PRELIMINARY DRAINAGE REPORT
COPPER CHASE AT STERLING RANCH

EL PASO COUNTY, COLORADO

AUGUST 2023

Prepared for:

Challenger Communities, LLC
Jim Byers
8605 Explorer Drive, Suite 250
Colorado Springs, Colorado, 80920

Prepared by:

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Project #09-014
PCD Project # PUDSP222

PRELIMINARY DRAINAGE REPORT
COPPER CHASE AT STERLING RANCH

DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

The attached drainage plan and report was 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 master plan of the drainage basin.

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

DEVELOPER'S STATEMENT

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

BY:_____
Jim Byers, VP of Community Development

TITLE:_____
DATE: 08/03/23

ADDRESS: Challenger Communities, LLC
8605 Explorer Drive, Suite 250
Colorado Springs, CO 80920

EL PASO COUNTY'S STATEMENT

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

BY:_____ DATE:_____
Josh Palmer, P.E.
County Engineer / ECM Administrator

PRELIMINARY DRAINAGE REPORT
COPPER CHASE AT STERLING RANCH

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APPENDIX

PRELIMINARY DRAINAGE REPORT
COPPER CHASE AT STERLING RANCH

PURPOSE

This document is the Final Drainage Report for Copper Chase at Sterling Ranch. This site was previously discussed, in the approved "Final Drainage Report for Sterling Ranch Filing No. 2" prepared by JR Engineering, approved November 2021. The purpose of this document is to identify and analyze the on and offsite drainage patterns and to ensure that post development runoff is routed through the site safely and in a manner that satisfies the requirements set forth by the El Paso County Drainage Criteria Manual.

GENERAL LOCATION AND DESCRIPTION

Copper Chase at Sterling Ranch is located within the Southeast quarter of Section 32 and within the Southwest quarter of Section 33, Township 12 south, Range 65 West and a portion of the Northeast quarter of Section 5, Township 13, Range 65 West, all west of the 6th Principal Meridian, in unincorporated El Paso County, Colorado. Sterling Ranch Filing No. 2 infrastructure encompasses the boundary of the site. The site is bound to the north by under-construction Vollmer Road, Alzada Drive, and Bynum Drive. The site is bound to the southwest by existing Marksheffel Road and to the southeast by existing Sterling Ranch Road. Copper Chase at Sterling Ranch lies within the Sand Creek Drainage Basin. Flows from this site are tributary to Sand Creek.

Copper Chase at Sterling Ranch consists of 19.65 acres and is presently undeveloped. Vegetation is sparse, consisting of native grasses. Existing site terrain generally slopes from north to southeast at grade rates that vary between 1.9% and 4.4%.

Copper Chase at Sterling Ranch is currently zoned RS-5000 for Residential Sub-Urban and is proposed to be PUD, or Planned Unit Development. Improvements proposed for the site include paved streets, utilities, and storm drainage improvements, as normally constructed for a planned unit development.

SOILS

Soils for this project are delineated by the map in the appendix as Blakeland Loamy Sand (8) and Columbine Gravelly Sandy Loam (19). Both are characterized as Hydrologic Soil Types "A". Soils in the study area are shown as mapped by S.C.S. in the "Soils Survey of El Paso County Area". Due to recent bulk grading activities, vegetation is sparse, consisting of native grasses and weeds.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report.

FLOODPLAIN STATEMENT

No portion of this site is within a designated F.E.M.A. floodplain as determined by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0533 G, effective date December 7th, 2018.

DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual, Volumes I & II, dated October 31, 2018, City of Colorado Springs Drainage Criteria Manual, Volumes I & II, dated May 2014, including subsequent updates. El Paso County has also adopted Chapter 6 and Section 3.2.1 of Chapter 13 in the City of Colorado Springs & El Paso County Drainage Criteria Manual Volumes I and II, dated May 2014. (Appendix I of the El Paso County's Engineering Criteria Manual (ECM), Adopted January 2015). In addition to the ECM, the Urban Storm Drainage Criteria Manuals, Volumes 1-3, published by the Urban Drainage and Flood Control District (Volumes 1 & 2 dated January 2016, Volume 3 dated November 2010 and updates). Calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method.

EXISTING DRAINAGE CONDITIONS

The Copper Chase at Sterling Ranch site consists of 19.65 acres and is situated west of the Sand Creek Channel. This area was previously studied in the "Sand Creek Drainage Basin Planning Study" (DBPS) prepared by Kiowa Corporation, revised March 1996. More recently the area was studied in the "Final Drainage Report for Sterling Ranch Filing No. 2" prepared by JR Engineering, LLC, approved November 2021 (henceforth referred to as "Sterling Ranch Filing No. 2 FDR"), and "Master Development Drainage Report for Sterling Ranch Filing Nos. 1 & 2", prepared by M&S Civil Consultants, dated December 2017. Copper Chase at Sterling Ranch and portions of the surrounding areas (with the exception of the existing Barbarick Subdivision), have already been bulk graded (refer to Sterling Ranch Filing No. 2: Grading, Erosion, and Stormwater Quality Control Plan, dated March 2018). Offsite flows in this condition are diverted by the exterior roadways and do not enter the site. Refer to the Final Drainage Report for Sterling Ranch Filing No 2 by JR Engineering, LLC for information on historic conditions and overlot drainage patterns and analysis. The existing condition discussion, calculations, and maps for this site come directly from the proposed condition discussion, calculations, and maps within the Sterling Ranch Filing No. 2 FDR. Supporting text, calculation, and map excerpts for the existing conditions can be found in the appendix under the following sections: "Existing Drainage Conditions Discussion", "Existing Hydrologic Calculations", "Existing Hydraulic Calculations", "Background", and "Existing Drainage Maps".

FOUR STEP PROCESS

Step 1 Employ Runoff Reduction Practices - Roof drains will be directed to side yard swales and, whenever possible, to grass lined swales to aid in minimizing direct connection of impervious surfaces. Residential lots are proposed to include open spaces and lawn areas, which helps minimize directly connected impervious areas and therefore reduces runoff volumes.

Step 2 Treat And Slowly Release the WQCV (Stabilize Drainageways) –at rates less than pre-development conditions. With the offsite, sub-regional, full spectrum detention facility (Pond W-5) in place, the runoff from the proposed planned unit development and other areas of Sterling Ranch developments (see Pond W-5 tributary area in Appendix) will be treated and reduced to predevelopment conditions. The developed discharge from the site is not anticipated to have negative effects on downstream drainageways.

Step 3 Stabilize Stream Channels Provide Water Quality Capture Volume (WQCV) - An existing Full Spectrum Detention Facility was planned and constructed to handle tributary flows for this site (see Sterling Ranch Filing No 2 FDR with PCD Filing No. SF1820, Pond W-5) which will incorporate water quality capture volumes that are intended to slowly drain in 40 hours and excess urban runoff volumes that are intended to drain within 72 hours. Channel stabilization has been provided at the outlet of the aforementioned pond.

Step 4 Consider Need for Selecting Industrial and Commercial BMP's – A Stormwater Management Plan will be implemented which will include property housekeeping practices, spill containment procedures, and coverage of storage/handling areas to mitigate the potential for erosion across the site and protect downstream waters. Specialized BMP's are not required since there aren't commercial/industrial areas being implemented with this project.

PROPOSED DRAINAGE CHARACTERISTICS

General Concept Drainage Discussion

The following is a description of the onsite basins, offsite flows and the overall drainage characteristics for the development of Copper Chase at Sterling Ranch. The development of Copper Chase at Sterling Ranch consists of paved streets, parking, and lots typical of a Planned Unit Development (PUD). Surface runoff is routed via roof drains and side lot swales between the lots to either the back or front of the lots. Surface runoff from the back of the lots and open spaces is directed by swales to low points within area drainage basins. Surface runoff directed to the front of the lots is conveyed within the streets to proposed CDOT Type R at-grade inlets or to low points equipped with proposed CDOT Type R sump inlets. In the event of clogging or inlet failure at low points, emergency overflow routes have been designed to convey runoff to either a downstream inlet, existing Bynum Drive, or Sterling Ranch Road (see the Proposed Drainage Map for emergency overflow arrows and general drainage patterns). Runoff captured by area drainage inlets or CDOT Type R inlets is conveyed underground by a proposed private storm sewer system to the southern corner of the parcel. Ultimately, the proposed storm sewer system ties into an existing Type I manhole within the right of way of Sterling Ranch Road. All existing storm drainage improvements within Sterling Ranch Road are being constructed with the Sterling Ranch Filing No. 2 infrastructure. Ultimately, runoff from the proposed development is conveyed to existing Sterling ranch Pond W-5, a subregional Full spectrum Detention Facility constructed along the southern boundary of

Sterling Ranch. (Refer to Pond W4 & W5 Tributary Area Exhibit by JR Engineering, included in the Background section of the Appendix). A final analysis of Pond W-5 will be included with the final plat submittal.

The following detailed drainage discussion provides an overview of the proposed development and ensures that no major modification of the proposed improvements is necessary due to the assumptions meeting that of the previously submitted Final Drainage Report for Sterling Ranch Filing No 2. Surface flow is designated as Design Points (DP). Captured flow within the storm sewer system is designated as Pipe Runs (PR). Flow bypassing the inlets is designated as flowby (FB).

Detailed Drainage Discussion (Design Points)

Design Point 1 (Q5=4.4 cfs, Q100=11.8 cfs)

Basin A consists of 3.59 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=4.4 and Q100=11.8 cfs) flows from north to south through the lots and onto Blue Feather Loop, a public roadway. The flow is conveyed to the southwest within the curb and gutter to a proposed 5' at-grade CDOT Type R inlet (**IN-1, Q5=2.5 and Q100=3.8 cfs**) where a portion enters **PR1**, a proposed private 18" RCP storm sewer. Flowby bypassing this inlet (Q5=1.9 cfs, Q100=8.0 cfs) continues to downstream infrastructure.

Design Point 2 (Q5=4.9 cfs, Q100=11.4 cfs)

Basin B consists of 3.40 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=4.9 and Q100=11.4 cfs) flows from the lots and onto Blue Feather Loop and Lost Trail Drive (two public roadways). The flow is conveyed within the streets via curb and gutter to a proposed 15' at-grade CDOT Type R inlet (**IN-2, Q5=4.9 and Q100=9.7 cfs**) where it enters **PR2**, a proposed private 18" RCP storm sewer. **PR1** and **PR2** join flows and are directed southeast within **PR3**, an 18" RCP private storm sewer. Flowby bypassing this inlet (Q5=0.0 cfs, Q100=1.7 cfs) continues to downstream infrastructure.

Design Point 3 (Q5=3.7 cfs, Q100=11.8 cfs)

Basin C consists of 1.02 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=1.8 and Q100=3.9 cfs) flows from the lots and onto Blue Feather Loop, a public roadway. The flow is conveyed southeast in the curb and gutter, combining with **FB-IN1**, to a proposed 5' at-grade CDOT Type R inlet (**IN-3, Q5=2.3 and Q100=3.9 cfs**). Intercepted flow enters **PR4**, a proposed private 18" RCP storm sewer. Flowby bypassing this inlet (Q5=1.4 cfs, Q100=7.9 cfs) continues to downstream infrastructure.

Design Point 4 (Q5=4.7 cfs, Q100=12.0 cfs)

Basin D consists of 2.90 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=4.8 and Q100=10.5 cfs) flows from the lots and onto Salt Fork Drive, a public roadway. The flow is conveyed southeast in the curb and gutter, combining with **FB-IN2**, to a proposed 15' at-grade CDOT Type R inlet (**IN-4, Q5=4.7 and Q100=10.0 cfs**). Intercepted flow enters **PR5**, a proposed private 18" RCP storm sewer. **PR3**, **PR4**, and **PR5** join flows and continue southeast in **PR12**, a proposed 24" RCP private storm sewer. Flowby bypassing this inlet (Q5=0.0 cfs, Q100= 2.0 cfs) continues to downstream infrastructure.

Design Point 5 (Q5=1.8 cfs, Q100=5.6 cfs)

Basin E consists of 0.89 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=2.1 and Q100=4.2 cfs) flows from north to south through the lots and onto Blue Feather Loop, a public roadway. The flow is conveyed southeast in the curb and gutter, combining with **FB-IN4**, to a proposed 15' sump CDOT Type R at **Design Point 9**.

Design Point 6 (Q5=4.2 cfs, Q100=10.0 cfs)

Basin F consists of 2.58 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=4.2 and Q100=10.0 cfs) flows from the lots and onto Blue Feather Loop, a public roadway. The flow is conveyed southeast in the curb and gutter to a proposed 15' at-grade CDOT Type R inlet (**IN-6, Q5=4.2 and Q100=8.9 cfs**) where it enters **PR6** to **PR9**, a proposed private 18" RCP storm sewer segment. Flowby bypassing this inlet (Q5=0.0 cfs, Q100=1.1 cfs) continues east to downstream infrastructure located offsite on Bynum Drive.

Design Point 7 (Q5=4.9 cfs, Q100=20.0 cfs)

Basin G consists of 1.65 acres of paved roadway and residential lots. Runoff produced within this basin (Q5=4.3 and Q100=8.7 cfs) flows to the curb and gutter of Bynum Drive, a public roadway, and combines with **FB-IN6**, **FB-INA1, FB-INA4**, and **FB-INA3** for peak rates of Q5=4.9 and Q100=20.0 cfs in the 5 and 100 year events, respectively. A portion of the flow is then captured by an existing 15' at-grade CDOT Type R inlet (**IN-A5, Q5=4.9 and Q100=13.3 cfs**) where it enters **1.3A**, an existing public 30" RCP storm sewer. A manhole redirects the flow south into **1.3**, a public 36" RCP storm sewer. Flowby bypassing this inlet (Q5=0.0 cfs, Q100=6.7 cfs) continues to downstream infrastructure located on existing Sterling Ranch Road.

Design Point 8 (Q5= 1.0 cfs, Q100=3.9 cfs)

Basin H consists of 1.22 acres of residential lots, open space, and landscaping. Runoff produced within this basin (Q5=1.0 and Q100=3.9 cfs) flows from north to south through the lots, entering a proposed triangular, earthen swale. This 2' deep swale with 3:1 side slopes directs the flow southeast, where it enters a proposed 3' CDOT Type C at grade area inlet (**IN-8, Q5=1.0 and Q100=3.9 cfs**) at its end. Design calculations for this swale shall be provided with the Final Drainage Report and Final Plat submittal. **PR10**, a proposed 18" RCP private storm sewer directs intercepted flows south. In the case of inlet failure or clogging, the inundated area will overflow southeast onto Blue Feather Loop and be conveyed to the sump inlet (**IN-5**) at **DP 9**. A weir-orifice analysis for this grate is provided in the Appendix.

Design Point 9 (Q5=4.0 cfs, Q100=10.5 cfs)

Basin I consists of 1.40 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=2.4 and Q100=5.2 cfs) drains from northwest to southeast to the curb and gutter of Salt Fork Drive, a public roadway, combining with surface flows from **Design Point 5** at peak rates of 4.0 and 10.5 cfs in the 5 and 100 year events, respectively. The flow is then captured by proposed 15' sump CDOT Type R inlet (**IN-5, Q5=4.0 and Q100=10.5 cfs**). Intercepted flows enter **PR11**, a proposed private 24" RCP storm sewer. In the case of inlet failure or clogging, flows would overtop the crown of the road, enter **IN-9**, then overtop the curb and gutter to flow through Tract E.

Design Point 10 (Q5=2.2 cfs, Q100=4.3 cfs)

Basin J consists of 0.89 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=2.2 and Q100=4.3 cfs) drains to the curb and gutter of Blue Feather Loop, a public roadway. The flow is then directed south and captured by proposed 15' sump CDOT Type R inlet at **Design Point 11**.

Design Point 11 (Q5=5.4 cfs, Q100=16.7 cfs)

Basin K consists of 1.07 acres of residential lots and paved roadway. Runoff produced within this basin (Q5=1.9 and Q100=4.2 cfs) drains from west to east to the curb and gutter of Blue Feather Loop. The flow is conveyed in the curb and gutter where it combines with flows from **Design Point 10** and **FB-IN3** and is captured by proposed 15' sump CDOT Type R inlet (**IN-9, Q5=5.4 and Q100=16.7 cfs**). Intercepted flow enters **PR13**, a proposed private 30" RCP storm sewer where flows from **PR9** and **PR12** combine at a Type I junction manhole. Flows continue south in **PR14,** a proposed 42" RCP private storm sewer that ties into the existing 42" RCP storm sewer (private) and Type I manhole in the right of way of Sterling Ranch Road (**PR14**: Q5=26.0, Q100=60.5 cfs). Flows anticipated in the FDR for Sterling Ranch Filing No. 2 by JR Engineering at this pipe location are Q5=27.5 cfs and Q100=60.6 cfs.

Design Point 12 (Q5=1.1 cfs, Q100=3.3 cfs)

Basin L consists of 1.21 acres of residential lots and open space at the rear of the lots. Runoff produced within this basin (Q5=1.1 and Q100=3.3 cfs) drains to the curb and gutter of Bynum Drive and Sterling Ranch Road, public roadways. The flow is then directed southeast and is captured by an existing 15' CDOT Type R at grade inlet (**IN-A8**) at **Design Point 15** and enters **1.5**, a public 48" RCP storm sewer.

Design Point 13 (Q5=0.3 cfs, Q100=1.6 cfs)

Basin M consists of 0.64 acres of residential lots and open space. Runoff produced within this basin (Q5=0.3 and Q100=1.6 cfs) drains to the curb and gutter of Sterling Ranch Road, an under-construction public roadway. The flow is then directed southeast and is captured by existing 15' CDOT Type R at grade inlet (**IN-A11**) on Marksheffel Road.

Design Point 14 (Q5=3.0 cfs, Q100=5.4 cfs)

Basin A4 consists of 0.64 acres of public roadway (Alzada Drive). Runoff produced within this basin (Q5=3.0 and Q100=5.4 cfs) drains from northwest to southeast to an existing 10' CDOT Type R at grade inlet (**IN-A4: Q5=3.0, Q100=4.8 cfs**). Flow bypassing this inlet (Q5=0.0 cfs, Q100=0.6 cfs) continues to downstream infrastructure.

Design Point 15 (Q5=5.1 cfs, Q100=19.8 cfs)

Basin A8 consists of 0.75 acres of public roadway. Runoff produced within this basin (Q5=3.0 and Q100=5.5 cfs) drains within the curb and gutter of Sterling Ranch Road, combining with **FB-INA6**, **FB-INA15, DP 12,** and **FB-INA5**. **Basin A6** consists of 1.37 acres of public roadway and existing residential lots. A majority of the flow is intercepted by a 15' CDOT Type R inlet (**IN-A6**: Q5=3.3, Q100=5.4 cfs) and enter the system through a 24" RCP public storm sewer, discharging into **1.3A**. 100 yr flowby of 1.3 cfs bypasses the inlet and is intercepted by downstream infrastructure at **Design Point 15**. **Basin A6A** consists of 0.53 acres of area with a similar imperviousness to commercial areas. Runoff from this basin (Q5=2.2, Q100=4.1 cfs) drains to the curb and gutter of Sterling Ranch Road and combines with the aforementioned flows at peak rates of Q5=5.1 and Q100=19.8 cfs in the 5 and 100 year events, respectively. Runoff is collected in an existing 15' CDOT Type R at grade inlet (**IN-A8: Q5=5.1, Q100=13.6 cfs**). JR Engineering anticipated surface flows of Q5=3.0 cfs and Q100=12.5 cfs, and intercepted and pipe flows of Q5=3.0 cfs, and Q100=10.6 cfs. Flow bypassing this inlet (Q5=0.0 cfs, Q100=6.2 cfs) continues to downstream infrastructure.

Design Point 16 (Q5=7.7 cfs, Q100=22.8 cfs)

Basin A11 consists of 2.79 acres of public roadway and landscaped right of way of Marksheffel Road. Runoff produced within this basin (Q5=7.4 and Q100=14.2 cfs) drains from northwest to southeast in the curb and gutter combining with **DP13**, **FB-INA8** and **FB-INA9** at peak rates of Q5=7.7 and Q100=20.5

cfs in the 5 and 100 year events, respectively. Runoff is collected at the existing 15' CDOT Type R at grade inlet (**IN-A11: Q5=7.6, Q100=14.7 cfs**). JR Engineering anticipated surface flows of Q5=9.5 cfs and Q100=18.1 cfs at this location, and intercepted flows of Q5=8.9 cfs and Q100=13.8 cfs. Intercepted flow enters pipe run **1.7**, and combines with flows from **1.6** in **1.8** at peak rates of Q5=60.8 cfs and Q100=124.8 cfs. Pipe flows of Q5=68.8 cfs and Q100=125.0 cfs were originally anticipated. Flows bypassing the inlet (Q5=0.1 cfs, Q100=8.1 cfs) continue to downstream infrastructure. Flows previously anticipated by this inlet prior to Copper Chase development by JR Engineering were Q5=0.6 cfs & Q100=6.1 cfs, representing a 33% increase. Downstream pipe sizes are greater than 54" past this point (up to 78" prior to discharging into Pond W-5). Based on JR's 125.0 cfs, 100 yr design flow of **1.8**, the increase in bypassed flows represents a 1.6% downstream increase. This increase has been determined to be well within the ~5% human error potentially introduced into the calculations along with other conservative factors built in to the equations. The calculated HGL by JR at the manhole tie in location is 6982.33', and is located 5.83' below finished grade. As such, the downstream facilities leading to Pond W-5 are anticipated to accommodate the additional bypass. A conveyance exhibit is provided for reference from JR's report in the Drainage Map section of the Appendix.

EROSION CONTROL

It is the policy of the El Paso County that a grading and erosion control plan be submitted with the drainage report. Bulk grading was completed with approval of "Sterling Ranch Filing No. 2: Grading, Erosion, and Stormwater Quality Plan", dated March 2018. Grading and Erosion control operations are currently finished. A Grading and Erosion Control plan for the proposed development is being concurrently submitted with this report.

CONSTRUCTION COST OPINION – COPPER CHASE AT STERLING RANCH

Drainage Facilities:

Construction Cost Estimate (Non-Reimbursable)				
Item	Amount	Unit	Unit Cost	Total Cost
5' CDOT Type R Inlet	2	EA	$ 6,500.00	$ 13,000.00
15' CDOT Type R Inlet	5	EA	$ 13,000.00	$ 65,000.00
Type I MH	1	EA	$ 9,800.00	$ 9,800.00
Type II MH	5	EA	$ 6,000.00	$ 30,000.00
3' CDOT Type C Inlet	1	EA	$ 5,000.00	$ 5,000.00
18" RCP	905	LF	$ 45.00	$ 40,725.00
24" RCP	443	LF	$ 81.00	$ 35,883.00
30" RCP	20	LF	$ 100.00	$ 2,000.00
42" RCP	37	LF	$ 166.00	$ 6,142.00
Total Cost:				**$ 207,550.00**

DRAINAGE & BRIDGE FEES – COPPER CHASE AT STERLING RANCH

This site is within the Sand Creek Drainage Basin. The 2023 Drainage and Bridge Fees per El Paso County for the Copper Chase at Sterling Ranch site are as follows:

Per Copper Chase at Sterling Ranch Site Boundary – **Total Area = 19.651 Acres**

COPPER CHASE AT STERLING RANCH FEES:

Drainage Fees:	19.651	x	58.7%	x	$23,821	=	$	274,778.50
Bridge Fees:	19.651	x	58.7%	x	$9,743	=	$	112,386.84
						Total	**$**	**387,165.34**

It should be noted that these fees are provided in this Final Drainage Report for informational purposes only.

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above is only an estimate of the facility cost and drainage basin fee amounts in 2023.

SUMMARY

Development of this site will not adversely affect the surrounding developments per this final drainage report with no negative impacts to the neighboring developments. The proposed and existing drainage facilities will adequately convey, detain, and route runoff from tributary and onsite flows to the Sand Creek Drainage channel via proposed onsite and existing offsite drainage improvements. Full Spectrum Detention and Water Quality Ponds will be used to discharge developed flows into Sand Creek per the Urban Drainage criteria flow rates. Sterling Ranch Metropolitan District No. 1 will own and maintain the private facilities. Care will be taken during construction to accommodate overland flow routes onsite and temporary drainage conditions. The development of the Copper Chase at Sterling Ranch project shall not adversely affect adjacent or downstream property.

REFERENCES

1.) "El Paso County and City of Colorado Springs Drainage Criteria Manual, Vol I & II".

2.) "Urban Storm Drainage Criteria Manuals, Volumes 1-3".

3.) NRSC Web Soil Survey Map for El Paso County. http://websoilsurvey.nrcs.usda.gov. Accessed September 29th, 2020.

4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency, Effective date December 7th, 2018. Accessed October 4th, 2021.

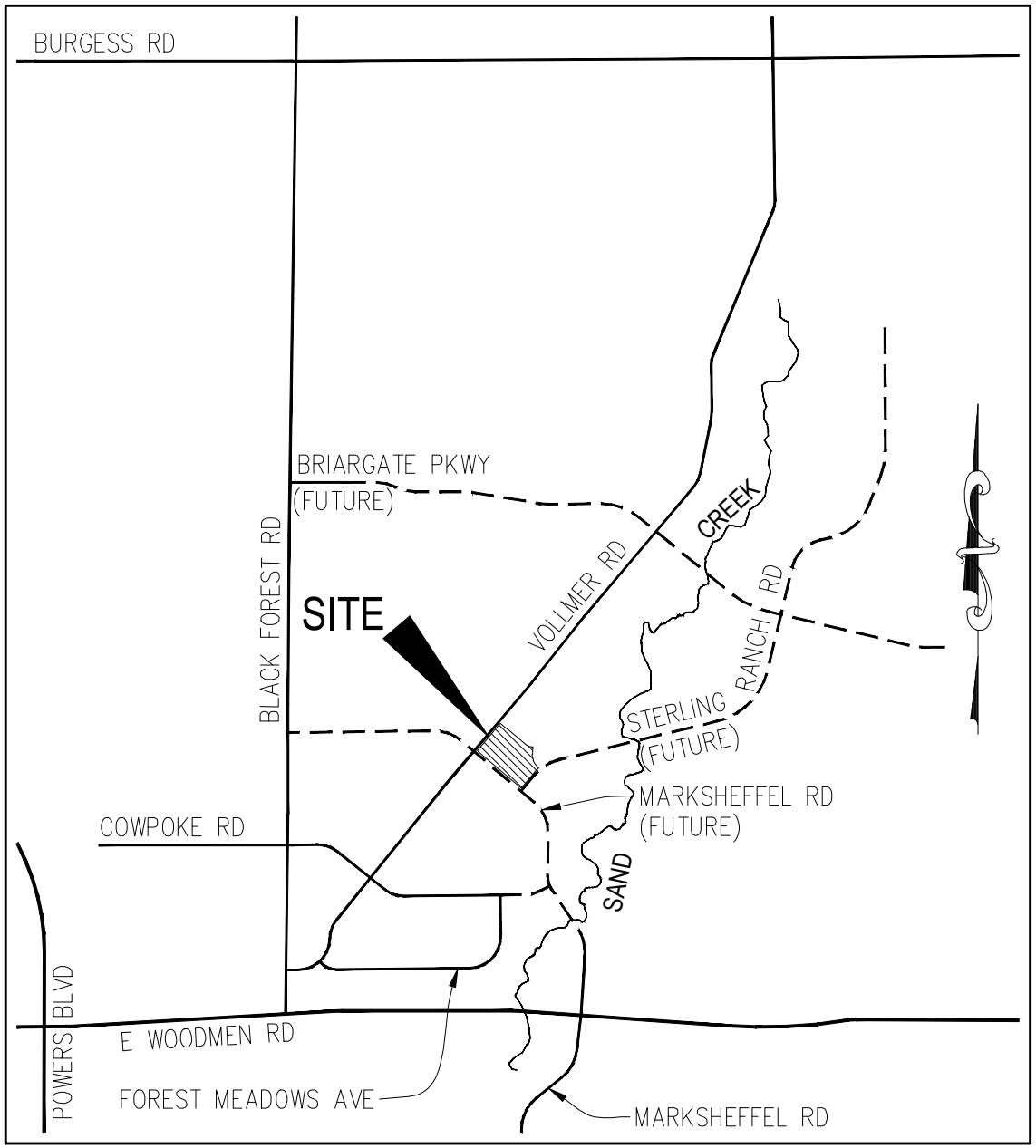
5.) "Sand Creek Drainage Basin Planning Study" (DBPS) prepared by Kiowa Corporation, revised March 1996

6.) "Final Drainage Report for Sterling Ranch Filing No. 2", dated November 2021, by JR Engineering

7.) "Master Development Drainage Plan for Sterling Ranch", (MDDP) prepared by M&S Civil Consultants, Inc., dated December 2017.

APPENDIX

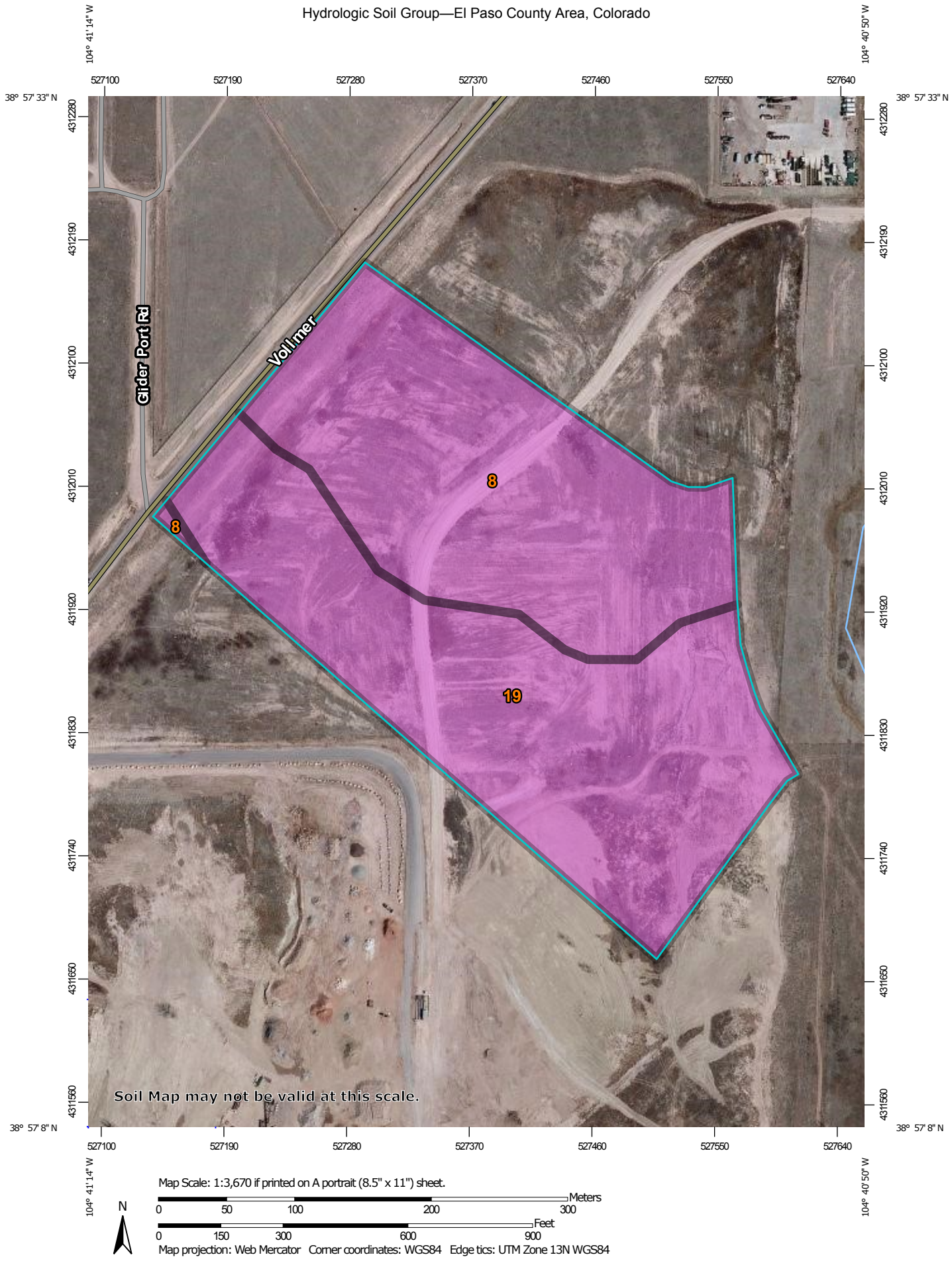
VICINITY MAP



VICINITY MAP

N.T.S.

SOILS MAP


104° 41' 14" W
104° 40' 50" W
38° 57' 33" N
38° 57' 8" N
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527190
527280
527370
527460
527550
527640
4312280
4312190
4312100
4312010
4311920
4311830
4311740
4311650
4311560
Cider Port Rd
Vollmer
8
8
19
Soil Map may not be valid at this scale.
Map Scale: 1:3,670 if printed on A portrait (8.5" x 11") sheet.
N
0 50 100 200 300 Meters
0 150 300 600 900 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 14, Sep 23, 2016

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

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	13.7	46.4%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	15.8	53.6%
Totals for Area of Interest			**29.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FIRM PANEL

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 used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

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

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

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

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

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

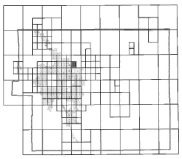
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)

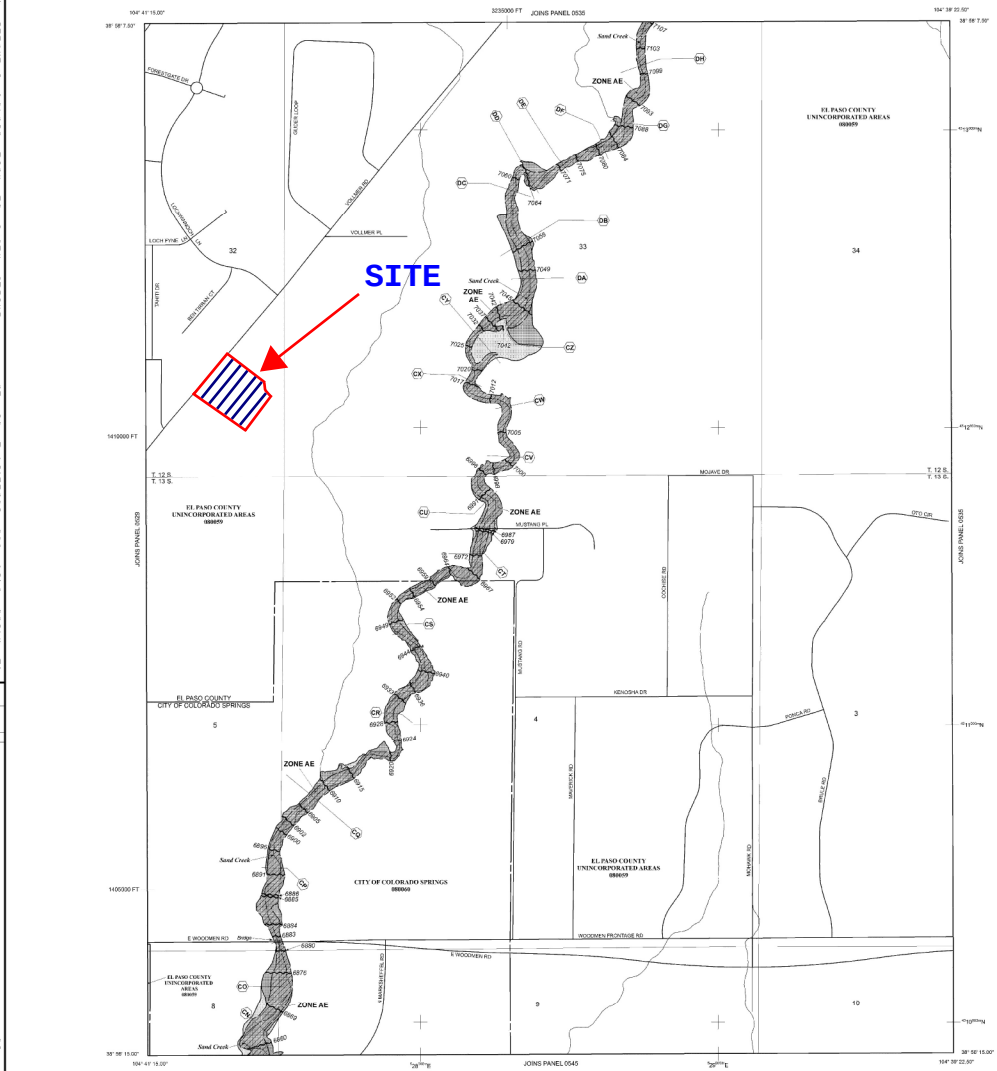
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION

Panel Location Map



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

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



NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

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

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

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

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

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

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0533G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 533 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0533	G
EL PASO COUNTY	080059	0533	G

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

MAP NUMBER
08041C0533G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

EXISITNG DRAINAGE CONDITIONS DISCUSSION
(BY J.R. ENGINEERING, APPROVED NOVEMBER 2021)

Basin A consists of Sub-Basins A1-A22 combining for a total of 123.19 acres. This basin represents all 49.5387 acres of the proposed Sterling Ranch Filing 2 development. This basin is primarily single-family residential, roadway and minor open space. This basin also contains future commercial sites, the future Sterling Ranch Phase 2 development, the proposed Copper Chase at Sterling Ranch Development and a proposed school site. Stormwater runoff is conveyed via public streets where it is captured via a series of on-grade and sump inlets. Runoff is then piped to a proposed onsite Full Spectrum Detention Pond W5. From the detention pond, the treated flows are then released directly into the Sand Creek Drainageway at below historic rates.

Off-Site Conveyance

The existing drainage patterns on the west side of Vollmer Road will not change due to the development of Sterling Ranch. Vollmer Road construction will address the roadside ditch flows along the west side of the road and will install drainage culverts where indicated in this report. The majority of the flows from the west side of Vollmer Road are to be routed in the historical direction to the southwest along the roadway to proposed Pond W-4. Runoff produced from the remaining off-site watershed located along the west edge of the existing development will be routed along the west side of Vollmer Road to the southwest corner of the existing development and a proposed Pond W-4. At the northwest corner of Tahiti Drive and Vollmer Road a 54" RCP will be installed to collect and convey runoff under proposed Marksheffel Road before ultimately discharging into Sand Creek. Runoff reaching the development along the south boundary line of the Barbarick Subdivision will be conveyed through and around the proposed site by proposed temporary swales and proposed storm sewer until it ultimately reaches Pond W-5. At the time of final for Sterling Ranch Filing No. 2 Phase 2, JR will coordinate with Barbarick to determine a more specific design solution for conveying the flows from their site. In general, the sand filter and double barrel 24" RCP will discharge onto the Sterling Ranch Phase 2 site where it will be picked up in a sump inlet structure and conveyed through a 48" RCP through the Sterling Ranch Storm system to Pond W5. The eastern Barbarick EDB discharge pipe will be connected into a structure and into a 36" RCP where the flows will be routed to Pond W5. Specific design details can be found within the Sterling Ranch Phase 2 drainage report. Runoff reaching the northern boundary of Phase I at proposed Briargate Parkway will be redirected around the site via a temporary swale to Sand Creek. BMP's will be installed to prevent erosion of the temporary swale. The intention of the drainage design for Sterling Ranch is to not adversely affect any adjacent property within the developed flows from Sterling Ranch.

Sub-basin A1 (Q_5=4.4 cfs, Q_{100}=9.4 cfs) consists of approximately 2.06 acres and is the northern most portion of the Sterling Ranch Filing No. 2 Phase 1 development. This basin is primarily single-family residential and minor open space. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter then captured by a 10' on-grade inlet at DP 1. From here, the flow is piped to Pond W5.

Sub-basin A2 (Q_5=1.9 cfs, Q_{100}=3.9 cfs) consists of approximately 0.82 acres and is the north eastern most portion of the Sterling Ranch Filing No. 2 Phase 1 development. This basin is primarily singlefamily residential and minor open space. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter then captured by a 10' Type R on-grade inlet at DP 2. From here, the flow is piped to Pond W5.

Sub-basin A3 (Q_5=11.1 cfs, Q_{100}=24.7 cfs) consists of approximately 6.76 acres and is the north western most portion of the Sterling Ranch Filing No. 2 Phase 1 development. This basin is primarily single-family residential and minor open space. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type-R on-grade inlet at DP 3. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1 & A2.

Sub-basin A4 (Q_5=3.7 cfs, Q_{100}=7.4 cfs) consists of approximately 1.51 acres and is the southern portion of Alzada Drive and this basin is primarily single-family residential(Copper Chase at Sterling Ranch) and proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 10' Type-R on-grade inlet at DP 4. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A3.

Sub-basin A5 (Q_5=4.1 cfs, Q_{100}=8.3 cfs) consists of approximately 1.70 acres and is the western portion of Bynum Drive. This basin is primarily single-family residential and proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 5. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A4.

Sub-basin A6A (Q_5=2.2 cfs, Q_{100}=4.1 cfs) consists of approximately 0.53 acres. This basin will serve as a tract including mail kiosks, parking, landscaping and sidewalks. Runoff from this sub-basin will sheet flow to DP 6A where it flows via curb and gutter to the 15' Type R inlet at DP6. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A5.

Sub-basin A6 (Q_5=3.3 cfs, Q_{100}=6.6 cfs) consists of approximately 1.37 acres and is the eastern portion of Bynum Drive. This basin is primarily single-family residential and proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R inlet on-grade inlet at DP 6. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A6A.

Sub-basin A7 (Q_5=27.5 cfs, Q_{100}=60.6 cfs) represents the future Copper Chase at Sterling Ranch development and consists of approximately 19.00 acres. This basin is primarily single-family residential and open space. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 36" RCP storm sewer stub at DP 7 with sediment control structure. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A6. Prior to being developed, storm runoff from this sub-basin will overland flow to temporary swales, where the flows will be captured by an interim 36" FES and piped to Pond W5.

Sub-basin A8 (Q_5=3.0 cfs, Q_{100}=6.3 cfs) consists of approximately 1.48 acres and is the south western portion of Sterling Ranch Road. This basin is primarily single-family residential and proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 8. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A7.

Sub-basin A9 (Q_5=1.9 cfs, Q_{100}=3.7 cfs) consists of approximately 0.61acres and is the south eastern portion of Sterling Ranch Road. This basin is comprised primarily of the proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 9. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A8.

Sub-basin A10 (Q_5=9.2 cfs, Q_{100}=17.3 cfs) consists of approximately 2.61 acres and is the south eastern portion of Marksheffel Road. This basin is comprised primarily of the proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 10. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A9.

Sub-basin A11 (Q_5=9.5 cfs, Q_{100}=18.1 cfs) consists of approximately 2.89 acres and is the north portion of Marksheffel Road. This basin is comprised primarily of the proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 11. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A10.

Sub-basin A12 (Q_5=1.9 cfs, Q_{100}=9.5 cfs) consists of approximately 3.87 acres and represents the open space area between the Sterling Ranch Filing No. 2 Phases 1 & 2 developments. This basin is primarily open space. This basin also contains a 50' and 30' gas easement that contain 3 major gas lines. Runoff from this sub-basin will be conveyed via sheet flow and earthen swale to an area inlet at DP 12. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A11.

Sub-basin A13 (Q_5=15.7 cfs, Q_{100}=34.6 cfs) consists of approximately 9.65 acres and is the northern portion of the future Sterling Ranch Phase 2 development. This basin is primarily single-family residential and minor open space. Runoff from this sub-basin will be captured by a storm sewer stub at DP 13. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A12. Prior to being developed, storm runoff from this sub-basin will overland flow to temporary swales, where the flows will be captured by an interim 36" FES and piped to Pond W5.

Sub-basin A14 (Q_5=16.0 cfs, Q_{100}=37.9 cfs) consists of approximately 11.76 acres and is the proposed future school site on the northern side of Sterling Ranch Road. Runoff from this sub-basin will be routed to a 36" RCP storm sewer stub at DP 14. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A13. Prior to being developed, storm runoff from this sub-basin will overland flow to Sterling Ranch Road, where the flows will be captured by inlets and piped to Pond W5.

Sub-basin A15 (Q_5=5.4 cfs, Q_{100}=11.7 cfs) consists of approximately 2.91 acres and is the north eastern portion of Sterling Ranch Road. This basin is primarily single-family residential and proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 15. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A14.

Sub-basin A16 (Q_5=4.4 cfs, Q_{100}=9.6 cfs) consists of approximately 2.34 acres and is the south eastern portion of Sterling Ranch Road. This basin is primarily single-family residential and proposed roadway. Runoff from this sub-basin will be conveyed via sheet flow and curb and gutter to a 15' Type R on-grade inlet at DP 16. From here, the flow is piped to Pond W5 along with the flows from Sub-basin A1-A15.

Sub-basin A17 (Q_5=1.4 cfs, Q_{100}=4.7 cfs) consists of approximately 1.76 acres and is the open space located along the western portion of the sterling Ranch Phase 2 development south of Sterling Ranch Road. This basin is primarily single-family open space with a small amount of lot runoff. Runoff from this sub-basin will be captured by a future Type C inlet at DP 17 and coveyed via sheet flow

EXISTING HYDROLOGIC CALCULATIONS
(BY J.R. ENGINEERING, APPROVED NOVEMBER 2021)

EXISITNG CONDITIONS COMPOSITE % IMPERVIOUS & RUNOFF COEFFICIENT SUMMARY
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

Basin ID	Total Area (ac)	Streets (100% Impervious)				Residential (65% Impervious) Neighborhood Area (70% Impervious) 2.5 Acre Residential (9% Impervious)				Light Industrial (80% Impervious) Commercial (95% Impervious) Gravel (80% Impervious)				Lawns/Pasture (0% Impervious) School (55% Impervious) Open Space (12%)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
A1	2.06	0.90	0.96	0.48	23.3%	0.45	0.59	1.34	42.3%	0.59	0.70	0.00	0.0%	0.08	0.35	0.24	0.0%	0.51	0.65	65.6%
A2	0.82	0.90	0.96	0.20	24.4%	0.45	0.59	0.56	44.4%	0.59	0.70	0.00	0.0%	0.08	0.35	0.06	0.0%	0.53	0.66	68.8%
A3	6.76	0.90	0.96	1.32	19.5%	0.45	0.59	4.16	40.0%	0.59	0.70	0.00	0.0%	0.08	0.35	1.28	0.0%	0.47	0.62	59.5%
A4	1.51	0.90	0.96	0.51	33.8%	0.45	0.59	1.00	43.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.60	0.71	76.8%
A5	1.70	0.90	0.96	0.51	30.0%	0.45	0.59	1.19	45.5%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.59	0.70	75.5%
A6	1.37	0.90	0.96	0.39	28.5%	0.45	0.59	0.98	46.5%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.58	0.70	75.0%
A6A	0.53	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.81	0.88	0.53	95.0%	0.08	0.35	0.00	0.0%	0.81	0.88	95.0%
A7	19.00	0.90	0.96	0.00	0.0%	0.45	0.59	19.00	65.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.45	0.59	65.0%
A8	1.48	0.90	0.96	0.74	50.0%	0.45	0.59	0.29	12.7%	0.59	0.70	0.00	0.0%	0.08	0.35	0.45	0.0%	0.56	0.70	62.7%
A9	0.61	0.90	0.96	0.48	78.7%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.13	0.0%	0.73	0.83	78.7%
A10	2.61	0.90	0.96	2.25	86.2%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.36	0.0%	0.79	0.88	86.2%
A11	2.89	0.90	0.96	2.40	83.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.49	0.0%	0.76	0.86	83.0%
A12	3.87	0.90	0.96	0.00	0.0%	0.45	0.59	0.50	8.4%	0.59	0.70	0.00	0.0%	0.08	0.35	3.37	0.0%	0.13	0.38	8.4%
A13	9.65	0.90	0.96	0.00	0.0%	0.45	0.59	9.65	65.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.45	0.59	65.0%
A14	11.76	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.81	0.88	0.00	0.0%	0.39	0.55	11.76	55.0%	0.39	0.55	55.0%
A15	2.91	0.90	0.96	1.57	54.0%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	1.34	0.0%	0.52	0.68	54.0%
A16	2.34	0.90	0.96	1.30	55.6%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	1.04	0.0%	0.54	0.69	55.6%
A17	1.76	0.90	0.96	0.00	0.0%	0.45	0.59	0.64	23.6%	0.59	0.70	0.00	0.0%	0.08	0.35	1.12	0.0%	0.21	0.44	23.6%
A18	5.27	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.81	0.88	1.18	21.3%	0.08	0.35	4.09	0.0%	0.24	0.47	21.3%
A19	31.85	0.90	0.96	0.00	0.0%	0.45	0.59	31.85	67.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.00	0.0%	0.45	0.59	67.0%
A20	1.83	0.90	0.96	1.63	89.1%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.20	0.0%	0.81	0.89	89.1%
A21	1.93	0.90	0.96	1.73	89.6%	0.45	0.59	0.00	0.0%	0.59	0.70	0.00	0.0%	0.08	0.35	0.20	0.0%	0.82	0.90	89.6%
A22	8.68	0.90	0.96	0.00	0.0%	0.45	0.59	0.70	5.2%	0.59	0.70	0.00	0.0%	0.08	0.35	7.98	0.0%	0.11	0.37	5.2%
B1	2.98	0.90	0.96	2.98	100.0%	0.59	0.70	0.00	0.0%	0.20	0.44	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
B2	3.89	0.90	0.96	3.89	100.0%	0.59	0.70	0.00	0.0%	0.20	0.44	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
B3	1.53	0.90	0.96	1.53	100.0%	0.59	0.70	0.00	0.0%	0.20	0.44	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
B4	1.50	0.90	0.96	1.50	100.0%	0.59	0.70	0.00	0.0%	0.20	0.44	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
B5	2.91	0.90	0.96	0.00	0.0%	0.59	0.70	0.00	0.0%	0.20	0.44	0.00	0.0%	0.08	0.35	2.91	0.0%	0.08	0.35	0.0%

EXISITNG CONDITIONS COMPOSITE % IMPERVIOUS & RUNOFF COEFFICIENT SUMMARY
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

Basin ID	Total Area (ac)	Streets (100% Impervious)				Residential (65% Impervious) Neighborhood Area (70% Impervious) 2.5 Acre Residential (9% Impervious)				Light Industrial (80% Impervious) Commercial (95% Impervious) Gravel (80% Impervious)				Lawns/Pasture (0% Impervious) School (55% Impervious) Open Space (12%)				Basins Total Weighted C Values		Basins Total Weighted % Imp.
		C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	Area (ac)	Weighted % Imp.	C_5	C_{100}	
C1	8.01	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.81	0.88	8.01	95.0%	0.08	0.35	0.00	0.0%	0.81	0.88	95.0%
C2	5.06	0.90	0.96	0.00	0.0%	0.45	0.59	0.00	0.0%	0.81	0.88	5.06	95.0%	0.08	0.35	0.00	0.0%	0.81	0.88	95.0%
D1	0.45	0.90	0.96	0.45	100.0%	0.45	0.59	0.00	0.0%	0.81	0.88	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
D2	0.43	0.90	0.96	0.43	100.0%	0.45	0.59	0.00	0.0%	0.81	0.88	0.00	0.0%	0.08	0.35	0.00	0.0%	0.90	0.96	100.0%
OS20	308.00	0.90	0.96	3.36	1.1%	0.59	0.70	157.32	4.6%	0.20	0.44	2.38	0.6%	0.09	0.36	144.94	0.0%	0.13	0.40	6.3%
OS21A	20.26	0.90	0.96	1.13	5.6%	0.59	0.70	19.13	8.5%	0.20	0.44	0.00	0.0%	0.09	0.36	0.00	0.0%	0.13	0.40	14.1%
OS21B	8.71	0.90	0.96	0.00	0.0%	0.59	0.70	8.71	9.0%	0.20	0.44	0.00	0.0%	0.09	0.36	0.00	0.0%	0.13	0.40	9.0%
OS2	17.00	0.90	0.96	0.00	0.0%	0.49	0.62	17.00	70.0%	0.59	0.70	0.00	0.0%	0.09	0.36	0.00	0.0%	0.49	0.62	70.0%
OS3	28.70	0.90	0.96	0.00	0.0%	0.49	0.62	28.70	70.0%	0.59	0.70	0.00	0.0%	0.09	0.36	0.00	0.0%	0.49	0.62	70.0%
OS4	5.08	0.90	0.96	0.00	0.0%	0.20	0.40	5.08	15.0%	0.59	0.70	0.00	0.0%	0.09	0.36	0.00	0.0%	0.20	0.40	15.0%
TOTAL (A1-A22,OS2-4)	173.97																			57.6%
TOTAL (B1-B5, OS20-21B)	349.78																			9.4%
TOTAL (C1-C2)	13.07																			95.0%
TOTAL	537.70																			27.9%

EXISTING CONDITIONS AREA RUNOFF COEFFICIENT & AREA DRAINAGE SUMMARY

BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
A1	2.06	A	66%	0.51	0.65	100	2.5%	7.8	388	3.0%	20.0	3.5	1.9	9.7	488.0	16.9	9.7
A2	0.82	A	69%	0.53	0.66	100	2.5%	7.6	183	1.0%	20.0	2.0	1.5	9.1	283.0	15.9	9.1
A3	6.76	A	60%	0.47	0.62	100	2.5%	8.4	1186	2.3%	20.0	3.0	6.5	15.0	1286.0	23.4	15.0
A4	1.51	A	77%	0.60	0.71	78	2.0%	6.3	795	2.9%	20.0	3.4	3.9	10.2	873.0	16.9	10.2
A5	1.70	A	76%	0.59	0.70	100	2.5%	6.9	645	3.1%	20.0	3.5	3.1	9.9	745.0	16.3	9.9
A6	1.37	A	75%	0.58	0.70	100	2.5%	7.0	632	3.1%	20.0	3.5	3.0	10.0	732.0	16.3	10.0
A6A	0.53	A	95%	0.81	0.88	100	2.0%	4.2	30	2.0%	20.0	2.8	0.2	4.3	130.0	10.0	5.0
A7	19.00	A	65%	0.45	0.59	100	2.5%	8.7	1419	1.5%	20.0	2.4	9.7	18.3	1519.0	25.6	18.3
A8	1.48	A	63%	0.56	0.70	80	2.0%	6.9	646	0.6%	20.0	1.5	7.0	13.9	726.0	23.2	13.9
A9	0.61	A	79%	0.73	0.83	15	2.0%	2.1	661	0.7%	20.0	1.7	6.6	8.7	676.0	19.2	8.7
A10	2.61	A	86%	0.79	0.88	15	2.0%	1.7	1357	3.4%	20.0	3.7	6.1	7.9	1372.0	17.2	7.9
A11	2.89	A	83%	0.76	0.86	16	2.0%	1.9	1357	2.8%	20.0	3.3	6.8	8.7	1373.0	18.4	8.7
A12	3.87	A	8%	0.13	0.38	100	5.0%	10.3	267	3.4%	15.0	2.8	1.6	11.9	367.0	26.9	11.9
A13	9.65	A	65%	0.45	0.59	100	2.5%	8.7	934	2.1%	20.0	2.9	5.4	14.0	1033.6	20.9	14.0
A14	11.76	A	55%	0.39	0.55	100	2.0%	10.2	867	2.0%	20.0	2.8	5.1	15.3	967.0	22.8	15.3
A15	2.91	A	54%	0.52	0.68	34	2.0%	4.8	1621	1.8%	20.0	2.7	10.1	14.9	1655.0	29.0	14.9
A16	2.34	A	56%	0.54	0.69	35	2.0%	4.8	1594	1.8%	20.0	2.7	9.9	14.7	1629.0	28.4	14.7
A17	1.76	A	24%	0.21	0.44	100	5.0%	9.4	403	1.1%	15.0	1.6	4.3	13.7	503.0	27.2	13.7
A18	5.27	A	21%	0.24	0.47	100	2.0%	12.3	703	2.0%	20.0	2.8	4.1	16.4	803.0	29.3	16.4
A19	31.85	A	67%	0.45	0.59	100	2.5%	8.7	2675	1.7%	20.0	2.6	17.1	25.8	2775.0	33.2	25.8
A20	1.83	A	89%	0.81	0.89	15	2.0%	1.6	936	1.5%	20.0	2.4	6.4	8.0	951.0	16.8	8.0
A21	1.93	A	90%	0.82	0.90	15	2.0%	1.6	1049	1.5%	20.0	2.4	7.1	8.7	1064.0	17.4	8.7
A22	8.68	A	5%	0.11	0.37	185	3.0%	16.9	540	0.5%	20.0	1.4	6.4	23.3	725.0	38.2	23.3
B1	2.98	A	100%	0.90	0.96	17	2.0%	1.2	2561	1.7%	20.0	2.6	16.4	17.6	2578.0	23.2	17.6
B2	3.89	A	100%	0.90	0.96	17	2.0%	1.2	2561	1.7%	20.0	2.6	16.4	17.6	2578.0	23.2	17.6
B3	1.53	A	100%	0.90	0.96	17	2.0%	1.2	1394	2.0%	20.0	2.8	8.2	9.4	1411.0	16.1	9.4
B4	1.50	A	100%	0.90	0.96	17	2.0%	1.2	1394	2.0%	20.0	2.8	8.2	9.4	1411.0	16.1	9.4

EXISTING AREA RUNOFF COEFFICIENT & AREA DRAINAGE SUMMARY

BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-2

TIME OF CONCENTRATION

Subdivision: Sterling Ranch Filing No. 2

Location: El Paso County

Project Name: Sterling Ranch Subdivision

Project No.: 25188.01

Calculated By: AAM

Checked By:

Date: 8/16/21

SUB-BASIN DATA						INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Impervious (%)	C_5	C_{100}	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
B5	2.91	A	0%	0.08	0.35	170	14.0%	10.1	259	0.5%	20.0	1.4	3.1	13.1	429.0	32.8	13.1
C1	8.01	A	95%	0.81	0.88	100	2.0%	4.2	965	2.0%	20.0	2.8	5.7	9.9	1065.0	14.9	9.9
C2	5.06	A	95%	0.81	0.88	100	2.0%	4.2	627	2.0%	20.0	2.8	3.7	7.9	727.0	13.2	7.9
D1	0.45	A	95%	0.81	0.88	17	2.0%	1.7	180	0.1%	20.0	0.6	5.3	7.0	197.0	14.6	7.0
D2	0.43	A	95%	0.81	0.88	17	2.0%	1.7	180	0.1%	20.0	0.6	5.3	7.0	197.0	14.6	7.0
OS20	308.00	A	6%	0.13	0.40	300	4.0%	19.2	6670	5.0%	10.0	2.2	49.7	68.9	6970.0	75.2	68.9
OS21A	20.26	A	14%	0.13	0.40	300	2.0%	24.1	2673	2.0%	10.0	1.4	31.5	55.6	2973.0	52.3	52.3
OS21B	8.71	A	9%	0.13	0.40	100	2.0%	13.9	1167	1.5%	15.0	1.8	10.6	24.5	1267.0	39.9	24.5
OS2	17.00	A	70%	0.49	0.62	300	1.0%	19.1	3020	1.5%	15.0	1.8	27.4	46.5	3320.0	36.0	36.0
OS3	28.70	A	70%	0.49	0.62	300	1.0%	19.1	4340	1.0%	15.0	1.5	48.2	67.3	4640.0	52.6	52.6
OS4	5.08	A	15%	0.20	0.40	300	1.0%	28.1	900	5.0%	10.0	2.2	6.7	34.9	1200.0	29.5	29.5

NOTES:

$$t_c = t_i + t_t$$ Equation 6-2

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$ Equation 6-4

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

$$t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$ Equation 6-5

Where:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

EXISTING CONDITIONS SURFACE & PIPE ROUTING SUMMARY (5 YEAR)
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C* A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A1	2.06	0.51	9.7	1.05	4.17	4.4					0.2	0.04	3.3	4.2	1.01	2.0	18	652 5	3.6 7.2	3.0 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.0
	2	A2	0.82	0.53	9.1	0.44	4.27	1.9								1.9	0.44	2.0	18	27	5.8	0.1	On-grade inlet Piped to DP 1.0
	1.0								9.7	1.45	4.17	6.0				6.0	1.45	3.0	18	335	9.1	0.6	Sum of DP 1 & DP 2, piped to DP 1.2
	3	A3	6.76	0.47	15.0	3.16	3.53	11.1					1.6	0.47	2.9	9.5	2.69	4.7	18	426 36	3.4 12.2	2.1 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	4	A4	1.51	0.60	10.2	0.91	4.10	3.7					0.1	0.03	2.9	3.6	0.88	4.7	18	395 0	3.4 9.2	1.9 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	1.1								15.0	3.57	3.52	12.6				12.6	3.57	1.0	24	74	7.4	0.2	Sum of DP 3 & DP 4, piped to DP 1.2
	1.2								15.2	5.02	3.50	17.6				17.6	5.02	3.3	24	319	12.5	0.4	Sum of DP 1.0 & DP 1.1, piped to DP 1.3
	6A	A6A	0.53	0.81	5.0	0.43	5.17	2.2															Overland Flow to DP1.3A
	6	A6	1.37	0.58	10.0	0.79	4.14	3.3								3.3	0.79	2.0	18	0	6.7	0.0	On-grade inlet Sum of Sub-basin A6 & Carryover flow from DP 2, Piped to DP 1.3A
	1.3A								10.0	1.22	4.14	5.0				5.0	1.22	1.0	24	36	5.7	0.1	Sum of DP 6 & DP 6A, piped to DP 1.3
	5	A5	1.70	0.59	9.9	0.99	4.14	4.1	17.0	1.53	3.33	5.1				5.1	1.53	2.0	18	0	7.6	0.0	On-grade inlet Sum of Sub-basin A5 & Carryover flows from DP 1, P 3 & DP 4. Piped to DP 1.3
	1.3								17.0	7.77	3.33	25.9				25.9	7.77	1.1	36	620	9.2	1.1	Sum of DP 1.2, 1.3A & DP 5, piped to DP 1.4
	7	A7	19.00	0.45	18.3	8.55	3.22	27.5								27.5	8.55	1.5	42	20	10.3	0.0	Future storm infrastructure from Copper Chase Subdivision Piped to DP 1.4
	1.4								18.4	16.32	3.22	52.5				52.5	16.32	0.5	48	26	8.2	0.1	Sum of DP 1.3 & DP 7, piped to DP 1.5
	8	A8	1.48	0.56	13.9	0.83	3.63	3.0								3.0	0.83	2.0	18	20	6.6	0.1	On-grade inlet, carryover flow to DP 11 Piped to DP 1.5
	1.5								18.4	17.15	3.21	55.1				55.1	17.15	0.5	48	91	8.3	0.2	Sum of DP 1.4 & DP 8, piped to DP 1.6
	9	A9	0.61	0.73	8.7	0.44	4.34	1.9	8.7	0.48	4.34	2.1				2.1	0.48	2.0	18	13	5.8	0.0	On-grade inlet Sum of Sub-basin A9 & carryover flows from DP 16, piped to DP 1.6
	1.6								18.6	17.63	3.20	56.4				56.4	17.63	0.5	48	95	8.3	0.2	Sum of DP 1.5 & DP 9, piped to DP 1.8
	10	A10	2.61	0.79	7.9	2.05	4.49	9.2					0.5	0.11	1.5	8.7	1.94	2.5	18	955 118	2.4 9.5	6.5 0.2	On-grade inlet, carryover flow to DP 20 Piped to DP 1.7
	11	A11	2.89	0.76	8.7	2.20	4.34	9.5					0.6	0.15	1.5	8.9	2.05	2.5	18	1049 0	2.4 9.4	7.1 0.0	On-grade inlet, carryover flow to DP 21 Piped to DP 1.7
	1.7								8.7	3.99	4.34	17.3				17.3	3.99	1.0	24	8	7.9	0.0	Sum of DP 10 & DP 11, piped to DP 1.8
	1.8								18.8	21.63	3.18	68.8				68.8	21.63	2.0	54	517	14.4	0.6	Sum of DP 1.6 & DP 1.7, piped to DP 2.7
	OS2	OS2	17.00	0.49	14.0	6.25	2.20	13.8								13.8	6.25	1.0	30	787	7.5	1.7	Future flow released from Barbarick Subdivision Piped to DP 2.0
	12	A12	3.87	0.13	11.9	0.49	3.86	1.9								1.9	0.49	2.0	18	17	5.6	0.1	Type C inlet Piped to DP 2.0
	2.0								15.7	6.74	3.45	23.2				23.2	6.74	1.0	48	52	8.4	0.1	Sum of DP OS2 & DP 12, Piped to DP 2.1
	13	A13	9.65	0.45	14.0	4.34	3.62	15.7								15.7	4.34	1.5	30	200	9.1	0.4	Future storm infrastructure from Sterling Ranch Phase 2 Piped to DP 2.1

EXISTING CONDITIONS SURFACE & PIPE ROUTING SUMMARY (5 YEAR)
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C* A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.1								15.9	11.08	3.44	38.1				38.1	11.08	1.6	48	65	11.4	0.1	Sum of DP 2.0 & DP 13, piped to DP 2.5
	OS3	OS3	28.70	0.49	19.0	14.06	1.25	17.6								17.6	14.06	1.0	30	719	8.0	1.5	Future flow released from Barbarick Subdivision Piped to DP 2.2
	14	A14	11.76	0.39	15.3	4.59	3.49	16.0								16.0	4.59	1.0	30	20	7.8	0.0	Future flow released from School Site Piped to DP 2.2
	2.2								20.5	18.65	3.05	56.9				56.9	18.65	1.5	48	773	12.4	1.0	Sum of DP OS3 & DP 14, piped to DP 2.3
	15	A15	2.91	0.52	14.9	1.52	3.53	5.4								5.4	1.52	1.3	18	35	6.5	0.1	On-grade inlet Piped to DP 2.3
	16	A16	2.34	0.54	14.7	1.25	3.55	4.4					0.1	0.04	0.8	4.3	1.21	2.0	18	697 12	1.8 7.2	6.5 0.0	On-grade inlet, carryover flow to DP 9 Piped to DP 2.3
	2.3								15.0	2.73	3.52	9.6				9.6	2.73	1.6	48	51	7.6	0.1	Sum of DP 15 & DP 16, piped to DP 2.4
	2.4								21.5	21.38	2.98	63.7				63.7	21.38	1.6	48	19	13.1	0.0	Sum of DP 2.2 & DP 2.3, piped to DP 2.5
	2.5								21.6	32.46	2.98	96.6				96.6	32.46	2.0	60	839	15.8	0.9	Sum of DP 2.1 & DP 2.4 piped to DP 2.6
	17	A17	1.76	0.21	13.7	0.38	3.66	1.4								1.4	0.38	1.0	18	24	4.1	0.1	Type C inlet Piped to DP 2.6
	2.6								21.6	32.84	2.98	97.8				97.8	32.84	2.0	60	32	15.8	0.0	Sum of DP 2.5 & DP 17, piped to DP 2.7
	2.7								21.6	54.47	2.97	162.0				162.0	54.47	0.6	78	220	11.5	0.3	Sum of DP1.8 & DP 2.6, piped to DP 2.8
	18	A18	5.27	0.24	16.4	1.28	3.38	4.3								4.3	1.28	1.0	18	24	5.6	0.1	Area inlet Piped to DP 2.6
	19	A19	31.85	0.45	25.8	14.33	2.71	38.8								38.8	14.33	1.0	18	24	22.0	0.0	Area inlet Piped to DP 2.6
	2.8								25.8	70.08	2.71	189.8				189.8	70.08	0.6	78	145	12.1	0.2	Sum of DP 2.7, DP 18 & DP 19, piped to DP 3.0.
	3.0								25.8	70.08	2.71	189.8	189.8	70.08	0.5					584	1.4	6.9	Detention Pond Trickle channel conveyance to DP 3.2
	20	A20	1.83	0.81	8.0	1.48	4.47	6.6	8.0	1.59	4.47	7.1				7.1	1.59	1.0	24	105	6.4	0.3	On-grade inlet Sum of Sub-basin A20 & carryover flow from DP 10, piped to DP 3.0
	21	A21	1.93	0.82	8.7	1.57	4.33	6.8	8.7	1.72	4.33	7.4	0.1	0.03	1.5	7.3	1.68	2.5	18	0	9.0	0.0	On-grade inlet Sum of Sub-basin A21 & carryover flow from DP 11, piped to DP 2.9
	2.9								8.7	3.27	4.33	14.2				14.2	3.27	2.0	24	58	9.8	0.1	Sum of DP 20 & DP 21,piped to DP 3.1
	3.1								8.7	3.27	4.33	14.2	14.2	3.27	0.5					568	1.4	6.7	Detention Pond Trickle channel conveyance to DP 3.2
	22	A22	8.68	0.11	23.3	0.95	2.86	2.7															Detention Pond Overland flow to DP 3.2
	OS4	OS4	5.08	0.20	29.5	1.02	2.51	2.6					2.6	1.02	13.0					113	5.4	0.3	Existing topography Overland flow to DP 4.1
	3.2								29.8	75.32	2.49	187.5											Outlet Structure Sum of DP 3.0, DP 3.1, DP 22 & DP OS4, outlet structure release to DP 4.8
	Pond W5								29.8	1.45	2.49	3.6				3.6	1.45	2.0	48	58	6.2	0.2	Outlet structure release to DP 4.8
	23	B1	2.98	0.90	17.6	2.68	3.29	8.8					0.4	0.12	2.0	8.4	2.56	0.5	30	1399 88	2.0 5.1	12.0 0.3	On-grade inlet Piped to DP 4.0

EXISTING CONDITIONS SURFACE & PIPE ROUTING SUMMARY (100 YEAR)
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

EXISTING SURFACE ROUTING SUMMARY (100 YEAR)

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A1	2.06	0.65	9.7	1.34	7.01	9.4					2.8	0.40	3.3	6.6	0.94	2.0	18	652 5	3.6 8.2	3.0 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.0
	2	A2	0.82	0.66	9.1	0.54	7.17	3.9					0.1	0.01	3.3	3.8	0.53	2.0	18	639 27	3.6 7.0	2.9 0.1	On-grade inlet, carryover flow to DP 6 Piped to DP 1.0
	1.0								9.7	1.47	7.00	10.3				10.3	1.47	3.0	18	335	10.6	0.5	Sum of DP 1 & DP 2, piped to DP 1.2
	3	A3	6.76	0.62	15.0	4.17	5.92	24.7					10.0	1.69	2.9	14.7	2.48	4.7	18	426 36	3.4 13.6	2.1 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	4	A4	1.51	0.71	10.2	1.08	6.88	7.4					1.6	0.24	2.9	5.8	0.84	4.7	18	395 0	3.4 10.7	1.9 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	1.1								15.0	3.33	5.91	19.7				19.7	3.33	1.0	24	74	8.1	0.2	Sum of DP 3 & DP 4, piped to DP 1.2
	1.2								15.1	4.80	5.89	28.2				28.2	4.80	3.3	24	319	13.9	0.4	Sum of DP 1.0 & DP 1.1, piped to DP 1.3
	6A	A6A	0.53	0.88	5.0	0.47	8.68	4.1															Overland Flow to DP1.3A
	6	A6	1.37	0.70	10.0	0.95	6.94	6.6	10.0	0.96	6.94	6.7	1.3	0.18	0.7	5.4	0.78	2.0	18	696 0	1.7 7.7	7.0 0.0	On-grade inlet, carryover flow to DP 8 Sum of Sub-basin A6 & Carryover flow from DP 2, Piped to DP 1.3A
	1.3A								10.0	1.25	6.94	8.7				8.7	1.25	1.0	24	36	6.7	0.1	Sum of DP 6 & DP 6A, piped to DP 1.3
	5	A5	1.70	0.70	9.9	1.19	6.95	8.3	17.0	3.51	5.59	19.6	6.5	1.17	0.7	13.1	2.34	2.0	18	664 0	1.7 9.4	6.6 0.0	On-grade inlet, carryover flow to DP 8 Sum of Sub-basin A5 & Carryover flows from DP 1, P 3 & DP 4. Piped to DP 1.3
	1.3								17.0	8.39	5.59	46.9				46.9	8.39	1.1	36	620	10.7	1.0	Sum of DP 1.2, 1.3A & DP 5, piped to DP 1.4
	7	A7	19.00	0.59	18.3	11.21	5.41	60.6								60.6	11.21	1.5	42	20	12.7	0.0	Future storm infrastructure from Copper Chase Subdivision Piped to DP 1.4
	1.4								18.4	19.60	5.40	105.9				105.9	19.60	0.5	48	26	9.2	0.0	Sum of DP 1.3 & DP 7, piped to DP 1.5
	8	A8	1.48	0.70	13.9	1.04	6.10	6.3	23.7	2.63	4.76	12.5	1.9	0.41	0.7	10.6	2.23	2.0	18	195 20	1.7 9.1	1.9 0.0	On-grade inlet, carryover flow to DP 11 Sum of Sub-basin A8 & Carryover flows from DP5, DP 6 & DP 15, Piped to DP 1.5
	1.5								23.7	21.83	4.76	103.9				103.9	21.83	0.5	48	91	9.2	0.2	Sum of DP 1.4 & DP 8, piped to DP 1.6
	9	A9	0.61	0.83	8.7	0.51	7.29	3.7	21.2	0.95	5.04	4.8	0.3	0.05	0.7	4.5	0.89	2.0	18	140 13	1.7 7.3	1.4 0.0	On-grade inlet, carryover flow to DP 11 Sum of Sub-basin A9 & carryover flows from DP 16, piped to DP 1.6
	1.6								23.9	22.72	4.74	107.7				107.7	22.72	0.5	48	95	9.1	0.2	Sum of DP 1.5 & DP 9, piped to DP 1.8
	10	A10	2.61	0.88	7.9	2.29	7.53	17.3					4.5	0.59	1.5	12.8	1.70	2.5	18	955 118	2.4 10.3	6.5 0.2	On-grade inlet, carryover flow to DP 20 Piped to DP 1.7
	11	A11	2.89	0.86	8.7	2.48	7.28	18.1	10.6	2.94	6.77	19.9	6.1	0.90	1.5	13.8	2.04	2.5	18	1049 0	2.4 10.4	7.1 0.0	On-grade inlet, carryover flow to DP 21 Sum of Sub-basin A11 & carryover flows from DP 8 & DP 9, piped to DP 1.7
	1.7								10.6	3.74	6.77	25.3				25.3	3.74	1.0	24	8	8.1	0.0	Sum of DP 10 & DP 11, piped to DP 1.8
	1.8								24.0	26.45	4.72	125.0				125.0	26.45	2.0	54	517	17.0	0.5	Sum of DP 1.6 & DP 1.7, piped to DP 2.7
	OS2	OS2	17.00	0.62	12.0	10.54	3.71	39.1								39.1	10.54	1.0	30	787	9.5	1.4	Future flow released from Barbarick Subdivision Piped to DP 2.0
	12	A12	3.87	0.38	11.9	1.47	6.49	9.5								9.5	1.47	2.0	18	17	8.9	0.0	Type C inlet Piped to DP 2.0
	2.0								13.4	12.01	6.20	74.5				74.5	12.01	1.0	48	52	11.6	0.1	Sum of DP OS2 & DP 12, Piped to DP 2.1
	13	A13	9.65	0.59	14.0	5.69	6.08	34.6								34.6	5.69	1.5	30	200	11.0	0.3	Future storm infrastructure from Sterling Ranch Phase 2 Piped to DP 2.1

EXISTING CONDITIONS SURFACE & PIPE ROUTING SUMMARY (100 YEAR)
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.1								14.3	17.70	6.02	106.6				106.6	17.70	1.6	48	65	15.1	0.1	Sum of DP 2.0 & DP 13, piped to DP 2.5
	OS3	OS3	28.70	0.62	15.0	17.79	2.75	48.9								48.9	17.79	1.0	30	719	10.0	1.2	Future flow released from Barbarick Subdivision Piped to DP 2.2
	14	A14	11.76	0.55	15.3	6.47	5.86	37.9								37.9	6.47	1.0	30	20	9.5	0.0	Future flow released from School Site Piped to DP 2.2
	2.2								16.2	24.26	5.72	138.7				138.7	24.26	1.5	48	773	15.5	0.8	Sum of DP OS3 & DP 14, piped to DP 2.3
	15	A15	2.91	0.68	14.9	1.98	5.93	11.7					1.4	0.24	0.7	10.3	1.74	1.3	18	724 35	1.7 7.6	7.2 0.1	On-grade inlet, carryover flow to DP 8 Piped to DP 2.3
	16	A16	2.34	0.69	14.7	1.61	5.96	9.6					2.6	0.44	0.8	7.0	1.17	2.0	18	697 12	1.8 8.2	6.5 0.0	On-grade inlet, carryover flow to DP 9 Piped to DP 2.3
	2.3								15.0	2.91	5.91	17.2				17.2	2.91	1.6	48	15	9.0	0.0	Sum of DP 15 & DP 16, piped to DP 2.4
	2.4								17.0	27.17	5.59	151.9				151.9	27.17	1.6	48	19	16.2	0.0	Sum of DP 2.2 & DP 2.3, piped to DP 2.5
	2.5								17.1	44.87	5.59	250.7				250.7	44.87	2.0	60	839	20.1	0.7	Sum of DP 2.1 & DP 2.4 piped to DP 2.6
	17	A17	1.76	0.44	13.7	0.77	6.14	4.7								4.7	0.77	1.0	18	24	5.7	0.1	Type C inlet Piped to DP 2.6
	2.6								17.7	45.64	5.49	250.4				250.4	45.64	2.0	60	32	20.2	0.0	Sum of DP 2.5 & DP 17, piped to DP 2.7
	2.7								24.5	72.10	4.67	336.8				336.8	72.10	0.6	78	220	13.7	0.3	Sum of DP1.8 & DP 2.6, piped to DP 2.8
	18	A18	5.27	0.47	16.4	2.47	5.68	14.0								14.0	2.47	1.0	18	24	7.9	0.1	Area inlet Piped to DP 2.6
	19	A19	31.85	0.59	25.8	18.79	4.55	85.4								85.4	18.79	1.0	18	24	48.4	0.0	Area inlet Piped to DP 2.6
	2.8								25.8	93.36	4.55	424.4				424.4	93.36	0.6	78	145	13.9	0.2	Sum of DP 2.7, DP 18 & DP 19, piped to DP 3.0.
	3.0								25.8	93.36	4.55	424.4	424.4	93.36	0.5					564	1.4	6.6	Detention Pond Trickle channel conveyance to DP 3.2
	20	A20	1.83	0.89	8.0	1.63	7.50	12.2	14.4	2.22	6.02	13.4	2.3	0.38	1.5	11.1	1.84	1.0	24	105	7.2	0.2	On-grade inlet Sum of Sub-basin A20 & carryover flow from DP 10, piped to DP 3.0
	21	A21	1.93	0.90	8.7	1.73	7.28	12.6	15.8	2.63	5.77	15.2	3.3	0.57	1.5	11.9	2.06	2.5	18	0	10.2	0.0	On-grade inlet Sum of Sub-basin A21 & carryover flow from DP 11, piped to DP 2.9
	2.9								15.8	3.91	5.77	22.5				22.5	3.91	2.0	24	58	11.0	0.1	Sum of DP 20 & DP 21,piped to DP 3.1
	3.1								15.8	3.91	5.77	22.5	22.5	3.91	0.5					568	1.4	6.7	Detention Pond Trickle channel conveyance to DP 3.2
	22	A22	8.68	0.37	23.3	3.21	4.80	15.4															Detention Pond Overland flow to DP 3.2
	OS4	OS4	5.08	0.40	29.5	2.03	4.21	8.5					8.5	2.03	13.0					113	5.4	0.3	Existing topography Overland flow to DP 3.2
	3.2								29.8	102.50	4.18	428.2											Outlet Structure Sum of DP 3.0, DP 3.1, DP 22 & DP OS4, outlet structure release to DP 4.8
	Pond W5								29.8	34.84	4.18	145.5				145.5	34.84	2.0	48	58	17.5	0.1	Outlet structure release to DP 4.8
	23	B1	2.98	0.96	17.6	2.86	5.51	15.8					3.6	0.65	2.0	12.2	2.21	0.5	30	1394 88	2.1 5.7	11.0 0.3	On-grade inlet Piped to DP 4.0
	24	B2	3.89	0.96	17.6	3.73	5.51	20.6					6.5	1.17	2.0	14.1	2.56	2.0	30	1394 0	2.1 9.7	11.0 0.0	On-grade inlet Piped to DP 4.0

PROPOSED HYDROLOGIC CALCULATIONS

COPPER CHASE AT STERLING RANCH
PROPOSED CONDITIONS
(Area Runoff Coefficient Summary)

			STREETS			*DEVELOPMENT*			*OPEN SPACE / LANDSCAPING*				
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A	**156397.009**	3.59	0.00	0.90	0.96	2.28	0.45	0.59	1.31	0.09	0.36	**0.32**	**0.51**
B	**148304.6808**	3.40	0.00	0.90	0.96	3.00	0.45	0.59	0.40	0.09	0.36	**0.41**	**0.56**
C	**44335.8117**	1.02	0.00	0.90	0.96	1.02	0.45	0.59	0.00	0.09	0.36	**0.45**	**0.59**
D	**126236.9571**	2.90	0.00	0.90	0.96	2.90	0.45	0.59	0.00	0.09	0.36	**0.45**	**0.59**
E	**38846.7466**	0.89	0.21	0.90	0.96	0.68	0.45	0.59	0.00	0.09	0.36	**0.56**	**0.68**
F	**112434.6262**	2.58	0.00	0.90	0.96	2.18	0.45	0.59	0.40	0.09	0.36	**0.39**	**0.55**
G	**71700.54**	1.65	0.44	0.90	0.96	1.21	0.45	0.59	0.00	0.09	0.36	**0.57**	**0.69**
H	**53106.3075**	1.22	0.00	0.90	0.96	0.39	0.45	0.83	0.83	0.12	0.39	**0.23**	**0.53**
I	**60953.98**	1.40	0.00	0.90	0.96	1.40	0.45	0.59	0.00	0.09	0.36	**0.45**	**0.59**
J	**38881.001**	0.89	0.30	0.90	0.96	0.59	0.45	0.59	0.00	0.09	0.36	**0.60**	**0.71**
K	**46538.1625**	1.07	0.00	0.90	0.96	1.07	0.45	0.59	0.00	0.09	0.36	**0.45**	**0.59**
L	**52574.1933**	1.21	0.00	0.90	0.96	0.52	0.45	0.59	0.69	0.09	0.36	**0.24**	**0.46**
M	**28034.2781**	0.64	0.00	0.90	0.96	0.06	0.45	0.59	0.58	0.09	0.36	**0.12**	**0.38**
A4	**24837.432**	0.64	0.64	0.90	0.96	0.00	0.45	0.59	0.00	0.09	0.36	**0.90**	**0.96**
A6	**N/A**	1.37	REFER TO "FINAL DRAINAGE REPORT FOR STERLING RANCH NO. 2" FOR DETAILS									**0.58**	**0.70**
A6A	**N/A**	0.53	REFER TO "FINAL DRAINAGE REPORT FOR STERLING RANCH NO. 2" FOR DETAILS									**0.81**	**0.88**
A8	**32551.5217**	0.75	0.75	0.90	0.96	0.00	0.45	0.59	0.00	0.09	0.39	**0.90**	**0.96**
A11	**121476.1738**	2.79	2.22	0.90	0.96	0.00	0.45	0.59	0.57	0.09	0.39	**0.73**	**0.84**

COPPER CHASE AT STERLING RANCH
PROPOSED CONDITIONS
(Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL**	**C_5**	**C_{100}**	**C_5**	**Length**	**Height**	**T_C**	**Length**	**Slope**	**Velocity**	**T_t**	**TOTAL**	**CHECK**	**I_5**	**I_{100}**	**Q_5**	**Q_{100}**
	(Acres)	*From DCM Table 5-1*			*(ft)*	*(ft)*	*(min)*	*(ft)*	*(%)*	*(fps)*	*(min)*	*(min)*	*(min)*	*(in/hr)*	*(in/hr)*	*(c.f.s.)*	*(c.f.s.)*
A	3.59	0.32	0.51	0.32	100	10.5	6.5	860	1.7%	2.6	5.4	11.9	15.3	3.9	6.5	***4.4***	***11.8***
B	3.40	0.41	0.56	0.41	100	1.4	11.2	735	1.6%	2.5	4.9	16.1	14.6	3.6	6.0	***4.9***	***11.4***
C	1.02	0.45	0.59	0.45	100	2.0	9.3	520	2.5%	3.2	2.7	12.1	13.4	3.8	6.5	***1.8***	***3.9***
D	2.90	0.45	0.59	0.45	100	2.2	9.0	795	1.9%	2.8	4.7	13.8	15.0	3.6	6.1	***4.8***	***10.5***
E	0.89	0.56	0.68	0.56	100	2.0	7.8	340	1.9%	2.8	2.0	9.9	12.4	4.1	7.0	***2.1***	***4.2***
F	2.58	0.39	0.55	0.39	100	13.0	5.5	855	2.7%	3.3	4.3	9.8	15.3	4.2	7.0	***4.2***	***10.0***
G	1.65	0.57	0.69	0.57	100	4.0	6.1	290	2.8%	3.4	1.4	7.5	12.2	4.6	7.7	***4.3***	***8.7***
H	1.22	0.23	0.53	0.23	100	3.3	10.6	655	2.1%	2.2	5.0	15.6	14.2	3.6	6.0	***1.0***	***3.9***
I	1.40	0.45	0.59	0.45	100	2.7	8.5	760	2.1%	2.9	4.4	12.8	14.8	3.8	6.3	***2.4***	***5.2***
J	0.89	0.60	0.71	0.60	100	2.0	7.2	470	1.4%	2.4	3.3	10.5	13.2	4.1	6.8	***2.2***	***4.3***
K	1.07	0.45	0.59	0.45	100	3.0	8.2	460	2.0%	2.8	2.7	10.9	13.1	4.0	6.7	***1.9***	***4.2***
L	1.21	0.24	0.46	0.24	100	3.5	10.2	655	1.2%	2.2	4.9	15.2	14.2	3.6	6.0	***1.1***	***3.3***
M	0.64	0.12	0.38	0.12	100	4.0	11.2	195	3.2%	1.3	2.6	13.7	11.6	3.9	6.6	***0.3***	***1.6***
A4	0.64	0.90	0.96	0.90	100	1.8	3.0	350	2.3%	3.0	1.9	4.9	12.5	5.2	8.7	***3.0***	***5.4***
A6	1.37	0.58	0.70				REFER TO "FINAL DRAINAGE REPORT FOR STERLING RANCH NO. 2" FOR DETAILS									***3.3***	***6.6***
A6A	0.53	0.81	0.88				REFER TO "FINAL DRAINAGE REPORT FOR STERLING RANCH NO. 2" FOR DETAILS									***2.2***	***4.1***
A8	0.75	0.90	0.96	0.90	100	1.5	3.2	600	1.2%	2.2	4.5	7.7	13.9	4.5	7.6	***3.0***	***5.5***
A11	2.79	0.73	0.84	0.73	100	0.9	6.8	1315	2.2%	3.0	7.3	14.2	17.9	3.6	6.1	***7.4***	***14.2***

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

Calculated by: CVW
Date: 12/8/2021
Checked by: VAS

COPPER CHASE AT STERLING RANCH
PROPOSED CONDITIONS
(Surface Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
1	**Basin A**	1.14	1.82	Basin A Tc was used			11.9					11.9	3.9	6.5	***4.4***	***11.8***	CDOT TYPE R AT-GRADE 5' INLET (IN-1)
2	**Basin B**	1.39	1.92	Basin B Tc was used			14.6					14.6	3.6	6.0	***4.9***	***11.4***	CDOT TYPE R AT-GRADE 15' INLET (IN-2)
3	**Basin C**	0.46	0.60	Basin C Tc was used			12.1					12.1	3.8	6.5	***3.7***	***11.8***	CDOT TYPE R AT-GRADE 5' INLET (IN-3)
	FB-IN1	0.50	1.23														
	Sum:	0.96	1.83														
4	**Basin D**	1.30	1.71	Design Point 2 Tc was used			14.6					14.6	3.6	6.0	***4.7***	***12.0***	CDOT TYPE R AT-GRADE 15' INLET (IN-4)
	FB-IN2	0.0	0.29														
	Sum:	1.31	2.00														
5	**Basin E**	0.50	0.60	Design Point 4 was used			14.6					14.6	3.6	6.0	***1.8***	***5.6***	CDOT TYPE R SUMP 15' INLET (IN-5)
	FB-IN4	0.0	0.33														
	Sum:	0.50	0.93														
6	**Basin F**	1.02	1.43	Basin F Tc was used			9.8					9.8	4.2	7.0	***4.2***	***10.0***	CDOT TYPE R 15' AT-GRADE INLET (IN-6)
7	**Basin G**	0.94	1.13	Weighted Tc was used			16.0					16.0	3.4	5.7	***4.9***	***20.0***	EX CDOT TYPE R 15' AT-GRADE INLET (IN-A5)
	FB-IN6	0.00	0.16														
	FB-INA1	0.05	0.40														
	FB-INA4	0.00	0.10														
	FB-INA3	0.45	1.69														
		1.44	3.48														
8	**Basin H**	0.27	0.65	Basin H Tc was used			14.2					14.2	3.6	6.0	***1.0***	***3.9***	CDOT TYPE C 3' AT- GRADE INLET (IN-8)
9	**Basin I**	0.63	0.83	Design Point 5 Tc was used			14.6					14.6	3.6	6.0	***4.0***	***10.5***	CDOT TYPE R SUMP 15' INLET (IN-5)
	DP 5	0.50	0.93														
	Sum:	1.13	1.76														
10	**Basin J**	0.54	0.64	Basin J Tc was used			10.5					10.5	4.1	6.8	***2.2***	***4.3***	
11	**Basin K**	0.48	0.63	Design Point 3 was used			12.1					12.1	3.8	6.5	***5.4***	***16.7***	CDOT TYPE R SUMP 15' INLET (IN-9)
	FB-IN3	0.4	1.32														
	DP 10	0.54	0.64														
	Sum:	1.40	2.59														
12	**Basin L**	0.29	0.55	Basin L Tc was used			14.2					14.2	3.6	6.0	***1.1***	***3.3***	
13	**Basin M**	0.08	0.25	Basin M Tc was used			11.6					11.6	3.9	6.6	***0.3***	***1.6***	
14	**Basin A4**	0.58	0.62	Basin A4 Tc was used			5.0					5.0	5.2	8.7	***3.0***	***5.4***	EX CDOT TYPE R 10' AT-GRADE INLET (IN-A4)

COPPER CHASE AT STERLING RANCH
PROPOSED CONDITIONS
(Surface Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
15	**Basin A8**	0.67	0.72	Basin A8 Tc was used			13.9					13.9	3.6	6.1	***5.1***	***19.8***	EX CDOT TYPE R 15' AT-GRADE INLET (IN-A8)
	FB-INA6	0.00	0.17														
	Basin A6A	0.43	0.47														
	FB-INA15	0.00	0.24														
	DP 12	0.29	0.55														
	FB-INA5	0.01	1.10														
		1.40	3.25														
16	**Basin A11**	2.05	2.35	Basin A11 Tc was used			14.2					14.2	3.6	6.1	***7.7***	***22.8***	EX CDOT TYPE R 15' AT-GRADE INLET (IN-A11)
	FB-INA8	0.00	1.11														
	DP 13	0.08	0.25														
	FB-INA9	0.00	0.06														
		2.13	3.77														

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

Calculated by: CVW
Date: 6/16/2022
Checked by: VAS

COPPER CHASE AT STERLING RANCH
PROPOSED CONDITIONS
(Storm Sewer Routing Summary)

PIPE	*Contributing Pipes/Design Points*	*Equivalent* CA_5	*Equivalent* CA_{100}	*Maximum* T_C	*Intensity**		*Flow*	
					I_5	I_{100}	Q_5	Q_{100}
PR1	**DP1 (IN-1)**	0.65	0.59	11.9	3.9	6.5	***2.5***	***3.8***
PR2	**DP2 (IN-2)**	1.38	1.62	14.6	3.6	6.0	***4.9***	***9.7***
PR3	**PR1, PR2**	2.02	2.21	14.4	3.6	6.0	***7.3***	***13.3***
PR4	**DP3 (IN-3)**	0.64	0.65	14.6	3.6	6.0	***2.3***	***3.9***
PR5	**DP4 (IN-4)**	1.31	1.67	14.6	3.6	6.0	***4.7***	***10.0***
PR6	**DP6 (IN-6)**	1.01	1.27	10.0	4.1	6.9	***4.2***	***8.8***
PR7	**PR6**	1.01	1.27	10.3	4.1	6.9	***4.1***	***8.7***
PR8	**PR7**	1.01	1.27	10.5	4.1	6.8	***4.1***	***8.7***
PR9	**PR8**	1.01	1.27	10.8	4.0	6.7	***4.1***	***8.6***
PR10	**DP8 (IN-8)**	0.27	0.65	14.2	3.6	6.0	***1.0***	***3.9***
PR11	**PR10, DP9 (IN-5)**	1.39	2.38	14.2	3.6	6.0	***5.0***	***14.4***
PR12	**PR3, PR4, PR5**	3.98	4.53	15.3	3.5	5.9	***13.9***	***26.6***
PR13	**PR11, DP11 (IN-9)**	2.79	4.97	12.1	3.8	6.5	***10.7***	***32.1***
PR14	**PR9, PR12, PR13**	7.78	10.78	16.9	3.3	5.6	***26.0***	***60.5***
1.0	**IN-A1, IN-A2**	1.45	1.47	9.7	4.2	7.0	***6.1***	***10.3***
1.1	**IN-A4, IN-A3**	3.27	3.10	15.5	3.5	5.8	***11.4***	***18.1***
1.2	**1.0, 1.1**	4.72	4.57	14.1	3.6	6.1	***17.1***	***27.7***
1.3A	**1.2, IN-A5, IN-A6**	6.87	7.54	15.4	3.5	5.8	***23.9***	***44.1***
1.3	**1.3A**	6.87	7.54	15.4	3.5	5.8	***23.9***	***44.1***
1.4	**1.3, PR14**	14.65	18.32	17.0	3.3	5.6	***48.8***	***102.5***
1.5	**DP15 (IN-A8), 1.4**	16.05	20.75	17.1	3.3	5.6	***53.4***	***115.8***
1.6	**IN-A9, 1.5**	16.69	21.48	17.4	3.3	5.5	***55.1***	***119.0***
1.7	**DP16 (IN-A11), IN-A10**	4.95	4.98	17.5	3.3	5.5	***16.3***	***27.5***
1.8	**1.7, 1.6**	21.65	26.46	24.1	2.8	4.7	***60.8***	***124.8***

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

DP - Design Point
EX - Existing Design Point
PR - Pipe Run
FB- Flow By from Design Point
IN- Proposed Inlet
IN-A(#)- Existing Inlet

Calculated by: CVW
Date: 6/16/2022
Checked by: VAS

Overall Imperviousness of Copper Chase at Sterling Ranch				
Contributing Basins	***Area (Acres)***	***C_5***	***Impervious % (I)***	***(Acres)*(I)***
A	3.59	0.32	44	157.39
B	3.40	0.41	58	198.10
C	1.02	0.45	65	66.16
D	2.90	0.45	65	188.37
E	0.89	0.56	73	65.32
F	2.58	0.39	56	144.57
G (on site portion)	0.47	0.57	260	122.39
H	1.22	0.23	26	31.15
I	1.40	0.45	65	90.96
J	0.89	0.60	77	68.52
K	1.07	0.45	65	69.44
L	1.21	0.24	32	38.43
M	0.64	0.12	12	7.99
Totals	***21.3***			***1248.79***
Imperviousness of Site	***58.7***	**%**		

EXISTING HYDRAULIC CALCULATIONS
(BY J.R. ENGINEERING, APPROVED NOVEMBER 2021)

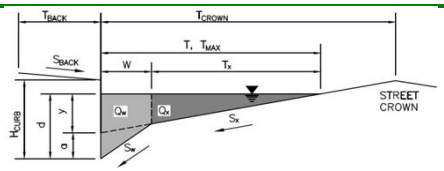
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

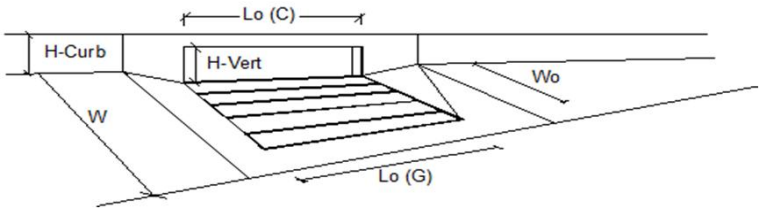
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.1**	**16.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.2**	**6.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**2.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**95**	**70**	**%**

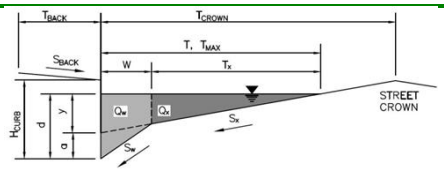
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A2



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

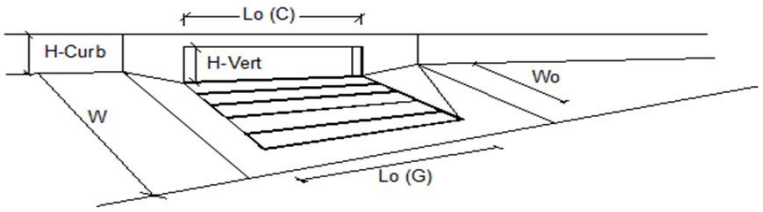
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**13.1**	**16.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.9**	**3.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**97**	**%**

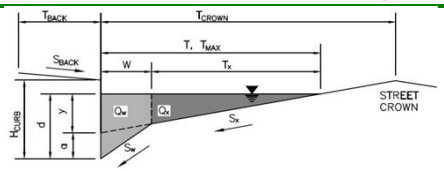
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

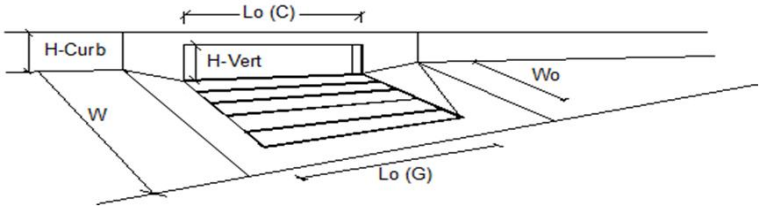
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.9**	**41.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**9.5**	**14.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.6**	**10.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**86**	**60**	**%**

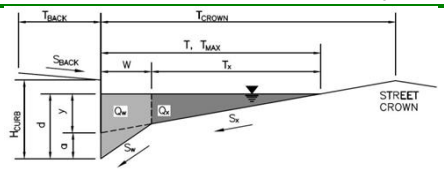
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A6



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.026	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

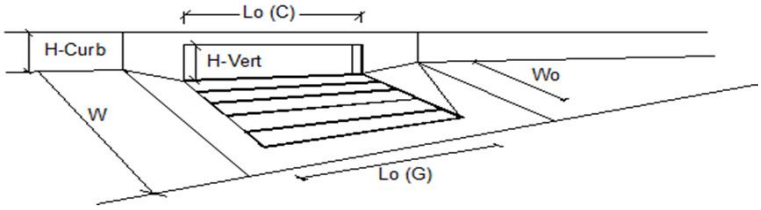
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.9**	**41.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.3**	**5.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**81**	**%**

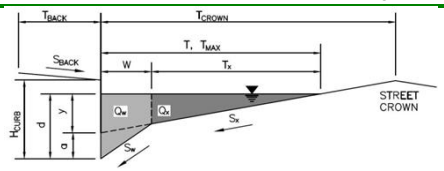
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A8



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.007	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

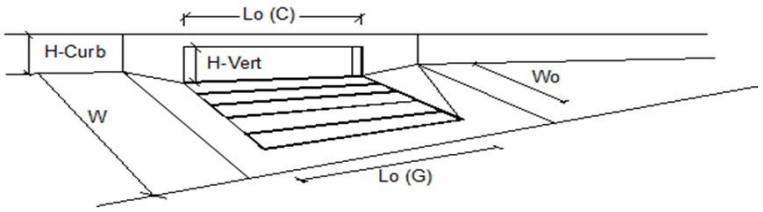
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.5**	**26.7**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.0**	**10.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**85**	**%**

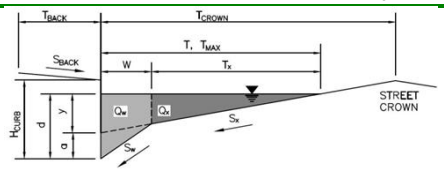
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A9



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.007	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

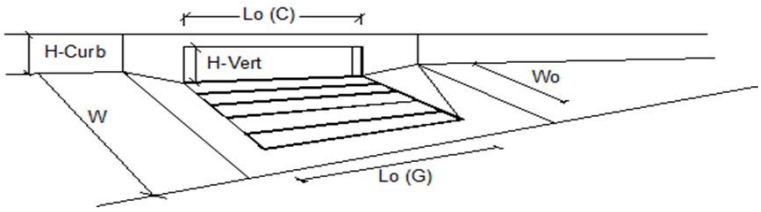
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.5**	**26.9**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.1**	**4.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**94**	**%**

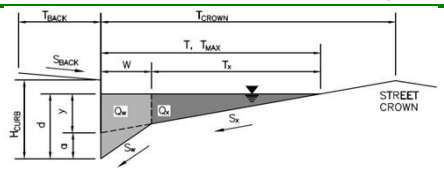
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A10



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	38.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	33.0	38.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

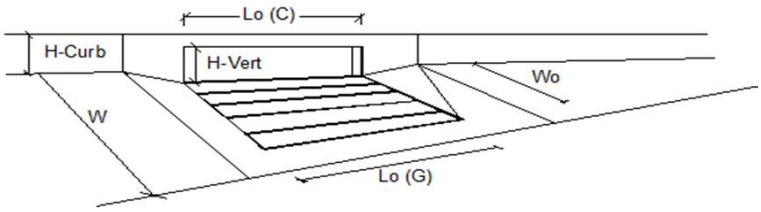
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.2**	**63.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.7**	**12.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**4.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**94**	**74**	**%**

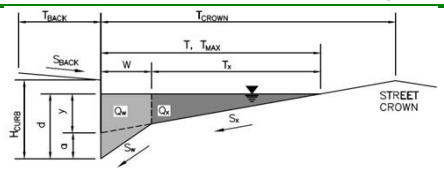
Version 4.05 Released March 2017

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

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

Project: Sterling Ranch Filing No. 2

Inlet ID: A15



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.023	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

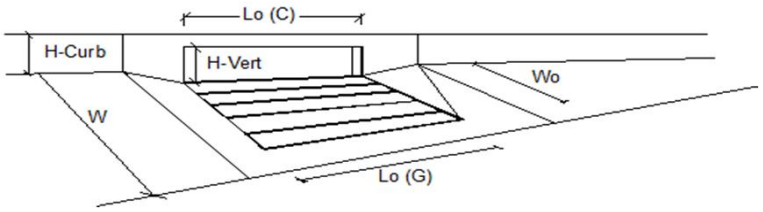
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**19.2**	**36.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



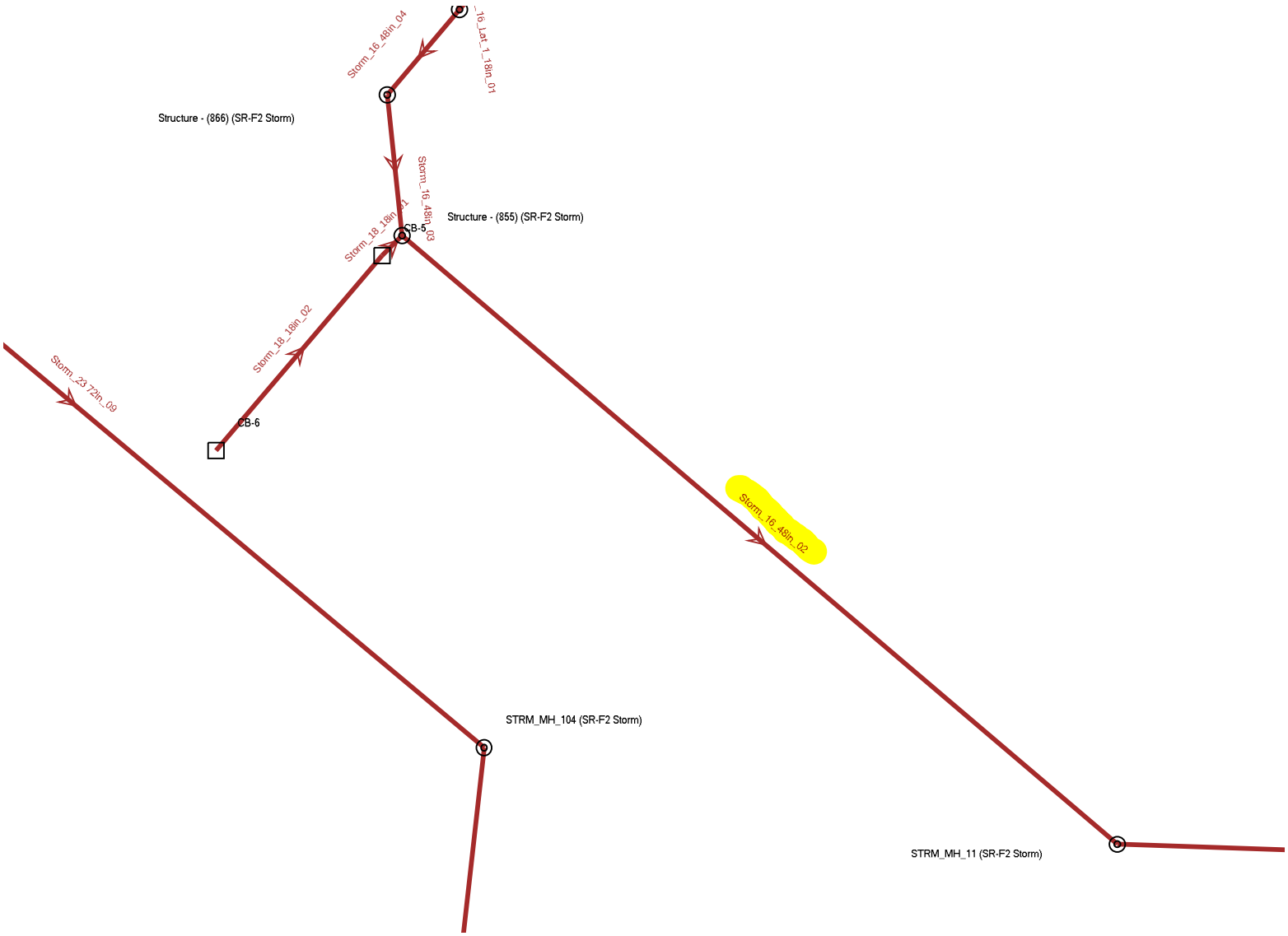
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.4**	**10.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**88**	**%**

Scenario: 100-YEAR
Current Time Step: 0.000 h
FlexTable: Conduit Table

Label	Flow (cfs)	Diameter (in)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Manning's n	Velocity (ft/s)	Capacity (Full Flow) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
Storm_17_48in_01	151.90	48.0	15.6	-0.020	0.013	17.70	202.74	6,990.38	6,989.68
Storm_14_66in_05	250.70	66.0	354.4	-0.014	0.013	17.68	397.24	6,985.83	6,982.04
Storm_20_48in_01	139.30	48.0	57.9	-0.020	0.013	17.42	203.30	6,964.17	6,962.31
Storm_17_48in_05	138.70	48.0	292.3	-0.020	0.013	17.39	203.11	7,001.66	6,996.18
Storm_23 54in_11	233.40	54.0	333.6	-0.014	0.013	16.67	232.65	6,996.60	6,991.45
Storm_23 54in_12	233.40	54.0	412.3	-0.014	0.013	16.67	232.63	7,004.71	6,998.44
Storm_17Lat2_36in_01	37.90	36.0	110.1	-0.040	0.013	16.24	133.20	7,006.00	7,003.91
Storm_14_48in_06	106.60	48.0	59.3	-0.017	0.013	15.42	187.87	6,990.60	6,988.91
Storm_17_48in_04	138.70	48.0	82.9	-0.014	0.013	15.23	172.06	6,995.63	6,994.99
Storm_17_48in_03	138.70	48.0	150.3	-0.014	0.013	15.21	171.79	6,994.44	6,992.83
CO-6	74.50	48.0	9.5	-0.021	0.013	15.20	208.41	6,991.39	6,991.40
Storm_17_48in_02	138.70	48.0	102.0	-0.014	0.013	15.09	170.08	6,992.28	6,991.01
Storm_19_Lat 2_18in_01	19.70	18.0	76.7	-0.049	0.013	14.72	23.16	7,006.74	7,003.66
Storm_23 54in_10	233.40	54.0	298.5	-0.014	0.013	14.68	232.69	6,986.54	6,982.33
Storm_23 54in_09	233.40	54.0	402.5	-0.015	0.013	14.68	240.88	6,981.49	6,975.82
Storm_23 54in_08	233.40	54.0	567.0	-0.015	0.013	14.68	240.76	6,974.99	6,967.00
Storm_23 54in_05	233.40	54.0	120.0	-0.015	0.013	14.68	240.88	6,962.34	6,960.65
Storm_23 54in_13	233.40	54.0	265.9	-0.005	0.013	14.68	138.03	7,015.89	7,011.98
Storm_23 54in_06	233.40	54.0	93.0	-0.015	0.013	14.68	240.46	6,965.32	6,964.01
Storm_18_18in_01	25.30	18.0	22.4	-0.059	0.013	14.32	25.59	6,984.40	6,983.10
Storm_23 54in_14	221.60	54.0	43.7	-0.005	0.013	13.93	136.36	7,019.46	7,018.90
Storm_19_24in_05	30.00	24.0	177.0	-0.030	0.013	13.74	39.18	7,002.90	6,997.04
Storm_19_24in_04	30.00	24.0	144.7	-0.030	0.013	13.74	39.18	6,997.59	6,994.14
Storm_14_36in_07	34.60	36.0	76.3	-0.020	0.013	12.31	94.31	6,991.91	6,991.40
Storm_14_72in_03	336.80	72.0	74.5	-0.005	0.013	11.91	306.40	6,977.10	6,976.63
Storm_14_72in_02	336.80	72.0	127.9	-0.005	0.013	11.91	299.58	6,976.08	6,975.27
Storm_19_18in_06	10.30	18.0	339.5	-0.040	0.013	11.81	20.95	7,016.29	7,003.66
Storm_17_48in_06	138.70	48.0	22.6	-0.020	0.013	11.04	202.28	7,002.97	7,002.76
Storm_14_84in_01	424.40	84.0	107.3	-0.005	0.013	11.03	453.09	6,974.79	6,974.32
Storm_14_66in_04	250.70	66.0	512.4	-0.012	0.013	10.55	366.67	6,981.61	6,978.75
Storm_23_66in_02	243.40	66.0	549.0	-0.002	0.013	10.24	138.58	6,957.00	6,954.11
Storm_23_66in_03	243.40	66.0	167.7	-0.002	0.013	10.24	139.63	6,958.28	6,957.40
Storm_19_Lat 1_ 18in_01	8.70	18.0	36.4	-0.030	0.013	10.18	18.18	6,994.36	6,994.14
Storm_16_48in_02	125.00	48.0	348.6	-0.024	0.013	9.95	220.31	6,982.33	6,979.69
Storm_23_84in_02	382.70	84.0	27.0	-0.003	0.013	9.94	347.91	6,951.54	6,951.16
Storm_23_84in_01	382.70	84.0	200.4	-0.003	0.013	9.94	325.38	6,953.31	6,952.64
Storm_19_30in_03	46.90	30.0	165.0	-0.024	0.013	9.55	64.17	6,993.43	6,991.28
Storm_15_42in_01-E	85.40	42.0	63.9	-0.004	0.013	8.88	65.41	6,975.73	6,975.27
Storm_16_48in_03	107.70	48.0	50.4	-0.020	0.013	8.57	203.42	6,983.38	6,983.10
Storm_16_48in_04	107.70	48.0	42.5	-0.020	0.013	8.57	203.12	6,984.19	6,983.95
Storm 23 three 42in_ 04	243.40	42.0	258.8	-0.008	0.013	8.43	264.00	6,960.38	6,958.69
Storm_21_48in_02	105.90	48.0	25.8	-0.030	0.013	8.43	248.66	6,986.94	6,986.80
Storm_19_Lat 2_18in_02	14.70	18.0	35.3	-0.015	0.013	8.32	12.86	7,008.40	7,007.71
Storm_21_48in_01	103.90	48.0	57.3	-0.030	0.013	8.27	248.76	6,986.27	6,985.97
Storm_16_48in_05	103.90	48.0	26.8	-0.020	0.013	8.27	203.11	6,984.90	6,984.76
Storm_15_18in_02-W	14.00	18.0	25.5	-0.049	0.013	7.92	23.36	6,975.72	6,975.27
Storm_18_18in_02	12.80	18.0	82.7	-0.050	0.013	7.24	23.47	6,987.22	6,985.99
Storm_19_Lat 3_18in_02	3.80	18.0	29.3	-0.020	0.013	7.05	14.90	7,016.96	7,016.97
Storm_17_36in_07	48.90	36.0	9.8	-0.020	0.013	6.92	94.31	7,003.97	7,003.91
STRM_ 29_01	11.80	18.0	66.2	-0.008	0.013	6.68	9.40	7,019.74	7,018.90
Storm_19_36in_02	46.90	36.0	144.5	-0.006	0.013	6.63	51.15	6,990.59	6,989.88
Storm_19_36in_01	46.90	36.0	302.2	-0.006	0.013	6.63	51.04	6,989.53	6,988.04
Storm_16_42in_01	125.00	42.0	158.3	-0.002	0.013	6.50	90.47	6,979.36	6,978.75
Storm_28 30in_01	12.20	30.0	90.0	-0.007	0.013	6.44	34.60	7,044.41	7,044.53
Storm_21_42in_03	60.60	42.0	101.2	-0.005	0.013	6.30	71.15	6,988.41	6,988.04
Storm_21_Lat_1_18in_01	10.60	18.0	19.4	-0.005	0.013	6.00	7.16	6,986.99	6,986.80
Storm_28 30in_01	26.10	30.0	35.4	-0.004	0.013	5.99	25.78	7,044.53	7,044.20
Storm_22_30in_01	29.10	30.0	113.0	-0.005	0.013	5.93	29.03	7,022.08	7,021.51
Storm_17_Lat_1_24in_01	17.20	24.0	8.8	-0.006	0.013	5.47	17.03	6,991.06	6,991.01
Storm_26 24in_01	14.50	24.0	80.7	-0.010	0.013	4.62	22.68	7,022.43	7,022.10
Storm_19_Lat 3_18in_01	6.60	18.0	6.0	-0.020	0.013	3.73	14.84	7,016.99	7,016.97
Storm_22_30in_02	13.70	30.0	79.4	-0.009	0.013	2.79	38.24	7,022.22	7,022.13
Storm_16_Lat_1_18in_01	4.50	18.0	13.2	-0.020	0.013	2.55	15.01	6,984.79	6,984.76
STRM_ 29_02	4.10	18.0	79.6	-0.027	0.013	2.32	17.27	7,020.00	7,019.88
Storm_17_Lat_1_24in_02	7.00	24.0	53.4	-0.007	0.013	2.23	18.29	6,991.23	6,991.18
Storm_25 30in_01	10.00	30.0	28.2	0.005	0.013	2.04	29.93	6,960.67	6,960.65

Sterling Ranch 5yr



PROPOSED HYDRAULIC CALCULATIONS

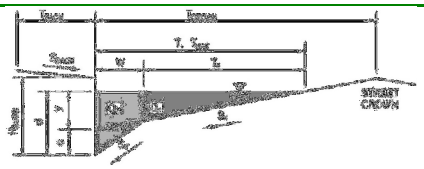
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-1**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

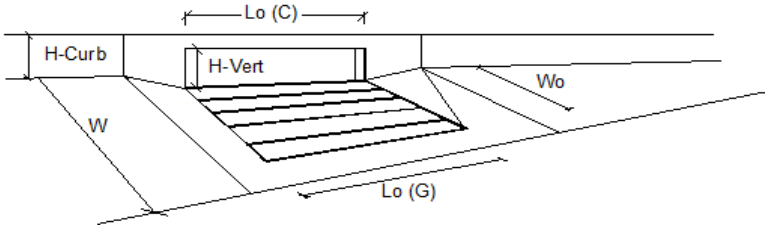
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**10.6**	**44.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.5**	**3.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.9**	**8.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**57**	**33**	**%**

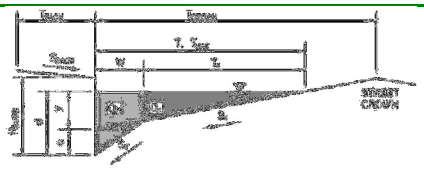
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-2**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.014	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

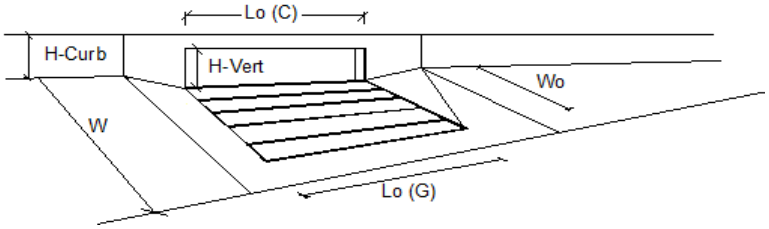
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**10.6**	**44.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.9**	**9.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**85**	**%**

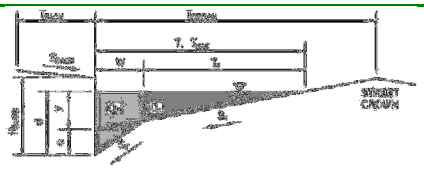
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-3**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

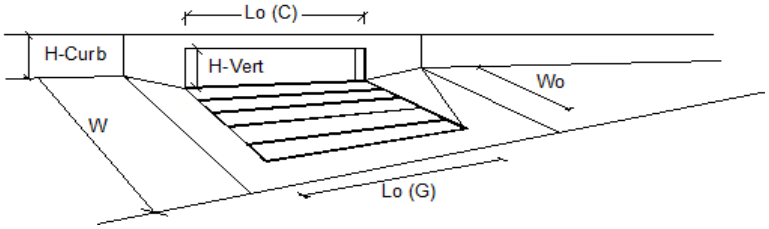
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**12.7**	**43.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.3**	**3.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.4**	**7.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**63**	**33**	**%**

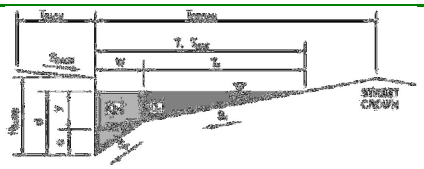
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

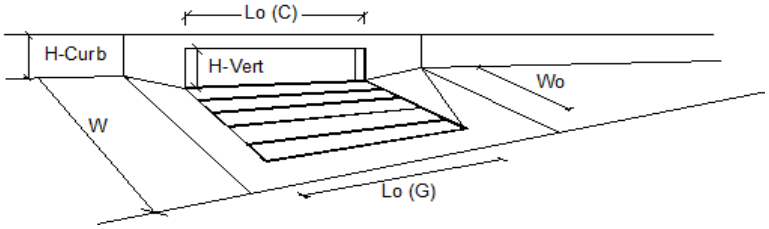
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**12.7**	**43.8**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.7**	**10.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**83**	**%**

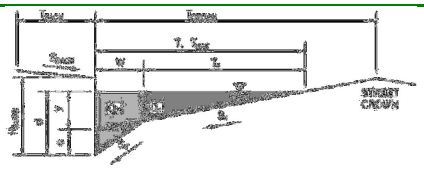
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-5**



Gutter Geometry:

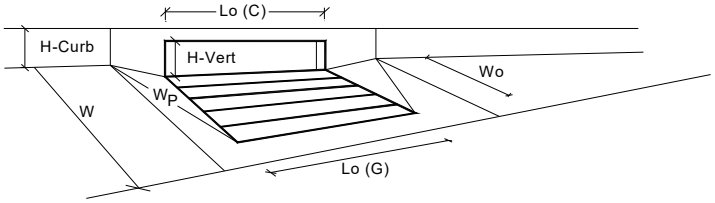
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	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	0.55	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.70	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.8**	**21.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.0	10.5	cfs

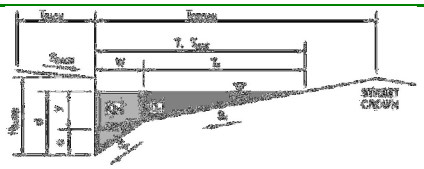
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-6**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**8.5**	**35.3**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

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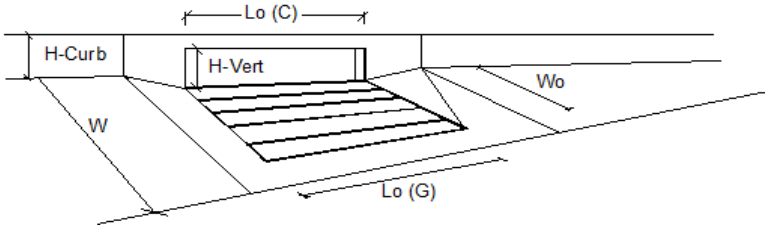
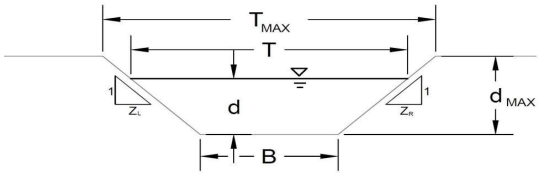


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.2**	**8.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

AREA INLET IN A SWALE

IN-8



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

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.035	
Channel Invert Slope	S_O =	0.0050	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	4.00	ft/ft
Right Side Sloe	Z2 =	4.00	ft/ft

Check one of the following soil types:

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

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

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**12.00**	**15.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.50**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**7.4**	**21.9**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.00**	**1.50**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**1.0**	**3.9**	**cfs**
Water Depth	d =	**0.47**	**0.79**	**ft**

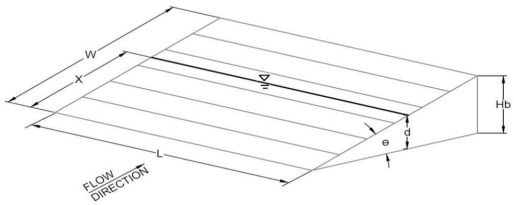
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

AREA INLET IN A SWALE

IN-8

Inlet Design Information (Input)

Type of Inlet: CDOT Type C — Inlet Type = CDOT Type C



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	3.00	ft
Open Area Ratio	A_{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	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	0.47	0.79	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.0**	**12.9**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

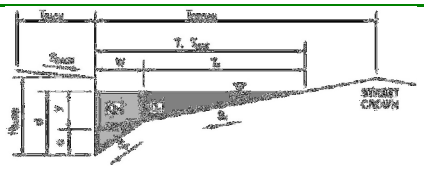
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-9**



Gutter Geometry:

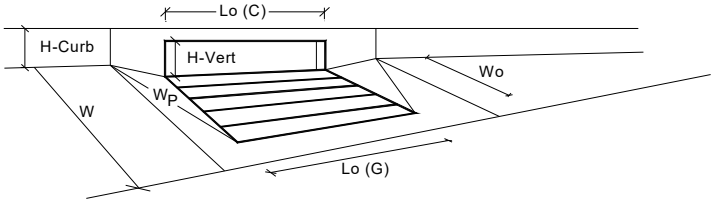
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	7.8	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	7.8	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	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	0.55	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	0.74	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.70	0.88	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.8**	**21.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.4	16.7	cfs

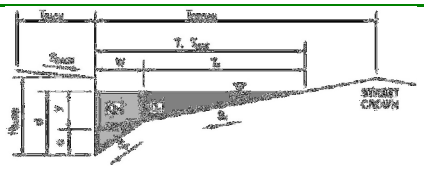
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-A4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.035	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

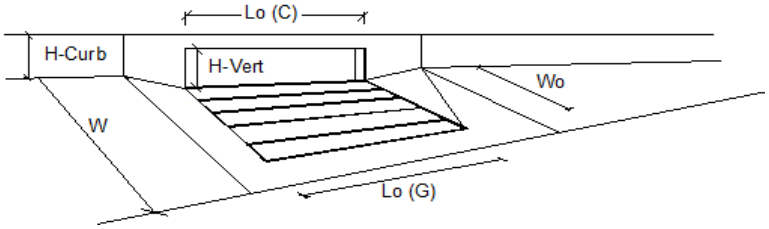
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**15.0**	**38.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



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

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.0**	**4.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**89**	**%**

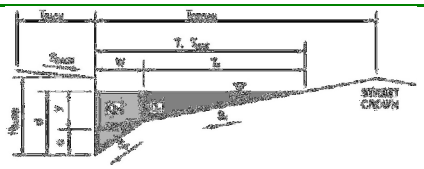
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-A5**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.029	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	15.8	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.6	7.8	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

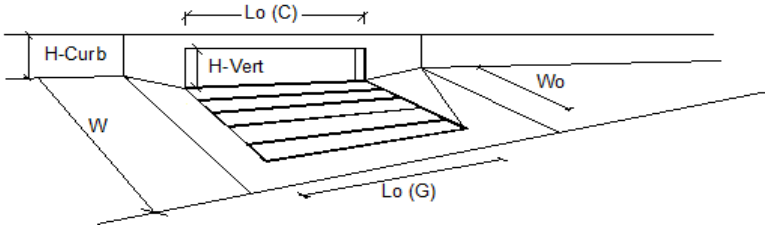
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**13.6**	**40.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.9**	**13.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**67**	**%**

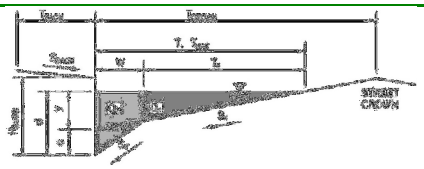
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-A8**



Gutter Geometry:			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	26.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.007	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	19.3	26.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

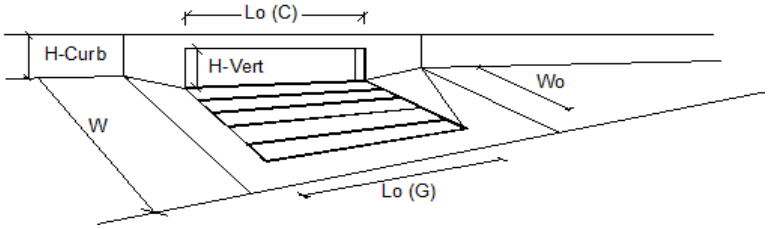
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**11.5**	**26.9**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.1**	**13.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**69**	**%**

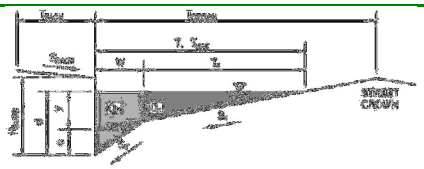
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project:

Inlet ID: **IN-A11**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.016	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	38.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	33.0	38.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.1	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

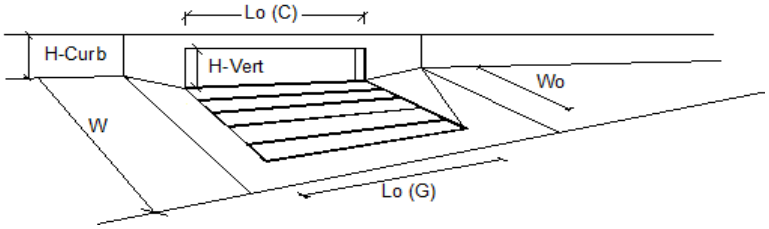
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**15.1**	**63.3**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

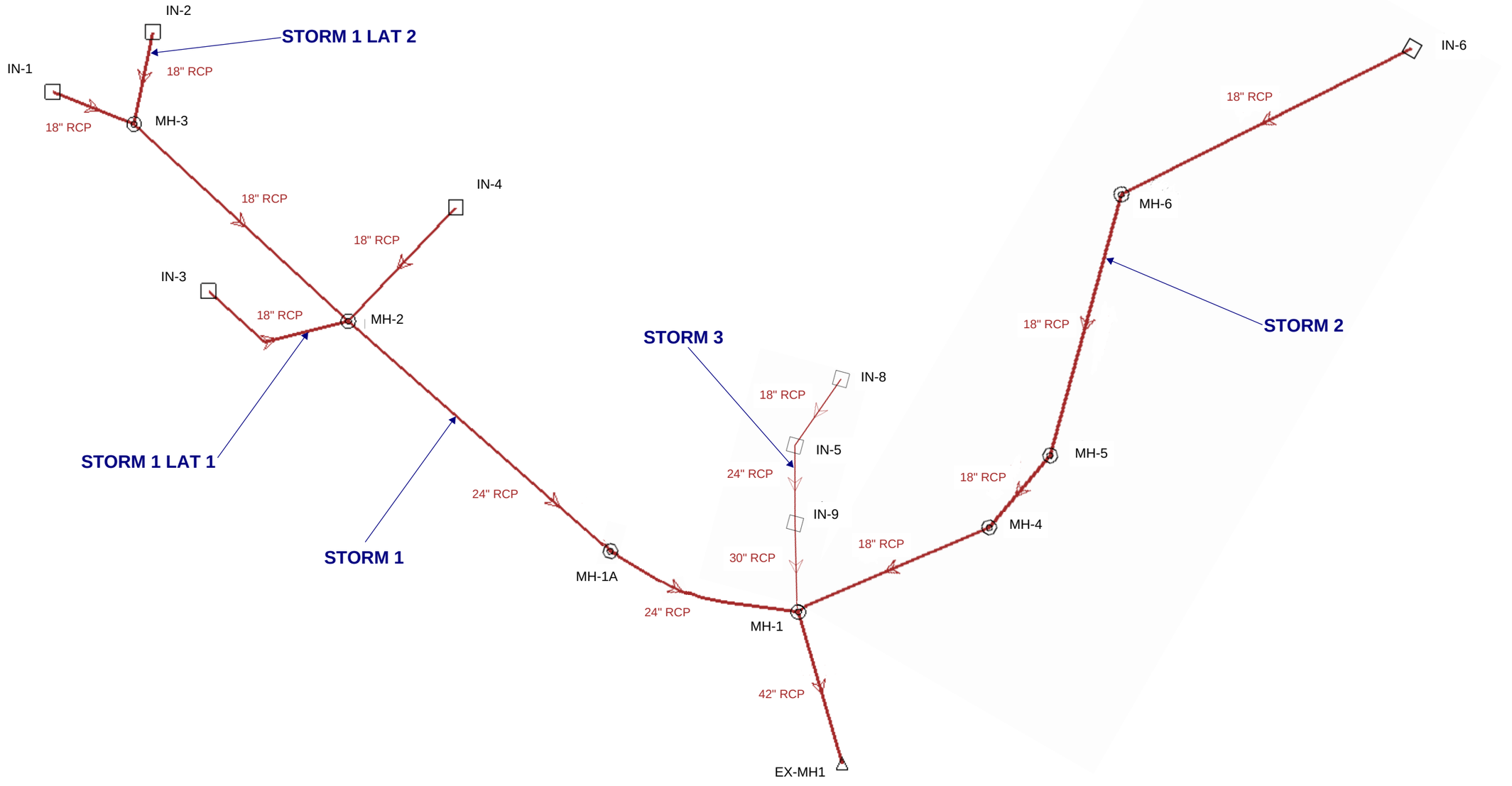
MHFD-Inlet, Version 5.01 (April 2021)

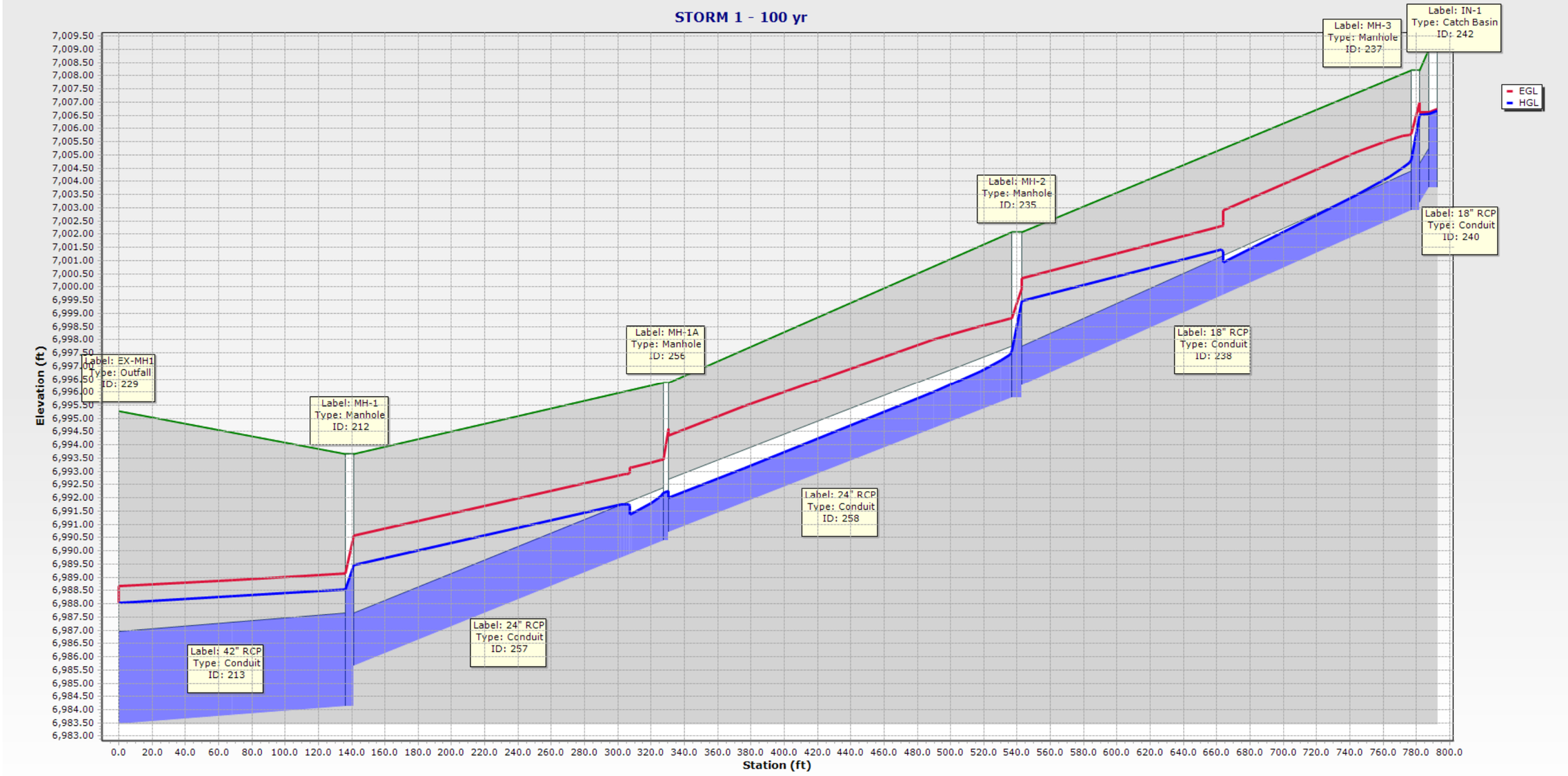


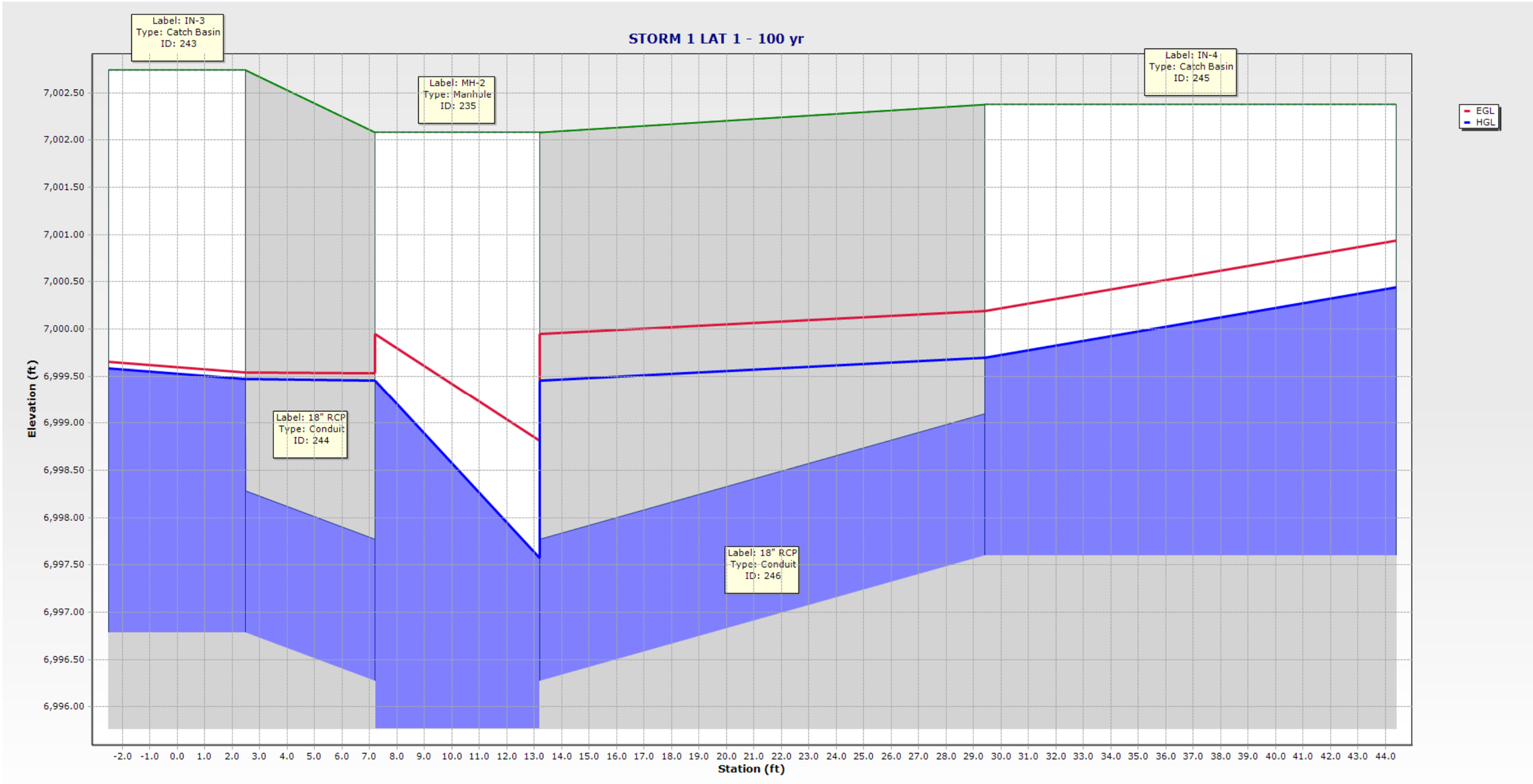
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

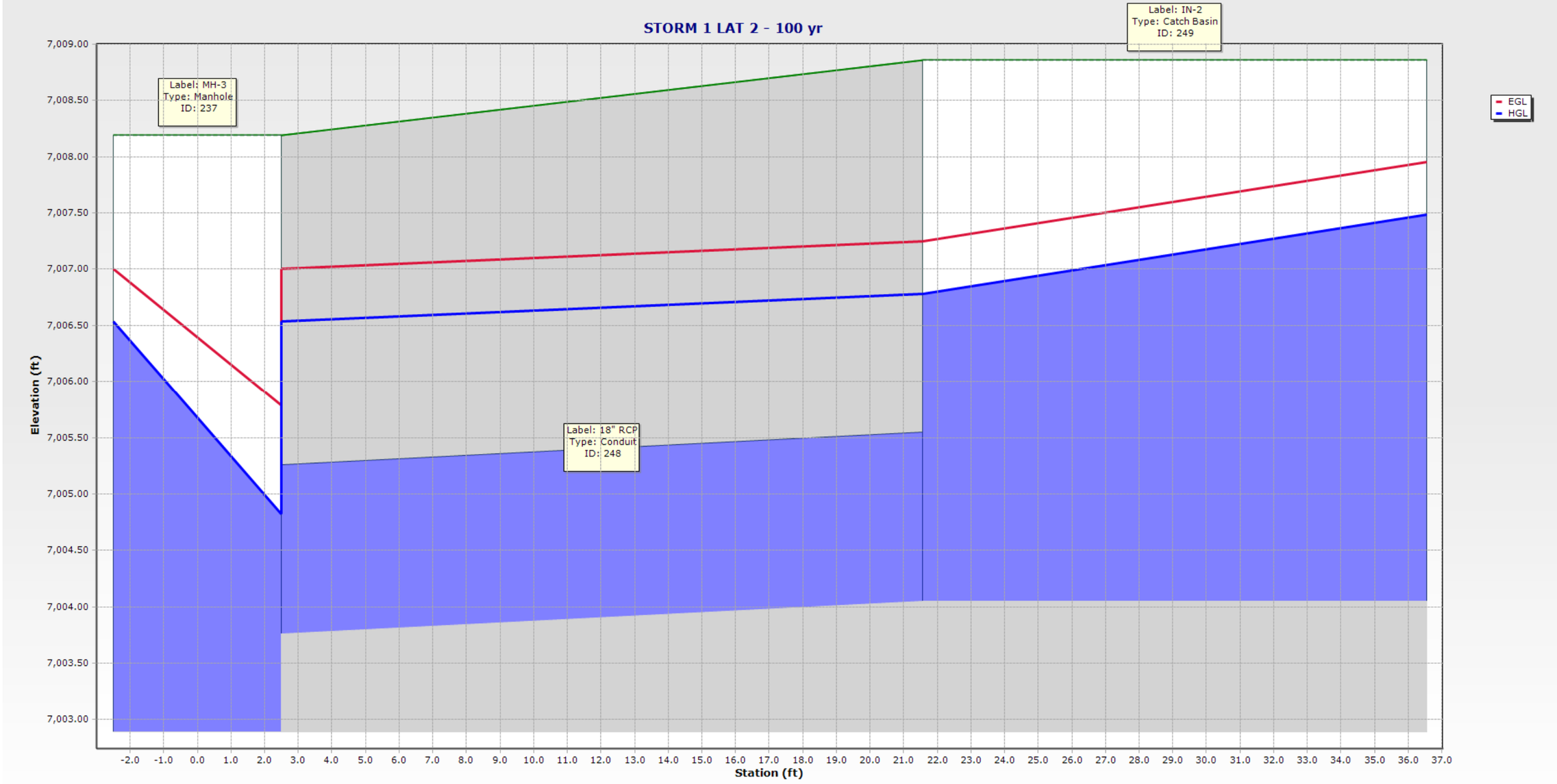
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**7.6**	**14.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**8.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**65**	**%**

STORM NETWORK LAYOUT




STORM 1 - 100 yr
Elevation (ft)
Station (ft)
EGL
HGL
Label: EX-MH1
Type: Outfall
ID: 229
Label: MH-1
Type: Manhole
ID: 212
Label: MH-1A
Type: Manhole
ID: 256
Label: MH-2
Type: Manhole
ID: 235
Label: MH-3
Type: Manhole
ID: 237
Label: IN-1
Type: Catch Basin
ID: 242
Label: 18" RCP
Type: Conduit
ID: 240
Label: 18" RCP
Type: Conduit
ID: 238
Label: 24" RCP
Type: Conduit
ID: 258
Label: 24" RCP
Type: Conduit
ID: 257
Label: 42" RCP
Type: Conduit
ID: 213


STORM 1 LAT 1 - 100 yr
Label: IN-3
Type: Catch Basin
ID: 243
Label: MH-2
Type: Manhole
ID: 235
Label: IN-4
Type: Catch Basin
ID: 245
Label: 18" RCP
Type: Conduit
ID: 244
Label: 18" RCP
Type: Conduit
ID: 246
EGL
HGL
Elevation (ft)
7,002.50
7,002.00
7,001.50
7,001.00
7,000.50
7,000.00
6,999.50
6,999.00
6,998.50
6,998.00
6,997.50
6,997.00
6,996.50
6,996.00
-2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0 38.0 39.0 40.0 41.0 42.0 43.0 44.0
Station (ft)

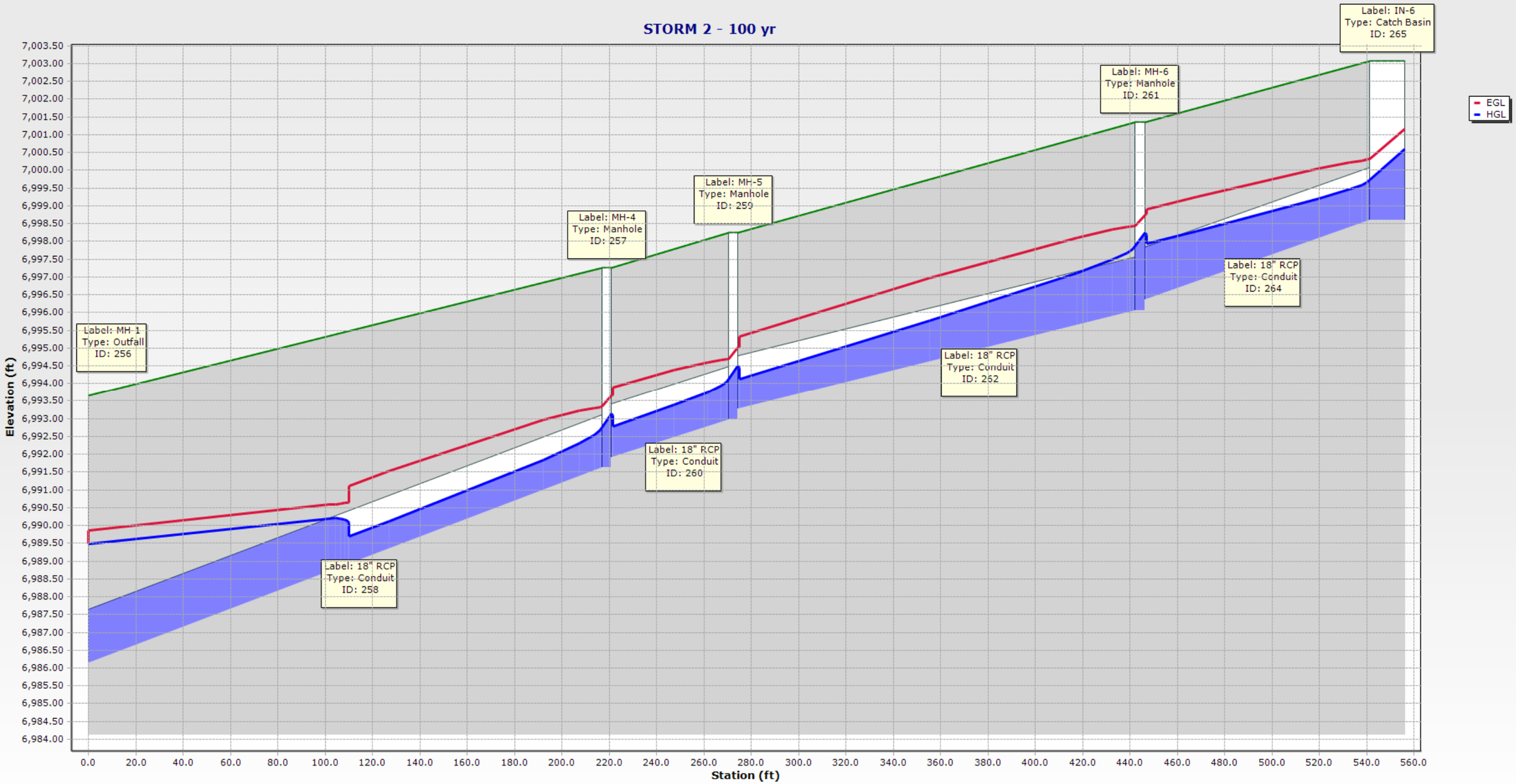

STORM 1 LAT 2 - 100 yr
Label: IN-2
Type: Catch Basin
ID: 249
Label: MH-3
Type: Manhole
ID: 237
Label: 18" RCP
Type: Conduit
ID: 248
EGL
HGL
Elevation (ft)
7,009.00
7,008.50
7,008.00
7,007.50
7,007.00
7,006.50
7,006.00
7,005.50
7,005.00
7,004.50
7,004.00
7,003.50
7,003.00
-2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0 27.0 28.0 29.0 30.0 31.0 32.0 33.0 34.0 35.0 36.0 37.0
Station (ft)

STORM 1: 100 YR FLEX TABLE

Conduit FlexTable: STRM - 100YR

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Froude Number	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)
18" RCP	238	MH-3	13.30	76.2	239.5	11.25	(N/A)	0.95	1.36	7,005.79	7,000.33	7,004.82	6,999.45
18" RCP	240	IN-1	3.80	15.8	10.7	2.15	(N/A)	0.47	0.75	7,006.63	7,006.61	7,006.56	7,006.53
18" RCP	244	IN-3	3.90	16.6	10.2	2.21	(N/A)	0.41	0.76	6,999.54	6,999.53	6,999.47	6,999.45
18" RCP	246	IN-4	10.00	42.7	26.7	5.66	(N/A)	0.68	1.22	7,000.19	6,999.95	6,999.70	6,999.45
18" RCP	248	IN-2	9.70	92.4	29.1	5.49	(N/A)	0.67	1.20	7,007.25	7,007.00	7,006.78	7,006.53
24" RCP	257	MH-1A	26.60	74.3	190.2	12.48	(N/A)	1.28	1.80	6,993.44	6,990.59	6,992.20	6,989.48
24" RCP	258	MH-2	26.60	75.9	211.0	12.26	(N/A)	1.30	1.80	6,998.81	6,994.35	6,997.57	6,992.01
42" RCP	213	MH-1	60.50	85.9	138.6	6.29	(N/A)	(N/A)	2.44	6,989.16	6,988.65	6,988.54	6,988.04

Headloss (ft)	Upstream Structure Hydraulic Grade Line (In) (ft)	Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
5.37	7,006.53	5.49	1.770	1.71	7,002.08	7,008.19	6,996.27	7,002.89	Circle - 18.0 in
0.02	7,006.67	2.15	1.500	0.11	7,008.19	7,009.00	7,003.19	7,003.75	Circle - 18.0 in
0.01	6,999.58	2.21	1.500	0.11	7,002.08	7,002.74	6,996.27	6,996.78	Circle - 18.0 in
0.24	7,000.44	5.66	1.500	0.75	7,002.08	7,002.38	6,996.27	6,997.60	Circle - 18.0 in
0.25	7,007.49	5.49	1.500	0.70	7,008.19	7,008.86	7,003.76	7,004.05	Circle - 18.0 in
2.72	6,992.26	12.26	0.050	0.06	6,993.66	6,996.37	6,985.64	6,990.40	Circle - 24.0 in
5.56	6,999.45	5.66	1.520	1.88	6,996.37	7,002.08	6,990.71	6,995.77	Circle - 24.0 in
0.50	6,989.48	8.47	1.520	0.93	6,995.29	6,993.66	6,983.46	6,984.14	Circle - 42.0 in


STORM 2 - 100 yr
Label: IN-6
Type: Catch Basin
ID: 265
Label: MH-6
Type: Manhole
ID: 261
Label: MH-5
Type: Manhole
ID: 259
Label: MH-4
Type: Manhole
ID: 257
Label: MH-1
Type: Outfall
ID: 256
Label: 18" RCP
Type: Conduit
ID: 264
Label: 18" RCP
Type: Conduit
ID: 252
Label: 18" RCP
Type: Conduit
ID: 260
Label: 18" RCP
Type: Conduit
ID: 258
EGL
HGL
Elevation (ft)
7,003.50
7,003.00
7,002.50
7,002.00
7,001.50
7,001.00
7,000.50
7,000.00
6,999.50
6,999.00
6,998.50
6,998.00
6,997.50
6,997.00
6,996.50
6,996.00
6,995.50
6,995.00
6,994.50
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6,993.50
6,993.00
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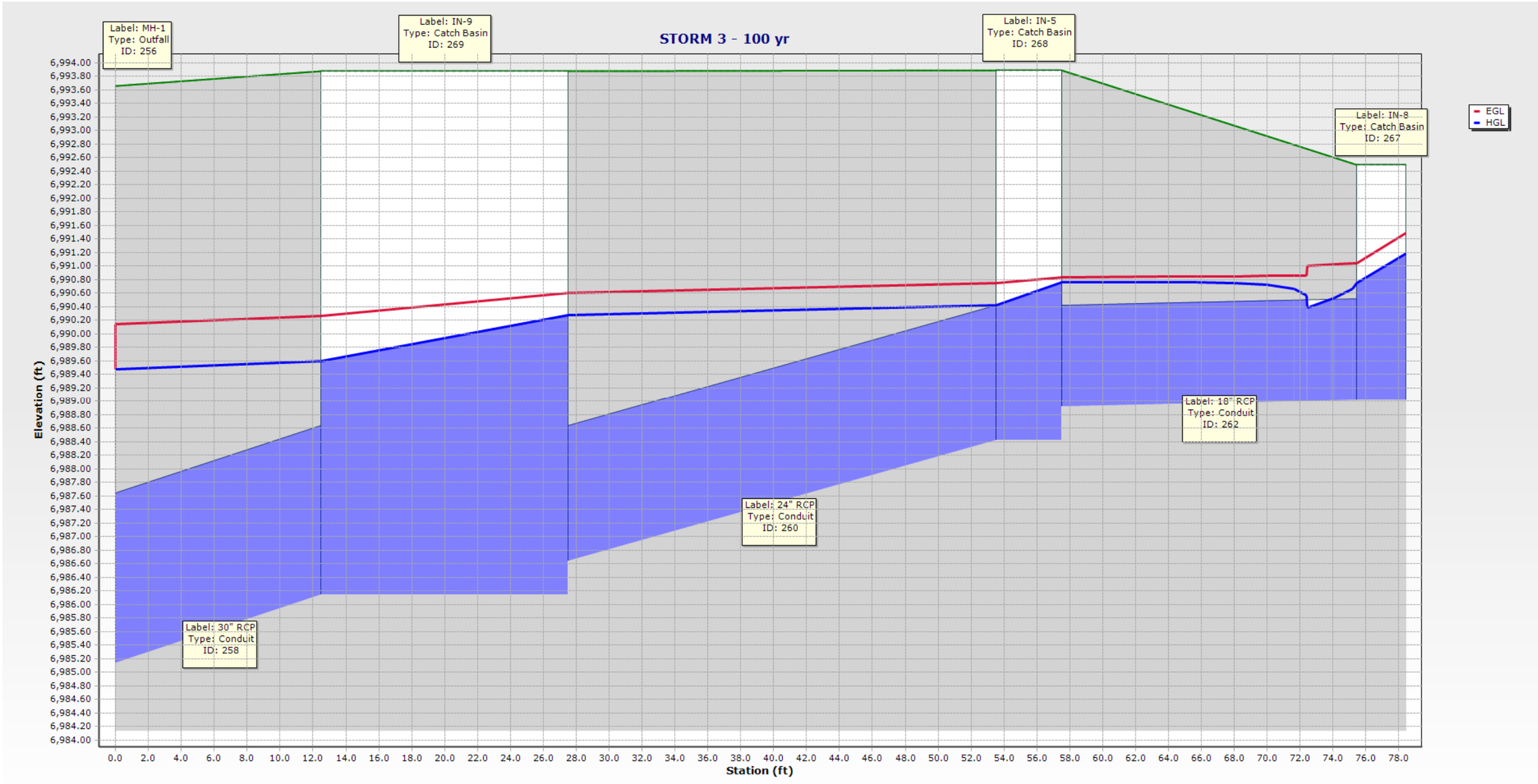
6,992.00
6,991.50
6,991.00
6,990.50
6,990.00
6,989.50
6,989.00
6,988.50
6,988.00
6,987.50
6,987.00
6,986.50
6,986.00
6,985.50
6,985.00
6,984.50
6,984.00
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
200.0
220.0
240.0
260.0
280.0
300.0
320.0
340.0
360.0
380.0
400.0
420.0
440.0
460.0
480.0
500.0
520.0
540.0
560.0
Station (ft)

STORM 2: 100 YR FLEX TABLE

Conduit FlexTable: STRM 2-100YR

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Froude Number	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)
18" RCP	258	MH-4	8.80	53.0	219.0	9.54	(N/A)	0.78	1.15	6,993.34	6,989.87	6,992.77	6,989.48	3.29
18" RCP	260	MH-5	8.80	59.5	53.4	8.74	(N/A)	0.83	1.15	6,994.70	6,993.65	6,994.13	6,993.13	0.99
18" RCP	262	MH-6	8.80	66.0	171.8	8.76	(N/A)	0.83	1.15	6,998.44	6,995.01	6,997.87	6,994.49	3.38
18" RCP	264	IN-6	8.80	57.2	104.4	7.85	(N/A)	0.91	1.15	7,000.31	6,998.75	6,999.74	6,998.23	1.50

Upstream Structure Hydraulic Grade Line (In) (ft)	Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
6,993.13	5.74	0.640	0.37	6,993.66	6,997.26	6,986.14	6,991.62	Circle - 18.0 in
6,994.49	5.74	0.640	0.37	6,997.26	6,998.24	6,991.92	6,992.98	Circle - 18.0 in
6,998.23	5.74	0.640	0.37	6,998.24	7,001.35	6,993.28	6,996.05	Circle - 18.0 in
7,000.59	6.06	1.500	0.86	7,001.35	7,003.07	6,996.35	6,998.59	Circle - 18.0 in


STORM 3 - 100 yr
Label: MH-1
Type: Outfall
ID: 256
Label: IN-9
Type: Catch Basin
ID: 269
Label: IN-5
Type: Catch Basin
ID: 268
Label: IN-8
Type: Catch Basin
ID: 267
EGL
HGL
Label: 18" RCP
Type: Conduit
ID: 262
Label: 24" RCP
Type: Conduit
ID: 260
Label: 30" RCP
Type: Conduit
ID: 258
Elevation (ft)
6,994.00
6,993.80
6,993.60
6,993.40
6,993.20
6,993.00
6,992.80
6,992.60
6,992.40
6,992.20
6,992.00
6,991.80
6,991.60
6,991.40
6,991.20
6,991.00
6,990.80
6,990.60
6,990.40
6,990.20
6,990.00
6,989.80
6,989.60
6,989.40
6,989.20
6,989.00
6,988.80
6,988.60
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6,988.20
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6,987.00
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6,986.60
6,986.40
6,986.20
6,986.00
6,985.80
6,985.60
6,985.40
6,985.20
6,985.00
6,984.80
6,984.60
6,984.40
6,984.20
6,984.00
0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0 66.0 68.0 70.0 72.0 74.0 76.0 78.0
Station (ft)

STORM 3: 100 YR FLEX TABLE

Conduit FlexTable: STRM 3-100YR

Label	ID	Upstream Structure	Flow (cfs)	Flow / Capacity (Design) (%)	Length (Unified) (ft)	Velocity (ft/s)	Froude Number	Depth (Normal) (ft)	Depth (Critical) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Headloss (ft)
30" RCP	258	IN-9	32.10	35.0	20.0	6.54	(N/A)	1.02	1.93	6,990.27	6,990.14	6,989.60	6,989.48	0.12
24" RCP	260	IN-5	14.40	28.4	35.5	4.58	(N/A)	0.73	1.37	6,990.75	6,990.61	6,990.42	6,990.28	0.14
18" RCP	262	IN-8	3.90	54.4	21.4	9.84	(N/A)	0.41	0.76	6,991.04	6,990.83	6,990.75	6,990.76	-0.01

Upstream Structure Hydraulic Grade Line (In) (ft)	Upstream Structure Velocity (In-Governing) (ft/s)	Upstream Structure Headloss Coefficient	Upstream Structure Headloss (ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Invert (Start) (ft)	Invert (Stop) (ft)	Conduit Description
6,990.28	4.58	1.020	0.68	6,993.66	6,993.88	6,985.14	6,986.14	Circle - 30.0 in
6,990.76	2.21	1.020	0.33	6,993.88	6,993.89	6,986.64	6,988.42	Circle - 24.0 in
6,991.19	4.37	1.500	0.45	6,993.89	6,992.50	6,988.92	6,989.02	Circle - 18.0 in

BACKGROUND

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 1/5/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A1	2.06	0.51	9.7	1.05	4.17	4.4					0.2	0.04	3.3	4.2	1.01	2.0	18	652 5	3.6 7.2	3.0 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.0
	2	A2	0.82	0.53	9.1	0.44	4.27	1.9								1.9	0.44	2.0	18	27	5.8	0.1	On-grade inlet Piped to DP 1.0
	1.0								9.7	1.45	4.17	6.0				6.0	1.45	3.0	18	335	9.1	0.6	Sum of DP 1 & DP 2, piped to DP 1.2
	3	A3	6.76	0.47	15.0	3.16	3.53	11.1					1.6	0.47	2.9	9.5	2.69	4.7	18	426 36	3.4 12.2	2.1 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	4	A4	1.51	0.60	10.2	0.91	4.10	3.7					0.1	0.03	2.9	3.6	0.88	4.7	18	395 0	3.4 9.2	1.9 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	1.1								15.0	3.57	3.52	12.6				12.6	3.57	1.0	24	74	7.4	0.2	Sum of DP 3 & DP 4, piped to DP 1.2
	1.2								15.2	5.02	3.50	17.6				17.6	5.02	3.3	24	319	12.5	0.4	Sum of DP 1.0 & DP 1.1, piped to DP 1.3
	6A	A6A	0.53	0.81	5.0	0.43	5.17	2.2															Overland Flow to DP1.3A
	6	A6	1.37	0.58	10.0	0.79	4.14	3.3								3.3	0.79	2.0	18	0	6.7	0.0	On-grade inlet Sum of Sub-basin A6 & Carryover flow from DP 2, Piped to DP 1.3A
	1.3A								10.0	1.22	4.14	5.0				5.0	1.22	1.0	24	36	5.7	0.1	Sum of DP 6 & DP 6A, piped to DP 1.3
	5	A5	1.70	0.59	9.9	0.99	4.14	4.1	17.0	1.53	3.33	5.1				5.1	1.53	2.0	18	0	7.6	0.0	On-grade inlet Sum of Sub-basin A5 & Carryover flows from DP 1, P 3 & DP 4. Piped to DP 1.3
	1.3								17.0	7.77	3.33	25.9				25.9	7.77	1.1	36	620	9.2	1.1	Sum of DP 1.2, 1.3A & DP 5, piped to DP 1.4
	7	A7	19.00	0.45	18.3	8.55	3.22	27.5								27.5	8.55	1.5	42	20	10.3	0.0	Future storm infrastructure from Copper Chase Subdivision Piped to DP 1.4
	1.4								18.4	16.32	3.22	52.5				52.5	16.32	0.5	48	26	8.2	0.1	Sum of DP 1.3 & DP 7, piped to DP 1.5
	8	A8	1.48	0.56	13.9	0.83	3.63	3.0								3.0	0.83	2.0	18	20	6.6	0.1	On-grade inlet, carryover flow to DP 11 Piped to DP 1.5
	1.5								18.4	17.15	3.21	55.1				55.1	17.15	0.5	48	91	8.3	0.2	Sum of DP 1.4 & DP 8, piped to DP 1.6
	9	A9	0.61	0.73	8.7	0.44	4.34	1.9	8.7	0.48	4.34	2.1				2.1	0.48	2.0	18	13	5.8	0.0	On-grade inlet Sum of Sub-basin A9 & carryover flows from DP 16, piped to DP 1.6
	1.6								18.6	17.63	3.20	56.4				56.4	17.63	0.5	48	95	8.3	0.2	Sum of DP 1.5 & DP 9, piped to DP 1.8
	10	A10	2.61	0.79	7.9	2.05	4.49	9.2					0.5	0.11	1.5	8.7	1.94	2.5	18	955 118	2.4 9.5	6.5 0.2	On-grade inlet, carryover flow to DP 20 Piped to DP 1.7
	11	A11	2.89	0.76	8.7	2.20	4.34	9.5					0.6	0.15	1.5	8.9	2.05	2.5	18	1049 0	2.4 9.4	7.1 0.0	On-grade inlet, carryover flow to DP 21 Piped to DP 1.7
	1.7								8.7	3.99	4.34	17.3				17.3	3.99	1.0	24	8	7.9	0.0	Sum of DP 10 & DP 11, piped to DP 1.8
	1.8								18.8	21.63	3.18	68.8				68.8	21.63	2.0	54	517	14.4	0.6	Sum of DP 1.6 & DP 1.7, piped to DP 2.7
	OS2	OS2	17.00	0.49	14.0	6.25	2.20	13.8								13.8	6.25	1.0	30	787	7.5	1.7	Future flow released from Barbarick Subdivision Piped to DP 2.0
	12	A12	3.87	0.13	11.9	0.49	3.86	1.9								1.9	0.49	2.0	18	17	5.6	0.1	Type C inlet Piped to DP 2.0
	2.0								15.7	6.74	3.45	23.2				23.2	6.74	1.0	48	52	8.4	0.1	Sum of DP OS2 & DP 12, Piped to DP 2.1
	13	A13	9.65	0.45	14.0	4.34	3.62	15.7								15.7	4.34	1.5	30	200	9.1	0.4	Future storm infrastructure from Sterling Ranch Phase 2 Piped to DP 2.1

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C* A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C* A (ac)	Slope (%)	Q_{pipe} (cfs)	C* A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.1								15.9	11.08	3.44	38.1				38.1	11.08	1.6	48	65	11.4	0.1	Sum of DP 2.0 & DP 13, piped to DP 2.5
	OS3	OS3	28.70	0.49	19.0	14.06	1.25	17.6								17.6	14.06	1.0	30	719	8.0	1.5	Future flow released from Barbarick Subdivision Piped to DP 2.2
	14	A14	11.76	0.39	15.3	4.59	3.49	16.0								16.0	4.59	1.0	30	20	7.8	0.0	Future flow released from School Site Piped to DP 2.2
	2.2								20.5	18.65	3.05	56.9				56.9	18.65	1.5	48	773	12.4	1.0	Sum of DP OS3 & DP 14, piped to DP 2.3
	15	A15	2.91	0.52	14.9	1.52	3.53	5.4								5.4	1.52	1.3	18	35	6.5	0.1	On-grade inlet Piped to DP 2.3
	16	A16	2.34	0.54	14.7	1.25	3.55	4.4					0.1	0.04	0.8	4.3	1.21	2.0	18	697 12	1.8 7.2	6.5 0.0	On-grade inlet, carryover flow to DP 9 Piped to DP 2.3
	2.3								15.0	2.73	3.52	9.6				9.6	2.73	1.6	48	51	7.6	0.1	Sum of DP 15 & DP 16, piped to DP 2.4
	2.4								21.5	21.38	2.98	63.7				63.7	21.38	1.6	48	19	13.1	0.0	Sum of DP 2.2 & DP 2.3, piped to DP 2.5
	2.5								21.6	32.46	2.98	96.6				96.6	32.46	2.0	60	839	15.8	0.9	Sum of DP 2.1 & DP 2.4 piped to DP 2.6
	17	A17	1.76	0.21	13.7	0.38	3.66	1.4								1.4	0.38	1.0	18	24	4.1	0.1	Type C inlet Piped to DP 2.6
	2.6								21.6	32.84	2.98	97.8				97.8	32.84	2.0	60	32	15.8	0.0	Sum of DP 2.5 & DP 17, piped to DP 2.7
	2.7								21.6	54.47	2.97	162.0				162.0	54.47	0.6	78	220	11.5	0.3	Sum of DP1.8 & DP 2.6, piped to DP 2.8
	18	A18	5.27	0.24	16.4	1.28	3.38	4.3								4.3	1.28	1.0	18	24	5.6	0.1	Area inlet Piped to DP 2.6
	19	A19	31.85	0.45	25.8	14.33	2.71	38.8								38.8	14.33	1.0	18	24	22.0	0.0	Area inlet Piped to DP 2.6
	2.8								25.8	70.08	2.71	189.8				189.8	70.08	0.6	78	145	12.1	0.2	Sum of DP 2.7, DP 18 & DP 19, piped to DP 3.0.
	3.0								25.8	70.08	2.71	189.8	189.8	70.08	0.5					584	1.4	6.9	Detention Pond Trickle channel conveyance to DP 3.2
	20	A20	1.83	0.81	8.0	1.48	4.47	6.6	8.0	1.59	4.47	7.1				7.1	1.59	1.0	24	105	6.4	0.3	On-grade inlet Sum of Sub-basin A20 & carryover flow from DP 10, piped to DP 3.0
	21	A21	1.93	0.82	8.7	1.57	4.33	6.8	8.7	1.72	4.33	7.4	0.1	0.03	1.5	7.3	1.68	2.5	18	0	9.0	0.0	On-grade inlet Sum of Sub-basin A21 & carryover flow from DP 11, piped to DP 2.9
	2.9								8.7	3.27	4.33	14.2				14.2	3.27	2.0	24	58	9.8	0.1	Sum of DP 20 & DP 21,piped to DP 3.1
	3.1								8.7	3.27	4.33	14.2	14.2	3.27	0.5					568	1.4	6.7	Detention Pond Trickle channel conveyance to DP 3.2
	22	A22	8.68	0.11	23.3	0.95	2.86	2.7															Detention Pond Overland flow to DP 3.2
	OS4	OS4	5.08	0.20	29.5	1.02	2.51	2.6					2.6	1.02	13.0					113	5.4	0.3	Existing topography Overland flow to DP 4.1
	3.2								29.8	75.32	2.49	187.5											Outlet Structure Sum of DP 3.0, DP 3.1, DP 22 & DP OS4, outlet structure release to DP 4.8
	Pond W5								29.8	1.45	2.49	3.6				3.6	1.45	2.0	48	58	6.2	0.2	Outlet structure release to DP 4.8
	23	B1	2.98	0.90	17.6	2.68	3.29	8.8					0.4	0.12	2.0	8.4	2.56	0.5	30	1399 88	2.0 5.1	12.0 0.3	On-grade inlet Piped to DP 4.0

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 1/5/21

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A1	2.06	0.65	9.7	1.34	7.01	9.4					2.8	0.40	3.3	6.6	0.94	2.0	18	652 5	3.6 8.2	3.0 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.0
	2	A2	0.82	0.66	9.1	0.54	7.17	3.9					0.1	0.01	3.3	3.8	0.53	2.0	18	639 27	3.6 7.0	2.9 0.1	On-grade inlet, carryover flow to DP 6 Piped to DP 1.0
	1.0								9.7	1.47	7.00	10.3				10.3	1.47	3.0	18	335	10.6	0.5	Sum of DP 1 & DP 2, piped to DP 1.2
	3	A3	6.76	0.62	15.0	4.17	5.92	24.7					10.0	1.69	2.9	14.7	2.48	4.7	18	426 36	3.4 13.6	2.1 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	4	A4	1.51	0.71	10.2	1.08	6.88	7.4					1.6	0.24	2.9	5.8	0.84	4.7	18	395 0	3.4 10.7	1.9 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	1.1								15.0	3.33	5.91	19.7				19.7	3.33	1.0	24	74	8.1	0.2	Sum of DP 3 & DP 4, piped to DP 1.2
	1.2								15.1	4.80	5.89	28.2				28.2	4.80	3.3	24	319	13.9	0.4	Sum of DP 1.0 & DP 1.1, piped to DP 1.3
	6A	A6A	0.53	0.88	5.0	0.47	8.68	4.1															Overland Flow to DP1.3A
	6	A6	1.37	0.70	10.0	0.95	6.94	6.6	10.0	0.96	6.94	6.7	1.3	0.18	0.7	5.4	0.78	2.0	18	696 0	1.7 7.7	7.0 0.0	On-grade inlet, carryover flow to DP 8 Sum of Sub-basin A6 & Carryover flow from DP 2, Piped to DP 1.3A
	1.3A								10.0	1.25	6.94	8.7				8.7	1.25	1.0	24	36	6.7	0.1	Sum of DP 6 & DP 6A, piped to DP 1.3
	5	A5	1.70	0.70	9.9	1.19	6.95	8.3	17.0	3.51	5.59	19.6	6.5	1.17	0.7	13.1	2.34	2.0	18	664 0	1.7 9.4	6.6 0.0	On-grade inlet, carryover flow to DP 8 Sum of Sub-basin A5 & Carryover flows from DP 1, P 3 & DP 4. Piped to DP 1.3
	1.3								17.0	8.39	5.59	46.9				46.9	8.39	1.1	36	620	10.7	1.0	Sum of DP 1.2, 1.3A & DP 5, piped to DP 1.4
	7	A7	19.00	0.59	18.3	11.21	5.41	60.6								60.6	11.21	1.5	42	20	12.7	0.0	Future storm infrastructure from Copper Chase Subdivision Piped to DP 1.4
	1.4								18.4	19.60	5.40	105.9				105.9	19.60	0.5	48	26	9.2	0.0	Sum of DP 1.3 & DP 7, piped to DP 1.5
	8	A8	1.48	0.70	13.9	1.04	6.10	6.3	23.7	2.63	4.76	12.5	1.9	0.41	0.7	10.6	2.23	2.0	18	195 20	1.7 9.1	1.9 0.0	On-grade inlet, carryover flow to DP 11 Sum of Sub-basin A8 & Carryover flows from DP5, DP 6 & DP 15, Piped to DP 1.5
	1.5								23.7	21.83	4.76	103.9				103.9	21.83	0.5	48	91	9.2	0.2	Sum of DP 1.4 & DP 8, piped to DP 1.6
	9	A9	0.61	0.83	8.7	0.51	7.29	3.7	21.2	0.95	5.04	4.8	0.3	0.05	0.7	4.5	0.89	2.0	18	140 13	1.7 7.3	1.4 0.0	On-grade inlet, carryover flow to DP 11 Sum of Sub-basin A9 & carryover flows from DP 16, piped to DP 1.6
	1.6								23.9	22.72	4.74	107.7				107.7	22.72	0.5	48	95	9.1	0.2	Sum of DP 1.5 & DP 9, piped to DP 1.8
	10	A10	2.61	0.88	7.9	2.29	7.53	17.3					4.5	0.59	1.5	12.8	1.70	2.5	18	955 118	2.4 10.3	6.5 0.2	On-grade inlet, carryover flow to DP 20 Piped to DP 1.7
	11	A11	2.89	0.86	8.7	2.48	7.28	18.1	10.6	2.94	6.77	19.9	6.1	0.90	1.5	13.8	2.04	2.5	18	1049 0	2.4 10.4	7.1 0.0	On-grade inlet, carryover flow to DP 21 Sum of Sub-basin A11 & carryover flows from DP 8 & DP 9, piped to DP 1.7
	1.7								10.6	3.74	6.77	25.3				25.3	3.74	1.0	24	8	8.1	0.0	Sum of DP 10 & DP 11, piped to DP 1.8
	1.8								24.0	26.45	4.72	125.0				125.0	26.45	2.0	54	517	17.0	0.5	Sum of DP 1.6 & DP 1.7, piped to DP 2.7
	OS2	OS2	17.00	0.62	12.0	10.54	3.71	39.1								39.1	10.54	1.0	30	787	9.5	1.4	Future flow released from Barbarick Subdivision Piped to DP 2.0
	12	A12	3.87	0.38	11.9	1.47	6.49	9.5								9.5	1.47	2.0	18	17	8.9	0.0	Type C inlet Piped to DP 2.0
	2.0								13.4	12.01	6.20	74.5				74.5	12.01	1.0	48	52	11.6	0.1	Sum of DP OS2 & DP 12, Piped to DP 2.1
	13	A13	9.65	0.59	14.0	5.69	6.08	34.6								34.6	5.69	1.5	30	200	11.0	0.3	Future storm infrastructure from Sterling Ranch Phase 2 Piped to DP 2.1

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 8/16/21

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	2.1								14.3	17.70	6.02	106.6				106.6	17.70	1.6	48	65	15.1	0.1	Sum of DP 2.0 & DP 13, piped to DP 2.5
	OS3	OS3	28.70	0.62	15.0	17.79	2.75	48.9								48.9	17.79	1.0	30	719	10.0	1.2	Future flow released from Barbarick Subdivision Piped to DP 2.2
	14	A14	11.76	0.55	15.3	6.47	5.86	37.9								37.9	6.47	1.0	30	20	9.5	0.0	Future flow released from School Site Piped to DP 2.2
	2.2								16.2	24.26	5.72	138.7				138.7	24.26	1.5	48	773	15.5	0.8	Sum of DP OS3 & DP 14, piped to DP 2.3
	15	A15	2.91	0.68	14.9	1.98	5.93	11.7					1.4	0.24	0.7	10.3	1.74	1.3	18	724 35	1.7 7.6	7.2 0.1	On-grade inlet, carryover flow to DP 8 Piped to DP 2.3
	16	A16	2.34	0.69	14.7	1.61	5.96	9.6					2.6	0.44	0.8	7.0	1.17	2.0	18	697 12	1.8 8.2	6.5 0.0	On-grade inlet, carryover flow to DP 9 Piped to DP 2.3
	2.3								15.0	2.91	5.91	17.2				17.2	2.91	1.6	48	15	9.0	0.0	Sum of DP 15 & DP 16, piped to DP 2.4
	2.4								17.0	27.17	5.59	151.9				151.9	27.17	1.6	48	19	16.2	0.0	Sum of DP 2.2 & DP 2.3, piped to DP 2.5
	2.5								17.1	44.87	5.59	250.7				250.7	44.87	2.0	60	839	20.1	0.7	Sum of DP 2.1 & DP 2.4 piped to DP 2.6
	17	A17	1.76	0.44	13.7	0.77	6.14	4.7								4.7	0.77	1.0	18	24	5.7	0.1	Type C inlet Piped to DP 2.6
	2.6								17.7	45.64	5.49	250.4				250.4	45.64	2.0	60	32	20.2	0.0	Sum of DP 2.5 & DP 17, piped to DP 2.7
	2.7								24.5	72.10	4.67	336.8				336.8	72.10	0.6	78	220	13.7	0.3	Sum of DP1.8 & DP 2.6, piped to DP 2.8
	18	A18	5.27	0.47	16.4	2.47	5.68	14.0								14.0	2.47	1.0	18	24	7.9	0.1	Area inlet Piped to DP 2.6
	19	A19	31.85	0.59	25.8	18.79	4.55	85.4								85.4	18.79	1.0	18	24	48.4	0.0	Area inlet Piped to DP 2.6
	2.8								25.8	93.36	4.55	424.4				424.4	93.36	0.6	78	145	13.9	0.2	Sum of DP 2.7, DP 18 & DP 19, piped to DP 3.0.
	3.0								25.8	93.36	4.55	424.4	424.4	93.36	0.5					564	1.4	6.6	Detention Pond Trickle channel conveyance to DP 3.2
	20	A20	1.83	0.89	8.0	1.63	7.50	12.2	14.4	2.22	6.02	13.4	2.3	0.38	1.5	11.1	1.84	1.0	24	105	7.2	0.2	On-grade inlet Sum of Sub-basin A20 & carryover flow from DP 10, piped to DP 3.0
	21	A21	1.93	0.90	8.7	1.73	7.28	12.6	15.8	2.63	5.77	15.2	3.3	0.57	1.5	11.9	2.06	2.5	18	0	10.2	0.0	On-grade inlet Sum of Sub-basin A21 & carryover flow from DP 11, piped to DP 2.9
	2.9								15.8	3.91	5.77	22.5				22.5	3.91	2.0	24	58	11.0	0.1	Sum of DP 20 & DP 21,piped to DP 3.1
	3.1								15.8	3.91	5.77	22.5	22.5	3.91	0.5					568	1.4	6.7	Detention Pond Trickle channel conveyance to DP 3.2
	22	A22	8.68	0.37	23.3	3.21	4.80	15.4															Detention Pond Overland flow to DP 3.2
	OS4	OS4	5.08	0.40	29.5	2.03	4.21	8.5					8.5	2.03	13.0					113	5.4	0.3	Existing topography Overland flow to DP 3.2
	3.2								29.8	102.50	4.18	428.2											Outlet Structure Sum of DP 3.0, DP 3.1, DP 22 & DP OS4, outlet structure release to DP 4.8
	Pond W5								29.8	34.84	4.18	145.5				145.5	34.84	2.0	48	58	17.5	0.1	Outlet structure release to DP 4.8
	23	B1	2.98	0.96	17.6	2.86	5.51	15.8					3.6	0.65	2.0	12.2	2.21	0.5	30	1394 88	2.1 5.7	11.0 0.3	On-grade inlet Piped to DP 4.0
	24	B2	3.89	0.96	17.6	3.73	5.51	20.6					6.5	1.17	2.0	14.1	2.56	2.0	30	1394 0	2.1 9.7	11.0 0.0	On-grade inlet Piped to DP 4.0

EXISTING PIPE ROUTING SUMMARY (5 YEAR)

EXISTING CONDITIONS PIPE ROUTING FOR COMPARISON (5 YEAR)
BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 5-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 1/5/21

		DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
	1	A1	2.06	0.51	9.7	1.05	4.17	4.4					0.2	0.04	3.3	4.2	1.01	2.0	18	652 5	3.6 7.2	3.0 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.0
	2	A2	0.82	0.53	9.1	0.44	4.27	1.9								1.9	0.44	2.0	18	27	5.8	0.1	On-grade inlet Piped to DP 1.0
	1.0								9.7	1.45	4.17	6.0				6.0	1.45	3.0	18	335	9.1	0.6	Sum of DP 1 & DP 2, piped to DP 1.2
	3	A3	6.76	0.47	15.0	3.16	3.53	11.1					1.6	0.47	2.9	9.5	2.69	4.7	18	426 36	3.4 12.2	2.1 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	4	A4	1.51	0.60	10.2	0.91	4.10	3.7					0.1	0.03	2.9	3.6	0.88	4.7	18	395 0	3.4 9.2	1.9 0.0	On-grade inlet, carryover flow to DP 5 Piped to DP 1.1
	1.1								15.0	3.57	3.52	12.6				12.6	3.57	1.0	24	74	7.4	0.2	Sum of DP 3 & DP 4, piped to DP 1.2
	1.2								15.2	5.02	3.50	17.6				17.6	5.02	3.3	24	319	12.5	0.4	Sum of DP 1.0 & DP 1.1, piped to DP 1.3
	6A	A6A	0.53	0.81	5.0	0.43	5.17	2.2															Overland Flow to DP1.3A
	6	A6	1.37	0.58	10.0	0.79	4.14	3.3								3.3	0.79	2.0	18	0	6.7	0.0	On-grade inlet Sum of Sub-basin A6 & Carryover flow from DP 2, Piped to DP 1.3A
	1.3A								10.0	1.22	4.14	5.0				5.0	1.22	1.0	24	36	5.7	0.1	Sum of DP 6 & DP 6A, piped to DP 1.3
	5	A5	1.70	0.59	9.9	0.99	4.14	4.1	17.0	1.53	3.33	5.1				5.1	1.53	2.0	18	0	7.6	0.0	On-grade inlet Sum of Sub-basin A5 & Carryover flows from DP 1, P 3 & DP 4. Piped to DP 1.3
	1.3								17.0	7.77	3.33	25.9				25.9	7.77	1.1	36	620	9.2	1.1	Sum of DP 1.2, 1.3A & DP 5, piped to DP 1.4
	7	A7	19.00	0.45	18.3	8.55	3.22	27.5								27.5	8.55	1.5	42	20	10.3	0.0	Future storm infrastructure from Copper Chase Subdivision Piped to DP 1.4
	1.4								18.4	16.32	3.22	52.5				52.5	16.32	0.5	48	26	8.2	0.1	Sum of DP 1.3 & DP 7, piped to DP 1.5
	8	A8	1.48	0.56	13.9	0.83	3.63	3.0								3.0	0.83	2.0	18	20	6.6	0.1	On-grade inlet, carryover flow to DP 11 Piped to DP 1.5
	1.5								18.4	17.15	3.21	55.1				55.1	17.15	0.5	48	91	8.3	0.2	Sum of DP 1.4 & DP 8, piped to DP 1.6
	9	A9	0.61	0.73	8.7	0.44	4.34	1.9	8.7	0.48	4.34	2.1				2.1	0.48	2.0	18	13	5.8	0.0	On-grade inlet Sum of Sub-basin A9 & carryover flows from DP 16, piped to DP 1.6
	1.6								18.6	17.63	3.20	56.4				56.4	17.63	0.5	48	95	8.3	0.2	Sum of DP 1.5 & DP 9, piped to DP 1.8
	10	A10	2.61	0.79	7.9	2.05	4.49	9.2					0.5	0.11	1.5	8.7	1.94	2.5	18	955 118	2.4 9.5	6.5 0.2	On-grade inlet, carryover flow to DP 20 Piped to DP 1.7
	11	A11	2.89	0.76	8.7	2.20	4.34	9.5					0.6	0.15	1.5	8.9	2.05	2.5	18	1049 0	2.4 9.4	7.1 0.0	On-grade inlet, carryover flow to DP 21 Piped to DP 1.7
	1.7								8.7	3.99	4.34	17.3				17.3	3.99	1.0	24	8	7.9	0.0	Sum of DP 10 & DP 11, piped to DP 1.8
	1.8								18.8	21.63	3.18	68.8				68.8	21.63	2.0	54	517	14.4	0.6	Sum of DP 1.6 & DP 1.7, piped to DP 2.7
	OS2	OS2	17.00	0.49	14.0	6.25	2.20	13.8								13.8	6.25	1.0	30	787	7.5	1.7	Future flow released from Barbarick Subdivision Piped to DP 2.0
	12	A12	3.87	0.13	11.9	0.49	3.86	1.9								1.9	0.49	2.0	18	17	5.6	0.1	Type C inlet Piped to DP 2.0
	2.0								15.7	6.74	3.45	23.2				23.2	6.74	1.0	48	52	8.4	0.1	Sum of DP OS2 & DP 12, Piped to DP 2.1
	13	A13	9.65	0.45	14.0	4.34	3.62	15.7								15.7	4.34	1.5	30	200	9.1	0.4	Future storm infrastructure from Sterling Ranch Phase 2 Piped to DP 2.1

EXISTING PIPE ROUTING SUMMARY (100 YEAR)

EXISTING CONDITIONS PIPE ROUTING FOR COMPARISON (100 YEAR) BY J.R. ENGINEERING (APPROVED NOVEMBER 2021)

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

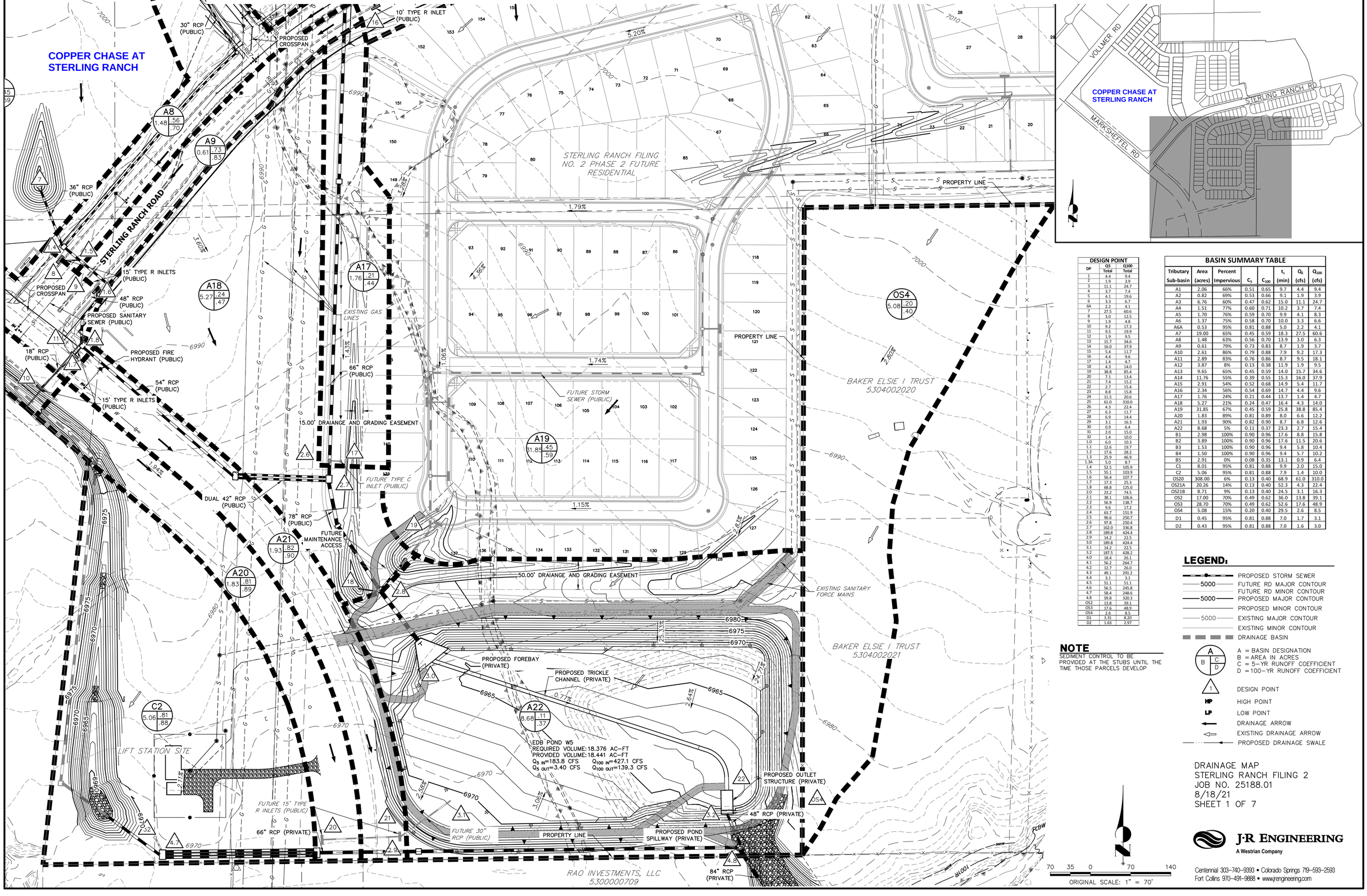
Subdivision: Sterling Ranch Filing No. 2
Location: El Paso County
Design Storm: 100-Year

Project Name: Sterling Ranch Subdivision
Project No.: 25188.01
Calculated By: AAM
Checked By:
Date: 1/5/21

Description	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET/SWALE			PIPE				TRAVEL TIME			REMARKS
		Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	$Q_{street/swale}$ (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	
	1	A1	2.06	0.65	9.7	1.34	7.01	9.4					2.8	0.40	3.3	6.6	0.94	2.0	18	652	3.6	3.0	On-grade inlet, carryover flow to DP 5
																				5	8.2	0.0	Piped to DP 1.0
	2	A2	0.82	0.66	9.1	0.54	7.17	3.9					0.1	0.01	3.3	3.8	0.53	2.0	18	639	3.6	2.9	On-grade inlet, carryover flow to DP 6
																				27	7.0	0.1	Piped to DP 1.0
	1.0								9.7	1.47	7.00	10.3				10.3	1.47	3.0	18	335	10.6	0.5	Sum of DP 1 & DP 2, piped to DP 1.2
	3	A3	6.76	0.62	15.0	4.17	5.92	24.7					10.0	1.69	2.9	14.7	2.48	4.7	18	426	3.4	2.1	On-grade inlet, carryover flow to DP 5
																				36	13.6	0.0	Piped to DP 1.1
	4	A4	1.51	0.71	10.2	1.08	6.88	7.4					1.6	0.24	2.9	5.8	0.84	4.7	18	395	3.4	1.9	On-grade inlet, carryover flow to DP 5
																				0	10.7	0.0	Piped to DP 1.1
	1.1								15.0	3.33	5.91	19.7				19.7	3.33	1.0	24	74	8.1	0.2	Sum of DP 3 & DP 4, piped to DP 1.2
	1.2								15.1	4.80	5.89	28.2				28.2	4.80	3.3	24	319	13.9	0.4	Sum of DP 1.0 & DP 1.1, piped to DP 1.3
	6A	A6A	0.53	0.88	5.0	0.47	8.68	4.1															Overland Flow to DP1.3A
	6	A6	1.37	0.70	10.0	0.95	6.94	6.6	10.0	0.96	6.94	6.7	1.3	0.18	0.7	5.4	0.78	2.0	18	696	1.7	7.0	On-grade inlet, carryover flow to DP 8
																				0	7.7	0.0	Sum of Sub-basin A6 & Carryover flow from DP 2, Piped to DP 1.3A
	1.3A								10.0	1.25	6.94	8.7				8.7	1.25	1.0	24	36	6.7	0.1	Sum of DP 6 & DP 6A, piped to DP 1.3
	5	A5	1.70	0.70	9.9	1.19	6.95	8.3	17.0	3.51	5.59	19.6	6.5	1.17	0.7	13.1	2.34	2.0	18	664	1.7	6.6	On-grade inlet, carryover flow to DP 8
																				0	9.4	0.0	Sum of Sub-basin A5 & Carryover flows from DP 1, P 3 & DP 4. Piped to DP 1.3
	1.3								17.0	8.39	5.59	46.9				46.9	8.39	1.1	36	620	10.7	1.0	Sum of DP 1.2, 1.3A & DP 5, piped to DP 1.4
	7	A7	19.00	0.59	18.3	11.21	5.41	60.6								60.6	11.21	1.5	42	20	12.7	0.0	Future storm infrastructure from Copper Chase Subdivision Piped to DP 1.4
	1.4								18.4	19.60	5.40	105.9				105.9	19.60	0.5	48	26	9.2	0.0	Sum of DP 1.3 & DP 7, piped to DP 1.5
	8	A8	1.48	0.70	13.9	1.04	6.10	6.3	23.7	2.63	4.76	12.5	1.9	0.41	0.7	10.6	2.23	2.0	18	195	1.7	1.9	On-grade inlet, carryover flow to DP 11
																				20	9.1	0.0	Sum of Sub-basin A8 & Carryover flows from DP5, DP 6 & DP 15, Piped to DP 1.5
	1.5								23.7	21.83	4.76	103.9				103.9	21.83	0.5	48	91	9.2	0.2	Sum of DP 1.4 & DP 8, piped to DP 1.6
	9	A9	0.61	0.83	8.7	0.51	7.29	3.7	21.2	0.95	5.04	4.8	0.3	0.05	0.7	4.5	0.89	2.0	18	140	1.7	1.4	On-grade inlet, carryover flow to DP 11
																				13	7.3	0.0	Sum of Sub-basin A9 & carryover flows from DP 16, piped to DP 1.6
	1.6								23.9	22.72	4.74	107.7				107.7	22.72	0.5	48	95	9.1	0.2	Sum of DP 1.5 & DP 9, piped to DP 1.8
	10	A10	2.61	0.88	7.9	2.29	7.53	17.3					4.5	0.59	1.5	12.8	1.70	2.5	18	955	2.4	6.5	On-grade inlet, carryover flow to DP 20
																				118	10.3	0.2	Piped to DP 1.7
	11	A11	2.89	0.86	8.7	2.48	7.28	18.1	10.6	2.94	6.77	19.9	6.1	0.90	1.5	13.8	2.04	2.5	18	1049	2.4	7.1	On-grade inlet, carryover flow to DP 21
																				0	10.4	0.0	Sum of Sub-basin A11 & carryover flows from DP 8 & DP 9, piped to DP 1.7
	1.7								10.6	3.74	6.77	25.3				25.3	3.74	1.0	24	8	8.1	0.0	Sum of DP 10 & DP 11, piped to DP 1.8
	1.8								24.0	26.45	4.72	125.0				125.0	26.45	2.0	54	517	17.0	0.5	Sum of DP 1.6 & DP 1.7, piped to DP 2.7
	OS2	OS2	17.00	0.62	12.0	10.54	3.71	39.1								39.1	10.54	1.0	30	787	9.5	1.4	Future flow released from Barbarick Subdivision Piped to DP 2.0
	12	A12	3.87	0.38	11.9	1.47	6.49	9.5								9.5	1.47	2.0	18	17	8.9	0.0	Type C inlet Piped to DP 2.0
	2.0								13.4	12.01	6.20	74.5				74.5	12.01	1.0	48	52	11.6	0.1	Sum of DP OS2 & DP 12, Piped to DP 2.1
	13	A13	9.65	0.59	14.0	5.69	6.08	34.6								34.6	5.69	1.5	30	200	11.0	0.3	Future storm infrastructure from Sterling Ranch Phase 2 Piped to DP 2.1

EXISTING DRAINAGE MAP
(BY J.R. ENGINEERING, APPROVED NOVEMBER 2021)

DOWNSTREAM CONVEYANCE EXHIBIT EXCERPT (FOR REFERENCE)



DESIGN POINT		
DP	Q5 Total	Q100 Total
1	4.4	9.4
2	1.9	3.9
3	11.1	24.7
4	3.7	7.4
5	4.1	19.6
6	3.3	6.7
6A	2.2	4.1
7	27.5	60.6
8	3.0	12.5
9	1.9	4.8
10	9.2	17.3
11	9.5	19.9
12	1.9	9.5
13	15.7	34.6
14	16.0	37.9
15	5.4	11.7
16	4.4	9.6
17	1.4	4.7
18	4.3	14.0
19	38.8	85.4
20	7.1	13.4
21	7.4	15.2
22	2.7	15.4
23	8.8	15.8
24	11.5	20.6
25	61.0	310.0
26	4.3	22.4
27	6.3	11.7
28	6.9	14.4
29	3.1	16.3
30	0.9	6.4
31	2.0	15.0
32	1.4	10.0
1.0	6.0	10.3
1.1	12.6	19.7
1.2	17.6	28.2
1.3	25.9	46.9
1.3A	5.0	8.7
1.4	52.5	105.9
1.5	55.1	103.9
1.6	56.4	107.7
1.7	17.3	25.3
1.8	68.8	125.0
2.0	23.2	74.5
2.1	38.1	106.6
2.2	56.9	138.7
2.3	9.6	17.2
2.4	63.7	151.9
2.5	96.6	250.7
2.6	97.8	250.4
2.7	162.0	336.8
2.8	189.8	424.4
2.9	14.2	22.5
3.0	189.8	424.4
3.1	14.2	22.5
3.2	187.5	428.2
4.0	18.4	26.1
4.1	56.2	264.7
4.2	12.7	26.0
4.3	49.1	291.2
4.4	3.1	3.1
4.5	51.1	51.1
4.6	56.5	245.8
4.7	58.4	248.6
4.8	59.8	320.3
OS2	13.8	39.1
OS3	17.6	48.9
OS4	2.6	8.5
D1	3.31	8.20
D2	1.63	2.97

BASIN SUMMARY TABLE								
Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A1	2.06	66%	0.51	0.65	9.7	4.4	9.4
A2	0.82	69%	0.53	0.66	9.1	1.9	3.9
A3	6.76	60%	0.47	0.62	15.0	11.1	24.7
A4	1.51	77%	0.60	0.71	10.2	3.7	7.4
A5	1.70	76%	0.59	0.70	9.9	4.1	8.3
A6	1.37	75%	0.58	0.70	10.0	3.3	6.6
A6A	0.53	95%	0.81	0.88	5.0	2.2	4.1
A7	19.00	65%	0.45	0.59	18.3	27.5	60.6
A8	1.48	63%	0.56	0.70	13.9	3.0	6.3
A9	0.61	79%	0.73	0.83	8.7	1.9	3.7
A10	2.61	86%	0.79	0.88	7.9	9.2	17.3
A11	2.89	83%	0.76	0.86	8.7	9.5	18.1
A12	3.87	8%	0.13	0.38	11.9	1.9	9.5
A13	9.65	65%	0.45	0.59	14.0	15.7	34.6
A14	11.76	55%	0.39	0.55	15.3	16.0	37.9
A15	2.91	54%	0.52	0.68	14.9	5.4	11.7
A16	2.34	56%	0.54	0.69	14.7	4.4	9.6
A17	1.76	24%	0.21	0.44	13.7	1.4	4.7
A18	5.27	21%	0.24	0.47	16.4	4.3	14.0
A19	31.85	67%	0.45	0.59	25.8	38.8	85.4
A20	1.83	89%	0.81	0.89	8.0	6.6	12.2
A21	1.93	90%	0.82	0.90	8.7	6.8	12.6
A22	8.68	5%	0.11	0.37	23.3	2.7	15.4
B1	2.98	100%	0.90	0.96	17.6	8.8	15.8
B2	3.89	100%	0.90	0.96	17.6	11.5	20.6
B3	1.53	100%	0.90	0.96	9.4	5.8	10.4
B4	1.50	100%	0.90	0.96	9.4	5.7	10.2
B5	2.91	0%	0.08	0.35	13.1	0.9	6.4
C1	8.01	95%	0.81	0.88	9.9	2.0	15.0
C2	5.06	95%	0.81	0.88	7.9	1.4	10.0
OS20	308.00	6%	0.13	0.40	68.9	61.0	310.0
OS21A	20.26	14%	0.13	0.40	52.3	4.3	22.4
OS21B	8.71	9%	0.13	0.40	24.5	3.1	16.3
OS2	17.00	70%	0.49	0.62	36.0	13.8	39.1
OS3	28.70	70%	0.49	0.62	52.6	17.6	48.9
OS4	5.08	15%	0.20	0.40	29.5	2.6	8.5
D1	0.45	95%	0.81	0.88	7.0	1.7	3.1
D2	0.43	95%	0.81	0.88	7.0	1.6	3.0

NOTE

SEDIMENT CONTROL TO BE PROVIDED AT THE STUBS UNTIL THE TIME THOSE PARCELS DEVELOP

LEGEND:

- PROPOSED STORM SEWER
- 5000 FUTURE RD MAJOR CONTOUR
- FUTURE RD MINOR CONTOUR
- 5000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 5000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- DRAINAGE BASIN
- A = BASIN DESIGNATION
  B = AREA IN ACRES
  C = 5-YR RUNOFF COEFFICIENT
  D = 100-YR RUNOFF COEFFICIENT
- 1 DESIGN POINT
- HP HIGH POINT
- LP LOW POINT
- DRAINAGE ARROW
- EXISTING DRAINAGE ARROW
- PROPOSED DRAINAGE SWALE

DRAINAGE MAP
STERLING RANCH FILING 2
JOB NO. 25188.01
8/18/21
SHEET 1 OF 7

ORIGINAL SCALE: 1" = 70'

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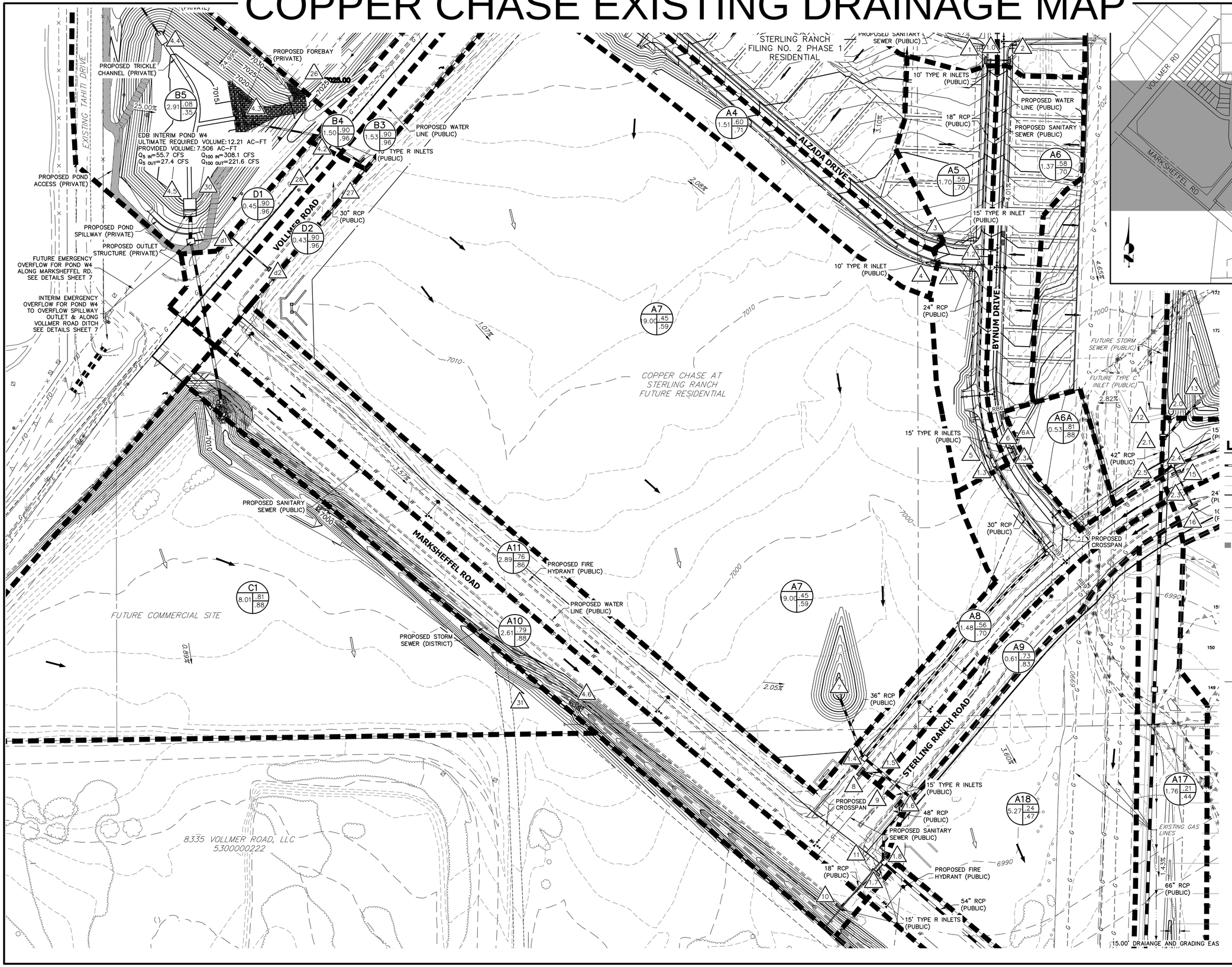
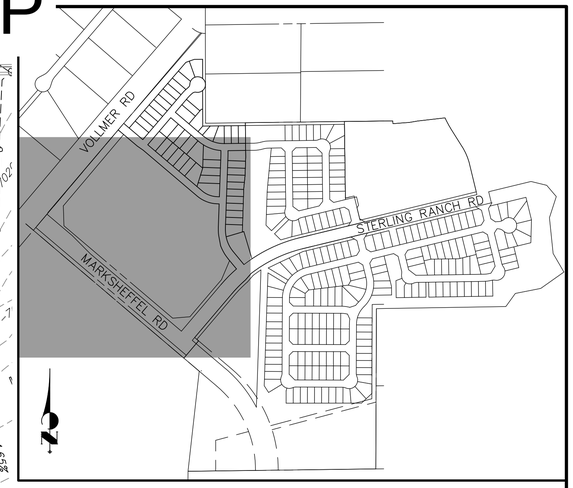
COPPER CHASE EXISTING DRAINAGE MAP





NOTE
SEDIMENT CONTROL TO BE PROVIDED AT THE STUBS UNTIL THE TIME THOSE PARCELS DEVELOP

LEGEND:

- PROPOSED STORM SEWER
- 5000 FUTURE RD MAJOR CONTOUR
- FUTURE RD MINOR CONTOUR
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- 5000 EXISTING MAJOR CONTOUR
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- 1 DESIGN POINT
- HP HIGH POINT
- LP LOW POINT
- DRAINAGE ARROW
- EXISTING DRAINAGE ARROW
- PROPOSED DRAINAGE SWALE

70 35 0 70 140
ORIGINAL SCALE: 1" = 70'

DRAINAGE MAP
STERLING RANCH FILING 2
JOB NO. 25188.01
8/18/21
SHEET 2 OF 7

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STERLING RANCH
PONDS W4 & W5 TRIBUTARY AREA EXHIBIT

LEGEND

- MDDP BASINS
- POND W4 TRIBUTARY AREA
- POND W5 TRIBUTARY AREA
- HISTORIC DBPS SC/EFSC BNDRY LINE
- PROPOSED SC/EFSC BNDRY LINE
- BASIN DIVERSION AREA (EAST FORK SAND CREEK TO SAND CREEK) * ~267.3 AC

MDDP BASIN

DBPS BASIN

77
MDDP 1,468 CFS
DBPS 2,262 CFS
FEMA 2,600 CFS

71
MDDP 1,612 CFS
DBPS 2,260 CFS

63
MDDP 1,385 CFS
DBPS 2,630 CFS
FEMA 2,600 CFS

61
MDDP 1,620.1 CFS
FEMA 2,600 CFS

POND FSD 17B

POND FSD 17A
Q100 OUT = 86.1 CFS

POND FSD 18
Q100 OUT = 69.6 CFS

POND 1
Q100 OUT = 103.1 CFS

POND 4
/FSD 12
Q100 OUT = 200.3 CFS

POND 8/
FSD 13
Q100 OUT = 47.2 CFS

POND W-4/
FSD 9

POND W-5/
FSD 6
Q100 OUT = 149.7 CFS
Q100 OUT = 289.90 CFS

POND FSD 16
Q100 OUT = 156.4 CFS

POND FSD 14A
Q100 OUT = 142.2 CFS

POND FSD 14B

POND FSD 11B
Q100 OUT = 69.5 CFS

ASPEN VALLEY RD.
WHEATLAND DR.
VOLLMER ROAD
WHEATLAND DRIVE
BRIARGATE PARKWAY
STERLING RANCH ROAD
DINES BLVD
BYNUM DRIVE
BEAVERHEAD CIRCLE
ALZADA DRIVE
MARKSHEFFEL ROAD

HOMESTEAD AT STERLING RANCH FILING NO. 1
HOMESTEAD AT STERLING RANCH FILING NO.2
BRANDING IRON AT STERLING RANCH FILING NO.2
BRANDING IRON AT STERLING RANCH FILING NO. 1
AMENDED PLAT BARBARICK SUBDIVISION
UNPLATTED REC. NO. 217051682
PAWNEE RANCHEROS FILING NO. 2 PLAT BOOK U-2 PAGE 45
BAR J-B ACRES SECOND FILING PLAT BOOK A-2, PAGE 56
PAWNEE RANCHEROS FILING NO. 1 PLAT BOOK I-2, PAGE 28

PONDS W4 & W5 TRIBUTARY AREA EXHIBIT
STERLING RANCH
JOB NO. 25188.00
04-14-2021
SHEET 1 OF 1

400 200 0 400 800
ORIGINAL SCALE: 1" = 400'

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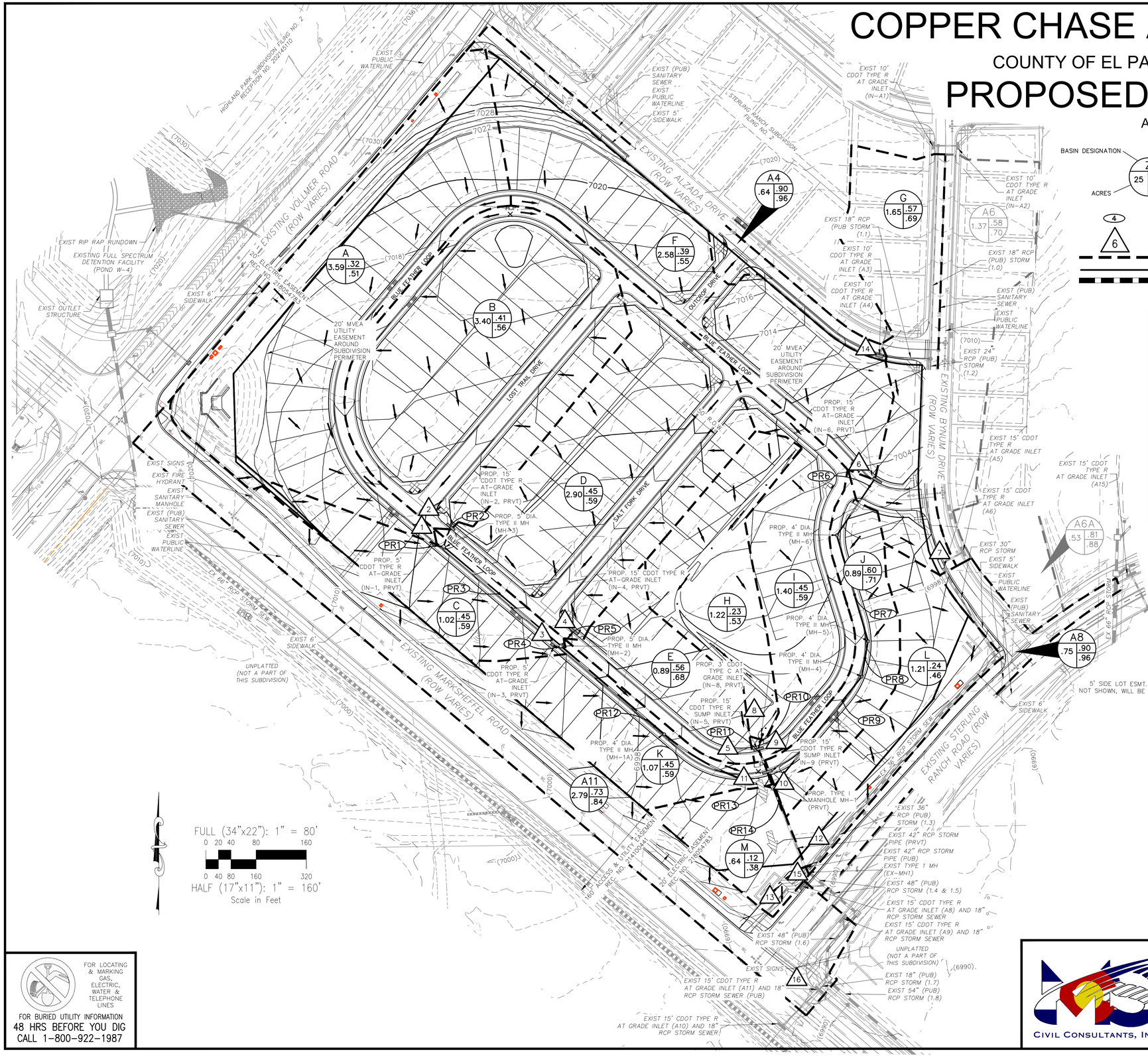
PROPOSED DRAINAGE MAP

COPPER CHASE AT STERLING RANCH

COUNTY OF EL PASO, STATE OF COLORADO

PROPOSED DRAINAGE MAP

AUGUST 2023



LEGEND

BASIN DESIGNATION: Z / 25 ACRES / .25 / .35 / C5 / C100

4 / 6 — PIPE RUN REFERENCE LABEL

SURFACE DESIGN POINT

BASIN BOUNDARY

SITE BOUNDARY

PROP STORM SEWER PIPE

7070 — PROP MAJ CONT

7072 — PROP MIN CONT

(7070) — EXIST MAJ CONT

(7072) — EXIST MIN CONT

EXISTING STORM SEWER PIPE

PROPOSED PRIVATE UTILITY EASEMENT

PROPOSED MVEA EASEMENT

PROPOSED DRAINAGE SWALE

EXISTING FIRE HYDRANT

INLET

EXISTING FLOW DIRECTION ARROW

EMERGENCY OVERFLOW DIRECTION

PROPOSED FLOW DIRECTION ARROW

FLARED END SECTION

H.P. HIGH POINT

L.P. LOW POINT

EXISTING SANITARY MANHOLE

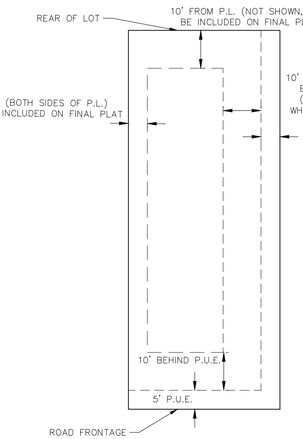
EXISTING SIGN

EX. WATER VALVE

CROSSPAN

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A	3.59	4.4	11.8
B	3.40	4.9	11.4
C	1.02	1.8	3.9
D	2.90	4.8	10.5
E	0.89	2.1	4.2
F	2.58	4.2	10.0
G	1.65	4.3	8.7
H	1.22	1.0	3.9
I	1.40	2.4	5.2
J	0.89	2.2	4.3
K	1.07	1.9	4.2
L	1.21	1.1	3.3
M	0.64	0.3	1.6
A4	0.64	3.0	5.4
A6	1.37	3.3	6.6
A6A	0.53	2.2	4.1
A8	0.75	3.0	5.5
A11	2.79	7.4	14.2

DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	BASIN/DP	STRUCTURE
1	4.4	11.8	A	5' CDOT TYPE R AT-GRADE INLET (IN-1)
2	4.9	11.4	B	15' CDOT TYPE R AT-GRADE INLET (IN-2)
3	3.7	11.8	C, FB-IN1	5' CDOT TYPE R AT-GRADE INLET (IN-3)
4	4.7	12.0	D, FB-IN2	15' CDOT TYPE R AT-GRADE INLET (IN-4)
5	1.8	5.6	E, FB-IN4	
6	4.2	10.0	F	15' CDOT TYPE R AT-GRADE INLET (IN-6)
7	4.9	20.0	G, FB-IN6, FB-INA1, FB-INA4, FB-INA3	EX 15' CDOT TYPE R AT-GRADE INLET (IN-A5)
8	1.0	3.9	H	3' CDOT TYPE C AT-GRADE INLET (IN-8)
9	4.0	10.5	I, DP5	15' CDOT TYPE R SUMP INLET (IN-5)
10	2.2	4.3	J	
11	5.4	16.7	K, DP 10, FB-IN3	15' CDOT TYPE R SUMP INLET (IN-9)
12	1.1	3.3	L	
13	0.3	1.6	M	
14	3.0	5.4	A4	EX 10' CDOT TYPE R AT-GRADE INLET (IN-A4)
15	5.1	19.8	A8, FB-INA6, A6A, FB-INA5, FB-INA15, DP12	EX 15' CDOT TYPE R AT-GRADE INLET (IN-A8)
16	7.7	22.8	A11, FB-INA8, DP13, FB-INA9	EX 15' CDOT TYPE R AT-GRADE INLET (IN-A11)



TYPICAL LOT WITH MVEA EASMENTS DETAIL
(UNLESS OTHERWISE NOTED)

STORM SEWER SUMMARY				
PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES & DESIGN POINTS
PR1	2.5	3.8	18" RCP	DP1 (IN-1)
PR2	4.9	9.7	18" RCP	DP2 (IN-2)
PR3	7.3	13.3	18" RCP	PR1, PR2
PR4	2.3	3.9	18" RCP	DP3 (IN-3)
PR5	4.7	10.0	18" RCP	DP4 (IN-4)
PR6	4.2	8.8	18" RCP	DP6 (IN-6)
PR7	4.1	8.7	18" RCP	PR6
PR8	4.1	8.7	18" RCP	PR7
PR9	4.1	8.6	18" RCP	PR8
PR10	1.0	3.9	18" RCP	DP8 (IN-8)
PR11	5.0	14.4	24" RCP	PR10, DP9 (IN-5)
PR12	13.9	26.6	24" RCP	PR3, PR4, PR5
PR13	10.7	32.1	30" RCP	PR11, DP11 (IN-9)
PR14	26.0	60.5	42" RCP	PR9, PR12, PR13
1.0	6.1	10.3	18" RCP	EX-INA1, EX-INA2
1.1	11.4	18.1	18" RCP	EX-INA4, EX-INA3
1.2	17.1	27.7	24" RCP	1.0, 1.1
1.3A	23.9	44.1	30" RCP	1.2, EXIN-A5, EXIN-A6
1.3	23.9	44.1	36" RCP	1.3A
1.4	48.8	102.5	48" RCP	1.3, PR14
1.5	53.4	115.8	48" RCP	DP15 (EX-INA8), 1.4
1.6	55.1	119.0	48" RCP	EX-INA9, 1.5
1.7	16.3	27.5	18" RCP	DP16,(EX-INA11), EX-INA10
1.8	60.8	124.8	54" RCP	1.7, 1.6

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CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

COPPER CHASE AT STERLING RANCH

PROPOSED DRAINAGE MAP

PROJECT NO. 09-014

DESIGNED BY: CVW
DRAWN BY: CVW
CHECKED BY: VAS

SCALE: HORIZONTAL: 1"=80' VERTICAL: N/A

DATE: 08/03/2023

SHEET 1 OF 1

PDM

File: O:\09014A\Challenger PUD\Drainage\Proposed Drainage Map PDM.dwg Plotstamp: 9/19/2023 10:45 AM