



INNOVATIVE DESIGN. CLASSIC RESULTS.

**FINAL DRAINAGE REPORT
FOR
STERLING RANCH EAST COMMUNITY PARK
SITE DEVELOPMENT PLAN
(PHASE 1)**

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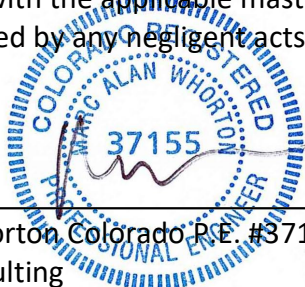
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PCD File No. PPR2536



FINAL DRAINAGE REPORT FOR STERLING RANCH EAST COMMUNITY PARK SITE DEVELOPMENT PLAN (PHASE 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
Classic Consulting

1/15/2026

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.

Loren J. Moreland

Loren J. Moreland, Vice President/Project Manager
Classic Homes

1/15/2026

Date

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.

Daniel Torres, P.E.

 Digitally signed by Daniel Torres,
P.E.
Reason: Authorized signatory as
County Engineer designee
Date: 2026.03.24 10:51:07-06'00'

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

3/24/2026

Date

Conditions:



FINAL DRAINAGE REPORT FOR STERLING RANCH EAST COMMUNITY PARK SITE DEVELOPMENT PLAN (PHASE 1)

TABLE OF CONTENTS:

PURPOSE	Page 1
GENERAL DESCRIPTION	Page 1
EXISTING DRAINAGE CONDITIONS	Page 2
PROPOSED DRAINAGE CONDITIONS	Page 3
DETENTION FACILITIES / STORMWATER QUALITY	Page 8
DRAINAGE CRITERIA	Page 9
FLOODPLAIN STATEMENT	Page 11
DRAINAGE AND BRIDGE FEES	Page 12
CONSTRUCTION COST OPINIONS	Page 12
SUMMARY	Page 12
REFERENCES	Page 13

APPENDICES

VICINITY MAP
SOILS MAP (S.C.S. SURVEY)
F.E.M.A. MAP
HYDROLOGIC / STORMWATER QUALITY CALCULATIONS
DRAINAGE MAPS



FINAL DRAINAGE REPORT FOR STERLING RANCH EAST COMMUNITY PARK SITE DEVELOPMENT PLAN (PHASE 1)

PURPOSE

The intent of the owner/developer is to develop/construct the Phase 1 of the Sterling Ranch East Community Park as contemplated in the Sterling Ranch East Park Land Agreement and as platted as Tract B, Sterling Ranch East Filing No. 1 (SF2235). The purpose of this Final Drainage Report is to identify all ultimate/full build-out 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 permanent outfall facilities. The drainage improvements proposed in this report are final in nature.

GENERAL DESCRIPTION

The Sterling Ranch East Community Park – Phase 1 includes an area of 12.76 acres within Tract B, Sterling Ranch East Filing No. 1 with a total area of 27.43 acres. The future Phase 2 park development will be on this remaining area of 14.67 acres. The Phase 1 Site Development Plan includes a multi-use turf field, outdoor pavilion, playground, dog park, food truck plaza area, pickle ball courts, open space/trails and multiple parking lots with direct access from Sterling Ranch Road. The entire Community Park area is located in section 33, township 12 south, range 65 west of the sixth principal meridian. The Phase 1 property is bounded on the north and east by existing single family detached lots within Sterling Ranch East Filing No. 1, to the south by Sterling Ranch Road and to the west by existing Sand Creek and Pond FSD-14A, constructed with Sterling Ranch East Filing No. 1. The site is within the upper portion of the Sand Creek drainage basin. The proposed land use matches the Sterling Ranch Sketch Plan (SKP241).

The soils within this site were originally Hydrologic Soil Group A, Blakeland loamy sand and Columbine gravelly sandy loam (See Appendix for Soil Map). However, based on significant



overlot grading and import of material previously done with the construction of Filing No. 1, Type B soils are used in the developed runoff calculations and sizing the proposed storm sewer infrastructure.

EXISTING DRAINAGE CONDITIONS

As previously mentioned, the entire site was overlot graded with the development of Sterling Ranch East Filing No. 1. The site currently sheet flows in a southerly direction towards Sterling Ranch Road. Off-site flows from rear yards of the adjacent Filing No. 1 residential lots sheet flow onto the property and are collected in multiple private Type C CDOT inlets along the northern portion of the site. These collected flows are then routed to a large diameter private storm system traversing the site and outfalls directly into the adjacent Pond FSD-14A (currently constructed). These private storm facilities on-site will remain in place and continue to convey these off-site flows directly to the pond. Another large diameter public storm system also traverses the site at the eastern edge and along Sterling Ranch Road. This system also outfalls directly into Pond FSD-14A. Both of these systems were planned and constructed with various storm stubs anticipated to handle the proposed park facilities. The existing sheet flows that directly enter the north curb line of Sterling Ranch Road travel to the west and are captured by an existing sump condition just east of the Sand Creek bridge crossing. This existing public 15' Type R sump inlet completely captures these existing flows and an existing storm system then conveys these flows to the existing interim Pond FSD-11B (CDR221), also currently constructed. This facility is south of Sterling Ranch Road and the future elementary school site, just east of Sand Creek. This facility treats these developed flows prior to release directly into the adjacent Sand Creek. This interim condition was designed to handle runoff from Sterling Ranch Road prior to the formal development of Sterling Ranch East Filing No. 3 (SF2428). This facility will be constructed to its ultimate condition along with the future construction of Sterling Ranch East Filing No. 3.



This entire property was previously studied in the Final Drainage Report for Sterling Ranch East Filing No. 1 (SF2235). The same proposed land use was contemplated in that report but now with a different configuration of park facilities. The following basin descriptions will describe the proposed developed drainage conditions for the planned park facilities within the Phase 1 along with the anticipated adjacent Phase 2 future facilities and compare them to the previously approved flow quantities and downstream facilities.

PROPOSED DRAINAGE CONDITIONS

Overall stormwater quality design for this property includes proposed impervious areas that will sheet flow across yards and landscape areas to slow runoff and increase time of concentration. This will minimize the effects of impervious areas. The existing constructed stormwater quality/detention facility (Pond FSD-14A) adjacent to the park site along with Pond FSD-11B south of Sterling Ranch Road will provide 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.

The following are design points for developed conditions with descriptions of final and anticipated future basin areas and final storm systems:

Design Point 1 ($Q_5 = 0.7$ cfs, $Q_{100} = 2.3$ cfs) consists of off-site flows from Basin R1 (0.77 ac.). These flows will continue to be collected by a planned (not constructed yet) existing private Type C CDOT inlet at the low point. This facility will be constructed with this development. A private



18" RCP outfall will then route these collected flows downstream towards the existing private 54" storm system traversing the park area. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-53 ($Q_5 = 1.1$ cfs, $Q_{100} = 3.1$ cfs).*

Design Point 2 ($Q_5 = 1.0$ cfs, $Q_{100} = 3.0$ cfs) consists of on/off-site flows from Basin R2 (1.0 ac.). These flows will continue to be collected by a planned (not constructed yet) existing private Type C CDOT inlet at the low point. This facility will be constructed with this development. A private 18" RCP outfall will then route these combined collected flows downstream towards the existing private 54" storm system. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-54 ($Q_5 = 1.4$ cfs, $Q_{100} = 3.7$ cfs).*

Design Point 3 ($Q_5 = 0.8$ cfs, $Q_{100} = 2.5$ cfs) consists of on/off-site flows from Basin R3 (0.76 ac.). These flows will continue to be collected by an existing private Type C CDOT inlet at the low point. This facility was constructed with Filing No. 1. A private 18" RCP outfall will then route these collected flows downstream towards the existing private 54" storm system. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-55A ($Q_5 = 1.1$ cfs, $Q_{100} = 3.2$ cfs).*

Design Point 4 ($Q_5 = 2.2$ cfs, $Q_{100} = 3.6$ cfs) consists of off-site flows from Basin R4 (0.92 ac.). These flows will continue to be collected by a public 5' Type R sump Inlet at the low point. This facility was constructed with Filing No. 1. A public 18" RCP outfall routes these collected flows downstream towards a different existing public 48" storm system traversing the park area. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-22 ($Q_5 = 2.4$ cfs, $Q_{100} = 4.9$ cfs).*

Design Point 5 ($Q_5 = 0.7$ cfs, $Q_{100} = 2.2$ cfs) consists of on/off-site flows from Basin R5 (0.74 ac.). These flows will continue to be collected by an existing private Type C CDOT inlet at the low point. This facility was constructed with Filing No. 1. A private 18" RCP outfall routes these collected flows downstream towards the existing private 54" storm system traversing the park area. *This*



compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-55B ($Q_5 = 2.2$ cfs, $Q_{100} = 7.0$ cfs).

Design Point 6 ($Q_5 = 5$ cfs, $Q_{100} = 9$ cfs) consists of on-site flows within the future Phase 2 park area from Basin R6 (1.9 ac.). These flows will be collected by a proposed private 10' Type R Sump Inlet at the low point. This facility is planned to be constructed with Phase 1 of the park development. An existing private 24" RCP stub was constructed with Filing No. 1 and will outfall these collected flows downstream into the existing public 48" storm system within the park area. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-51 ($Q_5 = 7.9$ cfs, $Q_{100} = 16.0$ cfs).*

Design Point 7 ($Q_5 = 3.2$ cfs, $Q_{100} = 8.5$ cfs) consists of on/off-site flows from Basin R7 (2.6 ac.). These flows will continue sheet flow directly into Sterling Ranch Road and be collected by an existing public 10' Type R at-grade inlet. This facility was constructed with Filing No. 1 and Sterling Ranch Road. A public 18" RCP outfall routes these collected flows downstream into the existing public 72" storm system adjacent to Sterling Ranch Road and then directly into Pond FSD-14A. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-26 ($Q_5 = 3.8$ cfs, $Q_{100} = 9.1$ cfs).*

Design Point 8 ($Q_5 = 4$ cfs, $Q_{100} = 8$ cfs) consists of on-site flows within Basin R8 (1.6 ac.). These flows will be collected by a proposed private 10' Type R Sump Inlet at the low point. This facility will be constructed with Phase 1 of the park development. A proposed private 18" RCP storm will outfall these collected flows downstream towards the existing private 54" storm system within the park area. *This compares to the Sterling Ranch East Filing No. 1 FDR represented by the north portion of Basin KK and DP-59 ($Q_5 = 1.5$ cfs, $Q_{100} = 9.2$ cfs). The additional 5-yr. flows are still able to be handled in the existing 54" private storm system as this increase is only 3.5% of what was anticipated.*



Design Point 9 ($Q_5 = 2$ cfs, $Q_{100} = 5$ cfs) consists of on-site flows within Basin R9 (1.4 ac.). These flows will be collected by a proposed private 10' Type R Sump Inlet at the low point. This facility is planned to be constructed with Phase 1 of the park development. A proposed private 18" RCP storm will outfall these collected flows downstream towards the existing private 54" storm system within the park area. *This new basin lies within the original basins LL2 and PP within the Sterling Ranch East Filing No. 1 FDR and best represented by DP-57 ($Q_5 = 2.1$ cfs, $Q_{100} = 11.0$ cfs).*

Design Point 10 ($Q_5 = 2$ cfs, $Q_{100} = 4$ cfs) consists of on-site flows within Basin R10 (0.61 ac.). These flows will be collected by a proposed private 5' Type R Sump Inlet at the low point. This facility is planned to be constructed with Phase 1 of the park development. A proposed private 18" RCP storm will outfall these collected flows downstream towards the existing private 54" storm system within the park area. *This basin lies within the original basin PP within the Sterling Ranch East Filing No. 1 FDR and again best represented by DP-57 ($Q_5 = 2.1$ cfs, $Q_{100} = 11.0$ cfs).*

Design Point 11 ($Q_5 = 1$ cfs, $Q_{100} = 2$ cfs) consists of on-site flows within Basin R11 (0.31 ac.). These flows will be collected by a proposed private 5' Type R Sump Inlet at the low point. This facility is planned to be constructed with Phase 1 of the park development. A proposed private 18" RCP storm will outfall these collected flows downstream towards the existing private 54" storm system within the park area. *This basin also lies within the original basin PP within the Sterling Ranch East Filing No. 1 FDR and again best represented by DP-57 ($Q_5 = 2.1$ cfs, $Q_{100} = 11.0$ cfs). The additional 5-yr. flows are still able to be handled in the existing 54" private storm system.*

Design Point 12 ($Q_5 = 2$ cfs, $Q_{100} = 7$ cfs) consists of on-site flows within Basin R12 (2.7 ac.). This basin mainly contains the proposed turf field area that is anticipated to have an underground drainage system. These flows will be collected by this system and then routed via a proposed private 18" RCP storm towards the existing private 54" storm system within the park area. *This basin lies within the original basin PP within the Sterling Ranch East Filing No. 1 FDR and again best represented by DP-57 ($Q_5 = 2.1$ cfs, $Q_{100} = 11.0$ cfs).*



Design Point 13 ($Q_5 = 4.3$ cfs, $Q_{100} = 11.6$ cfs) consists of on/off-site flows from Basin R15 (2.1 ac.) along with the 100-yr. flow-by from DP-7. These flows will continue sheet flow directly into Sterling Ranch Road and be collected by an existing public 15' Type R sump inlet and the low-point in Sterling Ranch Road. This facility was constructed with Filing No. 1 and Sterling Ranch Road. A public 18" RCP outfall routes these collected flows downstream towards the existing interim Pond FSD-11B south of Sterling Ranch Road. (CDR221) *This basin compares to the Sterling Ranch East Filing No. 1 FDR represented by DP-28 ($Q_5 = 7.3$ cfs, $Q_{100} = 14.6$ cfs).*

Basin R13A ($Q_5 = 0.6$ cfs, $Q_{100} = 3.0$ cfs) consists of the northeast end of the park area with some proposed sidewalks and trail but no structures. This basin will continue to sheet flow directly towards Sand Creek with minor grade changes that don't significantly alter the drainage patterns. Thus, this basin utilizes the trail exclusion (ECM I.7.1.B.9) for the sidewalk and trail areas and the undeveloped land to remain undeveloped exclusion (ECM I.7.1.B.7) for the remaining portion of the basin that will be revegetated with native seeding and some formal landscaping.

Basin R13B ($Q_5 = 1.7$ cfs, $Q_{100} = 4.6$ cfs) consists of the proposed Pavilion area. This basin will also continue to release flow directly into the existing stock pond within Sand Creek with minor grade changes that don't significantly alter the drainage patterns. The pavilion and seating area within this basin is approximately 18,000 SF of impervious surface and qualifies for the WQCV exclusion (ECM I.7.1.C.1.A) that allows 20% of a site up to 1.0 ac. to be excluded from water quality treatment. The remaining portion of this basin will utilize the undeveloped land to remain undeveloped exclusion (ECM I.7.1.B.7) and will be revegetated with native seeding and some formal landscaping.

Basin R13C ($Q_5 = 11$ cfs, $Q_{100} = 58$ cfs) consists of the existing Sand Creek corridor that will not be disturbed with the proposed development. This basin will continue to route the existing flows within the corridor south within Sand Creek. This basin qualifies for the exclusion I.7.1.B.7 (land



disturbance to undeveloped land where undeveloped land remains undeveloped following the project) (See SWQ Map in Appendix)

The intent of this FDR is to maintain what was previously planned and constructed for the total flows tributary to both Pond FSD-14A and Pond FSD-11B. As described in the above Design Point descriptions, all proposed 100-yr. developed flows are at or below the previously anticipated flows tributary to these facilities. This analysis shows that the existing Ponds design intents are still met and no adjustments to their outlet structure/plates are required. Based on recent field investigation, these facilities seem to be in good working order. See the following flow comparison from original Filing 1 report vs. this report:

<u>Pipe Run</u>	<u>Proposed Developed Flows:</u>	<u>Flows per Sterling Ranch East Filing 1 FDR:</u>	
42	Q₅ = 163.8 cfs, Q₁₀₀ = 355.3 cfs	Q₅ = 166.2 cfs,	Q₁₀₀ = 364.8 cfs
43	Q₅ = 4.3 cfs, Q₁₀₀ = 11.6 cfs	Q₅ = 7.3 cfs,	Q₁₀₀ = 14.6 cfs
95	Q₅ = 74.4 cfs, Q₁₀₀ = 161.5 cfs	Q₅ = 71.1 cfs,	Q₁₀₀ = 159.8 cfs

There is a decrease in flows for Pipe Run 42 and 43 and a slight increase in Pipe Run 95. However, the total increase into Pond FSD-14A is less than 1% of the original design flows and thus does not have a significant effect on the existing constructed pond structures.

DETENTION FACILITIES / STORMWATER QUALITY

Storm water quality measures will be utilized in order to reduce the amount of sediment, debris and pollutants that are allowed to enter Sand Creek. These features include Full Spectrum Extended Detention Basin Sedimentation Facilities. 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. As stated above, the referenced existing pond facilities (FSD-14A and FSD-11B) are sized appropriately to handle the proposed flows from the Phase 1 Park site and will continue to have maintenance provided by the Sterling Ranch Metro District.

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. FlowMaster Ver. 10.03 used for storm sewer and swale design, UD-Sewer 2009 Ver. 1.4.0.22 used for storm sewer HGL design, Mile High Flood District UD-BMP Ver. 3.07 used for EDB forebay sizing, Mile High Flood District UD-Inlet spreadsheet Ver. 4.05 used for inlet calculations and (MHFD)-Detention spreadsheet Ver. 4.06 used for Final 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:** Within this Phase 1 Park development, drive-aisles and parking lots will be constructed along with buried storm systems to handle the developed runoff. After developed flows utilize the runoff reduction practices through the park and open spaces, developed flows will travel via curb and gutter within the parking areas and eventually private storm systems. These collected flows are then routed directly to two existing extended detention basins prior to entering Sand Creek (FSD-14A and FSD-11B).
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 existing referenced Full-Spectrum permanent Extended Detention Basins designed per current El Paso County drainage criteria. The single basin that are not able to be captured and routed to a permanent extended detention basin (R12) qualify for exclusion I.7.1.B.9 – Park/open space and trails.

Reference the Water Quality Treatment Plan Map in the Appendix for the following calculations:

Area treated in existing Pond FSD-14A within Sterling Ranch East Filing 1 – SF2235 (Basins R1-12 and R14)	22.61 ac.
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Area treated in existing interim Pond FSD-11B Constructed under CDR221 (Basins R15)	2.1 ac.
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Area utilizing multiple exclusions: I.7.1.B.9 (Trail Exclusion) I.7.1.B.7 (Undev. land to remain undeveloped I.7.1.C.1.A (WQCV Exclusion – 0.41 ac.) (Basins R13A and R134B)	2.7 ac.
Area with Exclusion I.7.1.B.7 – Disturbance to undeveloped land to remain undeveloped (Basin R13C)	26.4 ac.
Existing Tract B, Sterling Ranch East Filing No. 1 total platted area	27.43 ac.
Proposed Phase 1 Park area within Tract B	12.76 ac.

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 the Phase 1 Park site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0533G, effective date, December 7, 2018 (See Appendix).



DRAINAGE AND BRIDGE FEES

This site lies within the Sand Creek Drainage Basin boundaries. However, this site was platted as Tract B, Sterling Ranch East Filing No. 1 (SF2235) and all drainage and bridge fees were previously paid and/or credits used. Therefore, no further fees are due at this time.

CONSTRUCTION COST OPINIONS

No public storm facilities are proposed for this development.

SUMMARY

The proposed Sterling Ranch East Phase 1 Park is within the Upper reach of the Sand Creek Drainage Basin. Recommendations are made within this report concerning necessary improvements that may be required as a result of development of this property. 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 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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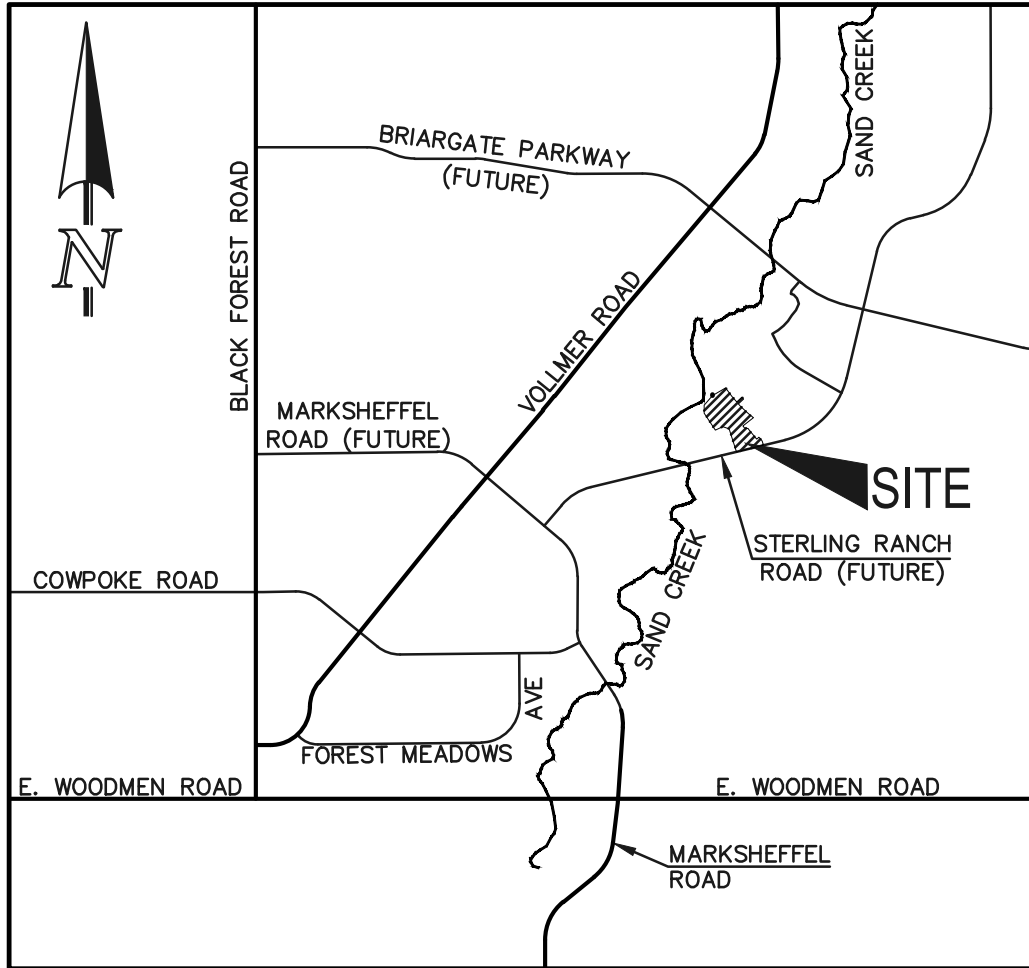
REFERENCES

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. "Urban Storm Drainage Criteria Manual Volume 1, 2 & 3" Urban Drainage and Flood Control District, dated January 2016.
3. "Sand Creek Drainage Basin Planning Study," Kiowa Engineering Corporation, dated March 1996.
4. "2018 Sterling Ranch MDDP", M&S Civil Consultants, Inc., June 2018
5. "Final Drainage Report for Retreat at TimberRidge Filing No. 1", Classic Consulting, approved November, 2020.
6. "Final Drainage Report for Homestead North at Sterling Ranch Filing No. 1", JR Engineering, LLC, dated June 2022
7. "Final Drainage Report for Homestead at Sterling Ranch Filing No. 1", M&S Civil Consultants, Inc. dated Nov. 2018
8. "MDDP Amendment for Sterling Ranch", JR Engineering, LLC, dated June 2022
9. "Final Drainage Report for Sterling Ranch East Filing No. 1", Classic Consulting, approved July, 2024.



APPENDIX

VICINITY MAP



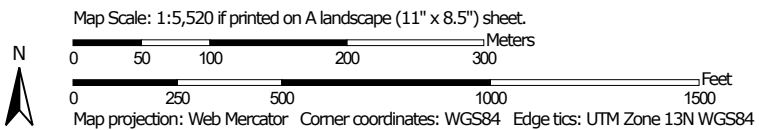
VICINITY MAP
NOT TO SCALE

SOILS MAP (S.C.S SURVEY)

Soil Map—El Paso County Area, Colorado



Soil Map may not be valid at this scale.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

10/31/2025
Page 1 of 3

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 23, Aug 29, 2025

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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
8	Blakeland loamy sand, 1 to 9 percent slopes	27.1	17.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	65.3	42.5%
71	Pring coarse sandy loam, 3 to 8 percent slopes	61.1	39.8%
Totals for Area of Interest		153.6	100.0%

El Paso County Area, Colorado

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p

Elevation: 6,500 to 7,300 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 125 to 145 days

Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent

Minor components: 3 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Fans, fan terraces, flood plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam

C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 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: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A

Ecological site: R049XY214CO - Gravelly Foothill

Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales
Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 23, Aug 29, 2025

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

Minor components: 15 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

Other soils

Percent of map unit: 10 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 5 percent

Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado

Survey Area Data: Version 23, Aug 29, 2025

F.E.M.A. MAP

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.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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.

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

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, NIMS12
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, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and 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.

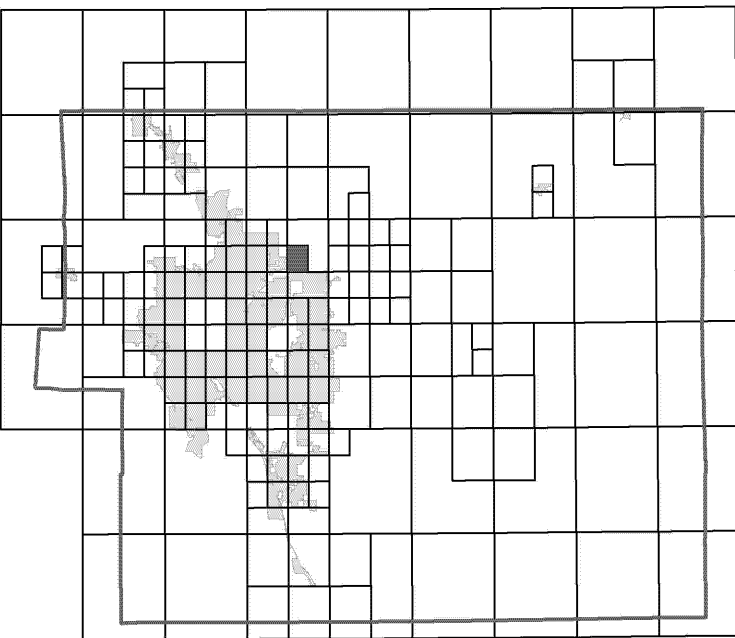
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FIMX) 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	

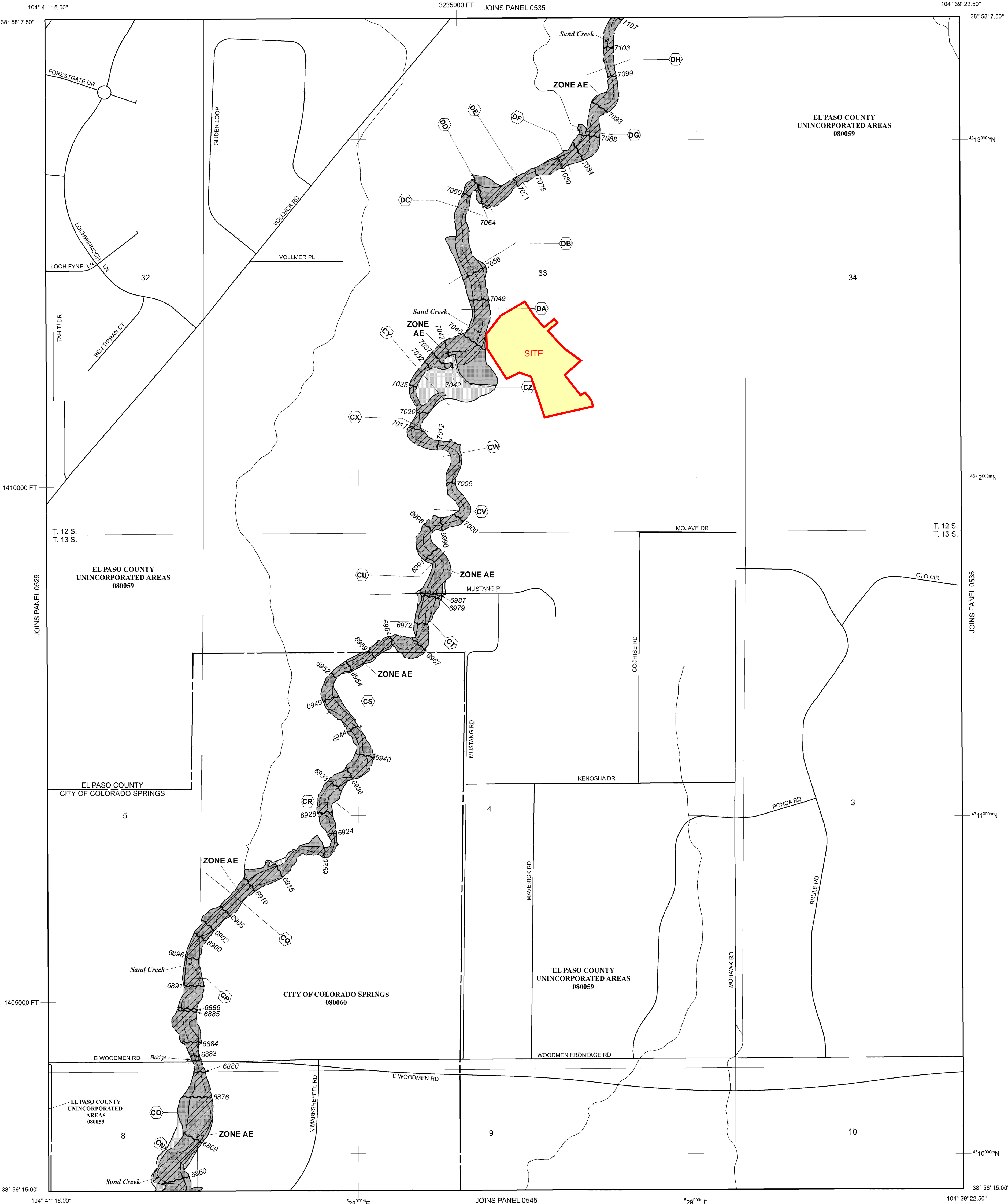
Panel Location Map



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.



HYDROLOGIC / STORMWATER QUALITY CALCULATIONS

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 $Z = 6,840 \text{ ft}/100$

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 curves² 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_r) 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_r) 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 6-7. 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

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

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_r) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \quad (\text{Eq. 6-10})$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional “calibration” of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

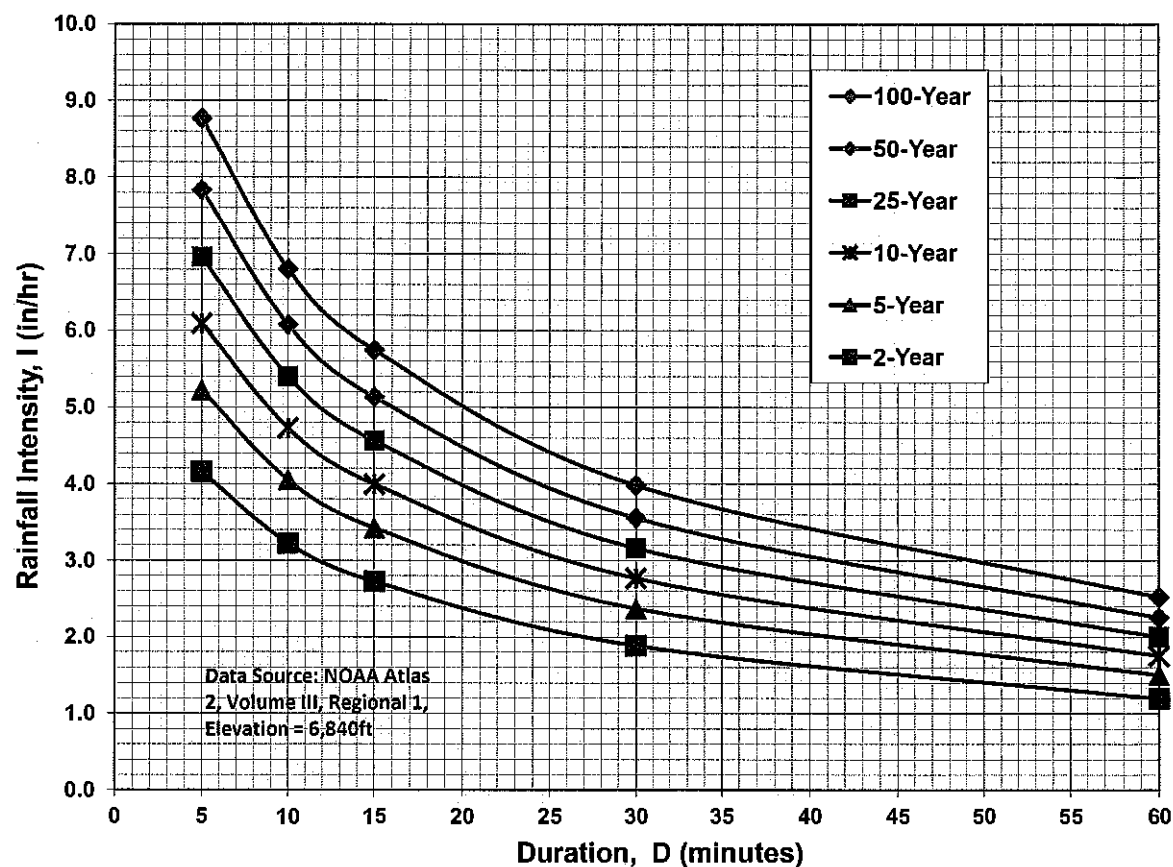
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

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: STERLING RANCH EAST COMMUNITY PARK - PHASE 1
 JOB NUMBER: 1183.35
 DATE: 01/15/26
 CALCULATED BY: MAW

BASIN RUNOFF COEFFICIENT SUMMARY

BASIN	TOTAL AREA (AC)	C VALUE DCM TABLE 6-6						C VALUE DCM TABLE 6-6						WEIGHTED "C" VALUE			WEIGHTED CA			WEIGHTED IMP.
		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
R1	0.77	RES 1/6	52.5%	0.40	0.32	0.38	0.55	PARK / OS	7.0%	0.37	0.05	0.12	0.39	0.19	0.25	0.47	0.15	0.19	0.36	30.6%
R2	1.00	RES 1/6	52.5%	0.60	0.32	0.38	0.55	LANDSCAPE	7.0%	0.40	0.05	0.12	0.39	0.21	0.27	0.48	0.21	0.27	0.48	34.3%
R3	0.76	RES 1/6	52.5%	0.48	0.32	0.38	0.55	LANDSCAPE	7.0%	0.28	0.05	0.12	0.39	0.22	0.28	0.49	0.17	0.21	0.37	35.7%
R4	0.92	RES 1/6	52.5%	0.45	0.32	0.38	0.55	STREETS	100.0%	0.47	0.89	0.90	0.96	0.61	0.64	0.76	0.56	0.59	0.70	76.8%
R5	0.74	RES 1/6	52.5%	0.40	0.32	0.38	0.55	LANDSCAPE	7.0%	0.34	0.05	0.12	0.39	0.20	0.26	0.47	0.15	0.19	0.35	31.6%
R6	1.90	ROOF / PVMT.	100.0%	1.30	0.89	0.90	0.96	LANDSCAPE	7.0%	0.60	0.05	0.12	0.39	0.62	0.65	0.78	1.19	1.24	1.48	70.6%
R7	2.60	STREETS	100.0%	0.80	0.89	0.90	0.96	LANDSCAPE	7.0%	1.80	0.05	0.12	0.39	0.31	0.36	0.57	0.80	0.94	1.47	35.6%
R8	1.60	ROOF / PVMT.	100.0%	1.30	0.89	0.90	0.96	LANDSCAPE	7.0%	0.30	0.05	0.12	0.39	0.73	0.75	0.85	1.17	1.21	1.37	82.6%
R9	1.40	ROOF	100.0%	0.40	0.89	0.90	0.96	LANDSCAPE	7.0%	1.00	0.05	0.12	0.39	0.29	0.34	0.55	0.41	0.48	0.77	33.6%
R10	0.61	PAVEMENT	100.0%	0.49	0.89	0.90	0.96	LANDSCAPE	7.0%	0.12	0.05	0.12	0.39	0.72	0.75	0.85	0.44	0.46	0.52	81.7%
R11	0.31	PAVEMENT	100.0%	0.27	0.89	0.90	0.96	LANDSCAPE	7.0%	0.04	0.05	0.12	0.39	0.78	0.80	0.89	0.24	0.25	0.27	88.0%
R12	2.70	SIDEWALKS	100.0%	0.20	0.89	0.90	0.96	LANDSCAPE	7.0%	2.50	0.05	0.12	0.39	0.11	0.18	0.43	0.30	0.48	1.17	13.9%
R13A	1.30	CONCRETE	100.0%	0.04	0.89	0.90	0.96	LANDSCAPE	7.0%	1.26	0.05	0.12	0.39	0.08	0.14	0.41	0.10	0.19	0.53	9.9%
R13B	1.40	CONCRETE	100.0%	0.39	0.89	0.90	0.96	LANDSCAPE	7.0%	1.01	0.05	0.12	0.39	0.28	0.34	0.55	0.40	0.47	0.77	32.9%
R13C	26.40	CONCRETE	100.0%	0.00	0.89	0.90	0.96	LANDSCAPE	7.0%	26.40	0.05	0.12	0.39	0.05	0.12	0.39	1.32	3.17	10.30	7.0%
R14	7.20	CONCRETE	100.0%	0.40	0.89	0.90	0.96	LANDSCAPE	7.0%	6.80	0.05	0.12	0.39	0.10	0.16	0.42	0.70	1.18	3.04	12.2%
R15	2.10	STREETS	100.0%	1.10	0.89	0.90	0.96	LANDSCAPE	7.0%	1.00	0.05	0.12	0.39	0.49	0.53	0.69	1.03	1.11	1.45	55.7%

JOB NAME: STERLING RANCH EAST COMMUNITY PARK - PHASE 1
 JOB NUMBER: 1183.35
 DATE: 03/28/03
 CALC'D BY: MAW

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.

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

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5} \quad T_c = L/V$$

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)
R1	0.15	0.19	0.36	0.12	100	3	12.3					12.3	3.05	3.82	6.41	0.4	0.7	2.3
R2	0.21	0.27	0.48	0.12	100	4	11.2	150	2.0%	1.0	2.5	13.7	2.92	3.65	6.13	0.6	1.0	3.0
R3	0.17	0.21	0.37	0.12	100	4	11.2					11.2	3.16	3.96	6.65	0.5	0.8	2.5
R4	0.56	0.59	0.70	0.12	50	1	10.0	550	1.5%	2.4	3.7	13.7	2.92	3.66	6.14	1.6	2.2	4.3
R5	0.15	0.19	0.35	0.12	85	2	12.3					12.3	3.05	3.82	6.41	0.4	0.7	2.2
R6	1.19	1.24	1.48	0.12	100	3	12.3	200	2.5%	3.2	1.1	13.4	2.95	3.69	6.20	4	5	9
R7	0.80	0.94	1.47	0.12	100	3	12.3	500	1.6%	2.5	3.3	15.7	2.76	3.46	5.80	2.2	3.2	8.5
R8	1.17	1.21	1.37	0.12	100	2	14.1	170	3.0%	3.5	0.8	14.9	2.82	3.53	5.93	3	4	8
R9	0.41	0.48	0.77	0.12	100	2	14.1					14.1	2.89	3.62	6.07	1	2	5
R10	0.44	0.46	0.52	0.12	50	1	10.0	160	3.5%	3.7	0.7	10.7	3.22	4.03	6.77	1	2	4
R11	0.24	0.25	0.27	0.12	50	1	10.0	120	3.5%	3.7	0.5	10.5	3.24	4.06	6.81	1	1	2
R12	0.30	0.48	1.17	0.12	100	2	14.1	100	2.0%	1.0	1.7	15.8	2.75	3.45	5.79	1	2	7

JOB NAME: STERLING RANCH EAST COMMUNITY PARK - PHASE 1
 JOB NUMBER: 1183.35
 DATE: 03/28/03
 CALC'D BY: MAW

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.

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

$$t_i = \frac{0.395(1.1 - C_s)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

$$T_c = L/V$$

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)
R13A	0.10	0.19	0.53	0.12	180	5	16.9					16.9	2.67	3.34	5.60	0.3	0.6	3.0
R13B	0.40	0.47	0.77	0.12	100	2	14.1	80	1.0%	2.0	0.7	14.7	2.83	3.55	5.95	1.1	1.7	4.6
R13C	1.32	3.17	10.30	0.12	100	2	14.1	300	4.0%	2.0	2.5	16.6	2.69	3.37	5.66	4	11	58
R14	0.70	1.18	3.04	0.12	100	2	14.1	350	1.0%	2.0	2.9	17.0	2.66	3.33	5.60	2	4	17
R15	1.03	1.11	1.45	0.12	50	1.5	8.7	750	3.5%	3.7	3.3	12.0	3.07	3.85	6.46	3.2	4.3	9.3

JOB NAME: STERLING RANCH EAST COMMUNITY PARK - PHASE 1
 JOB NUMBER: 1183.35
 DATE: 01/15/26
 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	R1	0.19	0.36	12.3	3.82	6.41	0.7	2.3	Ex. Type C Inlet
2	R2	0.27	0.48	13.7	3.65	6.13	1.0	3.0	Ex. Type C Inlet
3	R3	0.21	0.37	11.2	3.96	6.65	0.8	2.5	Ex. Type C Inlet
4	R4	0.59	0.59	13.7	3.66	6.14	2.2	3.6	Ex. 5' Type R Sump Inlet
5	R5	0.19	0.35	12.3	3.82	6.41	0.7	2.2	Ex. Type C Inlet
6	R6	1.24	1.48	13.4	3.69	6.20	5	9	Prop. 10' Type R Sump Inlet
7	R7	0.94	1.47	15.7	3.46	5.80	3.2	8.5	Ex. 10' Type R At-grade Inlet
8	R8	1.21	1.37	14.9	3.53	5.93	4	8	Prop. 10' Type R Sump Inlet
9	R9	0.48	0.77	14.1	3.62	6.07	2	5	Prop. Type C Inlet
10	R10	0.46	0.52	10.7	4.03	6.77	2	4	Prop. 5' Type R Sump Inlet
11	R11	0.25	0.27	10.5	4.06	6.81	1	2	Prop. 5' Type R Sump Inlet
12	R12	0.48	1.17	15.8	3.45	5.79	2	7	18" Storm Stub for Turf Field Drain
13	R15, 100-yr. Flow-by from DP-7	1.11	1.80	12.0	3.85	6.46	4.3	11.6	Ex. 15' Type R At-grade Inlet

JOB NAME: STERLING RANCH EAST COMMUNITY PARK - PHASE 1
 JOB NUMBER: 1183.35
 DATE: 01/15/26
 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		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
42	Upstream 48" and 60" pipe flows, DP-6 and DP-7	51.73	66.86	19.00	3.17	5.32	163.8	355.3	Exist. 72" RCP Storm Outfall
43	Basin R15, Flow-by from DP-7	1.11	1.80	12.0	3.86	6.47	4.3	11.6	Exist. 18" RCP
95	Upstream 54" pipe flows, DP-1, DP-2, DP-3, DP-5, DP8 - DP12	22.27	28.79	16.90	3.34	5.61	74.4	161.5	Exist. 54" RCP Storm Outfall

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-6	DP-8	DP-10
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{Known} (cfs)	5.0	4.0	4.0
Major Q_{Known} (cfs)	9.0	8.0	7.0

Bypass (Carry-Over) Flow from Upstream *Inlets must be organized from upstream (left) to downstream (right) in order for bypass flows to be linked.*

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	5.0	4.0	4.0
Major Total Design Peak Flow, Q (cfs)	9.0	8.0	7.0
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

INLET MANAGEMENT

Worksheet Protected

INLET NAME	DP-4	DP-7	DP-12
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT**User-Defined Design Flows**

Minor Q_{known} (cfs)	2.2	3.2	4.3
Major Q_{known} (cfs)	3.6	8.5	9.3

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

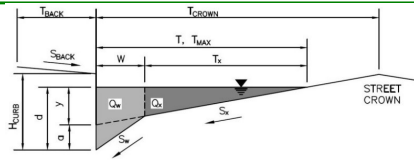
Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.2	3.2	4.3
Major Total Design Peak Flow, Q (cfs)	3.6	8.5	9.3
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	2.1	N/A

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

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

Project: **STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1**Inlet ID: **DP-4****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$$\begin{aligned} T_{\text{BACK}} &= 7.5 \text{ ft} \\ S_{\text{BACK}} &= 0.020 \text{ ft/ft} \\ n_{\text{BACK}} &= 0.012 \end{aligned}$$

$$\begin{aligned} H_{\text{CURB}} &= 6.00 \text{ inches} \\ T_{\text{CROWN}} &= 17.0 \text{ ft} \\ W &= 2.00 \text{ ft} \\ S_X &= 0.020 \text{ ft/ft} \\ S_W &= 0.083 \text{ ft/ft} \\ S_O &= 0.000 \text{ ft/ft} \\ n_{\text{STREET}} &= 0.016 \end{aligned}$$

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
T_{MAX}	17.0	17.0	ft
d_{MAX}	6.0	12.0	inches

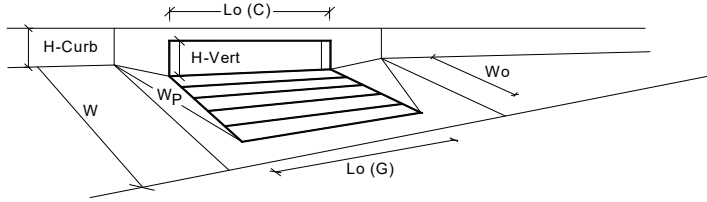
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

	Minor Storm	Major Storm	
Q_{allow}	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

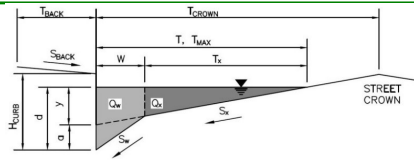
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	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
Open Area 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		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	0.83	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _a =	5.4	12.3	cfs
		Q _{PEAK REQUIRED} =	2.2	3.6	cfs

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

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

Project: **STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1**Inlet ID: **DP-6****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	10.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.020	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	25.0	ft
$W =$	1.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	10.0	20.0	ft
$d_{MAX} =$	6.0	7.0	inches
	☐	☐	

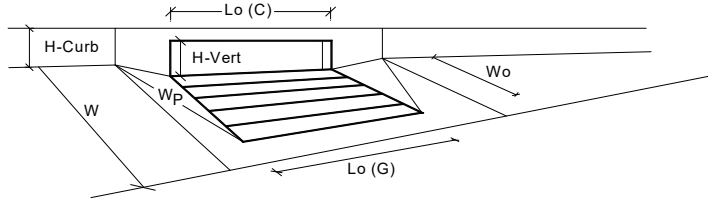
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

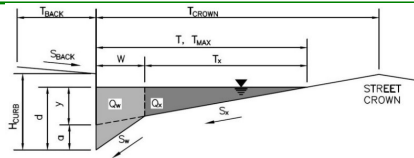
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		N_o =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	7.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		$L_o (G)$ =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_f (G)$ =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$ =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$ =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		$L_o (C)$ =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_o =	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	0.50	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.93	0.99	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		Q_a =	10.0	13.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		$Q_{PEAK REQUIRED}$ =	5.0	9.0	cfs

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

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

Project: **STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1**Inlet ID: **DP-7****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	13.5	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	38.0	ft
$W =$	2.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.015	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Allow Flow Depth at Street Crown (check box for yes, leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	38.0	ft
$d_{MAX} =$	6.0	12.0	inches
	☐	☐	

MINOR STORM Allowable Capacity is based on Spread Criterion

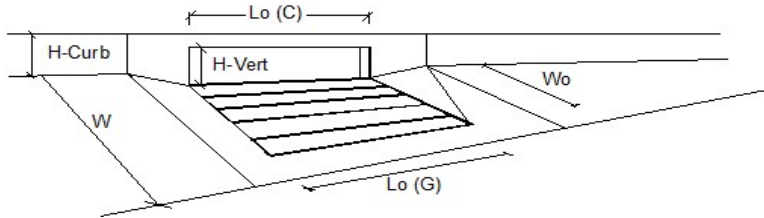
MAJOR STORM Allowable Capacity is based on Spread Criterion

	Minor Storm	Major Storm	
$Q_{allow} =$	13.3	125.1	cfs

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.20 cfs on sheet 'Inlet Management'**Major storm max. allowable capacity GOOD - greater than the design peak flow of 8.50 cfs on sheet 'Inlet Management'**

INLET ON A CONTINUOUS GRADE

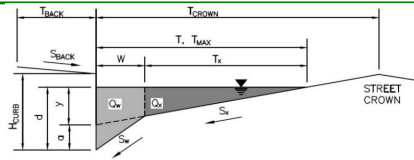
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	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 - $Q < \text{Allowable Street Capacity}$		MINOR	MAJOR	
Total Inlet Interception Capacity		$Q = 3.2$	6.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_o = 0.0$	2.1	cfs
Capture Percentage = Q_i/Q_o		$C\% = 100$	76	%

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

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

Project: **STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1**Inlet ID: **DP-8****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	10.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	25.0	ft
$W =$	1.00	ft
$S_x =$	0.025	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	10.0	20.0	ft
$d_{MAX} =$	6.0	6.0	inches
	☐	☐	

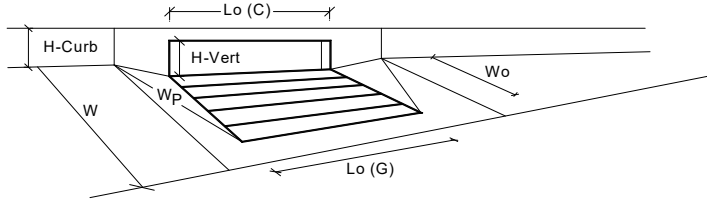
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

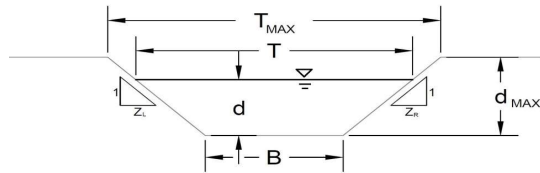
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information			MINOR	MAJOR	☒ Override Depths
Length of a Unit Grate		L _o (G) =	N/A	N/A	feet
Width of a Unit Grate		W _o =	N/A	N/A	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L _o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		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
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	10.0	10.0	cfs
		Q _{PEAK REQUIRED} =	4.0	8.0	cfs

AREA INLET IN A SWALE

STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1
DP-9



This worksheet uses the NRCS vegetal retardance method to determine Manning's n for grass-lined channels.

An override Manning's n can be entered for other channel materials.

Analysis of Trapezoidal Channel (Grass-Lined uses SCS Method)

NRCS Vegetal Retardance (A, B, C, D, or E)

Manning's n (Leave cell D16 blank to manually enter an n value)

Channel Invert Slope

Bottom Width

Left Side Slope

Right Side Slope

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

A, B, C, D, or E =

n =	0.035
S_0 =	0.0100 ft/ft
B =	1.00 ft
Z1 =	4.00 ft/ft
Z2 =	4.00 ft/ft

Choose One:

- ☒ Non-Cohesive
☐ Cohesive
☐ Paved

Maximum Allowable Top Width of Channel for Minor & Major Storm
Maximum Allowable Water Depth in Channel for Minor & Major Storm

	Minor Storm	Major Storm	
T_{MAX} =	6.00	10.00	ft
d_{MAX} =	0.50	1.00	ft

Allowable Channel Capacity Based On Channel Geometry

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	2.8	14.1	cfs
d_{allow} =	0.50	1.00	ft

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow

Water Depth

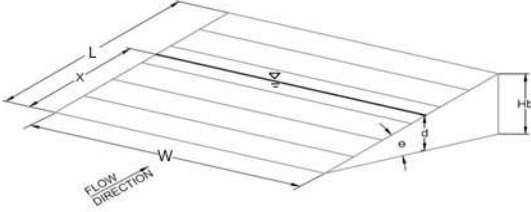
Q_o =	2.0	5.0	cfs
d =	0.43	0.64	ft

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'

AREA INLET IN A SWALE

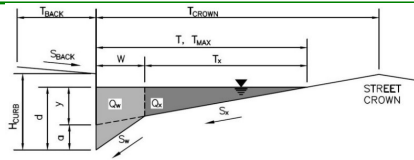
STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1
DP-9

Inlet Design Information (Input)																					
Type of Inlet	CDOT Type C																				
Inlet Type =	CDOT Type C																				
Angle of Inclined Grate (must be ≤ 30 degrees)	$\theta = 0.00$ degrees																				
Width of Grate	$W = 3.00$ ft																				
Length of Grate	$L = 3.00$ ft																				
Open Area Ratio	$A_{\text{RATIO}} = 0.70$																				
Height of Inclined Grate	$H_B = 0.00$ ft																				
Clogging Factor	$C_f = 0.50$																				
Grate Discharge Coefficient	$C_d = 0.96$																				
Orifice Coefficient	$C_o = 0.64$																				
Weir Coefficient	$C_w = 2.05$																				
																					
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)																					
Total Inlet Interception Capacity (assumes clogged condition)																					
Bypassed Flow																					
Capture Percentage = Q_a/Q_o																					
	<table border="1"> <thead> <tr> <th></th> <th>MINOR</th> <th>MAJOR</th> <th></th> </tr> </thead> <tbody> <tr> <td>$d =$</td> <td>0.43</td> <td>0.64</td> <td></td> </tr> <tr> <td>$Q_a =$</td> <td>5.2</td> <td>9.5</td> <td>cfs</td> </tr> <tr> <td>$Q_b =$</td> <td>0.0</td> <td>0.0</td> <td>cfs</td> </tr> <tr> <td>$C\% =$</td> <td>100</td> <td>100</td> <td>%</td> </tr> </tbody> </table>		MINOR	MAJOR		$d =$	0.43	0.64		$Q_a =$	5.2	9.5	cfs	$Q_b =$	0.0	0.0	cfs	$C\% =$	100	100	%
	MINOR	MAJOR																			
$d =$	0.43	0.64																			
$Q_a =$	5.2	9.5	cfs																		
$Q_b =$	0.0	0.0	cfs																		
$C\% =$	100	100	%																		

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

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

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

Project: **STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1**Inlet ID: **DP-10****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} =$	5.0	ft
$S_{BACK} =$	0.020	ft/ft
$n_{BACK} =$	0.013	

$H_{CURB} =$	6.00	inches
$T_{CROWN} =$	25.0	ft
$W =$	1.00	ft
$S_x =$	0.020	ft/ft
$S_w =$	0.083	ft/ft
$S_o =$	0.000	ft/ft
$n_{STREET} =$	0.016	

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	10.0	20.0	ft
$d_{MAX} =$	6.0	6.0	inches

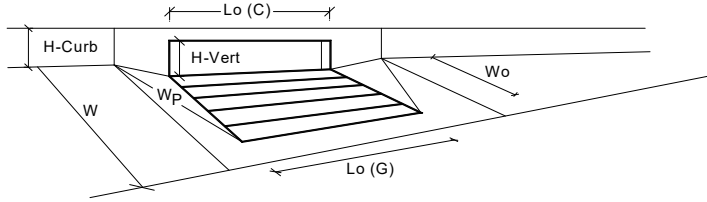
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

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

INLET IN A SUMP OR SAG LOCATION

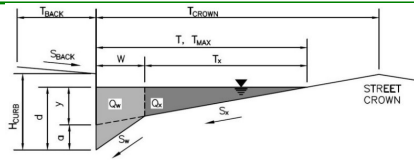
MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR		MAJOR	
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
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		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
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.93	0.93	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _s =	10.0	10.0	cfs
		Q _{PEAK REQUIRED} =	4.0	7.0	cfs

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

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

Project: **STERLING RANCH EAST COMMUNITY CENTER PARK - PHASE 1**Inlet ID: **DP-12****Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb

Side Slope Behind Curb (leave blank for no conveyance credit behind curb)

Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)

Street Longitudinal Slope - Enter 0 for sump condition

Manning's Roughness for Street Section (typically between 0.012 and 0.020)

Max. Allowable Spread for Minor & Major Storm

Max. Allowable Depth at Gutter Flowline for Minor & Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$$T_{BACK} = 13.5 \text{ ft}$$

$$S_{BACK} = 0.020 \text{ ft/ft}$$

$$n_{BACK} = 0.012$$

$$H_{CURB} = 6.00 \text{ inches}$$

$$T_{CROWN} = 38.0 \text{ ft}$$

$$W = 2.00 \text{ ft}$$

$$S_x = 0.020 \text{ ft/ft}$$

$$S_w = 0.083 \text{ ft/ft}$$

$$S_o = 0.000 \text{ ft/ft}$$

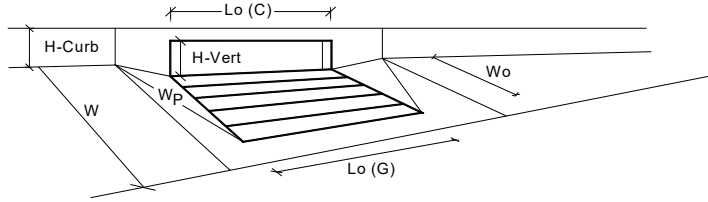
$$n_{STREET} = 0.016$$

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	38.0	ft
$d_{MAX} =$	6.0	12.0	inches

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

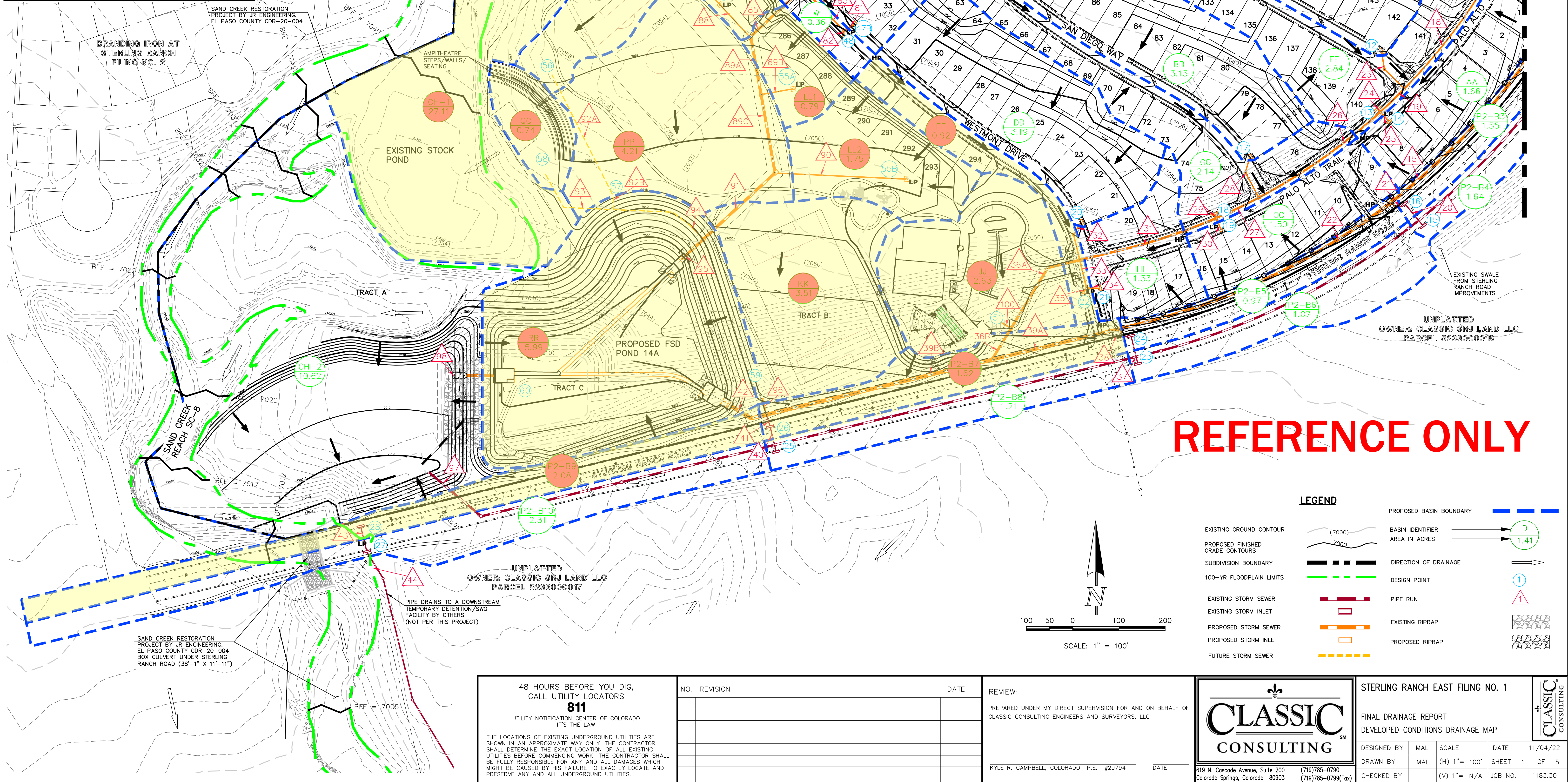
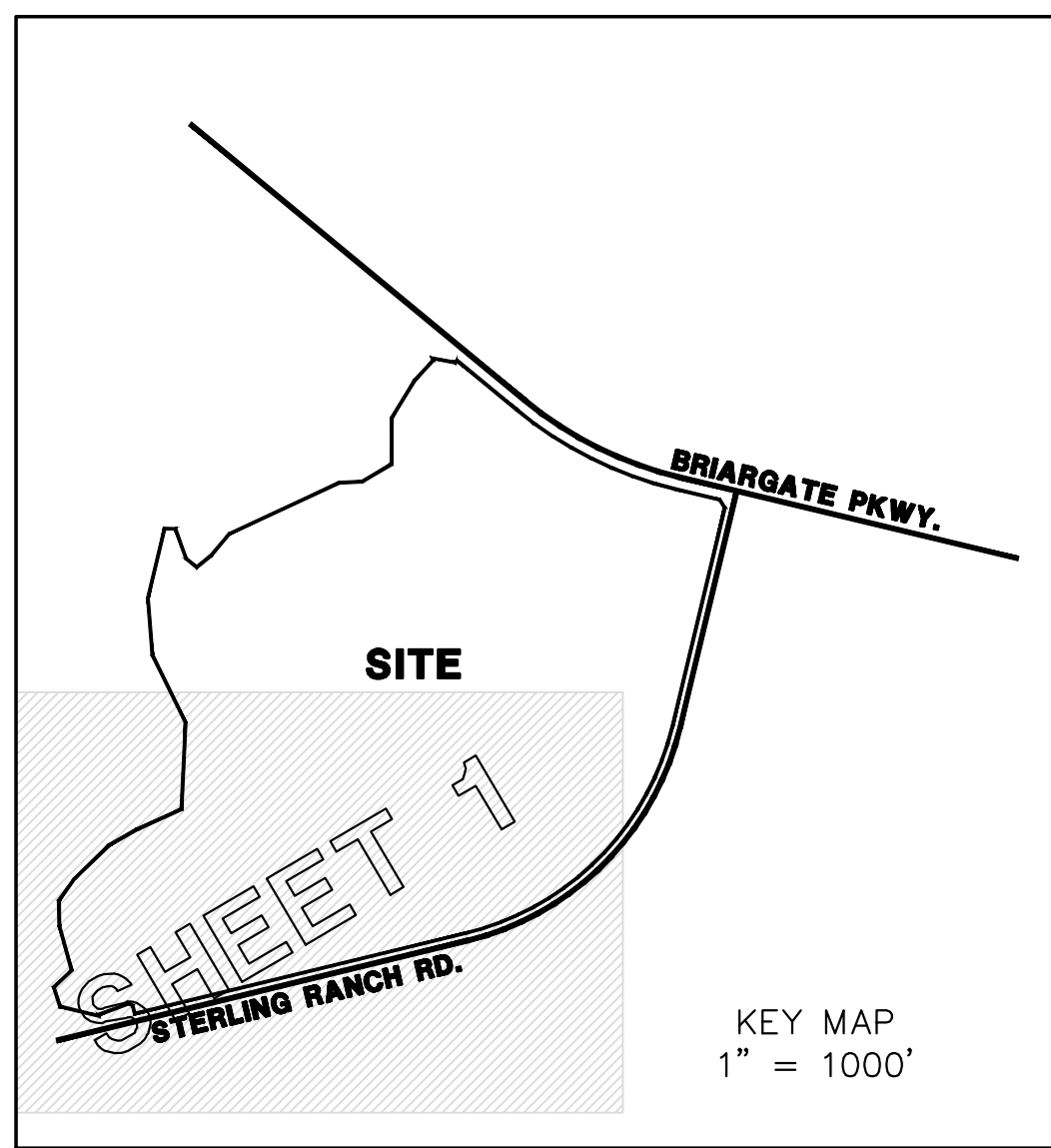
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a _{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.6	10.6	inches
Grate Information		MINOR		MAJOR	
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
Open Area Ratio for a Grate (typical values 0.15-0.90)		A _{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C _f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C _w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C _o (G) =	N/A	N/A	
Curb Opening Information		MINOR		MAJOR	
Length of a Unit Curb Opening		L _o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches		H _{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H _{throat} =	6.00	6.00	inches
Angle of Throat		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} =	0.30	0.72	ft
Grated Inlet Performance Reduction Factor for Long Inlets		RF _{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF _{Curb} =	0.76	0.99	
Combination Inlet Performance Reduction Factor for Long Inlets		RF _{Combination} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR		MAJOR	
		Q _s =	8.0	35.2	cfs
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)		Q _{PEAK REQUIRED} =	4.3	9.3	cfs

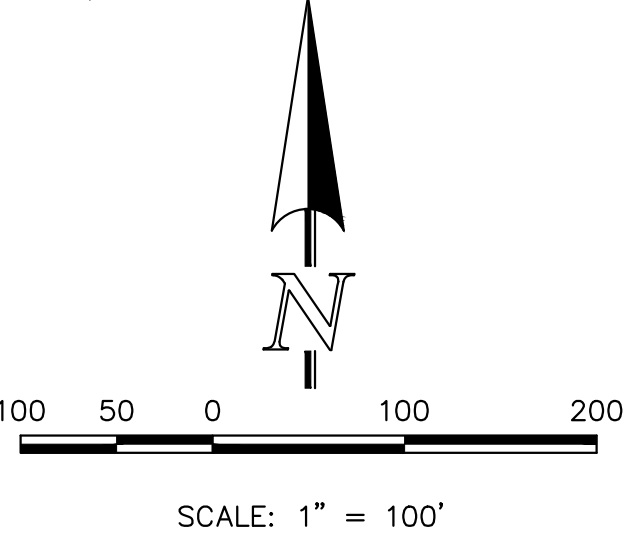
REFERENCE MATERIAL



REFERENCE ONLY

LEGEND

- EXISTING GROUND CONTOUR (7000)
- PROPOSED FINISHED GRADE CONTOURS (7000)
- SUBDIVISION BOUNDARY
- 100-YR FLOODPLAIN LIMITS
- EXISTING STORM SEWER
- EXISTING STORM INLET
- PROPOSED STORM SEWER
- PROPOSED STORM INLET
- FUTURE STORM SEWER
- PROPOSED BASIN BOUNDARY
- BASIN IDENTIFIER AREA IN ACRES
- DIRECTION OF DRAINAGE
- DESIGN POINT
- PIPE RUN
- EXISTING RIPRAP
- PROPOSED RIPRAP



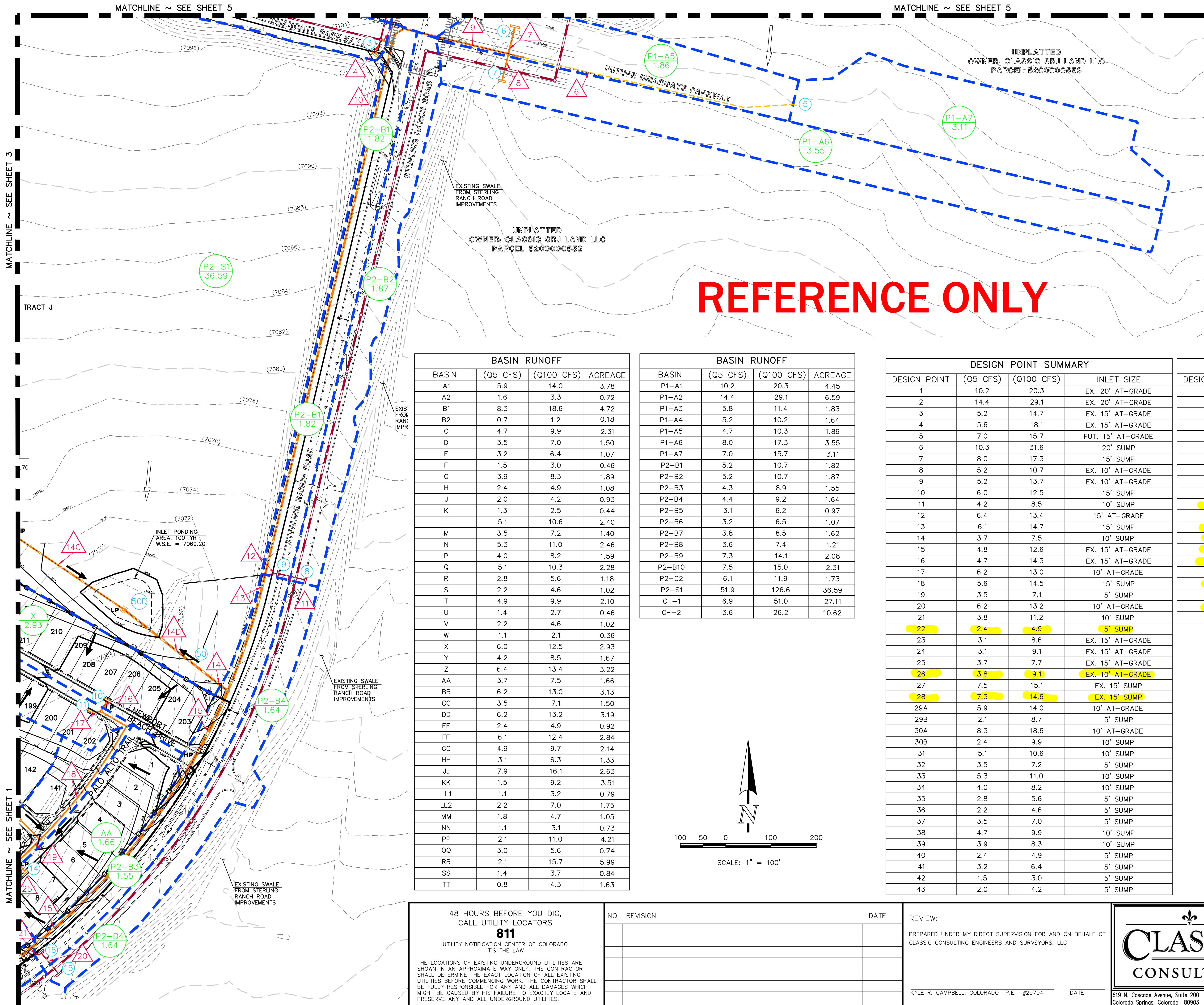
48 HOURS BEFORE YOU DIG,
CALL UTILITY LOCATORS
811
UTILITY NOTIFICATION CENTER OF COLORADO
IT'S THE LAW
THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE
SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR
SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING
UTILITIES BEFORE COMMENCING WORK. THE CONTRACTOR SHALL
BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH
MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND
PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NO.	REVISION	DATE

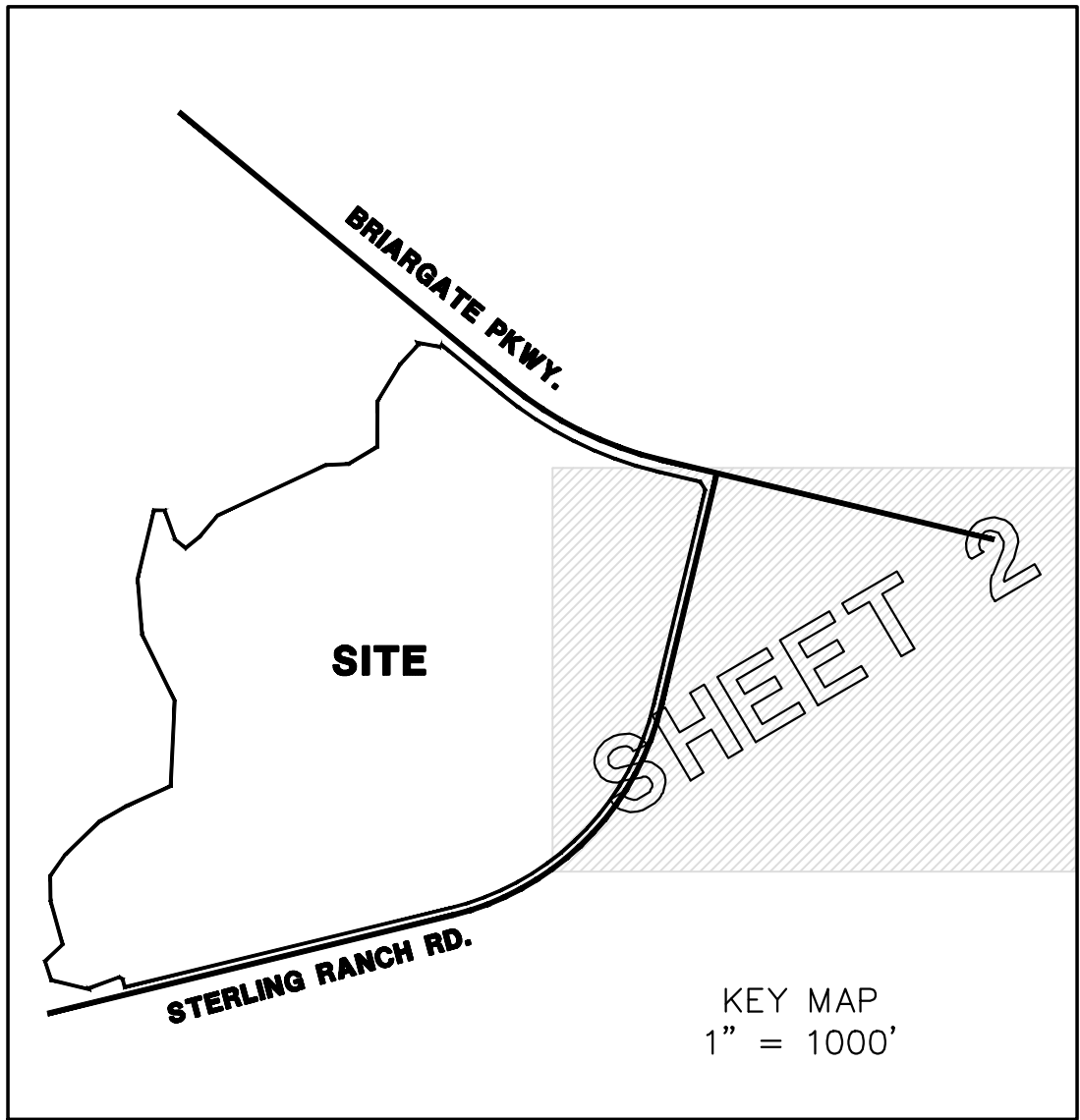
REVIEW:
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF
CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC
KYLE R. CAMPBELL, COLORADO P.E. #29794 DATE



STERLING RANCH EAST FILING NO. 1			
FINAL DRAINAGE REPORT DEVELOPED CONDITIONS DRAINAGE MAP			
DESIGNED BY	MAL	SCALE	DATE 11/04/22
DRAWN BY	MAL	(H) 1" = 100'	SHEET 1 OF 5
CHECKED BY	(V) 1" = N/A	JOB NO.	1183.30



REFERENCE ONLY

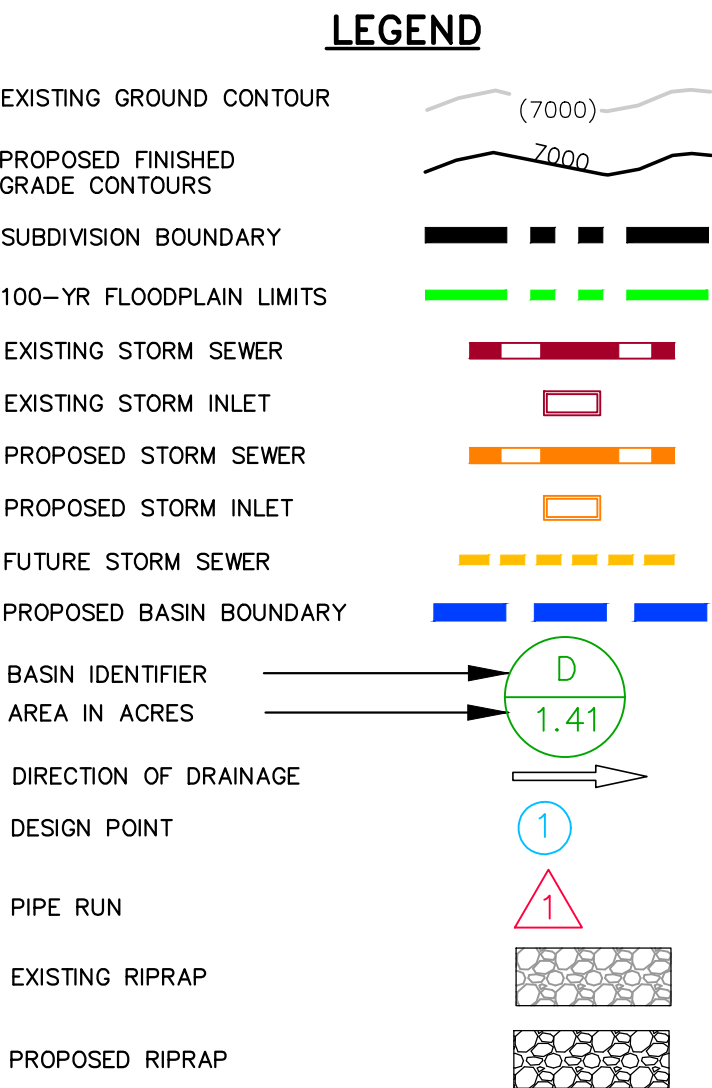


BASIN RUNOFF			
BASIN	(Q5 CFS)	(Q100 CFS)	ACREAGE
A1	5.9	14.0	3.78
A2	1.6	3.3	0.72
B1	8.3	18.6	4.72
B2	0.7	1.2	0.18
C	4.7	9.9	2.31
D	3.5	7.0	1.50
E	3.2	6.4	1.07
F	1.5	3.0	0.46
G	3.9	8.3	1.89
H	2.4	4.9	1.08
J	2.0	4.2	0.93
K	1.3	2.5	0.44
L	5.1	10.6	2.40
M	3.5	7.2	1.40
N	5.3	11.0	2.46
P	4.0	8.2	1.59
Q	5.1	10.3	2.28
R	2.8	5.6	1.18
S	2.2	4.6	1.02
T	4.9	9.9	2.10
U	1.4	2.7	0.46
V	2.2	4.6	1.02
W	1.1	2.1	0.36
X	6.0	12.5	2.93
Y	4.2	8.5	1.67
Z	6.4	13.4	3.22
AA	3.7	7.5	1.66
BB	6.2	13.0	3.13
CC	3.5	7.1	1.50
DD	6.2	13.2	3.19
EE	2.4	4.9	0.92
FF	6.1	12.4	2.84
GG	4.9	9.7	2.14
HH	3.1	6.3	1.33
JJ	7.9	16.1	2.63
KK	1.5	9.2	3.51
LL1	1.1	3.2	0.79
LL2	2.2	7.0	1.75
MM	1.8	4.7	1.05
NN	1.1	3.1	0.73
PP	2.1	11.0	4.21
QQ	3.0	5.6	0.74
RR	2.1	15.7	5.99
SS	1.4	3.7	0.84
TT	0.8	4.3	1.63

BASIN RUNOFF			
BASIN	(Q5 CFS)	(Q100 CFS)	ACREAGE
P1-A1	10.2	20.3	4.45
P1-A2	14.4	29.1	6.59
P1-A3	5.8	11.4	1.83
P1-A4	5.2	10.2	1.64
P1-A5	4.7	10.3	1.86
P1-A6	8.0	17.3	3.55
P1-A7	7.0	15.7	3.11
P2-B1	5.2	10.7	1.82
P2-B2	5.2	10.7	1.87
P2-B3	4.3	8.9	1.55
P2-B4	4.4	9.2	1.64
P2-B5	3.1	6.2	0.97
P2-B6	3.2	6.5	1.07
P2-B7	3.8	8.5	1.62
P2-B8	3.6	7.4	1.21
P2-B9	7.3	14.1	2.08
P2-B10	7.5	15.0	2.31
P2-C2	6.1	11.9	1.73
P2-S1	51.9	126.6	36.59
CH-1	6.9	51.0	27.11
CH-2	3.6	26.2	10.62

DESIGN POINT SUMMARY			
DESIGN POINT	(Q5 CFS)	(Q100 CFS)	INLET SIZE
1	10.2	20.3	EX. 20' AT-GRADE
2	14.4	29.1	EX. 20' AT-GRADE
3	5.2	14.7	EX. 15' AT-GRADE
4	5.6	18.1	EX. 15' AT-GRADE
5	7.0	15.7	FUT. 15' AT-GRADE
6	10.3	31.6	20' SUMP
7	8.0	17.3	15' SUMP
8	5.2	10.7	EX. 10' AT-GRADE
9	5.2	13.7	EX. 10' AT-GRADE
10	6.0	12.5	15' SUMP
11	4.2	8.5	10' SUMP
12	6.4	13.4	15' AT-GRADE
13	6.1	14.7	15' SUMP
14	3.7	7.5	10' SUMP
15	4.8	12.6	EX. 15' AT-GRADE
16	4.7	14.3	EX. 15' AT-GRADE
17	6.2	13.0	10' AT-GRADE
18	5.6	14.5	15' SUMP
19	3.5	7.1	5' SUMP
20	6.2	13.2	10' AT-GRADE
21	3.8	11.2	10' SUMP
22	2.4	4.9	5' SUMP
23	3.1	8.6	EX. 15' AT-GRADE
24	3.1	9.1	EX. 15' AT-GRADE
25	3.7	7.7	EX. 15' AT-GRADE
26	3.8	9.1	EX. 10' AT-GRADE
27	7.5	15.1	EX. 15' SUMP
28	7.3	14.6	EX. 15' SUMP
29A	5.9	14.0	10' AT-GRADE
29B	2.1	8.7	5' SUMP
30A	8.3	18.6	10' AT-GRADE
30B	2.4	9.9	10' SUMP
31	5.1	10.6	10' SUMP
32	3.5	7.2	5' SUMP
33	5.3	11.0	10' SUMP
34	4.0	8.2	10' SUMP
35	2.8	5.6	5' SUMP
36	2.2	4.6	5' SUMP
37	3.5	7.0	5' SUMP
38	4.7	9.9	10' SUMP
39	3.9	8.3	10' SUMP
40	2.4	4.9	5' SUMP
41	3.2	6.4	5' SUMP
42	1.5	3.0	5' SUMP
43	2.0	4.2	5' SUMP

DESIGN POINT SUMMARY			
DESIGN POINT	(Q5 CFS)	(Q100 CFS)	INLET SIZE
44	1.3	2.5	5' SUMP
45	2.2	4.6	5' SUMP
46	1.4	2.7	5' SUMP
47A	5.1	10.3	10' AT-GRADE
47B	5.3	13.0	10' SUMP
48	1.1	2.1	5' SUMP
50	51.9	126.6	FUTURE STORM
50B	2.4	17.5	TYPE D INLET
50C	2.4	17.5	TYPE D INLET
50D	2.4	17.5	TYPE D INLET
51	7.9	16.1	FUTURE STORM
52	1.8	4.7	TYPE C INLET
53	1.1	3.1	TYPE C INLET
54	1.4	3.7	TYPE C INLET
55A	1.1	3.2	TYPE C INLET
55B	2.2	7.0	TYPE C INLET
56	0.8	4.3	FUTURE STORM
57	2.1	11.0	FUTURE STORM
58	3.0	5.6	FUTURE STORM
59	1.5	9.2	FUTURE STORM
60	232.0	520.5	PROPOSED POND 14A



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MIGHT BE CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND
PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

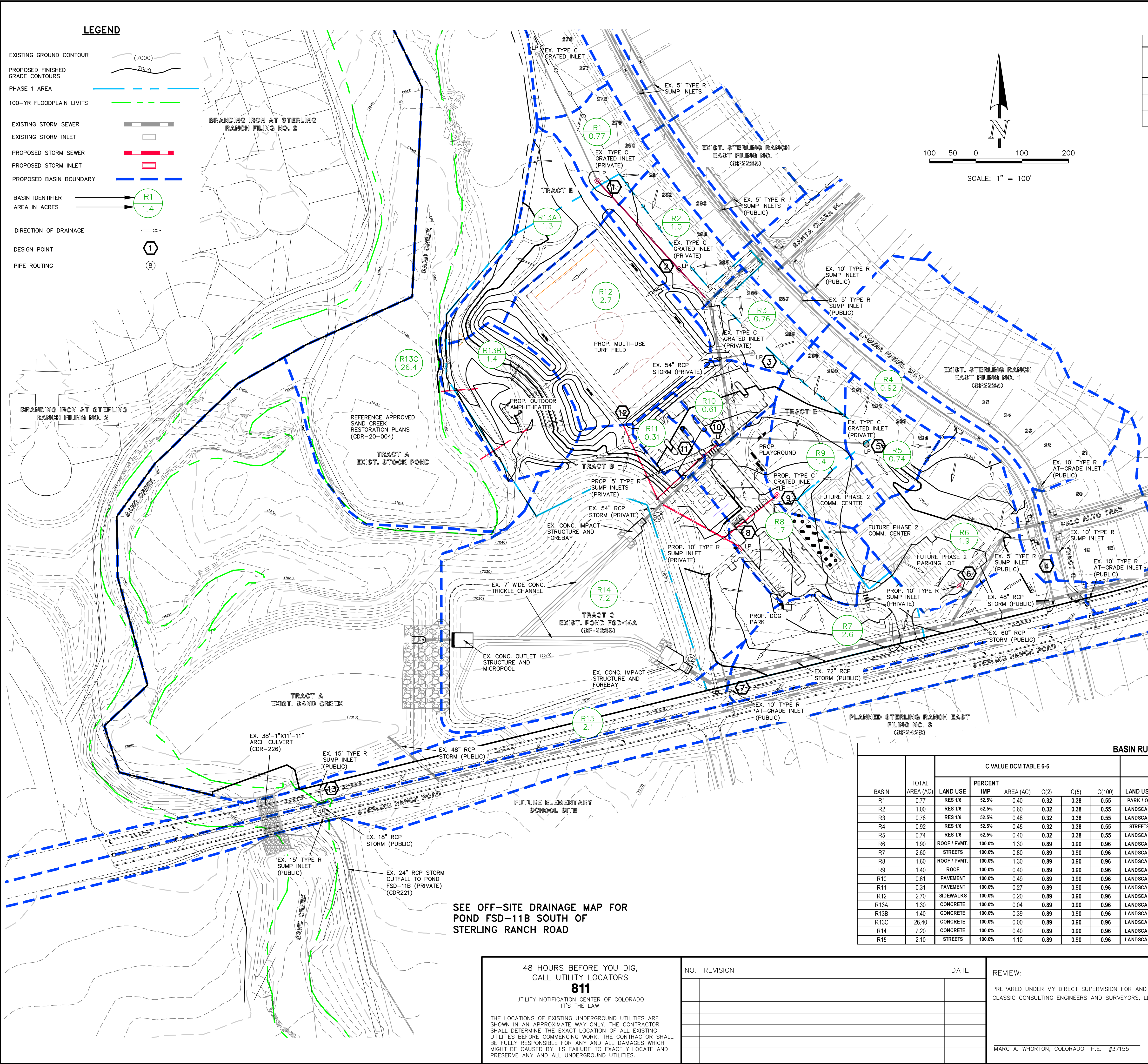
NO.	REVISION	DATE

REVIEW:
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF
CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC
KYLE R. CAMPBELL, COLORADO P.E. #29794 DATE



STERLING RANCH EAST FILING NO. 1			
FINAL DRAINAGE REPORT DEVELOPED CONDITIONS DRAINAGE MAP			
DESIGNED BY	MAL	SCALE	DATE 11/04/22
DRAWN BY	MAL	(H) 1" = 100'	SHEET 2 OF 5
CHECKED BY	(V) 1" = N/A	JOB NO.	1183.30

DRAINAGE MAPS



PIPE ROUTING SUMMARY									
Pipe Run	Contributing Basin / Design Point / Pipe Run	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Pipe Size*
					I(5)	I(100)	Q(5)	Q(100)	
42	Upstream 48" and 60" pipe flows, DP-6 and DP-7	51.73	66.86	19.00	3.17	5.32	163.8	355.3	Exist 72" RCP Storm Outfall
43	Basin R15, Flow-by from DP-7	1.11	1.80	12.0	3.86	6.47	4.3	11.6	Exist 18" RCP
95	Upstream 54" pipe flows, DP-1, DP-2, DP-3, DP-5, DP-8 - DP12	22.27	28.79	16.90	3.34	5.61	74.4	161.5	Exist 54" RCP Storm Outfall

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	R1	0.19	0.36	12.3	3.82	6.41	0.7	2.3	Ex. Type C Inlet
2	R2	0.27	0.48	13.7	3.65	6.13	1.0	3.0	Ex. Type C Inlet
3	R3	0.21	0.37	11.2	3.96	6.65	0.8	2.5	Ex. Type C Inlet
4	R4	0.59	0.59	13.7	3.66	6.14	2.2	3.6	Ex. 5" Type R Sump Inlet
5	R5	0.19	0.35	12.3	3.82	6.41	0.7	2.2	Ex. Type C Inlet
6	R6	1.24	1.48	13.4	3.69	6.20	5	9	Prop. 10" Type R Sump Inlet
7	R7	0.94	1.47	15.7	3.46	5.80	3.2	8.5	Ex. 10" Type R At-grade Inlet
8	R8	1.21	1.37	14.9	3.53	5.93	4	8	Prop. 10" Type R Sump Inlet
9	R9	0.48	0.77	14.1	3.62	6.07	2	5	Prop. Type C Inlet
10	R10	0.46	0.52	10.7	4.03	6.77	2	4	Prop. 5" Type R Sump Inlet
11	R11	0.25	0.27	10.5	4.06	6.81	1	2	Prop. 5" Type R Sump Inlet
12	R12	0.48	1.17	15.8	3.45	5.79	2	7	18" Storm Sub for Turf Field Drain
13	R15, 100-yr. Flow-by from DP-7	1.11	1.80	12.0	3.85	6.46	4.3	11.6	Ex. 15" Type R At-grade Inlet

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)		I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
R1	0.15	0.19	0.36	0.12	100	3	12.3					12.3	3.05	3.82	6.41	0.4	0.7	2.3
R2	0.21	0.27	0.48	0.12	100	4	11.2	150	2.0%	1.0	2.5	13.7	2.92	3.65	6.13	0.6	1.0	3.0
R3	0.17	0.21	0.37	0.12	100	4	11.2					11.2	3.16	3.96	6.65	0.5	0.8	2.5
R4	0.56	0.59	0.70	0.12	50	1	10.0	550	1.5%	2.4	3.7	13.7	2.92	3.66	6.14	1.6	2.2	4.3
R5	0.15	0.19	0.35	0.12	85	2	12.3					12.3	3.05	3.82	6.41	0.4	0.7	2.2
R6	1.19	1.24	1.48	0.12	100	3	12.3	200	2.5%	3.2	1.1	13.4	2.95	3.69	6.20	4	5	9
R7	0.80	0.94	1.47	0.12	100	3	12.3	500	1.6%	2.5	3.3	15.7	2.76	3.46	5.80	2.2	3.2	8.5
R8	1.17	1.21	1.37	0.12	100	2	14.1	170	3.0%	3.5	0.8	14.9	2.82	3.53	5.93	3	4	8
R9	0.41	0.48	0.77	0.12	100	2	14.1					14.1	2.89	3.62	6.07	1	2	5
R10	0.44	0.46	0.52	0.12	50	1	10.0	160	3.5%	3.7	0.7	10.7	3.22	4.03	6.77	1	2	4
R11	0.24	0.25	0.27	0.12	50	1	10.0	120	3.5%	3.7	0.5	10.5	3.24	4.06	6.81	1	1	2
R12	0.30	0.48	1.17	0.12	100	2	14.1	100	2.0%	1.0	1.7	15.8	2.75	3.45	5.79	1	2	7
R13A	0.10	0.19	0.53	0.12	180	5	16.9					16.9	2.67	3.34	5.60	0.3	0.6	3.0
R13B	0.40	0.47	0.77	0.12	100	2	14.1	80	1.0%	2.0	0.7	14.7	2.83	3.55	5.95	1.1	1.7	4.6
R13C	1.32	3.17	10.30	0.12	100	2	14.1	300	4.0%	2.0	2.5	16.6	2.69	3.37	5.66	4	11	58
R14	0.70	1.18	3.04	0.12	100	2	14.1	350	1.0%	2.0	2.9	17.0	2.66	3.33	5.60	2	4	17
R15	1.03	1.11	1.45	0.12	50	1.5	8.7	750	3.5%	3.7	3.3	12.0	3.07	3.85	6.46	3.2	4.3	9.3

BASIN RUNOFF COEFFICIENT SUMMARY																				
BASIN	TOTAL AREA (AC)	C VALUE DCM TABLE 6-6						C VALUE DCM TABLE 6-6						WEIGHTED "C" VALUE			WEIGHTED CA			WEIGHTED IMP.
		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)	
R1	0.77	RES 1/6	52.5%	0.40	0.32	0.38	0.55	PARK / OS	7.0%	0.37	0.05	0.12	0.39	0.19	0.25	0.47	0.15	0.19	0.36	30.6%
R2	1.00	RES 1/6	52.5%	0.60	0.32	0.38	0.55	LANDSCAPE	7.0%	0.40	0.05	0.12	0.39	0.21	0.27	0.48	0.21	0.27	0.48	34.3%
R3	0.76	RES 1/6	52.5%	0.48	0.32	0.38	0.55	LANDSCAPE	7.0%	0.28	0.05	0.12	0.39	0.22	0.28	0.49	0.17	0.21	0.37	35.7%
R4	0.92	RES 1/6	52.5%	0.45	0.32	0.38	0.55	STREETS	100.0%	0.47	0.89	0.90	0.96	0.61	0.64	0.76	0.56	0.59	0.70	76.8%
R5	0.74	RES 1/6	52.5%	0.40	0.32	0.38	0.55	LANDSCAPE	7.0%	0.34	0.05	0.12	0.39	0.20	0.26	0.47	0.15	0.19	0.35	31.6%
R6	1.90	ROOF / P/MT.	100.0%	1.30	0.89	0.90	0.96	LANDSCAPE	7.0%	0.60	0.05	0.12	0.39	0.62	0.65	0.78	1.19	1.24	1.48	70.6%
R7	2.60	STREETS	100.0%	0.80	0.89	0.90	0.96	LANDSCAPE	7.0%	1.80	0.05	0.12	0.39	0.31	0.36	0.57	0.80	0.94	1.47	35.6%
R8	1.60	ROOF / P/MT.	100.0%	1.30	0.89	0.90	0.96	LANDSCAPE	7.0%	0.30	0.05	0.12	0.39	0.73	0.75	0.85	1.17	1.21	1.37	82.6%
R9	1.40	ROOF	100.0%	0.40	0.89	0.90	0.96	LANDSCAPE	7.0%	1.00	0.05	0.12	0.39	0.29	0.34	0.55	0.41	0.48	0.77	33.6%
R10	0.61	PAVEMENT	100.0%	0.49	0.89	0.90	0.96	LANDSCAPE	7.0%	0.12	0.05	0.12	0.39	0.72	0.75	0.85	0.44	0.46	0.52	81.7%
R11	0.31	PAVEMENT	100.0%	0.27	0.89	0.90	0.96	LANDSCAPE	7.0%	0.04	0.05	0.12	0.39	0.78	0.80	0.89	0.24	0.25	0.27	88.0%
R12	2.70	SIDEWALKS	100.0%	0.20	0.89	0.90	0.96	LANDSCAPE	7.0%	2.50	0.05	0.12	0.39	0.11	0.18	0.43	0.30	0.48	1.17	13.9%
R13A	1.30	CONCRETE	100.0%	0.04	0.89	0.90	0.96	LANDSCAPE	7.0%	1.26	0.05	0.12	0.39	0.08	0.14	0.41	0.10	0.19	0.53	9.9%
R13B	1.40	CONCRETE	100.0%	0.39	0.89	0.90	0.96	LANDSCAPE	7.0%	1.01	0.05	0.12	0.39	0.28	0.34	0.55	0.40	0.47	0.77	32.9%
R13C	26.40	CONCRETE	100.0%	0.00	0.89	0.90	0.96	LANDSCAPE	7.0%	26.40	0.05	0.12	0.39	0.05	0.12	0.39	1.32	3.17	10.30	7.0%
R14	7.20	CONCRETE	100.0%	0.40	0.89	0.90	0.96	LANDSCAPE	7.0%	6.80	0.05	0.12	0.39	0.10	0.16	0.42	0.70	1.18	3.04	12.2%
R15	2.10	STREETS	100.0%	1.10	0.89	0.90	0.96	LANDSCAPE	7.0%	1.00	0.05	0.12	0.39	0.49	0.53	0.69	1.03	1.11	1.45	55.7%

SEE OFF-SITE DRAINAGE MAP FOR POND FSD-11B SOUTH OF STERLING RANCH ROAD

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NO. REVISION

DATE

REVIEW:

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF
CLASSIC CONSULTING ENGINEERS AND SURVEYORS, LLC

MARC A. WHORTON, COLORADO P.E. #37155

DATE

CLASSIC CONSULTING

619 N. Cascade Avenue, Suite 200
Colorado Springs, Colorado 80903

(719)785-0790
(719)785-0799(Fax)

STERLING RANCH EAST
COMMUNITY CENTER PARK - PHASE 1
FINAL DRAINAGE REPORT
DEVELOPED CONDITIONS DRAINAGE MAP

DESIGNED BY MAW
DRAWN BY MAW
CHECKED BY

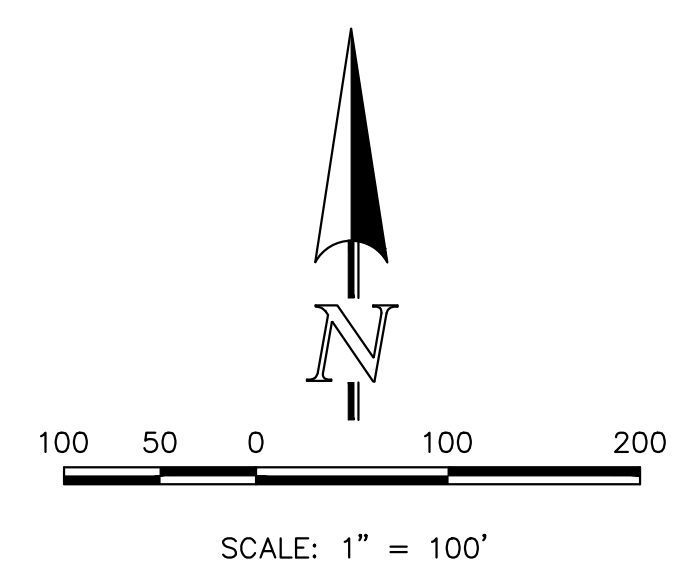
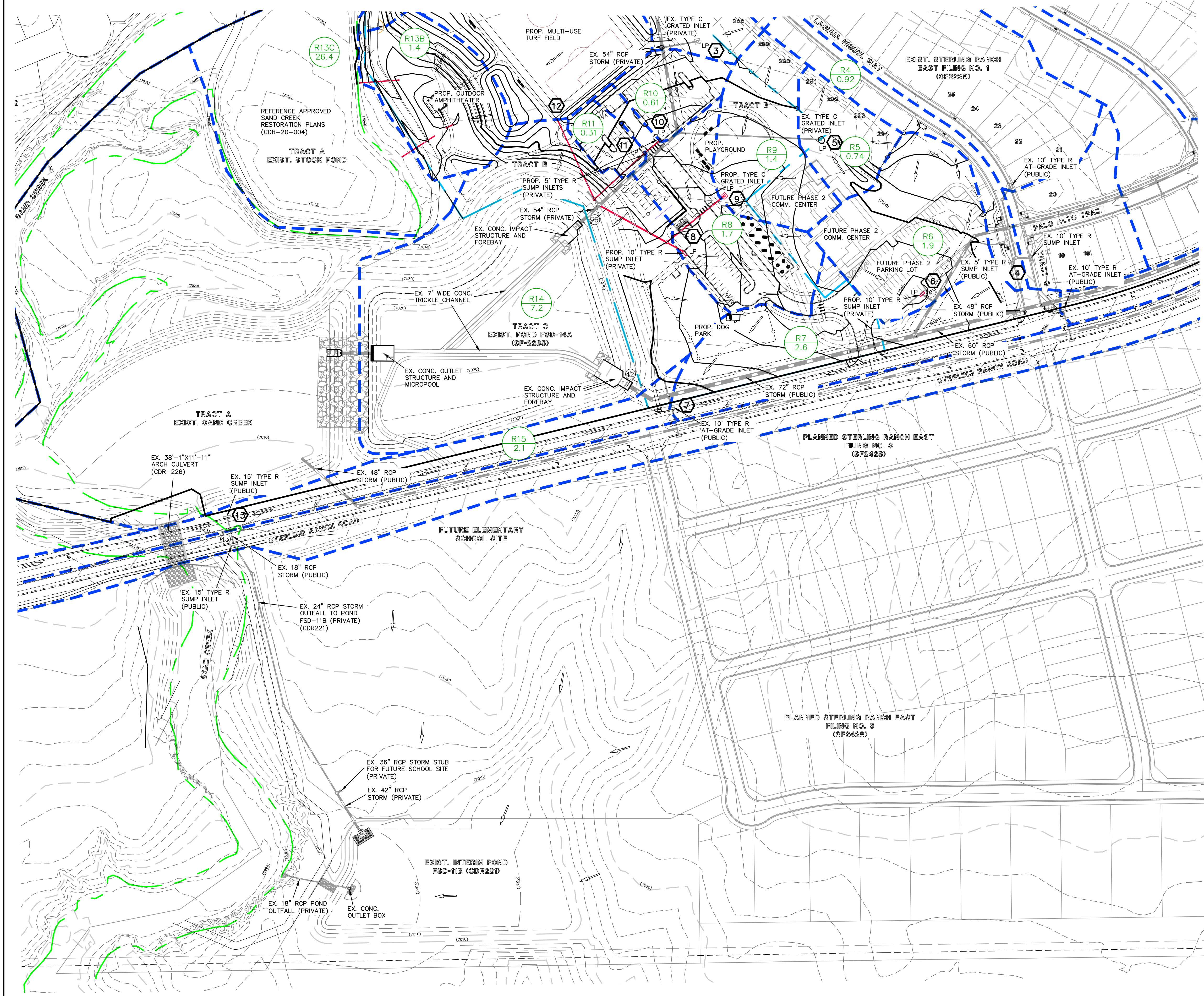
SCALE (H) 1"= 100'
(V) 1"= N/A

DATE 10/03/25
SHEET 1 OF 2
JOB NO. 1183.35

CLASSIC CONSULTING

1183.35

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LEGEND

- | | | | |
|----------------------------------|--------|-------------------------|------|
| EXISTING GROUND CONTOUR | (7000) | PROPOSED BASIN BOUNDARY | --- |
| PROPOSED FINISHED GRADE CONTOURS | (7000) | BASIN IDENTIFIER | → R1 |
| PHASE 1 AREA | --- | AREA IN ACRES | 1.4 |
| 100-YR FLOODPLAIN LIMITS | --- | DIRECTION OF DRAINAGE | → |
| EXISTING STORM SEWER | --- | DESIGN POINT | ① |
| EXISTING STORM INLET | □ | PIPE ROUTING | ⑧ |
| PROPOSED STORM SEWER | --- | | |
| PROPOSED STORM INLET | □ | | |

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