6 LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	C VALUE DCM TABLE 6-6 LAND USE	PERCENT IMP.	AREA (AC)	C(2)	C(5)	C(100)	WEIGHTED "C" VALUE C(2)	C(5)	C(100)	WEIGHTED CA CA(2)	CA(5)	CA(100)	WEIGHTED IMP. PERCENT
OS-1	12.80	RES. 5 AC.	7.0%	12.00	**0.05**	**0.12**	**0.39**	GRAVEL RD.	90.0%	0.80	0.57	0.59	0.70	0.08	0.15	0.41	**1.06**	**1.91**	**5.24**	**11.6%**
OS-2A	0.13	RES. 5 AC.	7.0%	0.13	**0.05**	**0.12**	**0.39**			0.00	0.02	0.08	0.35	0.05	0.12	0.39	**0.01**	**0.02**	**0.05**	**7.0%**
OS-2B	1.50	RES. 5 AC.	7.0%	1.50	**0.05**	**0.12**	**0.39**			0.00	0.02	0.08	0.35	0.05	0.12	0.39	**0.08**	**0.18**	**0.59**	**7.0%**
OS-3A	0.37	RES. 5 AC.	7.0%	0.37	**0.05**	**0.12**	**0.39**			0.00	0.02	0.08	0.35	0.05	0.12	0.39	**0.02**	**0.04**	**0.14**	**7.0%**
OS-3B	0.04	RES. 5 AC.	7.0%	0.04	**0.05**	**0.12**	**0.39**			0.00	0.02	0.08	0.35	0.05	0.12	0.39	**0.00**	**0.00**	**0.02**	**7.0%**
OS-4	2.10	UNDEV.	2.0%	1.68	**0.03**	**0.09**	**0.36**	PAVED RD.	100.0%	0.42	0.89	0.90	0.96	0.20	0.25	0.48	**0.42**	**0.53**	**1.01**	**21.6%**
A	0.10	RES. 1/8 AC.	65.0%	0.10	**0.41**	**0.45**	**0.59**			0.00	0.18	0.25	0.47	0.41	0.45	0.59	**0.04**	**0.05**	**0.06**	**65.0%**
B	0.75	RES. 1/8 AC.	65.0%	0.45	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.30	0.89	0.90	0.96	0.60	0.63	0.74	**0.45**	**0.47**	**0.55**	**79.0%**
C	0.18	RES. 1/8 AC.	65.0%	0.11	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.07	0.89	0.90	0.96	0.60	0.63	0.73	**0.11**	**0.11**	**0.13**	**78.6%**
D1	0.55	RES. 1/8 AC.	65.0%	0.35	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.20	0.89	0.90	0.96	0.58	0.61	0.72	**0.32**	**0.34**	**0.40**	**77.7%**
D2	0.58	RES. 1/8 AC.	65.0%	0.58	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.00	0.89	0.90	0.96	0.41	0.45	0.59	**0.24**	**0.26**	**0.34**	**65.0%**
E	0.31	RES. 1/8 AC.	65.0%	0.19	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.12	0.89	0.90	0.96	0.60	0.62	0.73	**0.18**	**0.19**	**0.23**	**78.5%**
F	0.60	RES. 1/8 AC.	65.0%	0.25	**0.41**	**0.45**	**0.59**	OPEN SPACE	7.0%	0.35	0.05	0.12	0.39	0.20	0.26	0.47	**0.12**	**0.15**	**0.28**	**31.2%**
G	0.66	RES. 1/8 AC.	65.0%	0.35	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.31	0.89	0.90	0.96	0.64	0.66	0.76	**0.42**	**0.44**	**0.50**	**81.4%**
H	0.77	RES. 1/8 AC.	65.0%	0.52	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.25	0.89	0.90	0.96	0.57	0.60	0.71	**0.44**	**0.46**	**0.55**	**76.4%**
I	1.30	RES. 1/8 AC.	65.0%	1.05	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.25	0.89	0.90	0.96	0.50	0.54	0.66	**0.65**	**0.70**	**0.86**	**71.7%**
J1	0.44	RES. 1/8 AC.	65.0%	0.15	**0.41**	**0.45**	**0.59**	OPEN SPACE	7.0%	0.29	0.05	0.12	0.39	0.17	0.23	0.46	**0.08**	**0.10**	**0.20**	**26.8%**
J2	0.59	RES. 1/8 AC.	65.0%	0.17	**0.41**	**0.45**	**0.59**	OPEN SPACE	7.0%	0.42	0.05	0.12	0.39	0.15	0.22	0.45	**0.09**	**0.13**	**0.26**	**23.7%**
K	0.17	RES. 1/8 AC.	65.0%	0.10	**0.41**	**0.45**	**0.59**	PAVED RD.	100.0%	0.07	0.89	0.90	0.96	0.61	0.64	0.74	**0.10**	**0.11**	**0.13**	**79.4%**
L	0.16	OPEN SPACE	13.0%	0.16	**0.07**	**0.16**	**0.41**			0.00	0.89	0.90	0.96	0.07	0.16	0.41	**0.01**	**0.03**	**0.07**	**13.0%**

TOTAL AREA TRIBUTARY TO POND 1	**21.67**	**27.4%**
DP-11	21.01	25.2%
DP-13	0.66	81.4%

BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	CA(5)	CA(100)	OVERLAND C(5)	Length (ft)	Height (ft)	Tc (min)	STREET / CHANNEL FLOW Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
OS-1	1.06	1.91	5.24	0.15	300	9	20.7	530	2.5%	1.1	8.0	28.7	2.04	2.55	4.28	2	5	**22**
OS-2A	0.01	0.02	0.05	0.08	100	3	12.8					12.8	3.00	3.76	6.31	0.02	**0.06**	0.32
OS-2B	0.08	0.18	0.59	0.12	250	8	19.1					19.1	2.53	3.16	5.31	0.2	0.6	3.1
OS-3A	0.02	0.04	0.14	0.12	240	8	18.4					18.4	2.57	3.21	5.39	0.0	0.1	0.8
OS-3B	0.00	0.00	0.02	0.12	55	3	7.5					7.5	3.64	4.56	7.66	0.01	**0.02**	0.12
OS-4	0.42	0.53	1.01	0.25	300	9	18.5	320	1.0%	2.0	2.7	21.2	2.40	3.00	5.04	1.0	1.6	5.1
A	0.04	0.05	0.06	0.08	50	1.5	9.1					9.1	3.41	4.28	7.18	0.1	0.2	0.4
B	0.45	0.47	0.55	0.08	80	1.6	13.1	150	2.0%	2.8	0.9	14.0	2.90	3.63	6.09	1.3	1.7	3.4
C	0.11	0.11	0.13				5.0					5.0	4.12	5.17	8.68	0.4	0.6	1.1
D1	0.32	0.34	0.40	0.25	100	2	12.2	100	2.0%	2.1	0.8	13.0	2.98	3.74	6.27	1.0	1.3	2.5
D2	0.24	0.26	0.34	0.25	100	2	12.2					12.2	3.06	3.83	6.43	0.7	1.0	2.2
E	0.18	0.19	0.23				5.0					5.0	4.12	5.17	8.68	0.8	1.0	2.0
F	0.12	0.15	0.28	0.25	100	2	12.2					12.2	3.06	3.83	6.43	0.4	0.6	1.8
G	0.42	0.44	0.50	0.25	100	2	12.2					12.2	3.06	3.83	6.43	1.3	1.7	3.2
H	0.44	0.46	0.55	0.25	80	1.6	10.9	225	2.5%	3.2	1.2	12.1	3.07	3.84	6.45	1.3	1.8	3.5
I	0.65	0.70	0.86	0.25	80	1.6	10.9	450	3.0%	3.5	2.2	13.1	2.97	3.73	6.25	1.9	2.6	5.4
J1	0.08	0.10	0.20	0.25	100	2.5	11.3	420	2.5%	2.4	3.0	14.3	2.87	3.59	6.03	0.2	0.4	1.2
J2	0.09	0.13	0.26	0.25	60	2	8.0	120	2.0%	2.1	0.9	8.9	3.43	4.30	7.22	0.3	0.5	1.9
K	0.10	0.11	0.13	0.25	30	0.6	6.7	85	1.5%	2.4	0.6	7.3	3.68	4.61	7.74	0.4	0.5	1.0
L	0.01	0.03	0.07	0.25	80	3.2	8.7					8.7	3.46	4.34	7.29	0.0	0.1	0.5

SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins / Design Point	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Facility/ Inlet Size*
1	OS-1, A	1.96	5.30	28.7	2.55	4.28	**5**	**23**	PROP. 30" RCP
2	OS-2A, B	0.49	0.60	19.4	3.13	5.26	**1.5**	**3.2**	5' TYPE R SUMP INLET
3	C	0.11	0.13	5.0	5.17	8.68	**0.6**	**1.1**	5' TYPE R SUMP INLET
4	OS-2B, D2	0.44	0.93	19.8	3.10	5.21	**1.4**	**4.8**	AREA DRAIN
5	D1	0.34	0.40	13.0	3.74	6.27	**1.3**	**2.5**	5' TYPE R SUMP INLET
6	E	0.19	0.23	5.0	5.17	8.68	**1.0**	**2.0**	5' TYPE R SUMP INLET
7	F	0.15	0.28	12.2	3.83	6.43	**0.6**	**1.8**	AREA DRAIN
8	H	0.46	0.55	12.1	3.84	6.45	**1.8**	**3.5**	5' TYPE R SUMP INLET
9	OS-3A, I	0.74	1.00	20.6	3.05	5.11	**2.3**	**5.1**	5' TYPE R SUMP INLET
10	OS-3B, J1	0.11	0.22	14.3	3.59	6.03	**0.4**	**1.3**	AREA DRAIN
11	**30" RCP INFLOW TO POND 1**	4.99	9.64	30.0	2.48	4.17	**12**	**40**	**30" RCP OUTFALL**
12	G	0.44	0.50	12.2	3.83	6.43	**1.7**	**3.2**	10' TYPE R AT-GRADE INLET
13	Collected Flows at DP-12	0.44	0.50	12.5	3.79	6.37	**1.7**	**3.2**	4'x6' CONC. FOREBAY
14	OS-4, K	0.64	1.13	21.2	3.00	5.04	**1.9**	**5.7**	5' TYPE R SUMP INLET
	TOTAL INFLOW INTO POND (INCL. BASIN J2)	**5.56**	**10.41**	**30.0**	2.48	4.17	**14**	**43**	**POND 1**

PIPE ROUTING SUMMARY

Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Pipe Size*
1	DP-1	1.96	5.30	28.7	2.55	4.28	5	23	PROP. 30" RCP
2	DP-2	0.49	0.60	19.4	3.13	5.26	1.5	3.2	PROP. 18" RCP
3	DP-3	0.11	0.13	5.0	5.17	8.68	0.6	1.1	PROP. 18" RCP
4	PR-1, PR-2, PR-3	2.56	6.04	29.2	2.52	4.24	6	26	PROP. 30" RCP
5	DP-4	0.44	0.93	19.8	3.10	5.21	1.4	4.8	PROP. 18" RCP
6	PR-5, DP-5	0.78	1.33	19.8	3.10	5.21	2	7	PROP. 24" RCP
7	PR-4, PR-6	3.34	7.36	29.2	2.52	4.24	8	31	PROP. 30" RCP
8	DP-6	0.19	0.23	5.0	5.17	8.68	1.0	2.0	PROP. 18" RCP
9	PR-7, PR-8	3.53	7.59	29.5	2.51	4.21	9	32	PROP. 30" RCP
10	DP-7	0.15	0.28	12.2	3.83	6.43	0.6	1.8	PROP. 18" RCP
11	PR-9, PR-10	3.68	7.87	29.7	2.50	4.19	9	33	PROP. 30" RCP
12	DP-8	0.46	0.55	12.1	3.84	6.45	1.8	3.5	PROP. 18" RCP
13	PR-11, PR-12	4.14	8.42	29.8	2.49	4.18	10	35	PROP. 30" RCP
14	DP-9	0.74	1.00	20.6	3.05	5.11	2.3	5.1	PROP. 18" RCP
15	PR-13, PR-14	4.89	9.42	30.0	2.48	4.17	12	39	PROP. 30" RCP
16	DP-10	0.11	0.22	14.3	3.59	6.03	0.4	1.3	PROP. 18" RCP
17	**PR-15, PR-16**	**4.99**	**9.64**	**30.0**	**2.48**	**4.17**	**12**	**40**	**PROP. 30" RCP**
18	DP-12 Pick-up	0.44	0.50	12.2	3.83	6.43	1.7	3.2	PROP. 18" RCP

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	(6910)
BASIN BOUNDARY	
DESIGN POINT	E1
PIPE RUN	2
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
STORM SEWER	

N

50 25 0 50 100

SCALE: 1" = 50'

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Colorado Springs, Colorado 80903 (719)785-0799 (Fax)

URBAN LANDING
FILING NO. 1
FINAL DRAINAGE REPORT
DEVELOPED DRAINAGE MAP

CLASSIC CONSULTING

DESIGNED BY	MAW	SCALE		DATE	12/2/24
DRAWN BY	MAW	(H) 1"= 50'		SHEET	2 OF 2
CHECKED BY		(V) 1"= N/A		JOB NO.	1308.01