FINAL DRAINAGE PLAN
SF 231

HILLSIDE AT LORSON RANCH FIL. NO. 1

DECEMBER, 2022
REV MAY, 2023

Prepared for:

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Project No. 100.065

CORE
ENGINEERING GROUP

TABLE OF CONTENTS

ENGINEER'S STATEMENT *1*

OWNER'S STATEMENT *1*

FLOODPLAIN STATEMENT *1*

1.0 LOCATION and DESCRIPTION *2*

2.0 DRAINAGE CRITERIA *2*

3.0 EXISTING HYDROLOGICAL CONDITIONS *3*

4.0 DEVELOPED HYDROLOGICAL CONDITIONS *4*

5.0 HYDRAULIC SUMMARY *10*

6.0 DETENTION and WATER QUALITY PONDS *25*

7.0 DRAINAGE and BRIDGE FEES *28*

8.0 FOUR STEP PROCESS *29*

9.0 CONCLUSIONS *29*

10.0 REFERENCES *30*

APPENDIX A

VICINITY MAP, SCS SOILS INFORMATION, FEMA FIRM MAP

APPENDIX B

HYDROLOGY CALCULATIONS

APPENDIX C

HYDRAULIC CALCULATIONS

APPENDIX D

POND CALCULATIONS

APPENDIX E

STORM SEWER SCHEMATIC and HYDRAFLOW STORM SEWER CALCS

BACK POCKET

EXISTING CONDITIONS DRAINAGE MAP

DEVELOPED CONDITIONS DRAINAGE MAPS

ENGINEER'S STATEMENT

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

Richard L. Schindler, P.E. #33997
For and on Behalf of Core Engineering Group, LLC

6-15-2023 Date

OWNER'S STATEMENT

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

Lorson, LLC

6/29/23
Date

By
Jeff Mark

Title
Manager

Address
212 N. Wahsatch Avenue, Suite 301, Colorado Springs, CO 80903

FLOODPLAIN STATEMENT

To the best of my knowledge and belief, this development is not located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. 08041C0957G and 08041C0976G, dated December 7, 2018. (See Appendix A, FEMA FIRM Exhibit)

Richard L. Schindler, #33997 Date

EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual, Volume 1 and 2, and Engineering Criteria Manual, As Amended.

Date

County Engineer/ECM Administrator

Conditions: _____

1.0 LOCATION and DESCRIPTION

Hillside at Lorson Ranch is located east of the East Tributary of Jimmy Camp Creek. The site is located on approximately 128.328 acres of vacant land. This project will develop this site into single-family residential developments. The land for the residential lots is currently owned by Lorson LLC or its nominees for Lorson Ranch.

The site is located in the North ½ of Section 23 and 24, Township 15 South and Range 65 West of the 6th Principal Meridian. The site is bounded on the west by Lorson Ranch East Filing No. 4, on the north by The Hills at Lorson Ranch and The Ridge at Lorson Ranch, on the east by unplatted lands, and the south by Peaceful Valley Lake Estates 1st Filing. For reference, a vicinity map is included in Appendix A of this report.

Conformance with applicable Drainage Basin Planning Studies

There is an existing (unapproved) DBPS for Jimmy Camp Creek prepared by Wilson & Company in 1987, and is referenced in this report. The only major drainage improvements for this study area according to the 1987 Wilson study was the reconstruction of the East Tributary of Jimmy Camp Creek (East Tributary). In 2014 and in 2018 the East Tributary was reconstructed from downstream of Lorson Boulevard north to the northern property line of Lorson Ranch in accordance with the 1987 study. The last section of the East Tributary (to the south property line of Lorson Ranch) has been designed by Kiowa Engineering and will be completed in 2020. There are no further improvements to be made on the East Tributary. On March 9, 2015, a new DBPS for Jimmy Camp Creek and the East Tributary was completed by Kiowa Engineering. The Kiowa Engineering DBPS for Jimmy Camp Creek has not been adopted by El Paso County but is allowed for concept design. The concept design includes the East Tributary armoring concept and the full spectrum detention pond requirements. The Kiowa DBPS did not calculate drainage fees so current El Paso County drainage/bridge fees apply to this development.

A portion of the site is located in the Upper Williams Drainage Basin which is an unstudied basin. Lorson Ranch has provided detention and water quality ponds for Hillside at Lorson Ranch runoff within this basin and the existing/proposed flows are the same at the south property line of Lorson Ranch.

Conformance with Lorson East MDDP by Core Engineering Group

Core Engineering Group has an approved MDDP for Lorson East, which covers this study area. This PDR conforms to the MDDP for Lorson East and is referenced in this report. The major infrastructure to be constructed in conjunction with this site includes offsite Detention/WQ Ponds C1 and D2 and on-site Ponds E1, G and H. Offsite Pond C1 was completed with The Hills at Lorson Ranch Filing No. 1. Offsite Pond D2 was completed with Lorson Ranch East Filing No. 1. On-site Pond E1 was graded in the Early Grading Plans for Lorson Ranch East under PUDSP-16-003 but will be increased in size to accommodate this project. On-site Ponds G and H will be constructed with this project. There are also two bridges over the East Tributary that were built in 2018 to provide access to this development across the East Tributary. The bridges are located at Fontaine Boulevard and Lorson Boulevard.

Hillside at Lorson Ranch is located within the ***"Jimmy Camp Creek Drainage Basin"***, which is a fee basin in El Paso County and Upper Williams Creek which is not a fee basin.

2.0 DRAINAGE CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs and El Paso County "Drainage Criteria Manual (DCM)", dated November, 1991, the El Paso County "Engineering Criteria Manual", Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, and the UDFCD "Urban Storm Drainage Criteria Manual" Volumes 1, 2 and 3 for inlet sizing and full spectrum ponds. No deviations from these published criteria are requested for this site.

The Rational Method as outlined in Section 6.3.0 of the May 2014 “Drainage Criteria Manual” and in Section 3.2.8.F of the El Paso County “Engineering Criteria Manual” was used for basins less than 130 acres to determine the rainfall and runoff conditions for the proposed development of the site. The runoff rates for the 5-year initial storm and 100-year major design storm were calculated.

Current updates to the Drainage Criteria manual for El Paso County states the if detention is necessary, Full Spectrum Detention will be included in the design, based on this criteria, Full Spectrum Detention will be required for this development.

3.0 EXISTING HYDROLOGICAL CONDITIONS

This site is currently undeveloped with native vegetation (grass with no shrubs) and moderate to steep slopes in a westerly direction the East Tributary of Jimmy Camp Creek and a small portion southerly in the Upper Williams Creek Drainage Basin.

The Soil Conservation Service (SCS) classifies the soils within the Hillside at Lorson Ranch property as Nelson-Tassel fine Sandy loam; and Wiley silt loam [3]. The sandy and silty loams are considered hydrologic soil group B soils with moderate to moderately rapid permeability. All of these soils are susceptible to erosion by wind and water, have low bearing strength, moderate shrink-swell potential, and high frost heave potential (see table 3.1 below). Weathered bedrock may be encountered beneath some of the site but it can be excavated using conventional techniques.

Table 3.1: SCS Soils Survey

Soil	Hydro. Group	Shrink/Swell Potential	Permeability	Surface Runoff Potential	Erosion Hazard
56-Nelson – Tassel Fine Sandy Loam	B	Moderate	Moderately Rapid	Slow	Moderate
108-Wiley Silt Loam	B	Moderate	Moderate	Medium	Moderate

Excerpts from the SCS “Soil Survey of El Paso County Area, Colorado” are provided in ***Appendix A*** for further reference.

For preparing hydrologic calculations for this report, the soil of each basin are assumed to be wholly comprised of the majority soil hydrologic group.

An existing electrical easement, with existing transmission towers, is located west side of this site and will be set aside as open space. It is the intent to utilize some of the open space under the towers for detention of storm flow.

This site is not located within the delineated 100-year floodplain of the East Tributary of Jimmy Camp Creek per the Federal Emergency Management Agency (FEMA) Flood Rate Insurance Map (FIRM) number 08041C10957 G and 08041C10976 G, effective December 7, 2018.

Basin C1.1-ex

This existing basin consists of existing flow from undeveloped areas north of the PUD boundary. Runoff flows overland northwesterly and drains into Existing Pond C1 excavated as part of Lorson Ranch East Filing No. 4 grading. The existing runoff is 2.9cfs and 19.5cfs for the 5-year and 100-year events.

Basin D1-ex
This existing basin consists of existing flow within the northerly area of the PUD site. Runoff flows overland westerly to Lorson Boulevard constructed as part of Lorson Ranch East Filing No. 1. The existing runoff is 2.6cfs and 17.6cfs for the 5-year and 100-year events.

Offsite Basin OS-E1.1
This existing offsite basin consists of existing flow from the Peaceful Valley Lake Estates subdivision located to the south of the PUD site. Runoff is directed overland northwesterly through basin EX-E1.2 to existing pond E1. The existing runoff is 2.0cfs and 13.4cfs for the 5-year and 100-year events.

Basin EX-E1.2
This existing basin consists of existing flow within the southerly area of the PUD site. Runoff flows overland westerly to existing pond E1. The existing runoff is 12.1cfs and 81.5cfs for the 5-year and 100-year events.

Offsite Basin OS-E2.1
This existing offsite basin consists of existing flow from the Peaceful Valley Lake Estates subdivision located to the south of the PUD site. Runoff is routed northwesterly via overland and swale to Lorson Ranch East Filing No. 4. The existing runoff is 4.5cfs and 30.2cfs for the 5-year and 100-year events.

Basin EX-F2
This existing basin consists of existing flow within the easterly area of the PUD site. Runoff is routed east toward the future Meridian Road. The existing runoff is 3.0cfs and 19.9cfs for the 5-year and 100-year events respectively.

Basin EX-G
This existing basin consists of existing flow within the easterly area of the PUD site. Runoff is routed southerly to the Peaceful Valley Lake Estates subdivision in the Upper Williams Creek Drainage Basin. The existing flows are 3.1cfs and 20.2cfs for the 5-yeqr and 100-year storm events respectively.

Basin EX-H
This existing basin consists of existing flow within the center area of the PUD site. Runoff is routed southerly to the Peaceful Valley Lake Estates subdivision in the Upper Williams Creek Drainage Basin. The existing runoff is 5.5cfs and 31.8cfs for the 5-year and 100-year events respectively

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for **Hillside at Lorson Ranch** drainage report was based on the City of Colorado Springs/El Paso County Drainage Criteria. Sub-basins that lie within this project were determined and the 5-year and 100-year peak discharges for the developed conditions have been presented in this report. Based on these flows, storm inlets will be added when the street capacity is exceeded.

Soil type B has been assumed for the developed hydrologic conditions. See Appendix A for SCS Soils Map.

The time of concentration for each basin and sub-basin was developed using an overland, ditch, street and pipe flow components. The maximum overland flow length for developed conditions was limited to 100 feet. Travel time velocities ranged from 2 to 6 feet per second. The travel time calculations are included in the back of this report.

Runoff coefficients for the various land uses were obtained from Table 6-6 dated May, 2014 from the updated City of Colorado Springs/El Paso County Drainage Criteria Manual. See Appendix B.

Drainage concepts for each of the basins are briefly discussed as follow:

Basin B1
This basin consists of runoff from residential development, Tin Mountain Trail and Wahluke Drive. Runoff will be directed west to Tin Mountain Trail and south to Wahluke Drive, flow is then routed south and west via curb/gutter to Design Point 2 where it will be collected by a Type R inlet. The developed flow from this basin is 5.4cfs and 11.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin B2
This basin consists of runoff from residential development, Tin Mountain Trail and Wahluke Drive. Runoff will be directed south to Wahluke Drive, flow is then routed west in Wahluke Drive via curb/gutter to Design Point 2 where it will be collected by a Type R inlet. The developed flow from this basin is 5.5cfs and 12.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin B3
This basin consists of runoff from residential development, Hackberry Hill Street and Wahluke Drive. Runoff will be directed northerly to Hackberry Hill Street then routed west to Wahluke Drive via curb/gutter then south in Wahluke Drive to Design Point 2 where it will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 3.0cfs and 6.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin B4
This basin consists of runoff from residential development, Wahluke Drive and Pond “H”. Runoff will be directed to Wahluke Drive, flow is then routed west and south in Wahluke Drive via curb/gutter to Design Point 4 where it will be collected by a Type R inlet. The developed flow from this basin is 4.3cfs and 9.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin B
This total basin consists of peak flow from residential development. Runoff will be directed to the interior streets and routed via curb/gutter to Design Points 2 and 4 where it will be collected by Type R inlets; flow is then directed through a storm pipe to Pond “H”. The peak developed flow from this basin is 15.2cfs and 33.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C1
This basin consists of runoff from residential development and Hackberry Hill Street. Runoff will be directed southerly to Hackberry Hill Street then routed northwesterly via curb/gutter in Hackberry Hill Street through basin C2 to Design Point 6 where it will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 3.1cfs and 6.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C2
This basin consists of runoff from residential development and Hackberry Hill Street. Runoff will be directed southwesterly to Hackberry Hill Street then routed northwesterly via curb/gutter in Hackberry Hill Street to Design Point 6 where it will be collected by a Type R inlet. Flowby continues northwesterly then northerly to Salt Spring Way. For more detailed information, see the design point discussions. The developed flow from this basin is 3.9cfs and 8.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C3
This basin consists of runoff from residential development, Whiskey Hill Lane, Shuksan Lane and Salt Spring Way. Runoff will be directed to the previously mentioned streets, and then routed northwesterly via curb/gutter in Salt Spring Way to Design Point 7 where it will be collected by a Type R inlet. For

more detailed information, see the design point discussions. The developed flow from this basin is 7.2cfs and 15.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C4

This basin consists of runoff from residential development and Salt Spring Way. Runoff will be directed southwesterly to Salt Spring Way then routed northwesterly via curb/gutter in Salt Spring Way, then northerly to Design Point 10 in Elk Hills Drive where it will be collected by a sump Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 4.8cfs and 10.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C5

This basin consists of runoff from residential development and Lorson Boulevard. Runoff will be directed northwesterly to Lorson Boulevard, then westerly in Lorson Boulevard in curb/gutter where it will be collected by an existing 10' Type R inlet near Walleye Dr. For more detailed information, see the design point discussions. The developed flow from this basin is 3.2cfs and 7.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C6

This basin consists of runoff from residential development and Lorson Boulevard. Runoff will be directed northwesterly to Lorson Boulevard, then westerly in Lorson Boulevard to Elk Hills Drive, then south to Design Point 10 in curb/gutter where it will be collected by a Type R sump inlet. Runoff from this inlet is routed via the storm drain system to the existing pond C1 in The Hills at Lorson Ranch. For more detailed information, see the design point discussions. The developed flow from this basin is 5.3cfs and 11.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D1.1

This basin consists of runoff from residential development and Crafton Court. Runoff will be directed to Crafton Court, then routed north via curb/gutter in Crafton Court to Design Point 13 and will be collected by a Type R sump inlet. Runoff from this inlet is routed via the storm drain system to the existing pond D2 in Lorson Ranch East Filing No. 1. For more detailed information, see the design point discussions. The developed flow from this basin is 3.8cfs and 8.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D1.2

This basin consists of runoff from residential development and Keynot Court. Runoff will be directed to Keynot Court, then routed north via curb/gutter in Keynot Court to Design Point 14 and will be collected by a Type R sump inlet. Runoff from this inlet is routed via the storm drain system to the existing pond D2 in Lorson Ranch East Filing No. 1. For more detailed information, see the design point discussions. The developed flow from this basin is 6.2cfs and 13.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D1.3

This basin consists of runoff from a small portion of residential development, a portion of the westerly side of Elks Hills Drive, and the south side of Lorson Boulevard. Runoff will be directed northerly, then westerly via curb/gutter in Elks Hills Drive and Lorson Boulevard towards Design Point 47c and will be collected by an existing 10' Type R inlet. Runoff from this inlet is routed via the storm drain system to the existing pond D2 in Lorson Ranch East Filing No. 1. For more detailed information, see the design point discussions. The developed flow from this 0.88 acre basin is 3.2cfs and 5.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D1.4

This offsite is included for information only and consists of runoff from the north side of Lorson Blvd, backyard runoff from The Hills at Lorson Ranch, and open space runoff. Runoff will be directed southerly, then westerly via curb/gutter in Lorson Boulevard towards Design Point 47d and will be

collected by an existing 10' Type R inlet. Runoff from this inlet is routed via the storm drain system to the existing pond D2 in Lorson Ranch East Filing No. 1. The developed flow from this 1.92 acre basin is 3.5cfs and 7.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin D1.5

This basin consists of runoff from the south side of Lorson Blvd, backyard runoff, and open space runoff under the electric transmission line. Runoff will be directed northerly, then westerly via curb/gutter in Lorson Boulevard towards Design Point 12 and will be collected by an existing 10' Type R inlet in Lorson Boulevard. Runoff from this inlet is routed via the storm drain system to the existing pond D2 in Lorson Ranch East Filing No. 1. The developed flow from this basin is 2.6cfs and 9.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin OS-E1.1

This existing offsite basin consists of existing flow from the Peaceful Valley Lake Estates subdivision located to the south of the Hillside at Lorson Ranch site. Runoff is directed overland northwesterly, flow then continues through basin E1.3 to Sawtooth Ridge Way. Flow is routed west via curb/gutter in Sawtooth Ridge Way to Design Point 16 and will be collected by a Type R at-grade inlet. For more detailed information, see the design point discussions. The developed flow from this offsite basin is 2.0cfs and 13.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.2

This basin consists of runoff from residential development, Hackberry Hill Street, Yamsay Way, and Sawtooth Ridge Way. Runoff will be directed to the interior streets southerly, then westerly via curb/gutter to Design Point 15 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 4.7cfs and 10.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.3

This basin consists of runoff from large lot residential lots and Sawtooth Ridge Way. Runoff will be directed northwesterly to Sawtooth Ridge Way, then westerly via curb/gutter to Design Point 16 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this 6.39 acre basin is 3.1cfs and 14.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E1.4

This basin consists of runoff from residential development and Sawtooth Ridge Way. Runoff will be directed to Sawtooth Ridge Way, then westerly via curb/gutter in Sawtooth Ridge Way to Design Point 17 and will be collected by a Type R sump inlet. Runoff from this inlet is routed via the storm drain system to existing pond E1. For more detailed information, see the design point discussions. The developed flow from this basin is 1.1cfs and 5.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin OS-E2.1

This existing offsite basin consists of existing flow from the Peaceful Valley Lake Estates subdivision located to the south of the Hillside at Lorson Ranch site. Runoff is routed northwesterly via overland and swale flow through basin E2.2 to design point 18. For more detailed information, see the design point discussions. The flow from this 21.39 offsite acre basin is 13.0cfs and 46.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E2.2

This basin consists of runoff from large lot residential lots located to the south and west of Sawtooth Ridge Way. Runoff is routed northwesterly via overland flow to design point 18, then continues to an existing double type D inlet in Lorson Ranch East Filing 4, adjacent to Trappe Drive. For more detailed information, see the design point discussions. The developed flow from this basin is 4.2cfs and 15.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E3
This basin consists of runoff from residential development, Yamsay Way, Hocking Trail and Sawtooth Ridge Way. Runoff will be directed to the interior streets easterly, westerly, and southerly, then flow continues westerly in Sawtooth Ridge Way via curb/gutter through basin E4 to Design Point 19 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 6.9cfs and 15.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E4
This basin consists of runoff from residential development, Salt Springs Way and Sawtooth Ridge Way. Runoff will be directed to the interior streets easterly, westerly, and southerly, then flow continues westerly in Sawtooth Ridge Way via curb/gutter to Design Point 19 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 3.0cfs and 6.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E5
This basin consists of runoff from residential development, Whiskey Hill Lane, Shuksan Lane and Sawtooth Ridge Way. Runoff will be directed to the interior streets easterly, westerly, and southerly, then flow continues westerly in Sawtooth Ridge Way via curb/gutter to Design Point 20 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 12.0cfs and 26.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E6
This basin consists of runoff from residential development, Sawtooth Ridge Way and Beacon Butte Place. Runoff will be directed to the interior streets, westerly and southerly, then flow continues westerly in Sawtooth Ridge Way, then northerly in Beacon Butte Place via curb/gutter to Design Point 23 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 2.8cfs and 6.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E7
This basin consists of runoff from residential development, Sperry Terrace and Trappe Drive. Runoff will be directed to the interior streets southwesterly, and northwesterly, then flow continues southerly in Sperry Terrace, then westerly in Trappe Drive via curb/gutter to Design Point 25 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 9.1cfs and 20.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E8
This basin consists of runoff from residential development, Sperry Terrace, Elk Hills Drive and Trappe Drive. Runoff will be directed to the interior streets southwesterly, and southeasterly, then flow continues southerly in Sperry Terrace and Elk Hills Drive, then westerly in Trappe Drive via curb/gutter to Design Point 26 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 8.1cfs and 17.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E9
This basin consists of runoff from residential development and Trappe Drive. Runoff will be directed northwesterly to Trappe Drive, then westerly in Trappe Drive via curb/gutter to Design Point 28 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 2.5cfs and 5.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E10
This basin consists of runoff from residential development Crafton Court and Trappe Drive. Runoff will be directed to the interior streets southwesterly, and southeasterly, then flow continues southerly in Crafton Court, then westerly in Trappe Drive via curb/gutter to Design Point 29 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 7.2cfs and 16.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E11
This basin consists of runoff from residential development, Beacon Butte Terrace and Trappe Drive. Runoff will be directed to Beacon Butte Terrace and northwesterly to Trappe Drive, then routed westerly in Trappe Drive via curb/gutter to Design Point 32 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 5.2cfs and 11.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E12
This basin consists of runoff from residential development, Keynot Court and Trappe Drive. Runoff will be directed to the interior streets then flow continues southerly in Keynot Court, then westerly in Trappe Drive via curb/gutter to Design Point 34 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 7.3cfs and 16.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E13
This basin consists of runoff from residential development and Trappe Drive. Runoff will be directed northwesterly to Trappe Drive, then routed southwesterly in Trappe Drive via curb/gutter to Design Point 36 and will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 1.4cfs and 3.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E14
This basin consists of runoff from residential development, Keynot Court and Long Ridge Court. Runoff will be directed southeasterly to Keynot Court, southwesterly and northwesterly to Longridge Court, flows are routed southerly in Keynot Court and westerly in Long Ridge Court via curb/gutter to Design Point 39 and will be collected by a Type R sump inlet. Runoff from this inlet is routed via the storm drain system to existing pond E1. For more detailed information, see the design point discussions. The developed flow from this basin is 4.7cfs and 10.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E15
This basin consists of runoff from a small portion of residential development, open space and pond E1. Runoff is routed overland via sheet flow to pond E1. For more detailed information, see the design point discussions. The developed flow from this basin is 3.9cfs and 16.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin E16
This basin consists of runoff from Trappe Drive. Runoff is routed southerly and westerly in Trappe Drive via curb/gutter to Basin E1.4 (Lorson Ranch East Fil. 4) and collected by an existing 15' type R inlet in Lorson Ranch East Filing No 4. This runoff flows to existing full spectrum/WQ Pond E2 constructed as part of Lorson Ranch East Filing No. 4. The developed flow from this basin is 3.5cfs and 6.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin F
This basin consists of runoff from a small portion of residential development and runoff reduction area open space, and a ROW tract for future Meridian Road. Runoff is routed easterly and southerly

overland via sheet flow to the east boundary line of Lorson Ranch. For more detailed information, see the design point discussions. The developed flow from this basin is 8.0cfs and 15.9cfs for the 5/100-year storm event. See the appendix for detailed calculations. The future Meridian Road drains east to Upper Williams Creek and water quality for the future road will be determined by that project.

Basin G1
This basin consists of runoff from residential development, Lorson Boulevard, Hackberry Hill Street and Tin Mountain Trail. Runoff will be directed to the interior streets, then routed westerly in Lorson Boulevard and Hackberry Hill Street, and southerly in Tin Mountain Trail via curb/gutter to Design Point 41 where it will be collected by a Type R inlet. For more detailed information, see the design point discussions. The developed flow from this basin is 7.9cfs and 17.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin G2
This basin consists of runoff from large residential lots. Runoff will be directed southerly overland via sheet flow across a runoff reduction area before sheet flowing into Peaceful Valley Lake Estates subdivision as in existing conditions. For more detailed information, see the design point discussions. The developed flow from this basin is 2.4cfs and 11.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin H1
This basin consists of runoff from large residential lots. Runoff will be directed southerly overland via sheet flow to an existing drainage swale located in Peaceful Valley Estates subdivision. Runoff from Pond H will be outletted via storm drain system to a proposed concrete spreader channel, these flows will then continue to the previously mentioned existing drainage swale. For more detailed information, see the design point discussions. The developed flow from this basin is 4.0cfs and 18.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

See the Developed Conditions Hydrology Calculations in the back of this report and the Developed Conditions Drainage Map (Map Pocket) for the 5-year and 100-year storm event amounts.

5.0 HYDRAULIC SUMMARY

The sizing of the hydraulic structures and detentions ponds were prepared by using the *StormSewers* and *Hydrographs* computer software programs developed by Intellisolve, which conforms to the methods outlined in the "City of Colorado Springs/El Paso County Drainage Criteria Manual". Street capacities and Inlets were sized by Denver Urban Drainage's xcel spreadsheet UD-Inlet.

It is the intent of this drainage report to use the proposed curb/gutter and storm sewer in the streets to convey runoff to detention and water quality ponds then to the East Tributary of Jimmy Camp Creek. Inlet size and location are preliminary only as shown on the storm sewer layout in the appendix. See Appendix C for detailed hydraulic calculations and the storm sewer model.

Table 1: Street Capacities (100-year capacity is only ½ of street)

	Residential Local		Residential Collector		Principal Arterial	
Street Slope	5-year	100-year	5-year	100-year	5-year	100-year
0.5%	6.3	26.4	9.7	29.3	9.5	28.5
0.6%	6.9	28.9	10.6	32.1	10.4	31.2
0.7%	7.5	31.2	11.5	34.6	11.2	33.7
0.8%	8.0	33.4	12.3	37.0	12.0	36.0
0.9%	8.5	35.4	13.0	39.3	12.7	38.2
1.0%	9.0	37.3	13.7	41.4	13.4	40.2
1.4%	10.5	44.1	16.2	49.0	15.9	47.6

1.8%	12.0	45.4	18.4	50.4	18.0	50.4
2.2%	13.3	42.8	19.4	47.5	19.5	47.5
2.6%	14.4	40.7	18.5	45.1	18.5	45.1
3.0%	15.5	39.0	17.7	43.2	17.8	43.2
3.5%	16.7	37.2	16.9	41.3	17.0	41.3
4.0%	17.9	35.7	16.2	39.7	16.3	39.7
4.5%	19.0	34.5	15.7	38.3	15.7	38.3
5.0%	19.9	33.4	15.2	37.1	15.2	37.1

Note: all flows are in cfs (cubic feet per second)

Design Point 1

Design Point 1 is located in the NE corner of a knuckle in Wahluke Dr and it the total street flow from the east from Basins B1 and B2. The total street flow is 8.9cfs/19.5cfs in the 5/100-year storm events for this basin.

Design Point 2

Design Point 2 is located at the NE corner of a knuckle in Wahluke Drive and accepts flows from Basins B1-B3 and bypass flow from Design Point 41.

(5-year storm)

Tributary Basins: B1+B2+B3 **Inlet/MH Number:** Inlet DP2
Upstream flowby: 0.1cfs from Des. Pt 41 **Total Street Flow:** 11.3cfs

Flow Intercepted: 11.3cfs **Flow Bypassed:** 0
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 12.0cfs, okay

(100-year storm)

Tributary Basins: B1+B2+B3 **Inlet/MH Number:** Inlet DP2
Upstream flowby: 4.3cfs from Des. Pt 41 **Total Street Flow:** 29.0cfs

Flow Intercepted: 25.4cfs **Flow Bypassed:** 3.6cfs to Des.Pt 4
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 45.4cfs (half street) is okay

Design Point 3

Design Point 3 is the storm sewer pipe flow in Wahluke Drive. The total pipe flow is 11.3cfs/25.4cfs in the 5/100-year storm events in the storm sewer.

Design Point 4

Design Point 4 is located at the SE corner of a knuckle in Wahluke Drive and accepts flows from Basin B4 and bypass flow from Design Point 2.

(5-year storm)

Tributary Basins: B4 **Inlet/MH Number:** Inlet DP2
Upstream flowby: 0 **Total Street Flow:** 4.3cfs

Flow Intercepted: 4.3cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 12.0cfs, okay

(100-year storm)

Tributary Basins: B4 **Inlet/MH Number:** Inlet DP2
Upstream flowby: 3.6cfs from Des. Pt 2 **Total Street Flow:** 13.1cfs

Flow Intercepted: 13.1cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.8%, capacity = 45.4cfs (half street) is okay

Design Point 5

Design Point 5 is the storm sewer pipe flow to Pond H. The total pipe flow is 15.6cfs/38.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 5a

Design Point 5a is the total developed outflow from Pond H calculated using the Full Spectrum EDB Xcel design spreadsheet. The total outflow is 1.5cfs/13.1cfs in the 5/100-year storm events in the 18" storm sewer pipe. Equation GB-1 from the Grass Buffer worksheet determines the length of the spreader (W=Q/.05) required to convert point discharges into sheet flow to reduce the erosion potential. For a flow of 13.1cfs, the length of the spreader from the storm sewer outfall is required to be 262' long with 1.5" wide openings every 2' along the curb spreader. The curb spreader will be 4' wide with 8" tall curbs. In addition to the curb spreader, the flows will drain and additional 25' overland before exiting the Lorson Ranch property. Also included is a Type 1 distribution MH located in the middle of the spreader channel which is designed to distribute the flows evenly to both sides of the spreader channel. The Type 1 distribution MH has two 6" high x 36" wide openings on the sides that discharge 13.1cfs into the 4' wide concrete spreader channel. Because the pond is located upstream of residential lots to the south, we have included a Type R emergency overflow structure connected to a 24" storm sewer designed to capture the incoming 100-yr developed pond flows (22.5cfs from xcel spreadsheet pond inflow) before flowing over the emergency overflow weir. Even though the 100-year pond inflow from Design Point 5 (38.5cfs) and from the xcel full spectrum spreadsheets (22.5cfs) differ, the Type R overflow weir is able to accommodate either flow. The Type R emergency overflow structure is 10' wide with a 14" high throat opening. The Type R throat opening elevation is above the 100-yr WSEL of the pond of 5810.35 and will flow at a depth of 0.77' deep for 22.5cfs and 1.10' deep for 38.5cfs. The Distribution MH is capable of discharging 22.5cfs through the side openings at a depth of 2.65' inside the manhole. The pond emergency overflow is a standard trapezoid weir with an invert elevation of 5811.90.

Design Point 5b

Design Point 5b is the total developed sheet flow from Pond H and Basin H1 that exits Lorson Ranch on the south property line. The total outflow is (1.5+4.0) = 5.5cfs in the 5-year storm event and

(13.1+18.7) = 31.8cfs in the 100-year storm event flowing offsite to the south. The developed flow matches the existing flow (Ex. Basin H) of 5.5cfs/31.8cfs in the 5/100-year storm events. By using the spreader channel the runoff exiting Lorson Ranch mimics existing conditions.

Design Point 6
Design Point 6 is located on the north side of Hackberry Hill Street east of Salt Spring Way

(5-year storm)
Tributary Basins: C1,C2 **Inlet/MH Number:** Inlet DP6
Upstream flowby: **Total Street Flow:** 5.9cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1%, capacity = 9.0cfs, okay

(100-year storm)
Tributary Basins: C1,C2 **Inlet/MH Number:** Inlet DP6
Upstream flowby: **Total Street Flow:** 12.9cfs

Flow Intercepted: 10.9cfs **Flow Bypassed:** 2.0cfs to Inlet DP10
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1%, capacity = 37.3cfs (half street) is okay

Design Point 6a
Design Point 6a is the pipe flow into the existing 24" storm sewer stub from Lorson Blvd constructed as part of The Ridge at Lorson Ranch . The total storm sewer flow is 5.9cfs in the 5-year storm event and 10.9cfs in the 100-year storm event flowing from the south. The allowable flow in the existing 24" storm sewer is 12.8cfs/28.3cfs in the 5/100-year storm events.

Design Point 7
Design Point 7 is located on the south side of Salt Spring Way west of Sperry Terrace

(5-year storm)
Tributary Basins: C3 **Inlet/MH Number:** Inlet DP7
Upstream flowby: **Total Street Flow:** 7.2cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.6%, capacity = 16.7cfs, okay

(100-year storm)
Tributary Basins: C3 **Inlet/MH Number:** Inlet DP7
Upstream flowby: **Total Street Flow:** 15.9cfs

Flow Intercepted: 12.5cfs **Flow Bypassed:** 3.4cfs to Des. Pt. 8
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.6%, capacity = 37.2cfs (half street) is okay

Design Point 8

Design Point 8 is the total developed flow on the east side of Elk Hills Drive from the south. Flow is from Basin C4 and flowby from Design Point 6 and 7. The total flow from the south is (0+0+4.8) = 4.8cfs in the 5-year storm event and (2+3.4+10.5) = 15.9cfs in the 100-year storm event flowing from the south. The street capacity at 1% is okay for minor and major storm events.

(5-year storm)

Tributary Basins: C4 **Inlet/MH Number:** Inlet DP8
Upstream flowby: **Total Street Flow:** 4.8cfs

Flow Intercepted: 2.8cfs **Flow Bypassed:** 2.0cfs to Des.Pt.10
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 1.%, capacity = 9.0cfs, okay

(100-year storm)

Tributary Basins: C4 **Inlet/MH Number:** Inlet DP8
Upstream flowby: 5.4cfs from Des. Pt 6/7 **Total Street Flow:** 15.9cfs

Flow Intercepted: 4.7cfs **Flow Bypassed:** 11.2cfs to Des.Pt 10
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 1.%, capacity = 37.3cfs (half street) is okay

Design Point 9

Design Point 9 is the total developed flow on the east side of Elk Hills Drive from Lorson Blvd. Flow is from Basin C6 and flowby from Design Point 9a. The total flow from Lorson Blvd is (0+5.3) = 5.3cfs in the 5-year storm event and (1.1+11.6) = 12.7cfs in the 100-year storm event flowing from Lorson Blvd. The street capacity at 1% is okay for minor and major storm events.

Design Point 9a (existing inlet)

Design Point 9a is located in the SE corner of Lorson Blvd and Walleye Drive at an existing 10' type R inlet

(5-year storm)

Tributary Basins: C5 **Inlet/MH Number:** existing 10' inlet
Upstream flowby: **Total Street Flow:** 3.2cfs

Flow Intercepted: 3.2cfs **Flow Bypassed:**
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1%, capacity = 9.0cfs, okay

(100-year storm)

Tributary Basins: C5 **Inlet/MH Number:** existing 10' inlet
Upstream flowby: **Total Street Flow:** 7.0cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:** 1.1cfs to Des. Pt 9
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1%, capacity = 37.3cfs (half street) is okay

Design Point 10

Design Point 10 is located at the SE corner of Salt Spring Way and Lorson Blvd and accepts flows from Design Point 8 and 9.

(5-year storm)

Tributary Basins: **Inlet/MH Number:** Inlet DP10
Upstream flowby: 2.0cfs from des.pt.8 **Total Street Flow:** 7.3cfs

Flow Intercepted: 7.3cfs **Flow Bypassed:** 0
Inlet Size: 30' type R, sump

(100-year storm)

Tributary Basins: **Inlet/MH Number:** Inlet DP10
Upstream flowby: 11.2cfs from des.pt.8 **Total Street Flow:** 23.9cfs

Flow Intercepted: 23.9cfs **Flow Bypassed:** 0
Inlet Size: 30' type R, sump

Notes: Should this inlet become plugged, runoff will flow west in Lorson Boulevard.

Design Point 10 (pipe flow)

Design Point 10 (pipe flow) is the total flow from Inlet DP8 and DP10 since they are connected by an 18" storm sewer. The total pipe flow is (2.8+7.3) 10.1cfs in the 5-yr storm event and (4.7+23.9) 28.6cfs in the 100-yr storm event.

Design Point 11

Design Point 11 is the pipe flowing into the existing 30" storm sewer stub from Lorson Blvd constructed as part of The Hills at Lorson Ranch. Flow is from Basins C3, C4, C6 from the xcel spreadsheet and runby from Design Point 6 and Design Point 9a. The total storm sewer flow is (0+0+15.7) = 15.7cfs in the 5-year storm event and (2+1.1+34.5) = 37.6cfs in the 100-year storm event flowing from the south. The allowable flow in the existing 30" storm sewer is 14.3cfs/38.0cfs in the 5/100-year storm events. The 5-year storm is slightly above allowable but the HGL is still below the top of pipe and will not adversely affect downstream pipe flow.

Design Point 12

Design Point 12 is located on Lorson Blvd at an existing 10' Type R inlet constructed as part of The Hills at Lorson Ranch. The inlet was sized to accept 2.6cfs/9.0cfs in the 5/100-year storm events from upstream overland flow and Lorson Blvd. The flow at this design point is from Basin D1.5 and is 2.6cfs/9.9cfs in the 5/100-year storm events. The existing inlet has capacity for this basin.

Design Point 13

Design Point 13 is located at the north end of Crafton Court in a cul-de-sac. The inlet connects to an existing 18" storm sewer with a capacity of 4.6cfs/10.1cfs in the 5/100-year storm events per The Hills fdr.

(5-year storm)

Tributary Basins: D1.1 **Inlet/MH Number:** Inlet DP13
Upstream flowby: 0 **Total Street Flow:** 3.8cfs

Flow Intercepted: 3.8cfs **Flow Bypassed:** 0
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 1%, capacity = 9.0cfs (half street) is okay

(100-year storm)

Tributary Basins: D1.1 **Inlet/MH Number:** Inlet DP13
Upstream flowby: **Total Street Flow:** 8.4cfs

Flow Intercepted: 8.4cfs **Flow Bypassed:** 0
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 1%, capacity = 37.3cfs (half street) is okay
The emergency overflow for this inlet is overland to the northwest to Lorson Boulevard

Design Point 14

Design Point 14 is located at the north end of Keynot Court in a cul-de-sac. The inlet connects to an existing 18" storm sewer with a capacity of 5.9cfs/13.0cfs in the 5/100-year storm events per The Hills fdr. The 5-yr HGL of the storm sewer is 6" below top of pipe and the 100-yr HGL is 3' below finished grade and the pipe has excess capacity for the additional flow.

(5-year storm)

Tributary Basins: D1.2 **Inlet/MH Number:** Inlet DP14
Upstream flowby: 0 **Total Street Flow:** 6.2cfs

Flow Intercepted: 6.2cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1%, capacity = 9.0cfs (half street) is okay

(100-year storm)

Tributary Basins: D1.2 **Inlet/MH Number:** Inlet DP14
Upstream flowby: **Total Street Flow:** 13.8cfs

Flow Intercepted: 13.8cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1%, capacity = 37.3cfs (half street) is okay
The emergency overflow for this inlet is overland to the northwest to Lorson Boulevard

Design Point 15
Design Point 15 is located on the south side of Sawtooth Ridge Way at Shuksan Lane.

(5-year storm)
Tributary Basins: E1.2 **Inlet/MH Number:** Inlet DP15
Upstream flowby: 0 **Total Street Flow:** 4.7cfs

Flow Intercepted: 2.8cfs **Flow Bypassed:** 1.9cfs to Des. Pt 16
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 12.0cfs (half street) is okay

(100-year storm)
Tributary Basins: E1.2 **Inlet/MH Number:** Inlet DP15
Upstream flowby: **Total Street Flow:** 10.4cfs

Flow Intercepted: 4.0cfs **Flow Bypassed:** 6.4cfs to Des. Pt 16
Inlet Size: 5' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 45.4cfs (half street) is okay

Design Point 16
Design Point 16 is located on the south side of Sawtooth Ridge Way at Beacon Butte Place.

(5-year storm)
Tributary Basins: E1.3 + OS-E1.1 **Inlet/MH Number:** Inlet DP16
Upstream flowby: 1.9cfs from Des.Pt.15 **Total Street Flow:** 7.0cfs

Flow Intercepted: 7.0cfs **Flow Bypassed:** 0
Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.3%, capacity = 10.4cfs (half street) is okay

(100-year storm)
Tributary Basins: E1.3 + OS-E1.1 **Inlet/MH Number:** Inlet DP16
Upstream flowby: 6.4cfs from Des.Pt.15 **Total Street Flow:** 34.0cfs

Flow Intercepted: 26.7cfs **Flow Bypassed:** 7.3cfs to Des. Pt 17
Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.3%, capacity = 44.0cfs (half street) is okay

Design Point 17

Design Point 17 is located on the west end of Sawtooth Ridge Way at a cul-de-sac.

(5-year storm)

Tributary Basins: E1.4 **Inlet/MH Number:** Inlet DP17
Upstream flowby: 0 **Total Street Flow:** 1.1cfs

Flow Intercepted: 1.1cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.3%, capacity = 10.4cfs (half street) is okay

(100-year storm)

Tributary Basins: E1.4 **Inlet/MH Number:** Inlet DP17
Upstream flowby: 7.3cfs from Des.Pt.16 **Total Street Flow:** 12.4cfs

Flow Intercepted: 12.4cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1.3%, capacity = 44.0cfs (half street) is okay
The emergency overflow for this inlet is overland to the west to Des. Pt. 18

Design Point 18

Design Point 18 is located southeast of Trappe Drive and Horton Drive. An existing double Type D inlet and swale captures overland runoff from Basin E2.2 and Basin OS-E2.1. The total overland flow at this design point is 21.9cfs/ 77.7cfs in the 5/100-year storm events. The existing inlet and swale was designed with a capacity of 26cfs/91cfs in the 5/100-year storm events per Lorson Ranch East Filing 4 fdr. The reason the flow has decreased from the Lorson Ranch East Filing No. 4 fdr is that Sawtooth Ridge Way diverts a portion of the offsite flow into Pond E1. Water quality for Basin E2.2 is provided in Pond E2 in Creekside South at Lorson Ranch.

Design Point 19

Design Point 19 is located on the north side of Sawtooth Ridge Way at Whiskey Hill Lane.

(5-year storm)

Tributary Basins: E3 + E4 **Inlet/MH Number:** Inlet DP19
Upstream flowby: **Total Street Flow:** 9.1cfs

Flow Intercepted: 8.7cfs **Flow Bypassed:** 0.4cfs to Des. Pt 20
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.7%, capacity = 14.4cfs (half street) is okay

(100-year storm)

Tributary Basins: E3 + E4 **Inlet/MH Number:** Inlet DP19
Upstream flowby: **Total Street Flow:** 20.0cfs

Flow Intercepted: 14.1cfs **Flow Bypassed:** 5.9cfs to Des. Pt 20
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.7%, capacity = 40.7cfs (half street) is okay

Design Point 20
Design Point 20 is located on the north side of Sawtooth Ridge Way at Shuksan Lane.

(5-year storm)
Tributary Basins: E5 **Inlet/MH Number:** Inlet DP20
Upstream flowby: 0.4cfs from Des.Pt.19 **Total Street Flow:** 12.4cfs

Flow Intercepted: 8.0cfs **Flow Bypassed:** 4.4cfs to Des. Pt 23
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 12.5cfs (half street) is okay

(100-year storm)
Tributary Basins: E5 **Inlet/MH Number:** Inlet DP20
Upstream flowby: 5.9cfs from Des.Pt.19 **Total Street Flow:** 32.4cfs

Flow Intercepted: 12.4cfs **Flow Bypassed:** 20.0cfs to Des. Pt 23
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 1.9%, capacity = 45.5cfs (half street) is okay

Design Point 21
Design Point 21 is the storm sewer pipe flow from Design Points 15, 19, and 20 in Sawtooth Ridge Way at Shuksan Lane. The total pipe flow is 19.5cfs/30.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 22
Design Point 22 is the storm sewer pipe flow from Design Points 16 and 21 in Sawtooth Ridge Way at Beacon Butte Place. The total pipe flow is 26.5cfs/57.2cfs in the 5/100-year storm events in the storm sewer.

Design Point 23
Design Point 23 is located on the east side of Beacon Butte Place SE of Trappe Drive

(5-year storm)
Tributary Basins: E6 **Inlet/MH Number:** Inlet DP23
Upstream flowby: 4.4cfs from Des.Pt.20 **Total Street Flow:** 7.2cfs

Flow Intercepted: 7.2cfs **Flow Bypassed:**
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.6%, capacity = 11.0cfs (half street) is okay

(100-year storm)
Tributary Basins: E6 **Inlet/MH Number:** Inlet DP23
Upstream flowby: 20.0cfs from Des.Pt.20 **Total Street Flow:** 26.1cfs

Flow Intercepted: 16.1cfs **Flow Bypassed:** 10.0cfs to Des. Pt 32
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 1.6%, capacity = 44.3cfs (half street) is okay

Design Point 24

Design Point 24 is the storm sewer pipe flow from Design Points 22 and 23 in Beacon Butte Place at Trappe Drive. The total pipe flow is 33.7cfs/73.3cfs in the 5/100-year storm events in the storm sewer.

Design Point 25

Design Point 25 is located on the south side of Trappe Drive at Elk Hills Drive

(5-year storm)

Tributary Basins: E7 **Inlet/MH Number:** Inlet DP25
Upstream flowby: **Total Street Flow:** 9.1cfs

Flow Intercepted: 6.9 cfs **Flow Bypassed:** 2.2cfs to Des. Pt 28
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 18.0cfs (half street) is okay

(100-year storm)

Tributary Basins: E7 **Inlet/MH Number:** Inlet DP25
Upstream flowby: **Total Street Flow:** 20.1cfs

Flow Intercepted: 10.2cfs **Flow Bypassed:** 9.9cfs to Des. Pt 28
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 35.0cfs (half street) is okay

Design Point 26

Design Point 26 is located on the north side of Trappe Drive at Elk Hills Drive

(5-year storm)

Tributary Basins: E8 **Inlet/MH Number:** Inlet DP26
Upstream flowby: **Total Street Flow:** 8.1cfs

Flow Intercepted: 8.0cfs **Flow Bypassed:** 0.1cfs to Des. Pt 29
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 18.0cfs (half street) is okay

(100-year storm)

Tributary Basins: E8 **Inlet/MH Number:** Inlet DP26
Upstream flowby: **Total Street Flow:** 17.8cfs

Flow Intercepted: 13.3cfs **Flow Bypassed:** 4.5cfs to Des. Pt 29
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 35.0cfs (half street) is okay

Design Point 27
Design Point 27 is the storm sewer pipe flow from Design Points 25 and 26 in Trappe Drive at Elk Hills Drive. The total pipe flow is 14.9cfs/23.5cfs in the 5/100-year storm events in the storm sewer.

Design Point 28
Design Point 28 is located on the south side of Trappe Drive at Keynot Court.

(5-year storm)
Tributary Basins: E9 **Inlet/MH Number:** Inlet DP28
Upstream flowby: 2.2cfs from Des.Pt.25 **Total Street Flow:** 4.7cfs

Flow Intercepted: 4.5cfs **Flow Bypassed:** 0.2cfs to Des. Pt 32
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 18.0cfs (half street) is okay

(100-year storm)
Tributary Basins: E9 **Inlet/MH Number:** Inlet DP28
Upstream flowby: 9.9cfs from Des.Pt.25 **Total Street Flow:** 15.4cfs

Flow Intercepted: 9.0cfs **Flow Bypassed:** 6.4cfs to Des. Pt 32
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 35.0cfs (half street) is okay

Design Point 29
Design Point 29 is located on the north side of Trappe Drive at Keynot Court.

(5-year storm)
Tributary Basins: E10 **Inlet/MH Number:** Inlet DP29
Upstream flowby: 0.1cfs from Des.Pt.26 **Total Street Flow:** 7.3cfs

Flow Intercepted: 7.3cfs **Flow Bypassed:** 0cfs to Des. Pt 34
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.8%, capacity = 16.7cfs (half street) is okay

(100-year storm)
Tributary Basins: E10 **Inlet/MH Number:** Inlet DP29
Upstream flowby: 4.5cfs from Des.Pt.26 **Total Street Flow:** 20.5cfs

Flow Intercepted: 14.4cfs **Flow Bypassed:** 6.1cfs to Des. Pt 34
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 3.8%, capacity = 37.2cfs (half street) is okay

Design Point 30
Design Point 30 is the storm sewer pipe flow from Design Points 27, 28, and 29 in Trappe Drive at Keynot Court. The total pipe flow is 26.7cfs/46.9cfs in the 5/100-year storm events in the storm sewer.

Design Point 31
Design Point 31 is the storm sewer pipe flow from Design Points 24 and 30 in Trappe Drive at Beacon Butte Place. The total pipe flow is 60.4cfs/120.2cfs in the 5/100-year storm events in the storm sewer.

Design Point 32
Design Point 32 is located on the south side of Trappe Drive at the electric powerlines

(5-year storm)
Tributary Basins: E11 **Inlet/MH Number:** Inlet DP32
Upstream flowby: 0.2cfs from Des.Pt.23 & 28 **Total Street Flow:** 5.4cfs

Flow Intercepted: 5.4cfs **Flow Bypassed:** 0
Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 10.6cfs (half street) is okay

(100-year storm)
Tributary Basins: E11 **Inlet/MH Number:** Inlet DP32
Upstream flowby: 16.4cfs from Des.Pt.23 & 28 **Total Street Flow:** 27.9cfs

Flow Intercepted: 23.9cfs **Flow Bypassed:** 4.0cfs to Des.Pt.36
Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 44.2cfs (half street) is okay

Design Point 33
Design Point 33 is the storm sewer pipe flow from Design Points 31 and 32 in Trappe Drive at the electric lines. The total pipe flow is 65.8cfs/144.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 34
Design Point 34 is located on the north side of Trappe Drive west of Beacon Butte Place.

(5-year storm)
Tributary Basins: E12 **Inlet/MH Number:** Inlet DP34
Upstream flowby: 0 **Total Street Flow:** 7.3cfs

Flow Intercepted: 7.3cfs **Flow Bypassed:** 0
Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 10.6cfs (half street) is okay

(100-year storm)
Tributary Basins: E12 **Inlet/MH Number:** Inlet DP34
Upstream flowby: 6.1cfs from Des. Pt. 29 **Total Street Flow:** 22.2cfs

Flow Intercepted: 20.6cfs **Flow Bypassed:** 1.6cfs to LRE4 in Trappe
Inlet Size: 25' type R, on-grade

Street Capacity: Street slope = 1.5%, capacity = 44.2cfs (half street) is okay

Design Point 35

Design Point 35 is the storm sewer pipe flow from Design Point 33 and 34. The 100-year flow has been adjusted for time of concentration. See xcel spreadsheet for design point. The total pipe flow is 73.1cfs/157.9cfs in the 5/100-year storm events in the storm sewer.

Design Point 36

Design Point 36 is located on the south side of Trappe Drive at the electric powerlines

(5-year storm)

Tributary Basins: E13 **Inlet/MH Number:** Inlet DP36
Upstream flowby: 0 **Total Street Flow:** 1.4cfs

Flow Intercepted: 1.4cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 18.0cfs (half street) is okay

(100-year storm)

Tributary Basins: E13 **Inlet/MH Number:** Inlet DP36
Upstream flowby: 4.0cfs from Des.Pt.32 **Total Street Flow:** 7.2cfs

Flow Intercepted: 6.0cfs **Flow Bypassed:** 1.2cfs to LRE4 in Trappe
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 4.3%, capacity = 35.0cfs (half street) is okay

Design Point 37

Design Point 37 is the storm sewer pipe flow from Design Points 17 and 36 in Trappe Drive at the electric lines. The total pipe flow is 2.5cfs/18.4cfs in the 5/100-year storm events in the storm sewer.

Design Point 38

Design Point 38 is the storm sewer pipe flow into Pond E1 (from the south) from Basins OS-E1.1, E1.2-E1.4, E3–E13 taken from the xcel spreadsheet which accounts for the time of concentrations. The total pipe flow is 75.6cfs/164.2cfs in the 5/100-year storm events in the storm sewer.

Design Point 39
Design Point 39 is located at the west end of Long Ridge Court in a cul-de-sac.

(5-year storm)
Tributary Basins: E14 **Inlet/MH Number:** Inlet DP39
Upstream flowby: 0 **Total Street Flow:** 4.7cfs

Flow Intercepted: 4.7cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1%, capacity = 9.0cfs (half street) is okay

(100-year storm)
Tributary Basins: E14 **Inlet/MH Number:** Inlet DP39
Upstream flowby: **Total Street Flow:** 10.3cfs

Flow Intercepted: 10.3cfs **Flow Bypassed:** 0
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 1%, capacity = 37.3cfs (half street) is okay

Design Point 40
Design Point 40 is pond outflow for Pond E1 calculated at 9.6cfs/36.3cfs in the 5/100-year storm events by the xcel spreadsheet for extended detention basins including water quality. The pond outlet structure connects to an existing 24" storm sewer constructed as part of Lorson Ranch East Filing No. 4 and the allowable storm sewer capacity is 12.8cfs/36.3cfs in the 5/100-year storm events

Design Point 40a
Design Point 40a is the runoff in Trappe Drive and is 3.5cfs/6.3cfs in the 5/100-year storm events. This basin area was included in the final drainage report for Lorson Ranch East Filing No. 4 and the detention/WQ was included in Pond E2 constructed as part of Lorson Ranch East Filing No. 4.

Design Point 41
Design Point 41 is located on the east side of Tin Mountain Trail north of Wahluke Drive.

(5-year storm)
Tributary Basins: G1 **Inlet/MH Number:** Inlet DP41
Upstream flowby: **Total Street Flow:** 7.9cfs

Flow Intercepted: 7.8cfs to Pond G **Flow Bypassed:** 0.1cfs to Des. Pt. 2
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 12.5cfs (half street) is okay

(100-year storm)
Tributary Basins: G1 **Inlet/MH Number:** Inlet DP41
Upstream flowby: **Total Street Flow:** 17.3cfs

Flow Intercepted: 13.0cfs to Pond G **Flow Bypassed:** 4.3cfs to Des. Pt. 2
Inlet Size: 15' type R, on-grade

Street Capacity: Street slope = 2.0%, capacity = 45.5cfs (half street) is okay

Design Point 42
Design Point 42 is the total developed outflow from Pond G calculated using the Full Spectrum EDB Xcel design spreadsheet. The total outflow is 0.7cfs/8.7cfs in the 5/100-year storm events in the 18" storm sewer pipe. Equation GB-1 from the Grass Buffer worksheet determines the length of the spreader (W=Q/.05) required to convert point discharges into sheet flow to reduce the erosion potential. For a flow of 8.7cfs, the length of the spreader from the storm sewer outfall is required to be 175' long with 1.5" wide openings every 2' along the curb spreader. The curb spreader will be 4' wide with 8" tall curbs. The pond emergency overflow is a standard trapezoid weir.

Design Point 43
Design Point 43 is the total developed sheet flow from Pond G and Basin G2 that exits Lorson Ranch on the south property line. The total outflow is (0.7+2.4) = 3.1cfs in the 5-year storm event and (8.7+11.5) = 20.2cfs in the 100-year storm event flowing offsite to the south. The developed flow matches the existing flow (Ex. Basin G) of 3.1cfs/20.2cfs in the 5/100-year storm events. By using the spreader channel the runoff exiting Lorson Ranch mimics existing conditions.

6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for Hillside at Lorson Ranch is required per El Paso County criteria. We have implemented the Full Spectrum approach for detention per the Denver Urban Drainage Districts specifications. Offsite Ponds C1 and D2 which have been previously constructed will be utilized to treat/detain storm runoff for small portions of this site. The three proposed on-site permanent full spectrum ponds will incorporate storm water quality features and comply with the Lorson Ranch East MDDP. The three proposed ponds will treat runoff from the majority of this site and have been sized and include access roads, outlet pipes, overflow structures, and low flow channels. This drainage report provides design information on the outlet structure, trickle channel, and the forebays.

Full Spectrum Pond Construction Requirements
Pond E1 which has been previously graded will be increased in size and the remaining two ponds will be graded with this development (Pond G, Pond H). Each pond will be discussed in this section including what type of structure is proposed. Structures built under the first plat in Hillside will occur in 2022-2023.

Design calculations for all proposed full spectrum ponds are included in this report. Grading of the ponds is shown on the Early Grading plans for Hillside at Lorson Ranch at this time in the Preliminary Plan submittal. The final design of the full spectrum ponds will consist of an outlet structure, storm sewer outfall, concrete low flow channels, sediment forebays, and overflow weirs. Soil borings, embankment, slope, and compaction requirements for detention ponds can be found in the geotechnical report for the Hillside at Lorson Ranch prepared by RMG.

Detention Pond E1
This is an on-site permanent full spectrum detention pond that includes water quality and discharges downstream to a storm sewer system in Trappe Drive. Pond E1 was graded in 2020 as part of Lorson Ranch East and will be made larger with this grading plan. The outlet Structure, low flow channel, forebays, and overflow wall will be built as part of the early grading plan. Pond E1 is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the full spectrum worksheets. The outlet structure is a standard full spectrum extended detention basin structure. The full spectrum print outs are in the appendix of this report. See Design Point 40 for discussion on outflow comparisons between the Lorson Ranch East Filing No. 4 and this final design. See map in appendix for watershed areas.

- Watershed Area: 69.2 acres
- Watershed Imperviousness: 52%
- Hydrologic Soils Group B
- Zone 1 WQCV: 1.226ac-ft, WSEL: 5731.75
- Zone 2 EURV: 3.873ac-ft, WSEL: 5733.72, Top outlet structure set at 5733.72, 6'x6' outlet structure with type C grate
- (5-yr): 4.249ac-ft, WSEL: 5733.96, 9.6cfs
- Zone 3 (100-yr): 8.297ac-ft, WSEL: 5736.21, 36.3cfs
- Pipe Outlet: 24" RCP at 1.0%
- Overflow Spillway: 100' wide bottom, elevation=5736.80
- Micropool Elevation: 5728.10

Detention Pond G

This is an on-site permanent full spectrum detention pond that includes water quality and discharges downstream to the south property line of Lorson Ranch. Pond G will be constructed with this grading plan. Pond G is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the modeled in the full spectrum worksheets. The outlet structure is a standard full spectrum extended detention basin structure and will include an emergency overflow spillway. The full spectrum print outs are in the appendix of this report. See Design Point 43 for discussion on outflow comparisons between the Lorson Ranch East MDDP, existing flows, and this final design. See map in appendix for watershed areas.

- Watershed Area: 4.76 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B
- Zone 1 WQCV: 0.087ac-ft, WSEL: 5838.01
- Zone 2 EURV: 0.283ac-ft, WSEL: 5839.41, Top outlet structure set at 5839.40, 6'x3' outlet structure with type C grate
- (5-yr): 0.286ac-ft, WSEL: 5839.43, 0.7cfs
- Zone 3 (100-yr): 0.354ac-ft, WSEL: 5839.83, 8.7cfs
- Pipe Outlet: 18" RCP at 1.0%
- Overflow Spillway: 10' wide bottom, elevation=5840.00, 4:1 side slopes, flow depth=0.5' 0.5' freeboard
- Micropool Elevation: 5835.77

Detention Pond H

This is an on-site permanent full spectrum detention pond that includes water quality and discharges downstream to the south property line of Lorson Ranch. Pond H will be constructed with this grading plan. Pond H is designed in the UDCF Full Spectrum spreadsheets for Water Quality and EURV volumes. The 5-year and 100-year flow rates meet the Lorson East MDDP and have been modeled in the modeled in the full spectrum worksheets. The outlet structure is a standard full spectrum extended detention basin structure and will include an emergency overflow spillway. The full spectrum print outs are in the appendix of this report. See Design Point 5b for discussion on outflow comparisons between the Lorson Ranch East MDDP, existing flows, and this final design. See map in appendix for watershed areas.

- Watershed Area: 10.41 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B
- Zone 1 WQCV: 0.191ac-ft, WSEL: 5807.35

- Zone 2 EURV: 0.619ac-ft, WSEL: 5809.24, Top outlet structure set at 5809.82, 6'x3' outlet structure with type C grate
- (5-yr): 0.619ac-ft, WSEL: 5809.24, 1.5cfs
- Zone 3 (100-yr): 0.969ac-ft, WSEL: 5810.35, 13.1cfs
- Pipe Outlet: 18" RCP at 1.0%
- Overflow Spillway: 15' wide bottom, elevation=5811.90, 4:1 side slopes, flow depth=0.58' 0.72' freeboard
- Micropool Elevation: 5804.40

Water Quality Design

Water quality will be provided by three offsite existing detention basins and three on-site permanent extended detention basins for the almost all of the PUD area with the exception of Basin H1/Basin G2 which flow south offsite of Lorson Ranch and Basin F which flows east offsite of Lorson Ranch. The "C" basins flow to existing Pond C1 located in The Hills at Lorson Ranch Filing No. 1, the "D" basins flow to existing Pond D2 located in Lorson Ranch East Filing No. 1, and a portion of the "E" basins flow to existing Pond E2 located in Lorson Ranch East Filing No. 4. On-site proposed Ponds E1, H, and G provide on-site detention and WQ for the majority of the proposed areas within this development. See map in appendix for pond areas.

Water Quality for Basin H1 and G2 draining south offsite

Developed runoff from these basins flows south offsite (shallow sheet flow) and does not include a water quality pond. Runoff from these basins is from 2.5-acre lots that are 195' deep. The building envelope is 95' deep and the southern 100 feet of the lot adjacent to Peaceful Valley Lake Estates is in a building setback zone. The Runoff Reduction Method procedure from the Mile High Flood Control District spreadsheet (UD-BMP-V3.07) calculations have been applied to a 100' wide section of each to address water quality provisions for development in these basins (see appendix). The UIA area is 9500sf (100'x95') and the RPA area is 5000sf (100'x50') for a 100' wide section which can then be applied to the remaining lots within the basin. The 50' deep "no-build" area adjacent to Peaceful Valley Lake Estates provides a 100% reduction in the water quality requirements for this basin. Grading within this basin should not channelize flow from backyards and flow should be allowed to pass under any backyard fencing without obstructing or channelizing the overland flow.

Water Quality for Basin F draining east offsite

Developed runoff from this basin flows east offsite (shallow sheet flow) and does not include a water quality pond. Runoff from this basin is from a standard 50'x110' lot with the back 90 feet of the residential lots which flows overland east across a wide open space tract prior to discharging to the east. The Runoff Reduction Method procedure from the Mile High Flood Control District spreadsheet (UD-BMP-V3.07) calculations have been applied to a standard 50' wide lot to address water quality provisions for development in this basin (see appendix). The UIA area is 4500sf (50'x90') and the RPA area is 6250sf (50'x125') per lot which can then be applied to the remaining lots within the basin. The large open space tract provides a 100% reduction in the water quality requirements for this basin. Grading within this basin should not channelize flow from backyards and flow should be allowed to pass under any backyard fencing without obstructing or channelizing the overland flow.

7.0 DRAINAGE AND BRIDGE FEES

Hillside at Lorson Ranch is located within the Jimmy Camp Creek drainage basin which is currently a fee basin in El Paso County and Upper Williams Creek which is an unstudied basin. Current El Paso County regulations require drainage and bridge fees to be paid for platting of land as part of the plat recordation process.

Hillside at Lorson Ranch Filing No. 1 contains 128.328 acres which 85.1acres is in the JCC drainage basin and 43.228acres is in the Upper Williams Creek Drainage Basin. 2023 drainage fees are $23,078, bridge fees are $1,079 per impervious acre per Resolution 22-442 and 23-35 and the Upper Williams Creek Drainage Basin does not have fees. The drainage and bridge fees are calculated when the final plat is submitted and are due at plat recordation. Lorson Ranch intends to use the Bridge Fee credits for the bridge fees and pay drainage fees unless the Jimmy Camp Creek DBPS drainage fee structure is updated by El Paso County. The following table details the drainage fees for this filing:

Table 7.1: 2023 Drainage/Bridge Fees (85.100ac in JCC, 43.228ac in Upper Williams)

Type of Land Use	Total Area (ac)	Imperviousness	Drainage Fee	Bridge Fee	
Residential Area	54.437	51%	$640,711	$29,956	
Large Lots	9.478	11%	$24,060	$1,124	
Open Space, Landscape Tracts, (Tracts A-J)	21.185	2%	$9,778	$457	
Upper Williams	43.228		0	0	
		Total	$674,549	$31,537	

Table 7.2: Public Drainage Facility Costs (non-reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
Rip Rap	150	CY	$50/CY	$7,500
Inlets/Manholes	42	EA	$3000/EA	$126,000
18” Storm	1108	LF	$35	$38,780
24” Storm	2275	LF	$40	$91,000
30” Storm	345	LF	$45	$106,525
36” Storm	185	LF	$55	$10,175
42” Storm	462	LF	$65	$30,030
48” Storm	117	LF	$85	$9,945
54” Storm	171	LF	$100	$17,100
			Subtotal	$346,055
			Eng/Cont (10%)	$34,605
			Total Est. Cost	$380,660

Table 7.3: Lorson Ranch Metro District Drainage Facility Costs (non-reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
Full Spectrum Ponds and Outlet	3	EA	$50,000	$150,000
			Subtotal	$150,000
			Eng/Cont (15%)	$22,500
			Total Est. Cost	$172,500

8.0 FOUR STEP PROCESS

The site has been developed to minimize wherever possible the rate of developed runoff that will leave the site and to provide water quality management for the runoff produced by the site as proposed on the development plan. The following four step process should be considered and incorporated into the storm water collection system and storage facilities where applicable.

Step 1: Employ Runoff Reduction Practices
Hillside at Lorson Ranch has employed several methods of reducing runoff.

- The street configuration was laid out to minimize the length of streets. Many streets are straight and perpendicular resulting in lots with less wasted space.
- There are large open space buffers under the 325' wide electric transmission easement and a "no-build" setback on the south side.
- Construct outlet structures for three Full Spectrum Detention Ponds. The full spectrum detention mimics existing storm discharges and includes water quality.

Step 2: Stabilize Drainageways
East Tributary of Jimmy Camp Creek is a major drainageway located west of this site. In 2014 and in 2018 the East Tributary of JCC was reconstructed and stabilized per county criteria. The design included a natural sand bottom and armored sides.

Step 3: Provide Water Quality Capture Volume
Treatment of the water quality capture volume (WQCV) is required for all new developments Hillside at Lorson Ranch will construct three full spectrum stormwater extended detention basins which include Water Quality Volumes and WQ outlet structures.

Step 4: Consider Need for Industrial and Commercial BMP's
There are no commercial or industrial areas within this site.

9.0 CONCLUSIONS

This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development discussed above are summarized as follows:

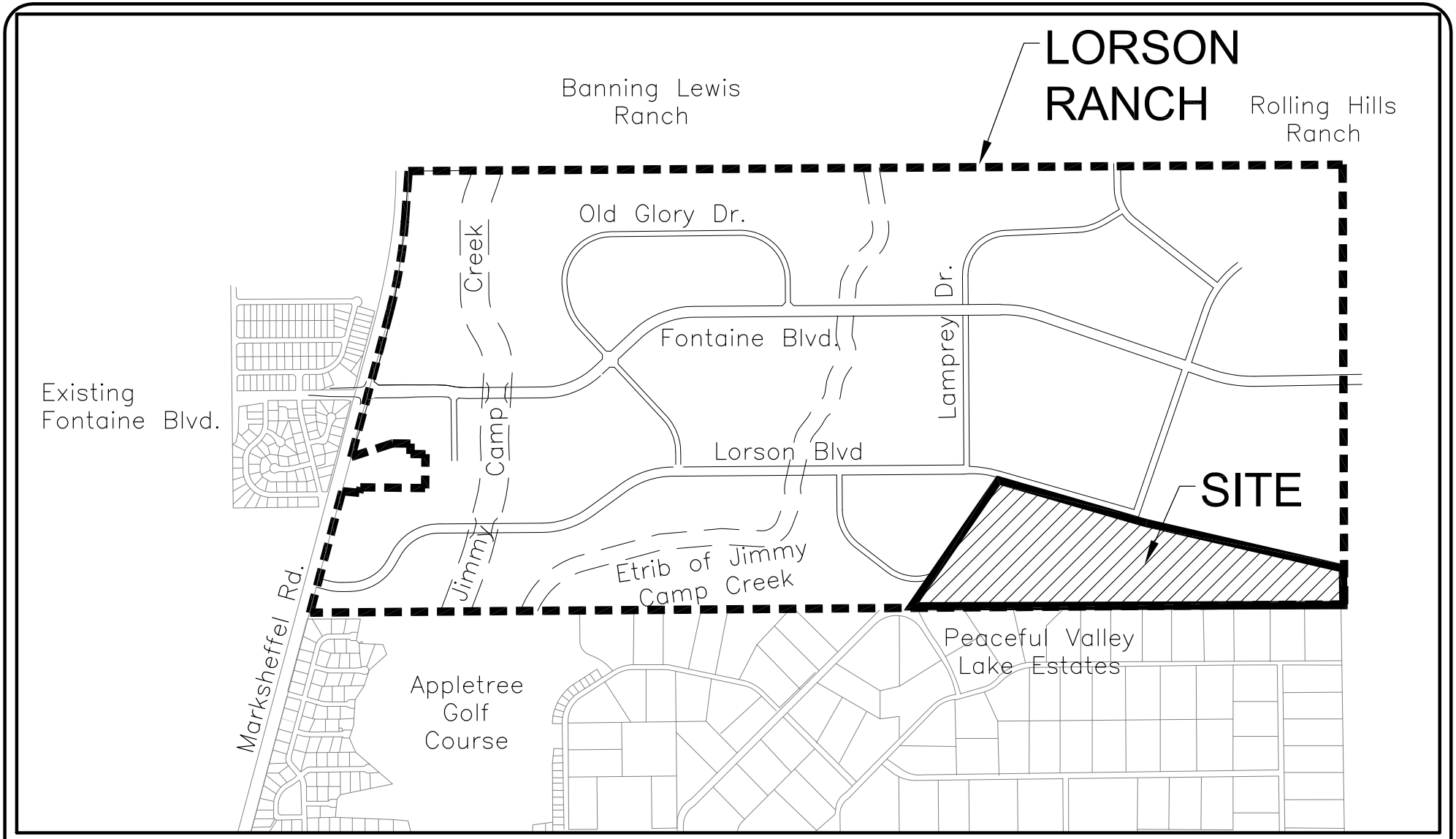
- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- The East Tributary of Jimmy Camp Creek has been reconstructed west of this study area
- Bridges over the East Tributary at Lorson Boulevard and Fontaine Boulevard and have been constructed providing access to this site.

- Detention and water quality for this site area will be provided in permanent ponds
- Existing runoff rates into the Upper Williams Creek Drainage basin have been maintained

10.0 REFERENCES

1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs “Drainage Criteria Manual, Volume 2
5. El Paso County “Engineering Criteria Manual”
6. El Paso County Resolution #15-042, El Paso County adoption of Chapter 6 and Section 3.2.1 of the City of Colorado Springs Drainage Criteria Manual dated May, 2014.
7. Lorson Ranch East MDDP prepared by Core Engineering Group, dated November 27, 2017
8. Final Drainage Report for The Hills at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, Reference CDR 20-007, approved November 25, 2020
9. Final Drainage Report for Lorson Ranch East Filing No. 4 prepared by Core Engineering Group, Reference SF19-008, approved September 12, 2019.
10. Preliminary Drainage Report for The Ridge at Lorson Ranch prepared by Core Engineering Group, Reference PUD/SP 21-006, approved January 11, 2022

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP



N

VICINITY MAP

NO SCALE

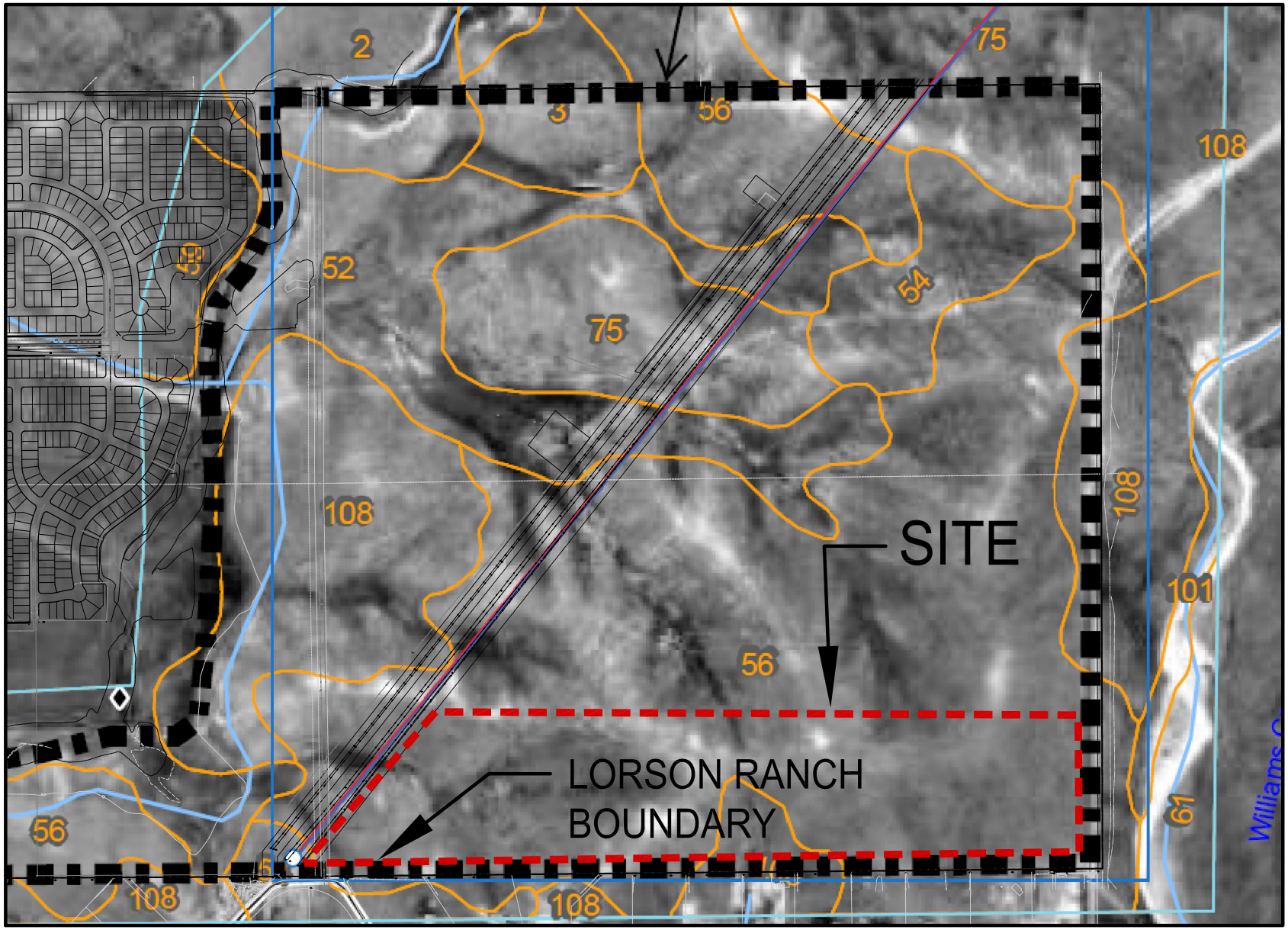
CORE ENGINEERING GROUP

15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100

CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

HILLSIDE AT LORSON RANCH
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	AUGUST 27, 2021	--



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HILLSIDE AT LORSON RANCH
SOILS MAP

SCALE:	DATE:	FIGURE NO.
NTS	JANUARY, 2022	--

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El Paso County Area, Colorado

56—Nelson-Tassel fine sandy loams, 3 to 18 percent slopes

Map Unit Setting

National map unit symbol: 3690
Elevation: 5,600 to 6,400 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Nelson and similar soils: 55 percent
Tassel and similar soils: 40 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nelson

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous residuum weathered from interbedded sedimentary rock

Typical profile

A - 0 to 5 inches: fine sandy loam
Ck - 5 to 23 inches: fine sandy loam
Cr - 23 to 27 inches: weathered bedrock

Properties and qualities

Slope: 3 to 12 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Description of Tassel

Setting

Landform: Hills
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous slope alluvium over residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
C - 4 to 10 inches: fine sandy loam
Cr - 10 to 14 inches: weathered bedrock

Properties and qualities

Slope: 3 to 18 percent
Depth to restrictive feature: 6 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 1.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: R067BY045CO - Shaly Plains
Other vegetative classification: SHALY PLAINS (069AY046CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent
Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021

El Paso County Area, Colorado

108—Wiley silt loam, 3 to 9 percent slopes

Map Unit Setting

National map unit symbol: 367b
Elevation: 5,200 to 6,200 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 135 to 155 days
Farmland classification: Not prime farmland

Map Unit Composition

Wiley and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wiley

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous silty eolian deposits

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 16 inches: silt loam
Bk - 16 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R067BY002CO - Loamy Plains

Other vegetative classification: LOAMY PLAINS (069AY006CO)
Hydric soil rating: No

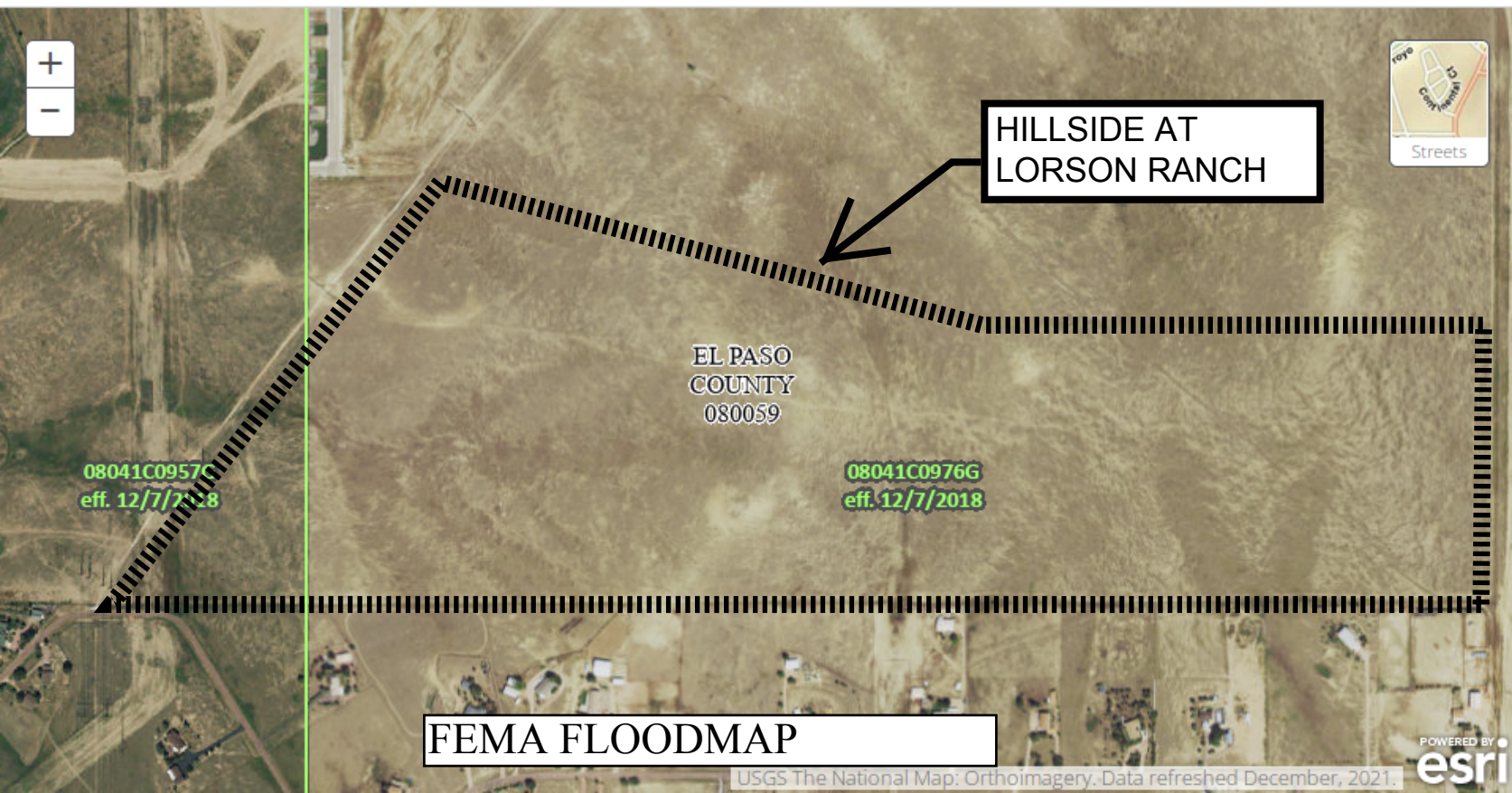
Minor Components

Other soils
Percent of map unit: 4 percent
Hydric soil rating: No

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 19, Aug 31, 2021


HILLSIDE AT
LORSON RANCH
EL PASO
COUNTY
080059
08041C0957G
eff. 12/7/2018
08041C0976G
eff. 12/7/2018
Streets
FEMA FLOODMAP
USGS The National Map: Orthoimagery. Data refreshed December, 2021.
POWERED BY esri

APPENDIX B – HYDROLOGY CALCULATIONS

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 22, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **5 - Year Event (Current)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
		ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C1.1-ex			12.46	0.09	27.8	1.12	2.60	2.9													
D1-ex			16.44	0.09	48.0	1.48	1.78	2.6													
OS-E1.1			9.96	0.09	35.4	0.90	2.23	2.0													
EX-E1.2			62.57	0.09	37.3	5.63	2.16	12.1													
OS-E2.1			21.39	0.09	33.1	1.93	2.33	4.5													
(E-ex)	**1E**	93.92							44.9	8.45	1.88	15.9									
EX-F2			16.64	0.09	41.8	1.56	1.98	3.1													
EX-G			13.27	0.09	29.5	1.19	2.51	3.0													
EX-H			28.00	0.09	42.8	2.66	2.06	5.5													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 22, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **100-Year Event (Current)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C1.1-ex			12.46	0.36	27.8	4.49	4.36	19.5													
D1-ex			16.44	0.36	48.0	5.92	2.98	17.6													
OS-E1.1			9.96	0.36	35.4	3.59	3.75	13.4													
EX-E1.2			62.57	0.36	37.3	22.53	3.62	81.5													
OS-E2.1			21.39	0.36	33.1	7.70	3.92	30.2													
(E-ex)	**1E**	93.92							44.9	33.81	3.15	106.5									
EX-F2			16.64	0.37	41.8	6.07	3.33	20.2													
EX-G			13.27	0.36	29.5	4.78	4.21	20.1													
EX-H			28.00	0.35	42.9	9.74	3.26	31.8													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
B1			3.33	0.45	14.4	1.50	3.59	5.4													
B2			2.55	0.45	6.5	1.15	4.77	5.5													
B1-B2	**1**	5.88							16.8	2.65	3.35	8.9									
B3			1.55	0.45	9.2	0.70	4.25	3.0													
B1-B3	**2** (I-2)	7.43							16.8	3.34	3.35	11.2									
B4	**4** (I-4)		2.96	0.45	18.0	1.33	3.24	4.3													
B1-B4	**5**	10.39							18.0	4.68	3.24	15.2									
C1			1.56	0.45	8.2	0.70	4.44	3.1													
C2			1.89	0.45	7.7	0.85	4.53	3.9													
C1-C2	**6** (I-6)	3.45							12.6	1.55	3.78	5.9									
C3	**7** (I-7)		4.44	0.45	14.0	2.00	3.62	7.2													
C4			3.35	0.45	19.1	1.51	3.16	4.8													
C1-C4	**8** (I-10)	11.24							19.9	3.51	3.10	10.9									
C5			1.68	0.45	9.6	0.76	4.19	3.2													
C6	(I-10)	6.80	3.45	0.45	16.4	1.55	3.39	5.3	19.1	3.06	3.16	9.7									
C5-C6	**9** (I-10)	5.13							19.1	2.31	3.16	7.3									
C3, C4, C6	**11**								19.9	5.06	3.10	15.7									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
D1.1	**13**		1.98	0.45	9.1	0.89	4.27	3.8													
D1.2	**14**		3.53	0.45	11.4	1.59	3.93	6.2													
D1.3			0.88	0.75	6.5	0.66	4.78	3.2													
D1.4			1.92	0.45	10.8	0.86	4.02	3.5													
D1-D4	**47** (I-47)	8.31							11.5	4.00	3.92	15.7									
D1.5			3.37	0.20	10.7	0.66	4.02	2.6													
OS-E1.1			9.96	0.09	35.4	0.90	2.23	2.0													
E1.2	**15** (I-15)		3.07	0.45	16.2	1.38	3.41	4.7													
E1.3	**16** (I-16)		6.39	0.15	18.3	0.96	3.22	3.1													
OS-E1.1,E1.3	**16** (I-16)	16.35							25.4	1.85	2.73	5.1									
E1.4	**17** (I-17)		2.07	0.15	14.4	0.31	3.59	1.1													
OS-E1.1-E1.4		21.49							18.3	3.55	3.22	11.4									
OS-E2.1			21.39	0.26	33.1	5.56	2.33	13.0													
E2.2			4.71	0.26	15.5	1.22	3.47	4.2													
OS-E2.1-E2.2	**18**	26.10							18.3	6.79	3.22	21.9									
E3			3.89	0.45	11.2	1.75	3.96	6.9													
E4			1.59	0.45	9.2	0.72	4.25	3.0													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
		ac.			min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
E3-E4	**19** (I-19)	5.48							13.4	2.47	3.69	9.1									
E5	I-20		7.27	0.45	13.5	3.27	3.68	12.0													
E3-E5	**20** (I-20)	12.75							15.4	5.74	3.48	20.0									
E1.2, E3 - E5	**21**	15.82							16.2	9.28	3.41	31.7									
E6	**23** (I-23)		1.73	0.45	14.7	0.78	3.55	2.8													
OS-E1.1-E1.4, E3 - E6		35.97							17.9	10.06	3.26	32.8									
E7	**25** (I-25)		5.48	0.45	13.3	2.47	3.70	9.1													
E8	**26** (I-26)		4.70	0.45	12.2	2.12	3.83	8.1													
E7-E8	**27**	10.18							9.5	4.58	4.20	19.3									
E9	**28** (I-28)		1.37	0.45	10.3	0.62	4.09	2.5													
E10	**29** (I-29)		4.33	0.45	13.1	1.95	3.72	7.2													
E7-E10	**30**	15.88							10.1	7.15	4.12	29.5									
OS-E1.1-E1.3, E3 - E10		49.78							18.2	13.97	3.23	45.1									
E11	**32** (I-32)		2.97	0.45	11.5	1.34	3.93	5.2													
OS-E1.1, E1.2, E3 - E11		52.75							20.0	15.31	3.09	47.3									
E12	**34** (I-34)		4.76	0.45	16.0	2.14	3.42	7.3													
OS-E1.1, E1.2, E3 - E12	**35**	57.51							20.1	20.38	3.08	62.9									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **5 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
E13	**36** (I-36)		0.72	0.45	8.1	0.32	4.44	1.4													
OS-E1.1- E1.4, E3 - E13	**38**	60.30							20.1	21.01	3.08	64.7									
E14	**39** (I-39)		2.58	0.45	10.7	1.16	4.03	4.7													
E15			7.06	0.16	16.1	1.13	3.42	3.9													
OS-E1.1-E1.4, E3-E15		69.20							20.6	21.01	3.05	64.0									
E16			0.76	0.90	5.0	0.68	5.17	3.5													
F			4.46	0.45	10.8	2.01	4.01	8.0													
G1	**41** (I-41)		4.76	0.45	13.5	2.14	3.68	7.9													
G2			4.10	0.15	11.3	0.62	3.95	2.4													
H1			7.44	0.15	13.4	1.09	3.70	4.0													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
		ac.			min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
B1			3.33	0.59	14.4	1.96	6.02	11.8													
B2			2.55	0.59	6.5	1.50	8.01	12.0													
B1-B2	**1**	5.88							16.8	3.47	5.62	19.5									
B3			1.55	0.59	9.2	0.91	7.14	6.5													
B1-B3	**2** (I-2)	7.43							16.8	4.38	5.62	24.7									
B4	**4** (I-4)		2.96	0.59	18.0	1.75	5.45	9.5													
B1-B4	**5**	10.39							18.0	6.13	5.45	33.4									
C1			1.56	0.59	8.2	0.92	7.45	6.9													
C2			1.89	0.59	7.7	1.12	7.60	8.5													
C1-C2	**6** (I-6)	3.45							12.6	2.04	6.34	12.9									
C3	**7** (I-7)		4.44	0.59	14.0	2.62	6.08	15.9													
C4			3.35	0.59	19.1	1.98	5.30	10.5													
C1-C4	**8** (I-10)	11.24							19.9	4.60	5.20	23.9									
C5			1.68	0.59	9.6	0.99	7.04	7.0													
C6	(I-10)	6.80	3.45	0.59	16.4	2.04	5.69	11.6	19.1	4.01	5.30	21.3									
C5-C6	**9** (I-10)	5.13							19.1	3.03	5.30	16.0									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

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Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C3, C4, C6	**11**								19.9	6.63	5.20	34.5									
D1.1	**13**		1.98	0.59	9.1	1.17	7.16	8.4													
D1.2	**14**		3.53	0.59	11.4	2.08	6.60	13.8													
D1.3			0.88	0.84	6.5	0.74	8.02	5.9													
D1.4			1.92	0.59	10.8	1.13	6.74	7.6													
D1-D4	**47** (I-47)	8.31							11.5	5.12	6.58	33.7									
D1.5			3.37	0.44	10.7	1.47	6.76	9.9													
OS-E1.1			9.96	0.36	35.4	3.59	3.75	13.4													
E1.2	**15** (I-15)		3.07	0.59	16.2	1.81	5.72	10.4													
E1.3			6.39	0.41	18.3	2.62	5.41	14.2													
OS-E1.1-E1.3	**16** (I-16)	16.35							25.4	6.21	4.44	27.6									
E1.4	**17** (I-17)		2.07	0.41	14.4	0.85	6.02	5.1													
OS-E1.1-E1.4		21.49	21.49			8.87			18.3	8.87	5.41	48.0									
OS-E2.1			21.39	0.55	33.1	11.76	3.92	46.1													
E2.2			4.71	0.55	15.5	2.59	5.82	15.1													
OS-E2.1-E2.2	**18**	26.10							18.3	14.36	5.41	77.7									

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
E3			3.89	0.59	11.2	2.30	6.64	15.3													
E4			1.59	0.59	9.2	0.94	7.13	6.7													
E3-E4	**19** (I-19)	5.48							13.4	3.23	6.19	20.0									
E5	I-20		7.27	0.59	13.5	4.29	6.17	26.5													
E3-E5	**20** (I-20)	12.75							15.4	7.52	5.84	44.0									
E1.2, E3 - E5	**21**	15.82							16.2	16.39	5.72	93.8									
E6	**23** (I-23)		1.73	0.59	14.7	1.02	5.96	6.1													
OS-E1.1-E1.4, E3 - E6		35.97							17.9	17.41	5.47	95.2									
E7	**25** (I-25)		5.48	0.59	13.3	3.23	6.21	20.1													
E8	**26** (I-26)		4.70	0.59	12.2	2.77	6.43	17.8													
E7-E8	**27**	10.18							9.5	6.01	7.06	42.4									
E9	**28** (I-28)		1.37	0.59	10.3	0.81	6.87	5.5													
E10	**29** (I-29)		4.33	0.59	13.1	2.55	6.25	16.0													
E7-E10	**30**	15.88							10.1	9.37	6.92	64.8									
OS-E1.1, E1.2, E3 - E6		49.78							18.2	24.12	5.42	130.8									
E11	**32** (I-32)		2.97	0.59	11.5	1.75	6.59	11.5													

CORE ENGINEERING GROUP

Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch
Design Storm: **100 - Year Event (Proposed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
		ac.			min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
OS-E1.1, E1.2, E3 - E11		52.75							20.0	25.87	5.19	134.2									
E12	**34** (I-34)		4.76	0.59	16.0	2.81	5.74	16.1													
OS-E1.1, E1.2, E3 - E12	**35**	57.51							20.1	30.49	5.18	157.9									
E13	**36** (I-36)		0.72	0.59	8.1	0.42	7.46	3.2													
OS-E1.1, E1.2, E3 - E13	**38**	60.30							20.1	31.76	5.17	164.2									
E14	**39** (I-39)		2.58	0.59	10.7	1.52	6.77	10.3													
E15			7.06	0.41	16.1	2.89	5.74	16.6													
OS-E1.1-E1.4, E3-E15		69.20							20.6	36.18	5.11	185.0									
E16			0.76	0.96	5.0	0.73	8.68	6.3													
F			4.46	0.53	10.8	2.36	6.73	15.9													
G1	**41** (I-41)		4.76	0.59	13.5	2.81	6.17	17.3													
G2			4.10	0.42	11.3	1.73	6.64	11.5													
H1			7.44	0.41	13.4	3.01	6.20	18.7													

CORE
ENGINEERING GROUP

15004 1st Avenue South
Burnsville, MN 55306

PROJECT NAME: Hillside at Lorson Ranch
PROJECT NUMBER: 100.065
ENGINEER: LAB
DATE: Nov. 22, 2021

Preliminary Drainage Plan
CURRENT CONDITIONS COEFFICIENT "C" CALCULATIONS

BASIN	Soil No.	Hydro Group	Area	Cover (%)	C5	Wtd. C5	C100	Wtd. C100	Impervious	Type of Cover
C2.1-ex	56	B	20.95	78.82%	0.09	0.07	0.36	0.28	100%	Undeveloped
	52/54	C	5.63	21.18%	0.16	0.03	0.51	0.11	80%	Undeveloped
			26.58	100.00%		0.10		0.39		
C2.2-ex	56	B	58.51	97.06%	0.09	0.09	0.36	0.35	10%	Undeveloped
	52	C	1.77	2.94%	0.16	0.00	0.51	0.01	10%	Undeveloped
			60.28	100.00%		0.09		0.36		
C3.1-ex	56	B	4.95	59.21%	0.09	0.05	0.36	0.21	10%	Undeveloped
	54	D	3.41	40.79%	0.16	0.07	0.51	0.21	10%	Undeveloped
			8.36	100.00%		0.12		0.42		
C4.1-ex	56	B	3.54	80.64%	0.09	0.07	0.36	0.29	10%	Undeveloped
	75	D	0.85	19.36%	0.16	0.03	0.51	0.10	10%	Undeveloped
			4.39	100.00%		0.10		0.39		
C4.2-ex	56/108	B	21.23	44.29%	0.09	0.04	0.36	0.16	10%	Undeveloped
	52/54/75	D	26.70	55.71%	0.16	0.09	0.51	0.28	10%	Undeveloped
			47.93	100.00%		0.13		0.44		
EX-F1	56/108	B	8.74	39.09%	0.08	0.03	0.35	0.14	10%	Undeveloped
	52	C	13.62	60.91%	0.15	0.09	0.50	0.30	10%	Undeveloped
			22.36	100.00%		0.12		0.44		
EX-F2	56/108	B	0.23	1.32%	0.08	0.00	0.35	0.00	10%	Undeveloped
	52	C	17.26	98.68%	0.15	0.15	0.50	0.49	10%	Undeveloped
			17.49	100.00%		0.15		0.50		

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Current

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Date: Nov. 22, 2021
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Job No: 100.065
Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	USDCM Recommended t_c=ti+tt (min)
C1.1-ex	0.09	12.46	5.0	300.00	5.20%	0.27	18.33	498.00	4.95%	1.11	7.46		
			15.0					227.00	1.60%	1.90	1.99	27.79	27.79
D1-ex	0.09	16.44	5.0	300.00	2.24%	0.21	24.30	1209.00	3.99%	1.00	20.18		
			15.0					555.00	3.07%	2.63	3.52	47.99	47.99
OS-E1.1	0.09	9.96	7.0	300.00	2.10%	0.20	24.82	750.00	2.86%	1.18	10.56	35.38	35.38
EX-E1.2	0.09	62.57	7.0	300.00	3.42%	0.24	21.12	1050.00	4.97%	1.56	11.21		
			15.0					840.00	3.57%	2.83	4.94	37.27	37.27
OS-E2.1	0.09	21.39	7.0	300.00	4.82%	0.27	18.85	795.00	2.11%	1.02	13.03		
			15.0					160.00	2.11%	2.18	1.22	33.11	33.11
DP-1E	0.09	93.92	7.0	300.00	2.10%	0.20	24.82	750.00	2.86%	1.18	10.56		
			7.0					860.00	4.65%	1.51	9.50	44.88	44.88
EX-F2	0.09	17.49	5.0	300.00	3.00%	0.23	21.98	1065.00	3.20%	0.89	19.85	41.83	41.83
EX-G	0.09	13.65	5.0	300.00	4.40%	0.26	19.37	650.00	4.60%	1.07	10.10	29.47	29.47
EX-H	0.09	27.9	5.0	300.00	3.20%	0.23	21.62	1275.00	4.00%	1.00	21.25	42.87	42.87
OS-E1.1	0.09	9.96	7.0	300.00	2.10%	0.20	24.82	750.00	2.86%	1.18	10.56	35.38	35.38

CORE ENGINEERING GROUP

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
(C4-ex) **4X**	0.13	52.32	7.0	300.00	4.50%	0.27	18.52	143.00	4.60%	1.50	1.59		
			7.0					500.00	5.25%	1.60	5.20		
			15.0					1307.00	2.75%	2.49	8.76	34.06	34.06
EX-F1	0.12	22.36	7.0	300.00	3.30%	0.24	20.67	390.00	3.30%	1.27	5.11	25.78	25.78
EX-F2	0.15	17.49	15.0	221.00	6.80%	0.27	13.55	406.00	5.90%	3.64	1.86	15.40	15.40
(EX-F) **2X**	0.13	39.85	7.0	300.00	3.30%	0.24	20.46	390.00	3.30%	1.27	5.11	25.57	25.57
EX-E1	0.09	62.57	7.0	300.00	3.42%	0.24	21.12	1050.00	4.97%	1.56	11.21		
			15.0					840.00	3.57%	2.83	4.94	37.27	37.27
OS-E2.1	0.09	21.39	7.0	300.00	4.82%	0.27	18.85	795.00	2.11%	1.02	13.03		
			15.0					160.00	2.11%	2.18	1.22	33.11	33.11

8	5	6.57	6.57	7.57	7.57	7	7	7.57	7.57	7.57	7.57	7.57	10	11	10

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
C1.1-ex	0.09	12.46	5.0	300.00	5.20%	0.27	18.33	498.00	4.95%	1.11	7.46				
			15.0					227.00	1.60%	1.90	1.99	27.79	1025.00	15.69	15.69
D1-ex	0.09	16.44	5.0	300.00	2.24%	0.21	24.30	1209.00	3.99%	1.00	20.18				
			15.0					555.00	3.07%	2.63	3.52	47.99	555.00	13.08	13.08
OS-E1.1	0.09	9.96	7.0	300.00	2.10%	0.20	24.82	750.00	2.86%	1.18	10.56	35.38	1050.00	15.83	35.38
EX-E1.2	0.09	62.57	7.0	300.00	3.42%	0.24	21.12	1050.00	4.97%	1.56	11.21				
			15.0					840.00	3.57%	2.83	4.94	37.27	840.00	14.67	14.67
OS-E2.1	0.09	21.39	7.0	300.00	4.82%	0.27	18.85	795.00	2.11%	1.02	13.03				
			15.0					160.00	2.11%	2.18	1.22	33.11	1255.00	16.97	33.11
DP-1E	0.09	93.92	7.0	300.00	2.10%	0.20	24.82	750.00	2.86%	1.18	10.56				
			7.0					860.00	4.65%	1.51	9.50	44.88	860.00	14.78	14.78
EX-F2	0.09	17.49	5.0	300.00	3.00%	0.23	21.98	1065.00	3.20%	0.89	19.85	41.83	1925.00	20.69	41.83
EX-G	0.09	13.65	5.0	300.00	4.40%	0.26	19.37	650.00	4.60%	1.07	10.10	29.47	950.00	15.28	29.47
EX-H	0.09	28.13	5.0	300.00	4.90%	0.27	18.75	550.00	6.42%	1.27	7.24				
	0.09	28.13	5.0	300.00	4.50%	0.26	19.29	1245.00	5.08%	1.13	18.41	37.70	1545.00	18.58	37.70

8	5	6.57	6.57	7.57	7.57	7	7	7.57	7.57	7.57	7.57	7.57	10	11	10

CORE ENGINEERING GROUP

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
B1	0.45	3.33	15.0	86.00	4.02%	0.21	6.90	83.00	2.41%	2.33	0.59				
			20.0					825.00	1.00%	2.00	6.88	14.37	994.00	15.52	14.37
B2	0.45	2.55	15.0	22.00	3.20%	0.10	3.76	134.00	3.28%	2.72	0.82				
			20.0					490.00	4.41%	4.20	1.94	6.53	646.00	13.59	6.53
(B1-B2) **DP-1**	0.45	5.88	15.0	86.00	4.02%	0.21	6.90	83.00	2.41%	2.33	0.59				
			20.0					825.00	1.00%	2.00	6.88				
			20.0					85.00	2.06%	2.87	0.49				
			20.0					490.00	4.41%	4.20	1.94	16.81	1569.00	18.72	16.81
B3	0.45	1.55	15.0	20.00	3.00%	0.09	3.67	28.00	1.40%	1.77	0.26				
			20.0					580.00	1.39%	2.36	4.10				
			20.0					330.00	5.25%	4.58	1.20	9.23	958.00	15.32	9.23
(B4) **DP-4**	0.45	2.96	20.0	35.00	2.00%	0.11	5.55	1422.00	1.32%	2.30	10.31				
			20.0					518.00	4.23%	4.11	2.10				
			18" RCP					100.00	13.00%	11.89	0.08	18.04	2075.00	21.53	18.04
C1	0.45	1.56	15.0	57.00	5.26%	0.18	5.14	90.00	2.22%	2.23	0.67				
			20.0					447.00	2.53%	3.18	2.34	8.15	594.00	13.30	8.15
C2	0.45	1.89	7.0	27.00	25.00%	0.21	2.11	58.00	3.45%	1.30	0.74				

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			15.0					55.00	2.58%	2.41	0.38				
			20.0					752.00	2.00%	2.83	4.43	7.67	892.00	14.96	7.67
(C1-C2) **DP-6**	0.45	3.45	15.0	57.00	5.26%	0.18	5.14	90.00	2.22%	2.23	0.67				
			20.0					447.00	2.53%	3.18	2.34				
			20.0					760.00	2.00%	2.83	4.48	12.63	1354.00	17.52	12.63
(C3) **DP-7**	0.45	3.22	15.0	77.00	2.00%	0.16	8.22	54.00	2.00%	2.12	0.42				
			20.0					874.00	1.83%	2.71	5.38	14.03	1005.00	15.58	14.03
C4	0.45	4.57	20.0	100.00	2.00%	0.18	9.37	1540.00	1.71%	2.62	9.81	19.19	1640.00	19.11	19.11
(C1-C4) **DP-8**	0.45	11.24	15.0	57.00	5.26%	0.18	5.14	90.00	2.22%	2.23	0.67				
			20.0					447.00	2.53%	3.18	2.34				
			20.0					760.00	2.00%	2.83	4.48				
			20.0					1208.00	1.93%	2.78	7.25	19.88	2562.00	24.23	19.88
C5	0.45	1.68	20.0	20.00	2.00%	0.08	4.19	1220.00	3.55%	3.77	5.40	9.59	1240.00	16.89	9.59
C6	0.45	3.45	7.0	50.00	2.00%	0.13	6.63	28.00	25.00%	3.50	0.13				
			7.0					110.00	4.45%	1.48	1.24				
			20.0					1050.00	1.10%	2.10	8.34	16.35	1238.00	16.88	16.35
(C5-C6) **DP-9**	0.45	5.13	20.0	100.00	2.00%	0.18	9.37	1540.00	1.71%	2.62	9.81	19.19	1640.00	19.11	19.11
(C1-C6) **DP-10**	0.45	16.37	15.0	57.00	5.26%	0.18	5.14	90.00	2.22%	2.23	0.67				

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			20.0					447.00	2.53%	3.18	2.34				
			20.0					760.00	2.00%	2.83	4.48				
			20.0					1208.00	1.93%	2.78	7.25	19.88	2562.00	24.23	19.88
(D1) **DP-13**	0.45	1.98	15.0	99.00	9.09%	0.29	5.65	91.00	2.20%	2.22	0.68				
			20.0					340.00	1.03%	2.03	2.79	9.12	530.00	12.94	9.12
(D2) **DP-14**	0.45	3.53	20.0	54.00	3.28%	0.15	5.85	823.00	1.53%	2.47	5.54	11.39	877.00	14.87	11.39
D1.3	0.75	0.88	20.0	33.00	2.00%	0.19	2.90	828.00	3.68%	3.84	3.60	6.50	861.00	14.78	6.50
D1.4	0.45	1.92	20.0	50.00	2.00%	0.13	6.63	887.00	3.17%	3.56	4.15	10.78	937.00	15.21	10.78
(D1-D4) **DP-47**	0.45	8.31	20.0	54.00	3.28%	0.15	5.85	823.00	1.53%	2.47	5.54				
			18" RCP					55.00	1.00%	7.20	0.13	11.52	932.00	15.18	11.52
D1.5	0.21	3.37	20.0	96.00	6.25%	0.19	8.62	505.00	4.02%	4.01	2.10	10.72	601.00	13.34	10.72
	0.21	3.37	20.0	96.00	6.25%	0.19	8.62	505.00	4.02%	4.01	2.10	10.72	601.00	13.34	10.72
OS-E1.1	0.09	9.96	7.0	300.00	2.10%	0.20	24.82	750.00	2.86%	1.18	10.56	35.38	1050.00	15.83	35.38
E1.2 **(DP-15)**	0.45	3.07	20.0	38.00	2.00%	0.11	5.78	398.00	3.52%	3.75	1.77				
			20.0					810.00	1.25%	2.24	6.04				
			20.0					508.00	2.72%	3.30	2.57	16.15	1754.00	19.74	16.15

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Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended t_c=t_i+t_t (min)
E1.3 **(DP-16)**	0.15	6.39	7.0	100.00	2.35%	0.13	12.99	780.00	3.87%	1.38	9.44				
			20.0					611.00	2.86%	3.38	3.01	25.44	1491.00	18.28	18.28
E1.4 **(DP-17)**	0.15	2.07	7.0	100.00	3.17%	0.14	11.76	127.00	3.52%	1.31	1.61				
			7.0					30.00	12.47%	2.47	0.20				
			20.0					527.00	2.74%	3.31	2.65	16.23	784.00	14.36	14.36
OS-E2.1	0.09	21.39	7.0	300.00	4.82%	0.27	18.85	795.00	2.11%	1.02	13.03				
			15.0					160.00	2.11%	2.18	1.22	33.11	1255.00	16.97	33.11
E2.2	0.15	3.80	7.0	100.00	2.70%	0.13	12.40	653.00	4.74%	1.52	7.14				
			15.0					245.00	2.45%	2.35	1.74	21.28	998.00	15.54	15.54
OS-E1.1-E1.2 **DP-18**	0.11	25.19	7.0	100.00	2.35%	0.12	13.49	780.00	3.87%	1.38	9.44				
			20.0					611.00	2.86%	3.38	3.01	25.94	1491.00	18.28	18.28
E3	0.45	3.89	20.0	55.00	2.42%	0.14	6.53	767.00	1.86%	2.73	4.69	11.21	822.00	14.57	11.21
E4	0.45	1.59	15.0	37.00	2.00%	0.11	5.70	45.00	2.20%	2.22	0.34				
			20.0					632.00	2.71%	3.29	3.20	9.24	714.00	13.97	9.24
(E3-E4) **DP-19**	0.45	5.48	20.0	55.00	2.42%	0.14	6.53	767.00	1.86%	2.73	4.69				
			20.0					265.00	1.00%	2.00	2.21	13.42	1087.00	16.04	13.42
(E5) **DP-20**	0.45	7.27	15.0	110.00	2.10%	0.19	9.67	30.00	2.12%	2.18	0.23				
			20.0					753.00	3.00%	3.46	3.62	13.52	893.00	14.96	13.52

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BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
(E3-E5) **DP-20**	0.45	12.75	20.0	55.00	2.42%	0.14	6.53	1028.00	1.86%	2.73	6.28				
			20.0					390.00	2.77%	3.33	1.95				
			18" RCP					400.00	3.00%	10.30	0.65	15.41	1873.00	20.41	15.41
E1.2,E3-E5 **DP-21**	0.45	15.82	20.0	38.00	2.00%	0.11	5.78	398.00	3.52%	3.75	1.77				
			20.0					810.00	1.25%	2.24	6.04				
			20.0					508.00	2.72%	3.30	2.57	16.15	1754.00	19.74	16.15
(E6) **DP-23**	0.45	1.73	15.0	91.00	2.86%	0.19	7.94	55.00	2.00%	2.12	0.43				
			20.0					1276.00	2.82%	3.36	6.33	14.71	1422.00	17.90	14.71
OS-E1.1-E1.4, E3 - E6	0.45	35.97	20.0	38.00	2.00%	0.11	5.78	398.00	3.52%	3.75	1.77				
			20.0					810.00	1.25%	2.24	6.04				
			20.0					508.00	2.72%	3.30	2.57				
			24" RCP					1228.00	2.72%	11.88	1.72	17.87	2982.00	26.57	17.87
(E7) **DP-25**	0.45	5.48	15.0	80.00	2.10%	0.16	8.25	160.00	3.70%	2.89	0.92				
			20.0					886.00	3.14%	3.54	4.17	13.34	1126.00	16.26	13.34
(E8) **DP-26**	0.45	4.70	20.0	80.00	2.00%	0.16	8.38	850.00	3.46%	3.72	3.81	12.19	930.00	15.17	12.19
(E7-E8) **DP-27**	0.45	10.18	20.0	35.00	2.00%	0.11	5.55	885.00	3.46%	3.72	3.96	9.51	920.00	15.11	9.51
(E9) **DP-28**	0.45	1.37	15.0	80.00	2.10%	0.16	8.25	140.00	3.69%	2.88	0.81				

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
			20.0					260.00	3.21%	3.58	1.21	10.27	480.00	12.67	10.27
(E10) **DP-29**	0.45	4.33	15.0	70.00	2.10%	0.15	7.72	90.00	3.29%	2.72	0.55				
			20.0					910.00	2.43%	3.12	4.86	13.13	1070.00	15.94	13.13
(E7-E10) **DP-30**	0.45	15.88	15.0	80.00	2.10%	0.16	8.25	140.00	3.29%	2.72	0.86				
			20.0					910.00	2.43%	3.12	4.86	13.97	1130.00	16.28	13.97
OS-E1.1-E1.3, E3-E10	0.45	49.78	20.0	38.00	2.00%	0.11	5.78	398.00	3.52%	3.75	1.77				
			20.0					810.00	1.25%	2.24	6.04				
			20.0					508.00	2.72%	3.30	2.57				
			24" RCP					1228.00	2.72%	11.88	1.72				
			36" RCP					252.00	3.20%	12.47	0.34	18.21	3234.00	27.97	18.21
(E11) **DP32**	0.45	2.97	15.0	80.00	3.88%	0.20	6.73	125.00	2.64%	2.44	0.85				
			20.0					693.00	2.24%	2.99	3.86	11.45	898.00	14.99	11.45
OS-E1.1, E1.2, E3-E11	0.45	52.75	20.0	38.00	2.60%	0.12	5.30	321.00	3.54%	3.76	1.42				
			20.0					600.00	4.83%	4.40	2.28				
			20.0					539.00	1.39%	2.36	3.81				
			20.0					1225.00	2.61%	3.23	6.32				
			24" RCP					246.00	3.00%	12.47	0.33				
			36" RCP					400.00	1.68%	12.23	0.55	20.00	3369.00	28.72	20.00

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

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Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
(E12) **DP34**	0.45	4.76	15.0	80.00	2.20%	0.16	8.12	80.00	2.00%	2.12	0.63				
			20.0					1330.00	2.32%	3.05	7.28	16.03	1490.00	18.28	16.03
OS-E1.1, E1.2, E3-E12	0.45	57.51	20.0	38.00	2.60%	0.12	5.30	321.00	3.54%	3.76	1.42				
			20.0					600.00	4.83%	4.40	2.28				
			20.0					539.00	1.39%	2.36	3.81				
			20.0					1225.00	2.61%	3.23	6.32				
			24" RCP					246.00	3.00%	12.47	0.33				
			36" RCP					450.00	1.68%	12.23	0.61	20.06	3419.00	28.99	20.06
(E13) **DP36**	0.45	0.72	7.0	68.00	5.15%	0.20	5.65	120.00	2.83%	1.18	1.70				
			20.0					150.00	2.73%	3.30	0.76	8.11	338.00	11.88	8.11
OS-E1.1, E1.2, E3-E13	0.45	58.23	20.0	38.00	2.60%	0.12	5.30	321.00	3.54%	3.76	1.42				
			20.0					600.00	4.83%	4.40	2.28				
			20.0					539.00	1.39%	2.36	3.81				
			20.0					1225.00	2.61%	3.23	6.32				
			24" RCP					246.00	3.00%	12.47	0.33				
			36" RCP					450.00	1.68%	12.23	0.61				
			48" RCP					72.00	2.00%	16.17	0.07	20.14	3491.00	29.39	20.14

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
(E14) **DP39**	0.45	2.58	20.0	90.00	3.56%	0.20	7.35	715.00	3.23%	3.59	3.32	10.66	805.00	14.47	10.66
E15	0.16	7.06	7.0	100.00	2.00%	0.12	13.55	598.00	5.35%	1.62	6.16				
			7.0					43.00	33.33%	4.04	0.18				
			7.0					140.00	3.57%	1.32	1.76				
			20.0					208.00	0.50%	1.41	2.45	24.10	1089.00	16.05	16.05
E16	0.90	0.76	20.0	18.00	2.00%	0.25	1.22	431.00	4.52%	4.25	1.69	2.91	449.00	12.49	2.91
OS-E1.1-E16	0.42	69.94	20.0	38.00	2.60%	0.11	5.52	321.00	3.54%	3.76	1.42				
			20.0					600.00	4.83%	4.40	2.28				
			20.0					539.00	1.39%	2.36	3.81				
			20.0					1225.00	2.61%	3.23	6.32				
			24" RCP					246.00	3.00%	12.47	0.33				
			36" RCP					450.00	1.68%	12.23	0.61				
			48" RCP					72.00	2.00%	16.17	0.07				
			54"RCP					181.00	1.12%	13.09	0.23	20.59	3672.00	30.40	20.59

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: Nov. 23, 2021
Checked By: Leonard Beasley

Job No: 100.065
Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
F	0.45	4.46	7.0	50.00	7.00%	0.19	4.38	83.00	1.20%	0.77	1.80				
			5.0					93.00	1.08%	0.52	2.98				
			5.0					155.00	9.68%	1.56	1.66	10.83	381.00	12.12	10.83
(G1) **DP-41**	0.45	4.76	15.0	85.00	4.12%	0.21	6.80	82.00	2.44%	2.34	0.58				
			20.0					736.00	1.00%	2.00	6.13	13.52	903.00	15.02	13.52
G2	0.15	4.10	7.0	65.00	2.00%	0.10	11.04	48.00	2.08%	1.01	0.79				
			5.0					22.00	9.09%	1.51	0.24				
			5.0					90.00	11.11%	1.67	0.90	12.98	225.00	11.25	11.25
H1	0.16	7.44	7.0	100.00	4.40%	0.16	10.44	236.00	5.34%	1.62	2.43				
			7.0					22.00	22.73%	3.34	0.11				
			5.0					245.00	7.06%	1.33	3.07	16.06	603.00	13.35	13.35

APPENDIX C – HYDRAULIC CALCULATIONS

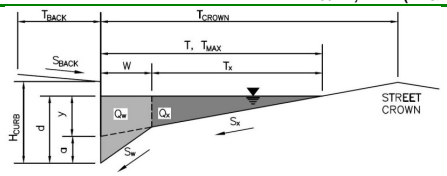
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-2, DP-2 (B2&B3)



Gutter Geometry (Enter data in the blue cells)

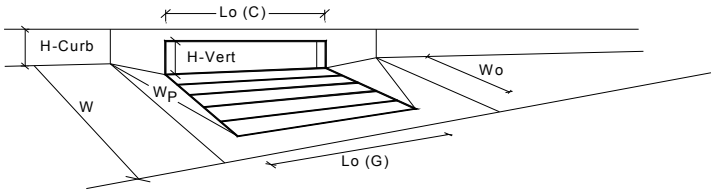
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.7	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.8	7.9	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.32	0.49	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.55	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.78	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**11.4**	**25.4**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	11.3	29.0	cfs

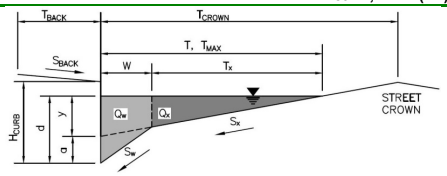
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-4, DP-4 (B4)



Gutter Geometry (Enter data in the blue cells)

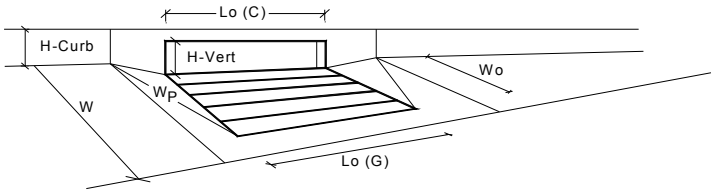
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening			
Type of Inlet	Type =	MINOR: CDOT Type R Curb Opening	MAJOR: 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	7.2	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.23	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	0.68	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.85	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.3**	**13.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.3	13.1	cfs

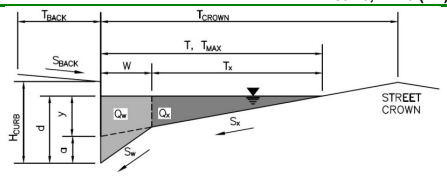
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-6, DP-6 (C2)



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} =	0.015	
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 =	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

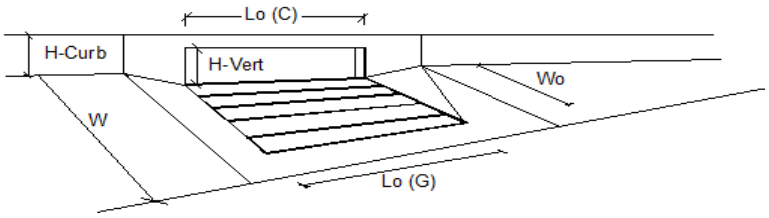
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.9**	**31.5**	**cfs**

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 =**	**5.9**	**10.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**85**	**%**

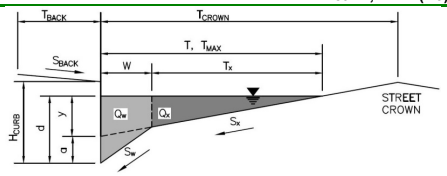
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-7, DP-7 (C3)



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} =	0.015	
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 =	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 =	0.036	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☑	☑	check = yes

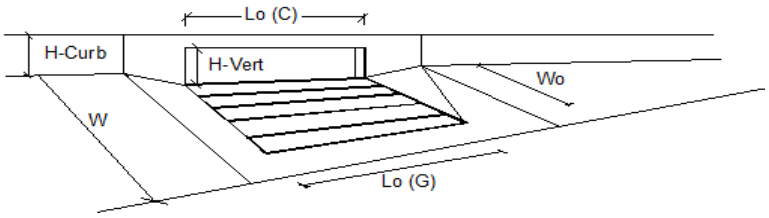
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.8**	**31.2**	**cfs**

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

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 =**	**7.2**	**12.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**79**	**%**

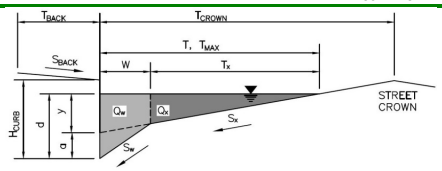
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet DP-8



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} =	0.015	
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 =	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

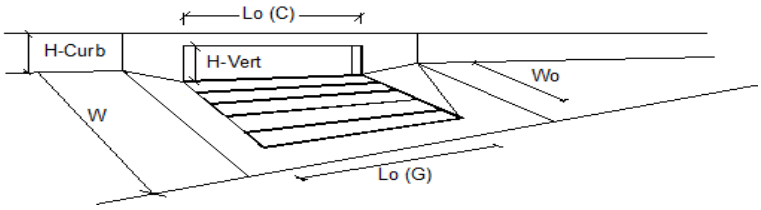
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**10.2**	**10.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



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

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.8**	**4.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.0**	**11.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**58**	**29**	**%**

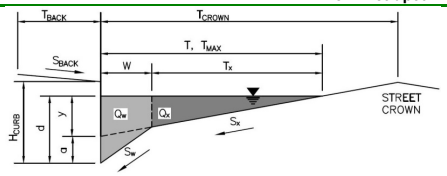
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: ex inlet dp9a



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	22.0	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 =	0.022	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.5	22.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.4	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

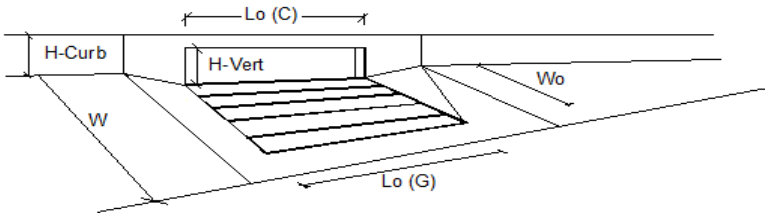
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**18.4**	**46.7**	**cfs**

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 =**	**3.2**	**5.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**84**	**%**

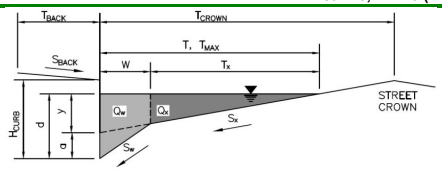
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-10, DP-10 (C4)



Gutter Geometry (Enter data in the blue cells)

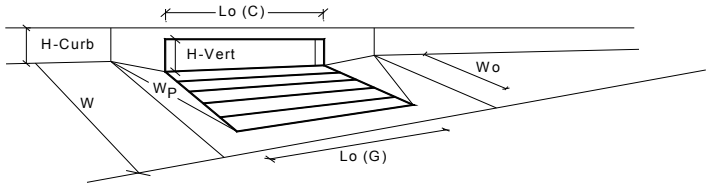
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00 inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.5	6.70 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) =	30.00	30.00 feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00 inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00 inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67
Low Head Performance Reduction (Calculated)			MINOR	MAJOR
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.29	0.39 ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.52	0.63
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	0.75	0.83
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A
			MINOR	MAJOR
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**13.8**	**24.1** **cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	7.3	23.9 cfs

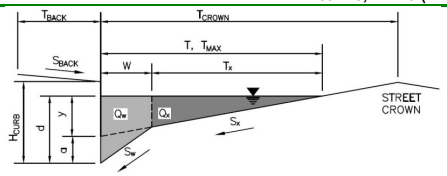
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-13, DP-13 (D1.1)



Gutter Geometry (Enter data in the blue cells)

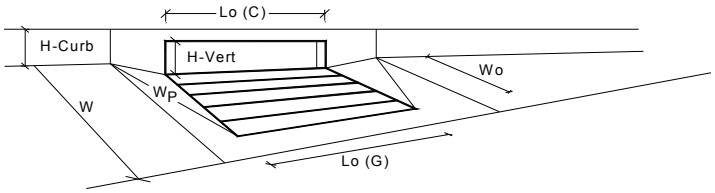
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	47.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.2	7.4	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.27	0.45	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.66	0.95	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**3.8**	**8.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	3.8	8.4	cfs

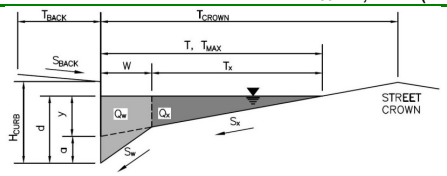
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-14, DP-14 (D1.2)



Gutter Geometry (Enter data in the blue cells)

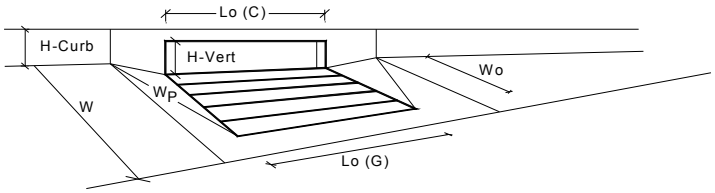
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	47.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening			
Type of Inlet	Type =	MINOR: CDOT Type R Curb Opening	MAJOR: CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.4	7.4	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.28	0.45	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.51	0.70	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.90	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**13.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.2	13.8	cfs

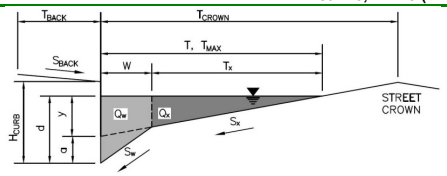
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-15, DP-15 (E1.2)



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} =	0.015	
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 =	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 =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

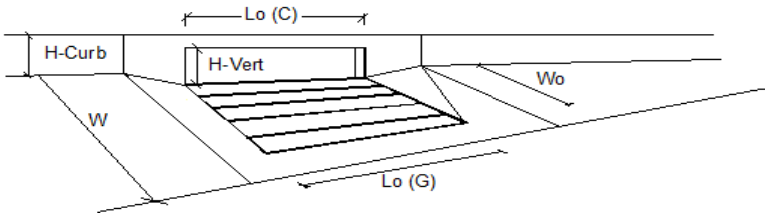
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**14.1**	**37.7**	**cfs**

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 =	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 =**	**2.8**	**4.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.9**	**6.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**60**	**38**	**%**

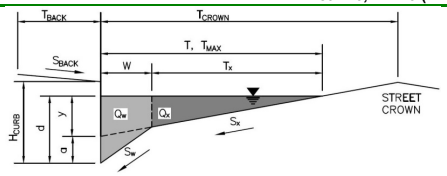
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-16, DP-16 (E1.3)



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} =	0.015	
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 =	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 =	0.013	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

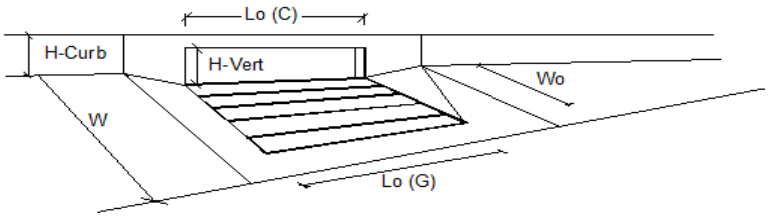
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.5**	**35.5**	**cfs**

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 =	25.00	25.00	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 =**	**7.0**	**26.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**78**	**%**

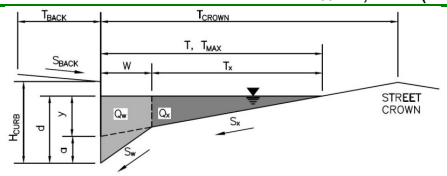
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-17, DP-17 (E1.4)



Gutter Geometry (Enter data in the blue cells)

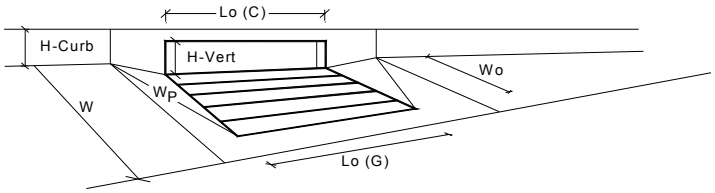
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	47.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.5	47.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	9.8	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

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	3.3	7.7	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.10	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.31	0.73	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.71	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**1.1**	**15.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.1	12.4	cfs

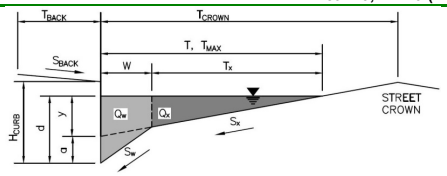
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-19, DP-19 (E4)



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} =	0.015	
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 =	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 =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

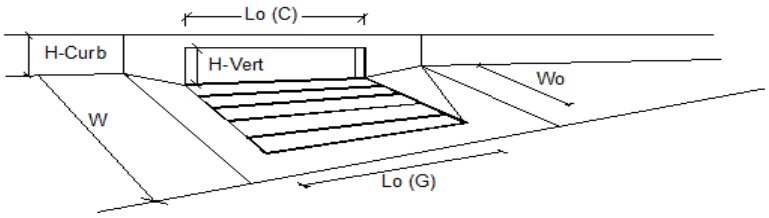
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.6**	**34.0**	**cfs**

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

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**	**14.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.4**	**5.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**96**	**71**	**%**

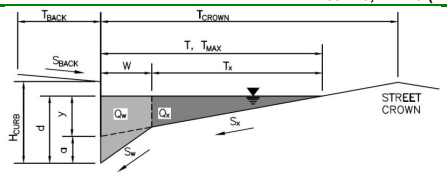
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-20, DP-20 (E5)



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} =	0.015	
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 =	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 =	0.019	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

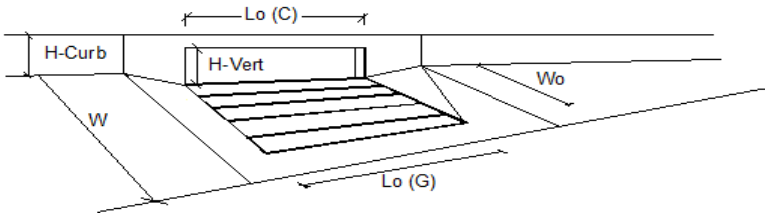
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**13.1**	**37.7**	**cfs**

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 =**	**8.0**	**12.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**4.4**	**20.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**65**	**38**	**%**

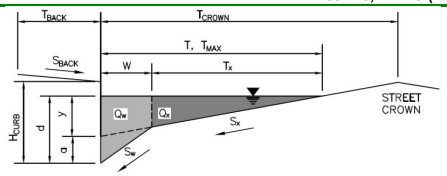
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-23, DP-23 (E6)



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} =	0.015	
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 =	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 =	0.016	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

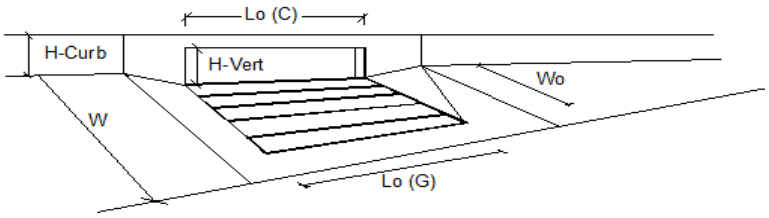
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**12.0**	**39.7**	**cfs**

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 =	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 =**	**7.2**	**16.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**10.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**62**	**%**

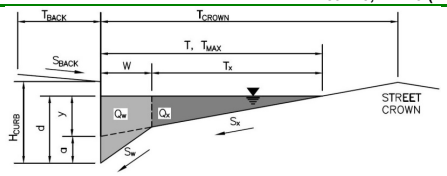
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-25, DP-25 (E7)



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} =	0.015	
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 =	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 =	0.043	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

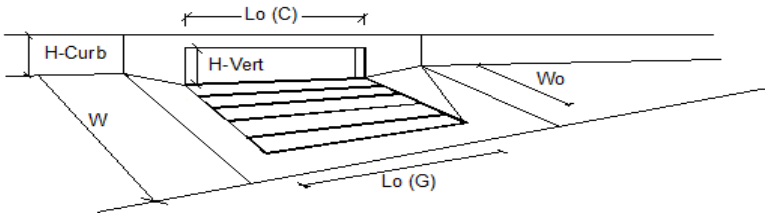
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.0**	**29.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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 =**	**6.9**	**10.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.2**	**9.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**76**	**51**	**%**

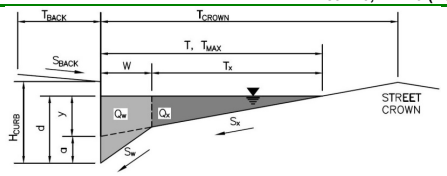
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-26, DP-26 (E8)



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} =	0.015	
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 =	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 =	0.043	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

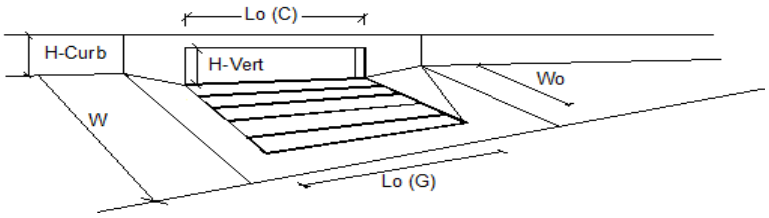
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.0**	**29.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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 =**	**8.0**	**13.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**4.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**98**	**75**	**%**

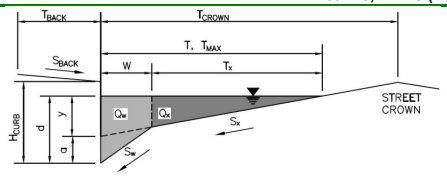
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-28, DP-28 (E9)



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} =	0.015	
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 =	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 =	0.038	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

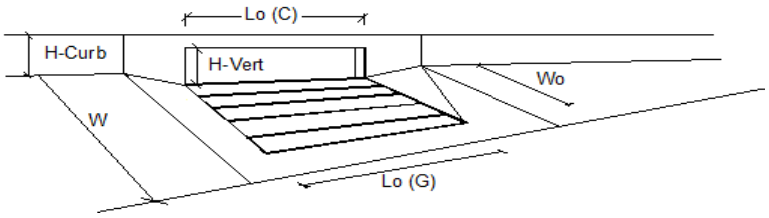
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.6**	**30.8**	**cfs**

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 =	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 =**	**4.5**	**9.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**6.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**97**	**58**	**%**

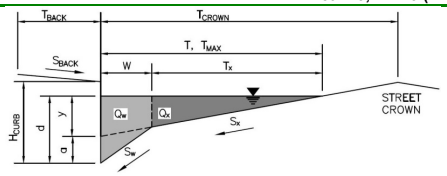
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-29, DP-29 (E10)



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} =	0.015	
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 =	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 =	0.038	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

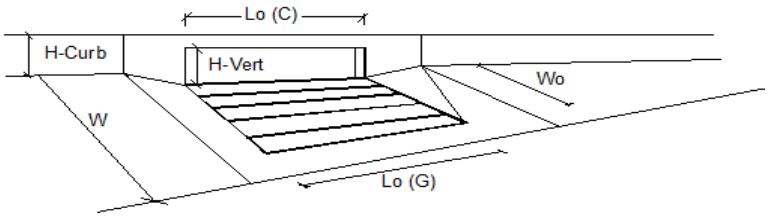
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.6**	**30.8**	**cfs**

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 =**	**7.3**	**14.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**70**	**%**

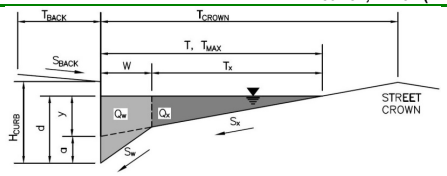
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-32, DP-32 (E11)



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} =	0.015	
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 =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

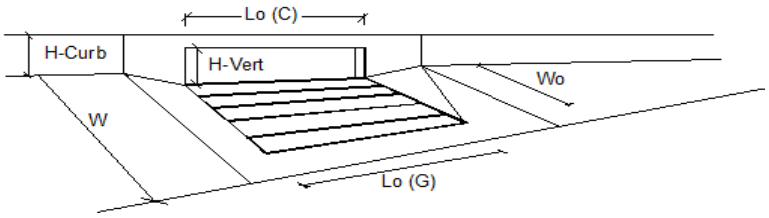
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**11.6**	**38.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	25.00	25.00	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**	**23.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**86**	**%**

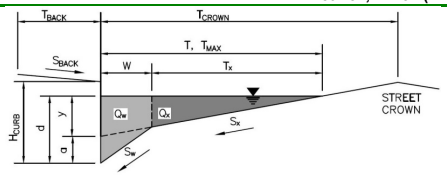
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-34, DP-34 (E12)



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} =	0.015	
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 =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

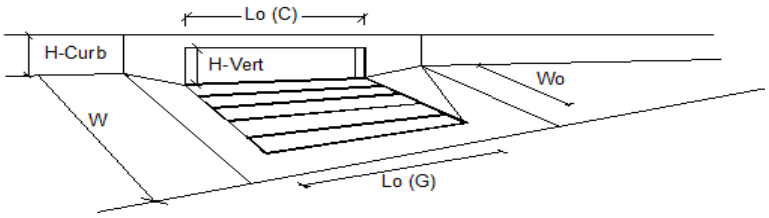
	Minor Storm	Major Storm	
Q_{allow} =	**11.6**	**38.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	25.00	25.00	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 =**	**7.3**	**20.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**93**	**%**

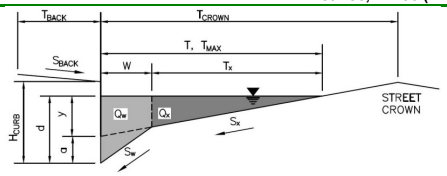
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-36, DP-36 (E13)



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} =	0.015	
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 =	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 =	0.043	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

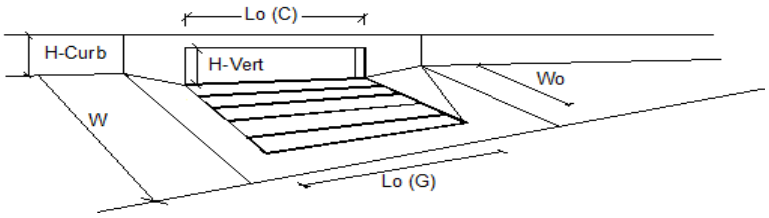
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**15.0**	**29.6**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	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 =**	**1.4**	**6.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**84**	**%**

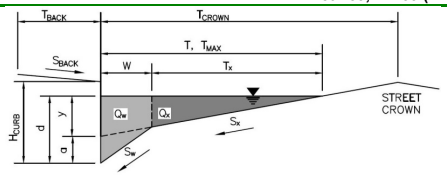
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-39, DP-39 (E14)



Gutter Geometry (Enter data in the blue cells)

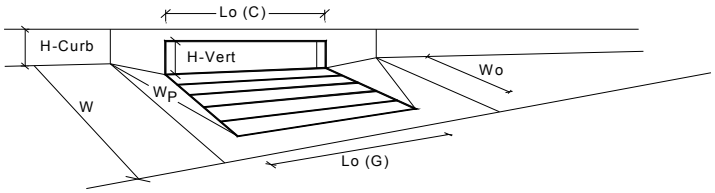
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	47.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	24.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	7.9	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening			
Type of Inlet	Type =	MINOR: CDOT Type R Curb Opening	MAJOR: 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 =	4.9	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.24	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.46	0.62	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.86	0.96	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.7**	**10.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.7	10.3	cfs

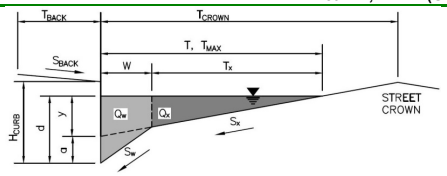
Version 4.05 Released March 2017

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

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

Project: Hillside at Lorson Ranch

Inlet ID: Inlet I-41, DP-41 (G1)



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} =	0.015	
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 =	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 =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.017	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.5	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.6	7.9	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

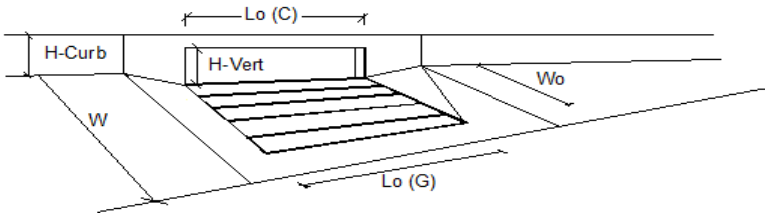
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**13.4**	**37.2**	**cfs**

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

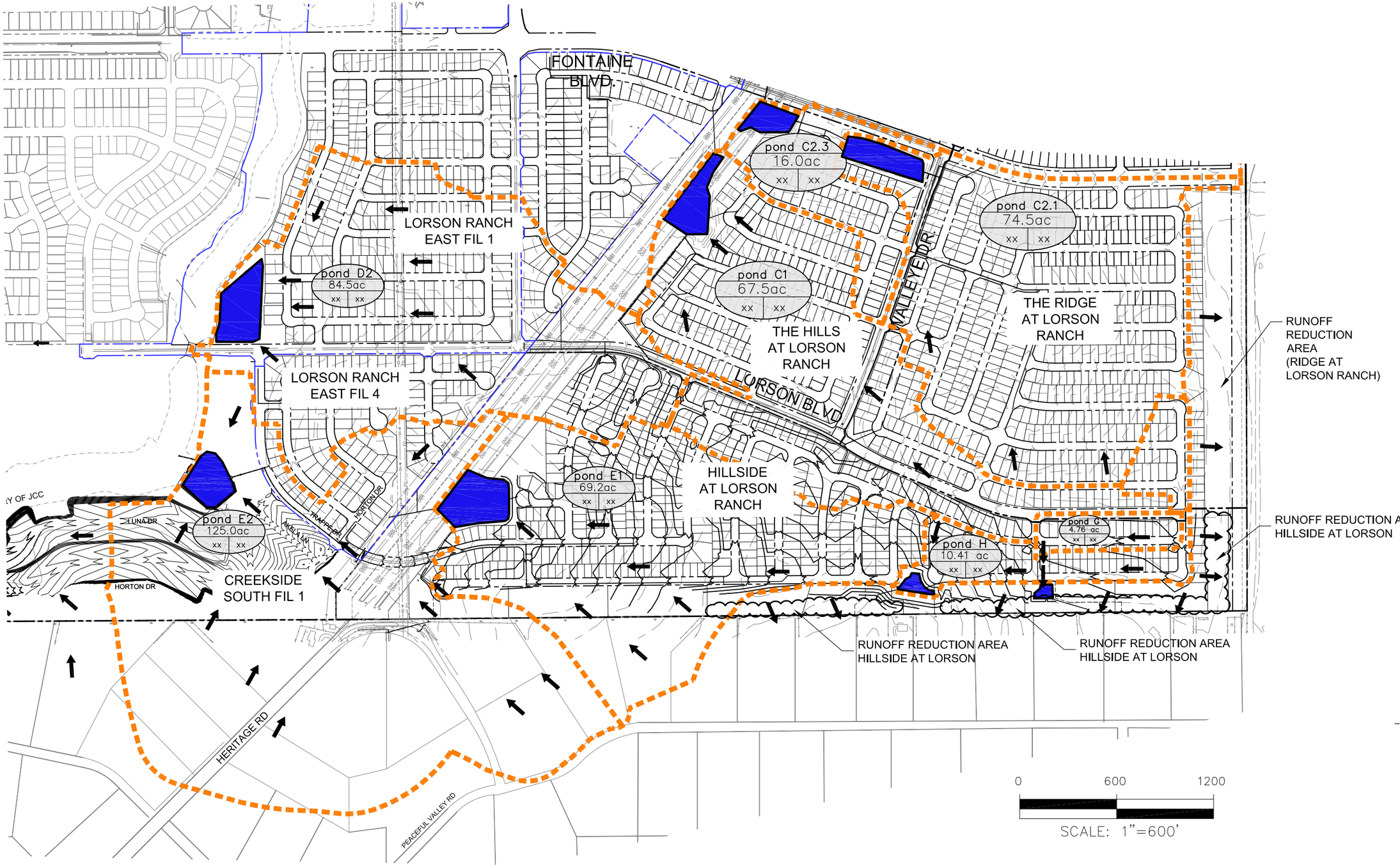
Version 4.05 Released March 2017



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 =**	**7.8**	**13.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**4.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**75**	**%**

APPENDIX D – POND AND ROUTING CALCULATIONS



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HILLSIDE AT LORSON RANCH
WATER QUALITY & POND TRIBUTARY AREAS

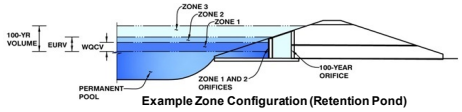
SCALE:	DATE:	FIGURE NO.
NTS	APRIL, 2022	1

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Hillside at Lorson Ranch

Basin ID: Pond E1



Example Zone Configuration (Retention Pond)

micropool=5728.10

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	69.20	acres
Watershed Length =	3,000	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.025	ft/ft
Watershed Imperviousness =	52.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.221	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	3.859	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.655	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.184	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	6.521	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	8.294	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	9.743	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	11.572	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	15.305	acre-feet		inches
Approximate 2-yr Detention Volume =	2.923	acre-feet		
Approximate 5-yr Detention Volume =	3.994	acre-feet		
Approximate 10-yr Detention Volume =	5.258	acre-feet		
Approximate 25-yr Detention Volume =	5.738	acre-feet		
Approximate 50-yr Detention Volume =	5.995	acre-feet		
Approximate 100-yr Detention Volume =	6.660	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.221	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.638	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	3.412	acre-feet
Total Detention Basin Volume =	7.271	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

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

Depth Increment = 0.20 ft

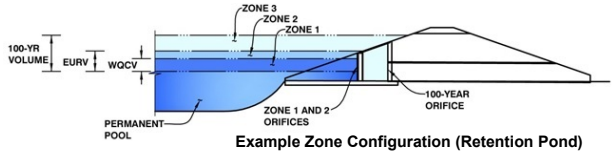
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	48	0.001		
5728.43	--	0.33	--	--	--	48	0.001	16	0.000
5729	--	0.90	--	--	--	679	0.016	223	0.005
5730	--	1.90	--	--	--	9,926	0.228	5,525	0.127
5731	--	2.90	--	--	--	30,276	0.695	25,626	0.588
5732	--	3.90	--	--	--	48,238	1.107	64,883	1.490
5733	--	4.90	--	--	--	63,363	1.455	120,684	2.771
5734	--	5.90	--	--	--	72,715	1.669	188,723	4.332
5735	--	6.90	--	--	--	78,459	1.801	264,310	6.068
5736	--	7.90	--	--	--	82,532	1.895	344,805	7.916
5737	--	8.90	--	--	--	87,374	2.006	429,758	9.866
5738	--	9.90	--	--	--	90,000	2.066	518,445	11.902

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Hillside at Lorson Ranch

Basin ID: Pond E1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.65	1.221	Orifice Plate
Zone 2 (EURV)	5.62	2.638	Rectangular Orifice
Zone 3 (100+1/2WQCV)	7.56	3.412	Weir&Pipe (Restrict)
Total (all zones)		7.271	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.375E-02	ft^2
Depth at top of Zone using Orifice Plate =	3.65	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	14.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	3.42	sq. inches (use rectangular openings)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.22	2.43					
Orifice Area (sq. inches)	3.42	3.42	3.42					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.65	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.65	N/A
Depth at top of Zone using Vertical Orifice =	5.62	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches			
Vertical Orifice Width =	15.67		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	5.62	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.62	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	8.92	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	25.06	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	12.53	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.81	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	Outlet Orifice Centroid =	0.90	N/A
Restrictor Plate Height Above Pipe Invert =	20.10		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.31	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.02	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	9.72	feet
Spillway End Slopes =	10.00	H:V	Basin Area at Top of Freeboard =	2.05	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	11.51	acre-ft

micropool=5728.10=stage 0

Calculated Parameters for Spillway

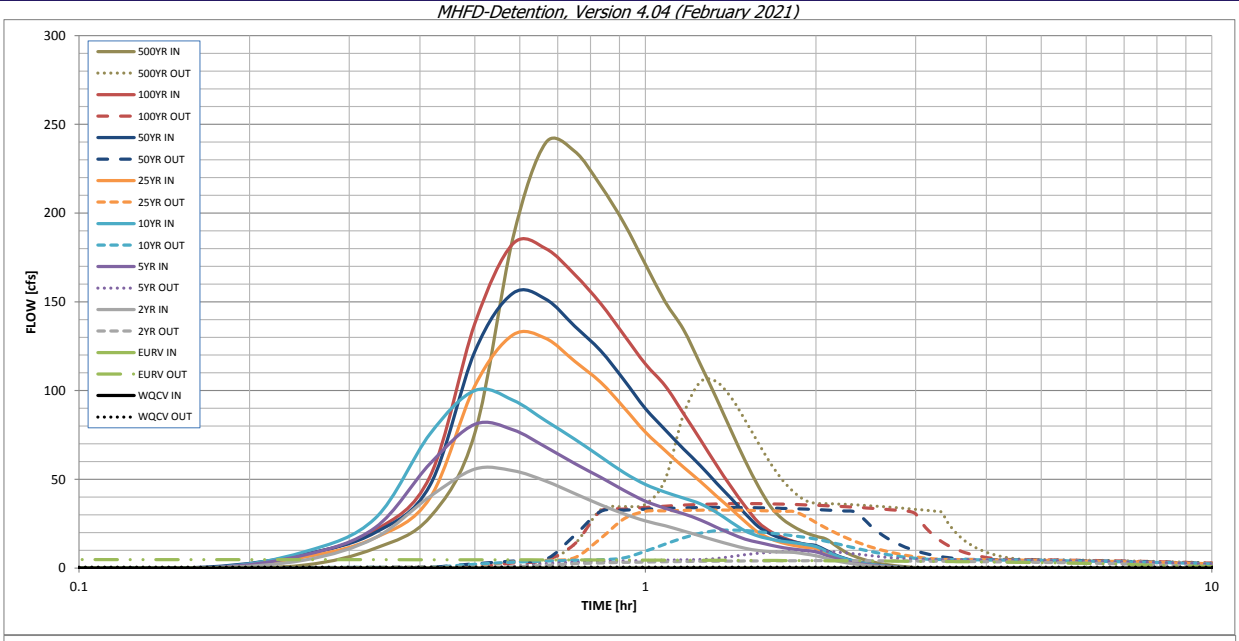
Routed Hydrograph Results

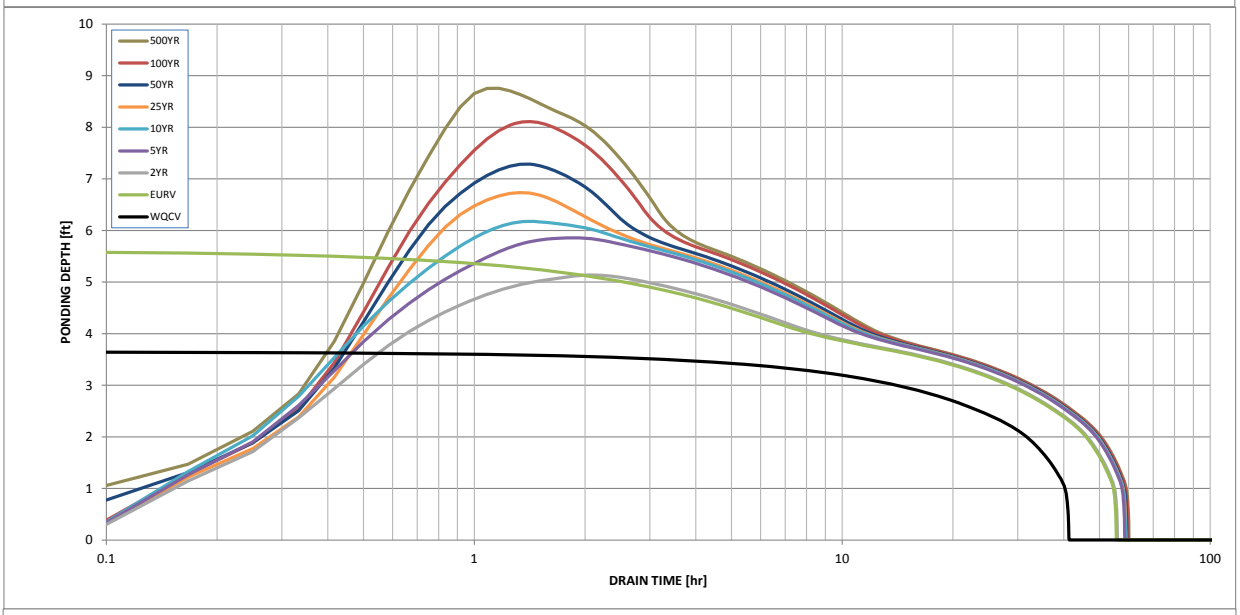
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

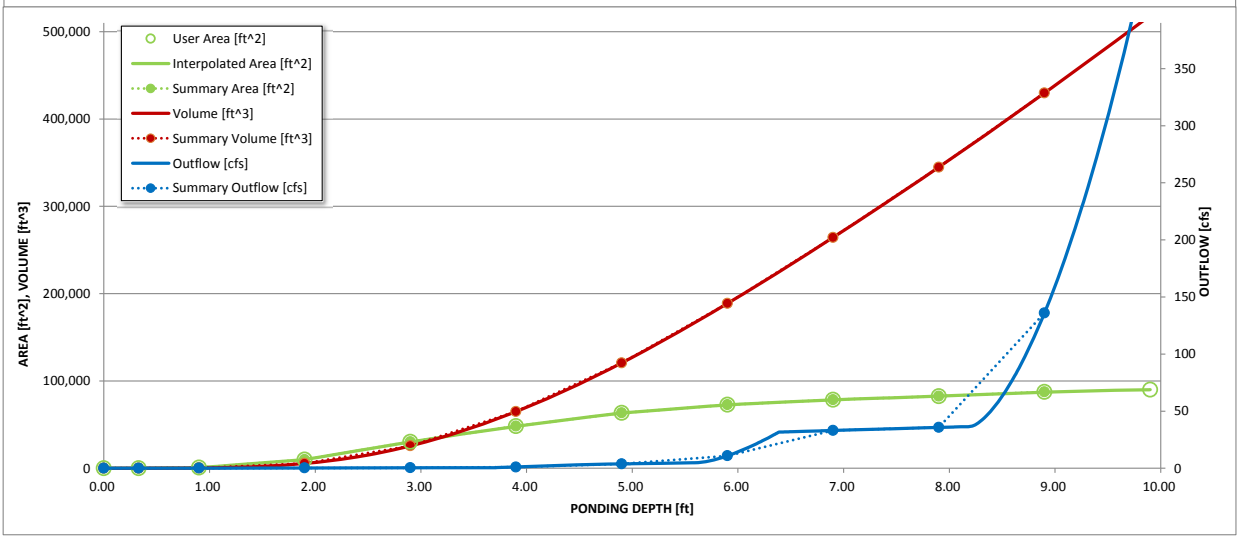
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	1.221	3.859	3.655	5.184	6.521	8.294	9.743	11.572
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.655	5.184	6.521	8.294	9.743	11.572
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.2	20.1	30.5	54.6	68.6	87.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.29	0.44	0.79	0.99	1.26
Peak Inflow Q (cfs) =	N/A	N/A	55.7	81.0	100.0	131.3	154.8	182.6
Peak Outflow Q (cfs) =	0.5	4.8	4.2	9.6	21.4	32.7	34.2	36.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.7	0.6	0.5	0.4
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.6	1.1	1.1	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	48	49	47	45	44	42
Time to Drain 99% of Inflow Volume (hours) =	**40**	52	53	54	54	53	53	52
Maximum Ponding Depth (ft) =	3.65	5.62	5.13	5.86	6.17	6.73	7.28	8.11
Area at Maximum Ponding Depth (acres) =	1.00	1.61	1.50	1.66	1.70	1.78	1.84	1.92
Maximum Volume Stored (acre-ft) =	1.226	3.873	3.111	4.249	4.788	5.763	6.759	8.297

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
5728.1	0.00	48	0.001	0	0.000	0.00
5728.43	0.33	48	0.001	16	0.000	0.07
5729	0.90	679	0.016	223	0.005	0.11
5730	1.90	9,926	0.228	5,525	0.127	0.25
5731	2.90	30,276	0.695	25,626	0.588	0.42
5732	3.90	48,238	1.107	64,883	1.490	1.00
5733	4.90	63,363	1.455	120,684	2.771	3.80
5734	5.90	72,715	1.669	188,723	4.332	10.91
5735	6.90	78,459	1.801	264,310	6.068	33.13
5736	7.90	82,532	1.895	344,805	7.916	35.78
5737	8.90	87,374	2.006	429,758	9.866	135.94

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

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

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: R. Schindler
Company: Core Engineering Group
Date: April 14, 2022
Project: Hillside at Lorson Ranch
Location: Pond E1 - WQ pond

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 52.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.520

C) Contributing Watershed Area — Area = 69.200 ac

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

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

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

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

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
— $V_{DESIGN\ USER}$ = 1.220 ac-ft

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

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

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

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

3. Basin Side Slopes

A) Basin Maximum Side Slopes
(Horizontal distance per unit vertical, 4:1 or flatter preferred)
— Z = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

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

5. Forebay

A) Minimum Forebay Volume
(V_{FMIN} = 3% of the WQCV)
— V_{FMIN} = 0.037 ac-ft

B) Actual Forebay Volume
— V_F = 0.038 ac-ft

C) Forebay Depth
(D_F = 30 inch maximum)
— D_F = 30.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
— Q_{100} = 182.60 cfs

ii) Forebay Discharge Design Flow
($Q_F = 0.02 * Q_{100}$)
— Q_F = 3.65 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

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

G) Rectangular Notch Width
— Calculated W_N = 9.3 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: R. Schindler
Company: Core Engineering Group
Date: January 11, 2022
Project: Hillside at Lorson Ranch
Location: Pond E1 - WQ pond

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 48 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 1.84 inches

E) Total Outlet Area — A_{ot} = 10.26 square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = 159 cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 16.0 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 332 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) — *Other (Please describe below)*

Other (Y/N): Y

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio = 0.6

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 553 sq. in. **Based on type 'Other' screen ratio**

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 3.65 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 71.8 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: R. Schindler
Company: Core Engineering Group
Date: January 11, 2022
Project: Hillside at Lorson Ranch
Location: Pond E1 - WQ pond

10. Overflow Embankment

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

TRM added to emergency overflow. All of 100-year flows will enter outlet structure before entering emergency overflow.

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

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Notes:

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: R. Schindler
Company: Core Engineering Group
Date: April 14, 2022
Project: Hillside at Lorson Ranch
Location: Pond E1 - WQ pond

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 52.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.520

C) Contributing Watershed Area — Area = 69.200 ac

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

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

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

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

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired) — $V_{DESIGN\ USER}$ = 1.220 ac-ft

USE THESE CALCULATIONS ONLY FOR RECTANGULAR NOTCH IN FOREBAY FOR 54" RCP OUTLET

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

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

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

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.037 ac-ft

B) Actual Forebay Volume — V_F = 0.033 ac-ft VF < MINIMUM VF

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 30.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 164.20 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 3.28 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

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

G) Rectangular Notch Width — Calculated W_N = 9.0 in

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: R. Schindler
Company: Core Engineering Group
Date: April 14, 2022
Project: Hillside at Lorson Ranch
Location: Pond E1 - WQ pond

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 52.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.520

C) Contributing Watershed Area — Area = 69.200 ac

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

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

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

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

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired) — $V_{DESIGN\ USER}$ = 1.220 ac-ft

USE THESE CALCULATIONS ONLY FOR RECTANGULAR NOTCH IN FOREBAY FOR 18" RCP OUTLET

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

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred) — Z = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

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

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV) — V_{FMIN} = 0.037 ac-ft

B) Actual Forebay Volume — V_F = 0.004 ac-ft VF < MINIMUM VF

C) Forebay Depth (D_F = 30 inch maximum) — D_F = 30.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 10.30 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 0.21 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

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

G) Rectangular Notch Width — Calculated W_N = 6.2 in

Channel Report

Hydraflow Express by Intelisolve — Tuesday, Jan 11 2022, 7:38 AM

LOW FLOW CHANNEL (2 x forebay=7.3cfs)

Rectangular

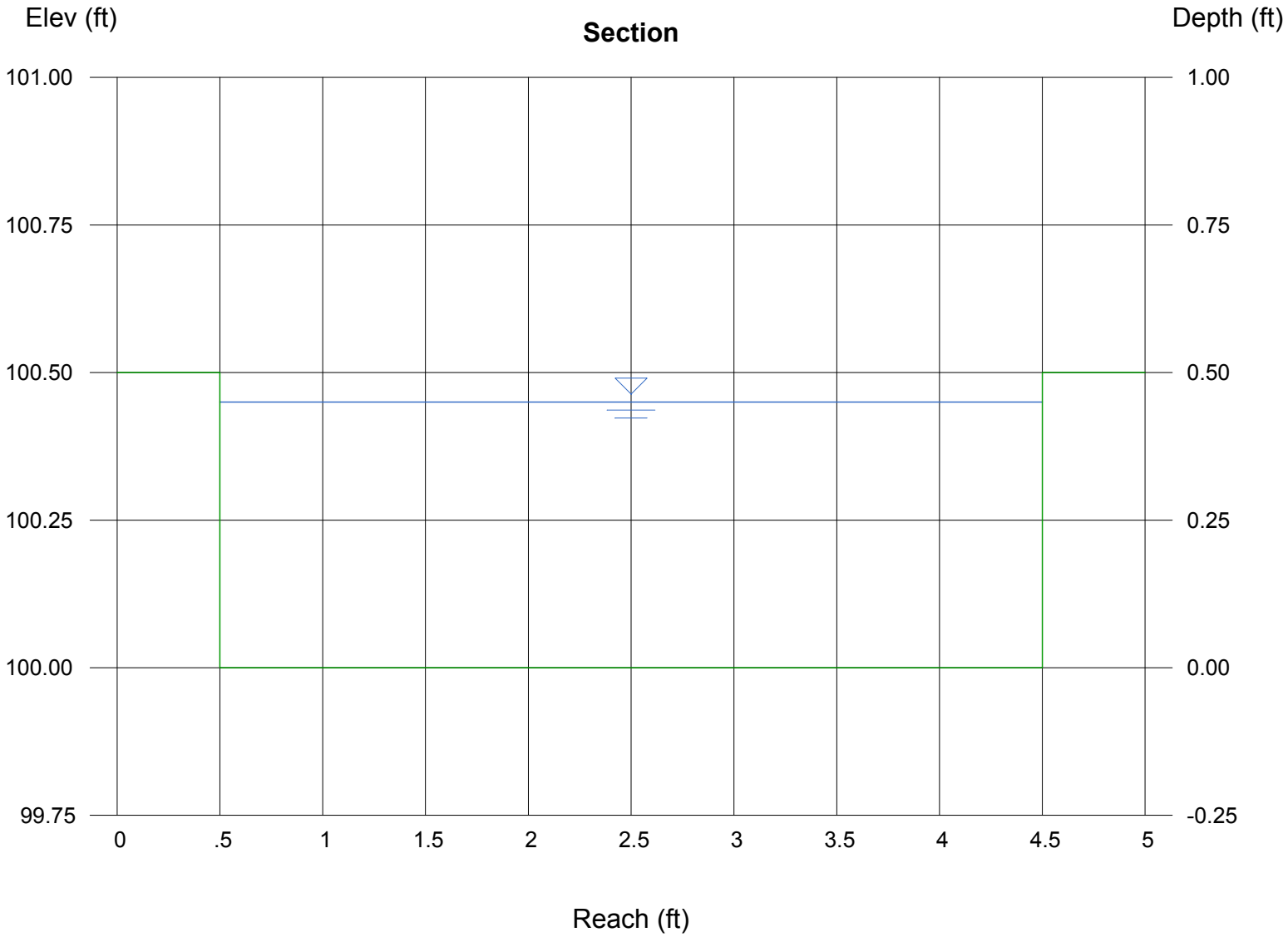
Botom Width (ft)	= 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.013

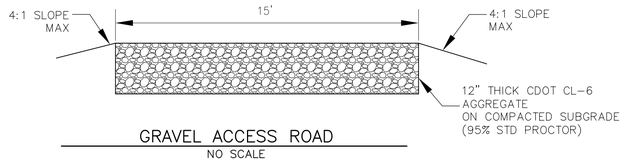
Calculations

Compute by:	Known Q
Known Q (cfs)	= 7.30

Highlighted

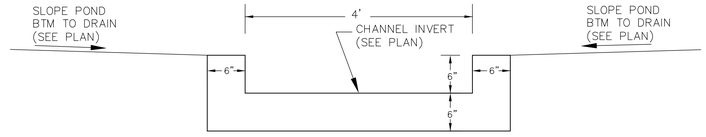
Depth (ft)	= 0.45
Q (cfs)	= 7.300
Area (sqft)	= 1.80
Velocity (ft/s)	= 4.06
Wetted Perim (ft)	= 4.90
Crit Depth, Yc (ft)	= 0.47
Top Width (ft)	= 4.00
EGL (ft)	= 0.71



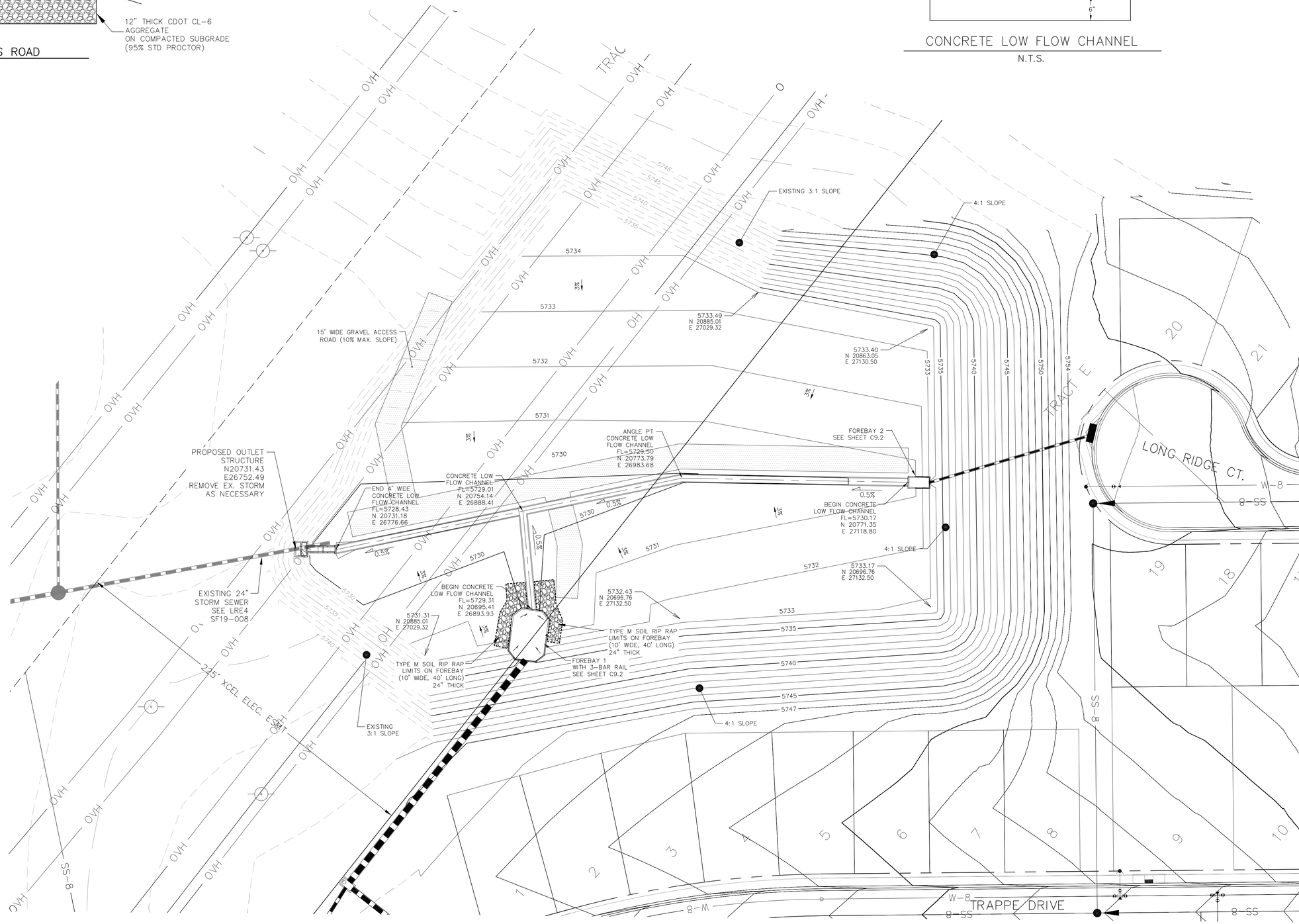


GRAVEL ACCESS ROAD
NO SCALE

NOTE:
1. POND SLOPES SHALL BE 3:1 UNLESS OTHERWISE NOTED
2. STRAW ECB SHALL BE PLACED ON ALL POND SIDE SLOPES UNLESS NOTED OTHERWISE



CONCRETE LOW FLOW CHANNEL
N.T.S.



30 20 10 0 30 60
SCALE: 1"=30'

CORE
ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlschindler@ceg1.com

NO.	DESCRIPTION	DATE

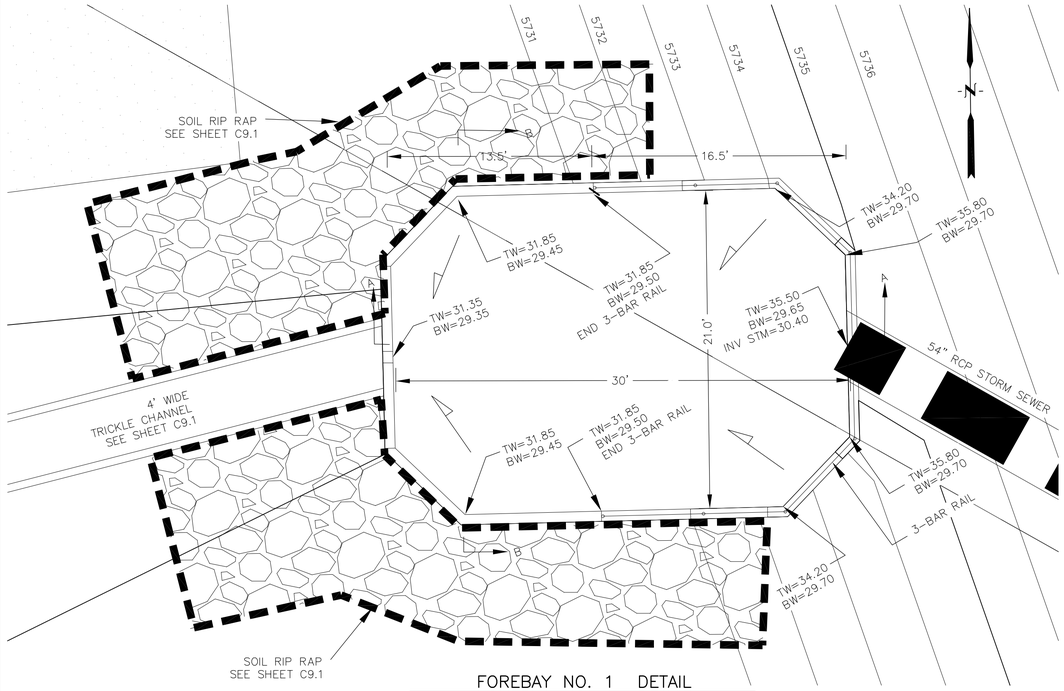
PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD - WALLEYE DR
COLORADO SPRINGS, COLORADO

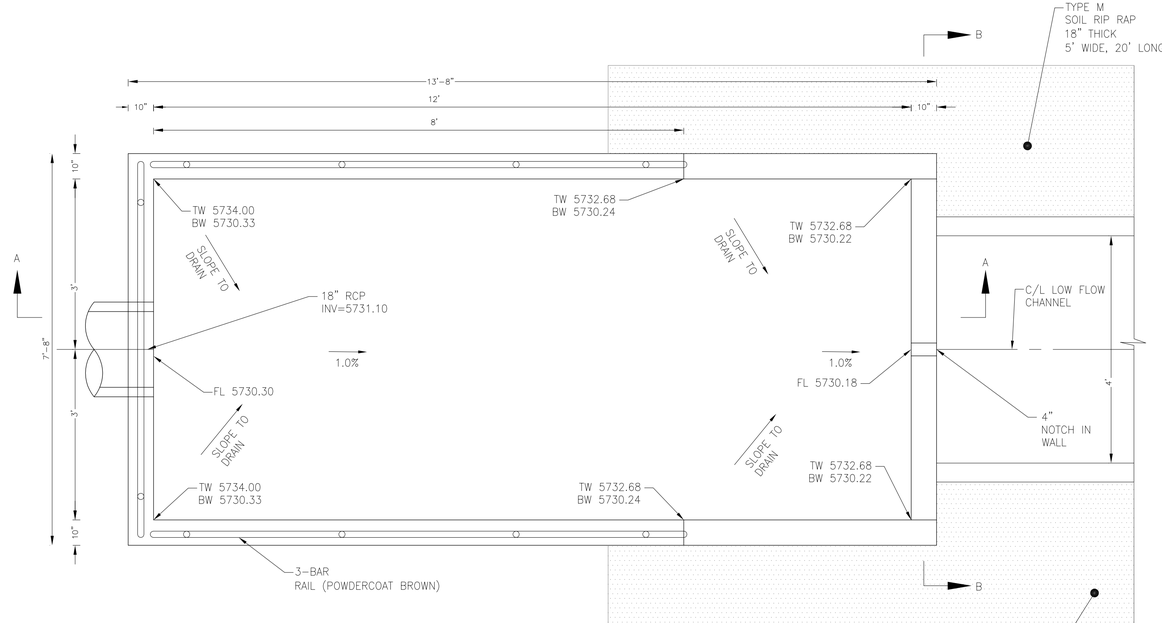
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND E1
POND GRADING AND TRICKLE CHANNEL

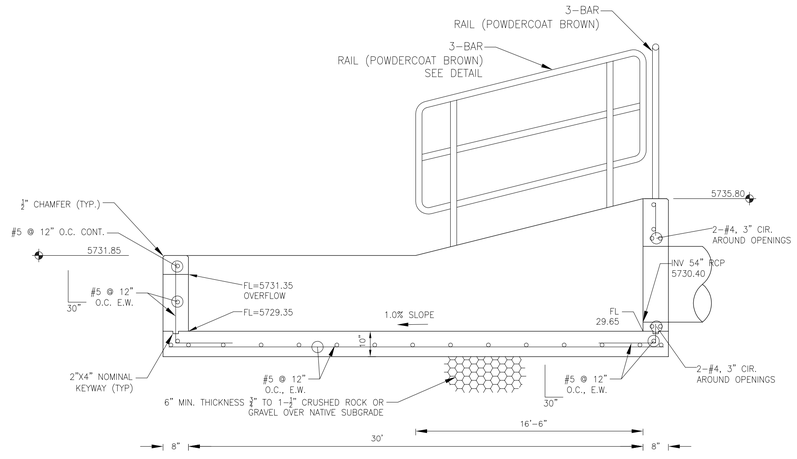
DATE: JULY, 2022
PROJECT NO. 100.065
SHEET NUMBER C9.1
TOTAL SHEETS: 20



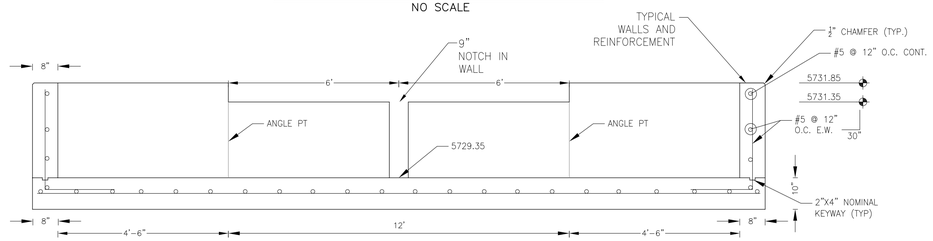
FOREBAY NO. 1 DETAIL
SCALE: 1"=5'



FOREBAY NO. 2
NO SCALE



FOREBAY NO. 1 SECTION A-A
NO SCALE



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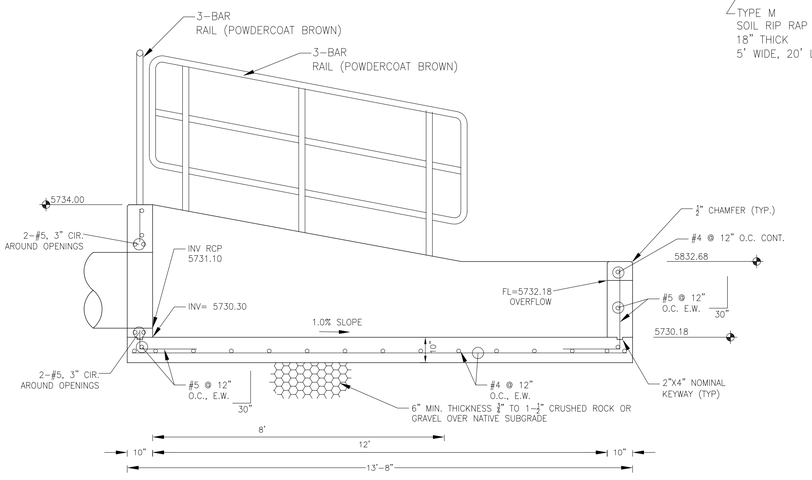

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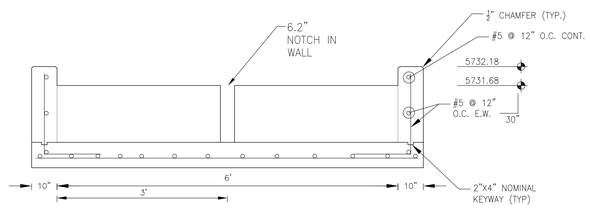
NO SCALE



FOREBAY NO. 2 SECTION B-B
NO SCALE

CORE
ENGINEERING GROUP
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BURNSVILLE, MN 55306
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EMAIL: Rich@ceg1.com

NO. | DESCRIPTION | DATE

PREPARED FOR:
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212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD - WALLEYE DR
COLORADO SPRINGS, COLORADO

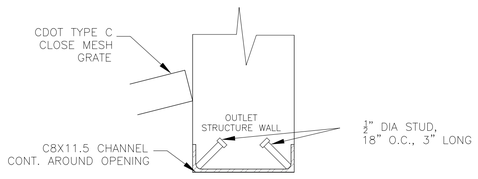
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND E1
POND FOREBAY DETAILS

DATE:
JULY, 2022

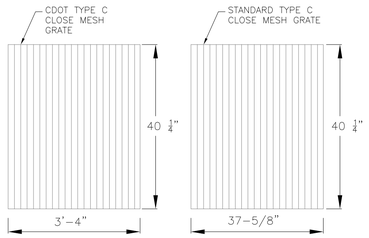
PROJECT NO.
100.065

SHEET NUMBER
C9.2
TOTAL SHEETS: 20



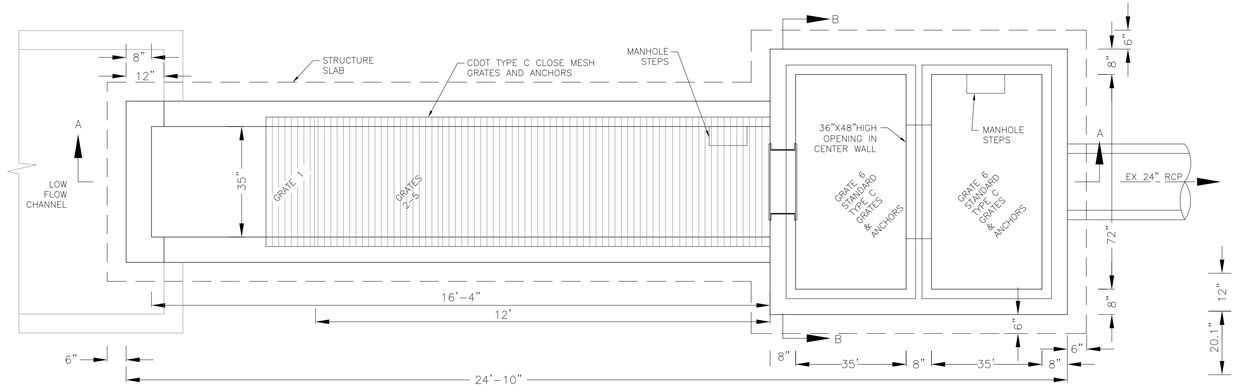
DETAIL A
NO SCALE

NOTE:
AFTER CONCRETE STRUCTURE HAS BEEN POURED ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO GRATE CONSTRUCTION

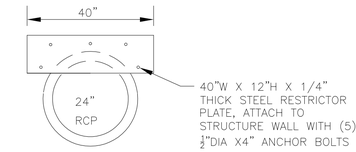


GRATE 1
NO SCALE

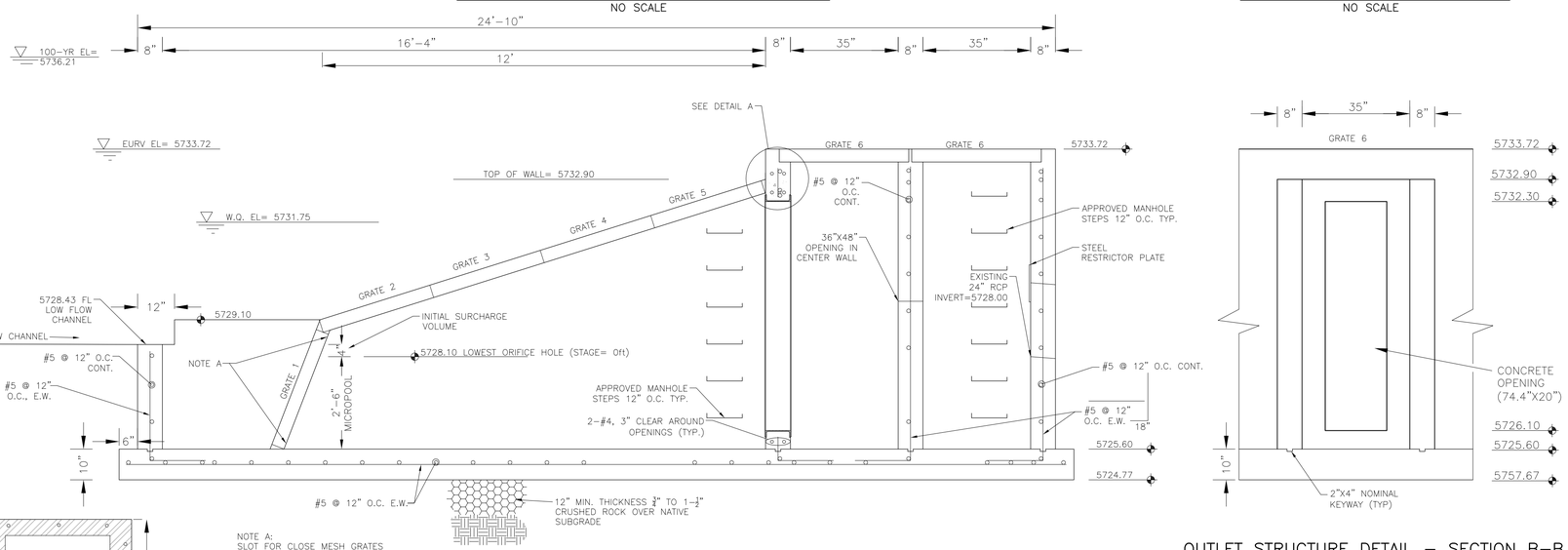
GRATES 2,3,4,5
NO SCALE



OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

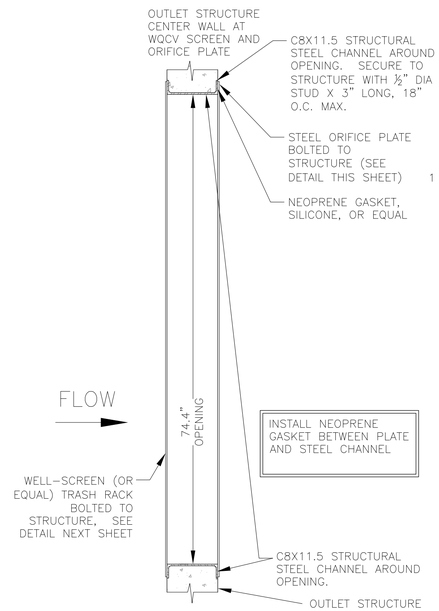


OUTLET RESTRICTOR PLATE
NO SCALE

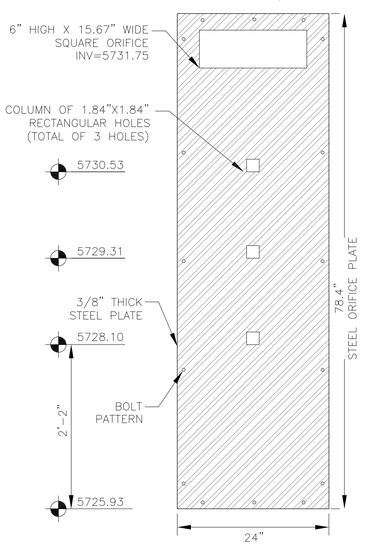


OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE

OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO–INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.

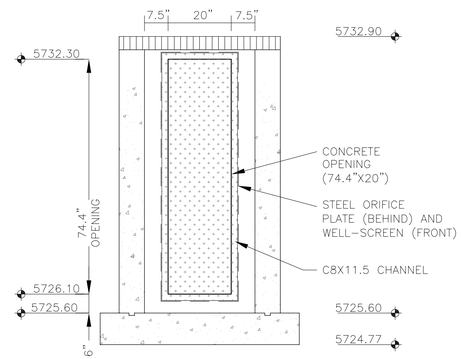
BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'–3"	1'–7"	2'–0"

3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M–213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A ¾" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL–SCREEN NOTES:

1. Well–Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.

2. WQCV Well Screen
- Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
- Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
- Type and Size of Support Rod: TE 0.074"X0.50"
- Spacing of Support Rod (O.C.): 1.0 Inch
- Total Screen Thickness: 0.655"
- Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlcs@coreeg1.com

DATE
DESCRIPTION
NO.

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635–3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND E1
FULL SPECTRUM / WQ POND
OUTLET STRUCTURE DETAILS

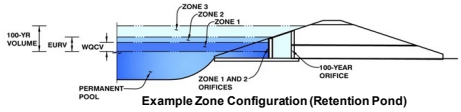
DATE: JULY, 2022
PROJECT NO. 100.065
SHEET NUMBER C9.3
TOTAL SHEETS: 20

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Hillside at Lorson Ranch

Basin ID: Pond G



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	4.76	acres
Watershed Length =	840	ft
Watershed Length to Centroid =	400	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.087	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.282	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.257	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.361	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.451	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.569	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.666	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.788	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.037	acre-feet	inches
Approximate 2-yr Detention Volume =	0.215	acre-feet	
Approximate 5-yr Detention Volume =	0.292	acre-feet	
Approximate 10-yr Detention Volume =	0.381	acre-feet	
Approximate 25-yr Detention Volume =	0.415	acre-feet	
Approximate 50-yr Detention Volume =	0.433	acre-feet	
Approximate 100-yr Detention Volume =	0.478	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.087	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.195	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.239	acre-feet
Total Detention Basin Volume =	0.521	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

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

top micropool=5835.77

Depth Increment = 0.20 ft

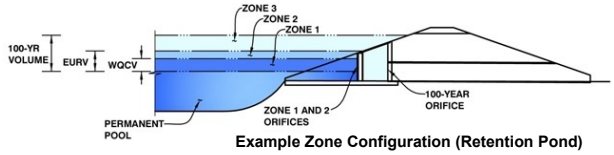
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	30	0.001		
5837	--	1.23	--	--	--	1,180	0.027	744	0.017
5838	--	2.23	--	--	--	4,840	0.111	3,754	0.086
5839	--	3.23	--	--	--	6,608	0.152	9,478	0.218
5840	--	4.23	--	--	--	8,201	0.188	16,883	0.388
5841	--	5.23	--	--	--	9,600	0.220	25,783	0.592
5842	--	6.23	--	--	--	10,600	0.243	35,883	0.824

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Hillside at Lorson Ranch

Basin ID: Pond G



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.25	0.087	Orifice Plate
Zone 2 (EURV)	3.64	0.195	Rectangular Orifice
Zone 3 (100+1/2WQCV)	4.91	0.239	Weir&Pipe (Restrict)
Total (all zones)		0.521	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.569E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.25	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	9.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.37	sq. inches (diameter = 11/16 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80	1.60					
Orifice Area (sq. inches)	0.37	0.37	0.37					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.27	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.08	N/A
Depth at top of Zone using Vertical Orifice =	3.64	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.04	N/A
Vertical Orifice Height =	1.00	N/A	inches			
Vertical Orifice Width =	12.00		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	3.63	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	3.63	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.09	N/A
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	12.53	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	6.26	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.23	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.50	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	5.23	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.22	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	0.59	acre-ft

Calculated Parameters for Spillway

top micropool = 5835.77 = stage 0

Routed Hydrograph Results

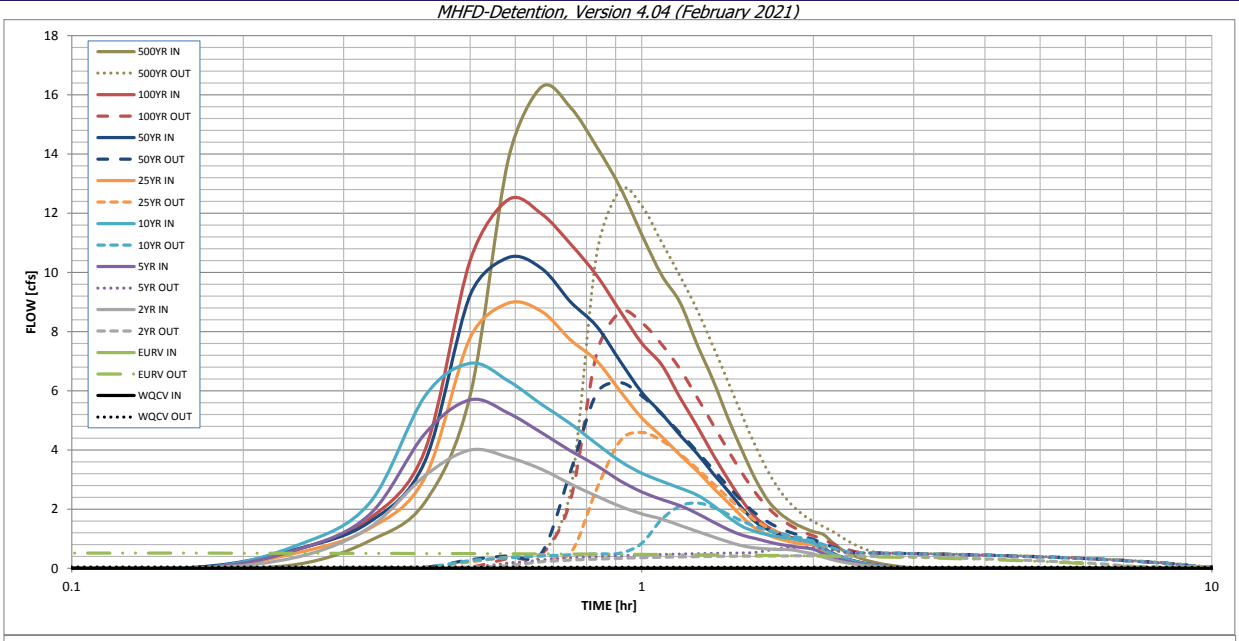
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

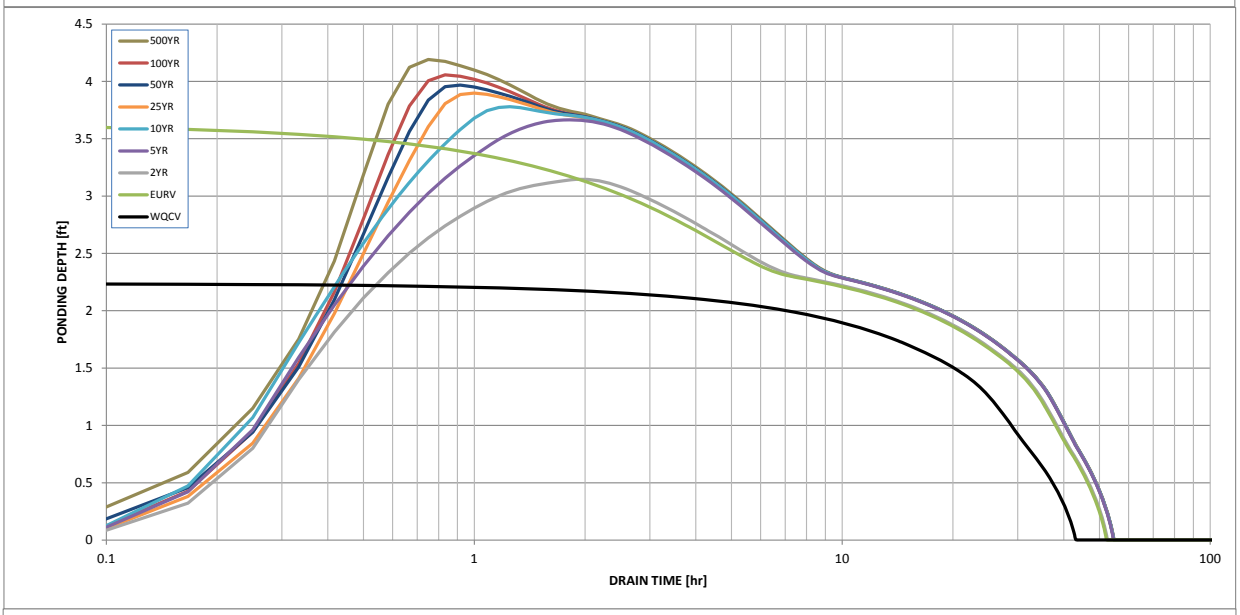
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.087	0.282	0.257	0.361	0.451	0.569	0.666	0.788
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.257	0.361	0.451	0.569	0.666	0.788
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.5	1.3	2.0	3.6	4.5	5.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.28	0.42	0.75	0.94	1.21
Peak Inflow Q (cfs) =	N/A	N/A	4.0	5.7	6.9	9.0	10.5	12.5
Peak Outflow Q (cfs) =	0.0	0.5	0.4	0.7	2.2	4.6	6.3	8.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	1.1	1.3	1.4	1.5
Structure Controlling Flow =	Plate	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	0.00	N/A	0.0	0.1	0.3	0.5	0.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	40	41	41	39	37	36	34
Time to Drain 99% of Inflow Volume (hours) =	**41**	47	48	48	47	46	45	43
Maximum Ponding Depth (ft) =	2.24	3.64	3.15	3.66	3.78	3.90	3.97	4.06
Area at Maximum Ponding Depth (acres) =	0.11	0.17	0.15	0.17	0.17	0.18	0.18	0.18
Maximum Volume Stored (acre-ft) =	0.087	0.283	0.204	0.286	0.305	0.326	0.338	0.354

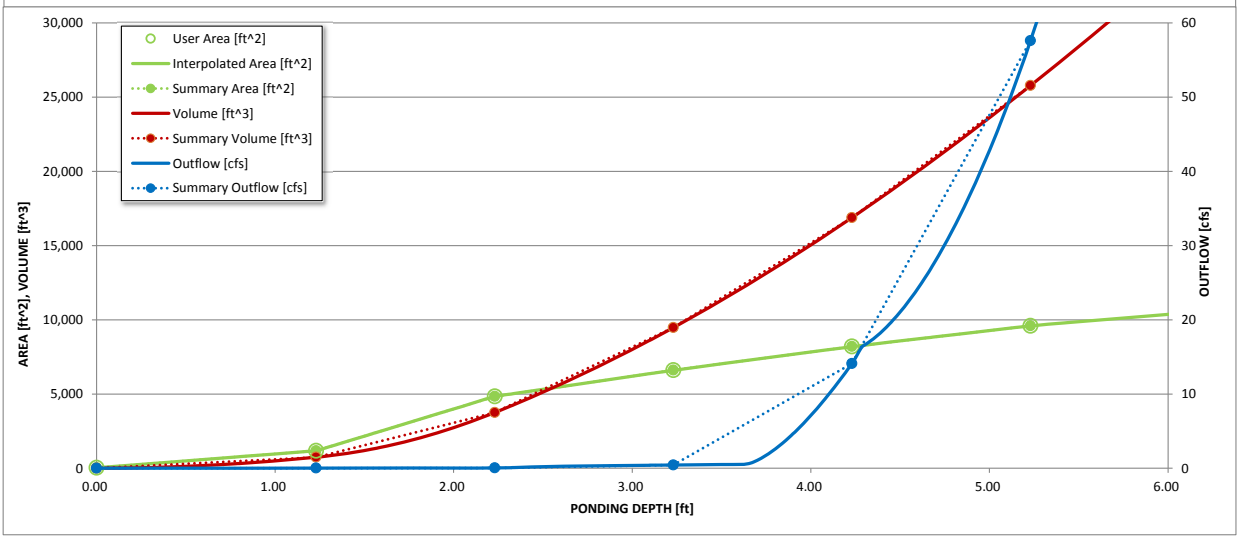
SEE DESIGN POINT 43 FOR DISCUSSION OF OFFSITE FLOWS MEETING EXISTING CONDITIONS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.14
	0:15:00	0.00	0.00	0.39	0.64	0.80	0.54	0.67	0.65	0.93
	0:20:00	0.00	0.00	1.39	1.82	2.21	1.35	1.57	1.68	2.24
	0:25:00	0.00	0.00	3.13	4.56	5.82	3.08	3.62	4.00	5.85
	0:30:00	0.00	0.00	4.00	5.69	6.93	7.80	9.23	10.41	13.81
	0:35:00	0.00	0.00	3.75	5.24	6.33	8.96	10.50	12.46	16.26
	0:40:00	0.00	0.00	3.35	4.58	5.55	8.69	10.14	11.98	15.57
	0:45:00	0.00	0.00	2.85	3.97	4.88	7.72	9.01	10.96	14.25
	0:50:00	0.00	0.00	2.44	3.47	4.21	7.01	8.18	9.90	12.87
	0:55:00	0.00	0.00	2.09	2.96	3.62	5.98	6.99	8.68	11.28
	1:00:00	0.00	0.00	1.84	2.58	3.22	5.08	5.95	7.61	9.91
	1:05:00	0.00	0.00	1.67	2.33	2.95	4.46	5.23	6.88	8.99
	1:10:00	0.00	0.00	1.45	2.12	2.71	3.83	4.50	5.77	7.58
	1:15:00	0.00	0.00	1.25	1.86	2.48	3.30	3.88	4.82	6.36
	1:20:00	0.00	0.00	1.07	1.57	2.13	2.73	3.21	3.85	5.08
	1:25:00	0.00	0.00	0.90	1.32	1.74	2.23	2.62	3.02	3.97
	1:30:00	0.00	0.00	0.76	1.12	1.42	1.74	2.03	2.29	3.01
	1:35:00	0.00	0.00	0.69	1.01	1.24	1.35	1.57	1.72	2.28
	1:40:00	0.00	0.00	0.66	0.90	1.13	1.12	1.30	1.39	1.85
	1:45:00	0.00	0.00	0.64	0.81	1.05	0.98	1.14	1.18	1.57
	1:50:00	0.00	0.00	0.63	0.75	1.00	0.89	1.02	1.04	1.38
	1:55:00	0.00	0.00	0.55	0.70	0.94	0.83	0.94	0.93	1.24
	2:00:00	0.00	0.00	0.49	0.65	0.85	0.79	0.89	0.86	1.14
	2:05:00	0.00	0.00	0.38	0.50	0.65	0.60	0.68	0.64	0.85
	2:10:00	0.00	0.00	0.28	0.37	0.48	0.45	0.50	0.47	0.62
	2:15:00	0.00	0.00	0.21	0.28	0.36	0.33	0.37	0.35	0.46
	2:20:00	0.00	0.00	0.16	0.21	0.26	0.25	0.28	0.26	0.34
	2:25:00	0.00	0.00	0.12	0.15	0.19	0.18	0.20	0.19	0.25
	2:30:00	0.00	0.00	0.09	0.11	0.14	0.13	0.15	0.14	0.18
	2:35:00	0.00	0.00	0.06	0.08	0.10	0.10	0.11	0.10	0.13
	2:40:00	0.00	0.00	0.04	0.05	0.07	0.07	0.08	0.07	0.09
	2:45:00	0.00	0.00	0.03	0.03	0.04	0.04	0.05	0.05	0.06
	2:50:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.04
	2:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
	0.00	30	0.001	0	0.000	0.00
	1.23	1,180	0.027	744	0.017	0.02
	2.23	4,840	0.111	3,754	0.086	0.04
	3.23	6,608	0.152	9,478	0.218	0.44
	4.23	8,201	0.188	16,883	0.388	14.10
	5.23	9,600	0.220	25,783	0.592	57.61

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

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

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: R. Schindler
Company: Core Engineering Group
Date: April 14, 2022
Project: Hillside at Lorson Ranch
Location: Pond G - WQ pond

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 55.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.550

C) Contributing Watershed Area — Area = 4.760 ac

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

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

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

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

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = 0.120 ac-ft

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

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

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

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

3. Basin Side Slopes

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

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:
Concentrated inflows into Pond G are from a storm sewer which is dissipated in a concrete forebay structure.

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 2% of the WQCV)
V_{FMIN} = 0.002 ac-ft

B) Actual Forebay Volume
V_F = 0.003 ac-ft

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

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 12.50 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 0.25 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

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

G) Rectangular Notch Width
Calculated W_N = 4.1 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: R. Schindler
Company: Core Engineering Group
Date: January 6, 2022
Project: Hillside at Lorson Ranch
Location: Pond G - WQ pond

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 13 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 0.68 inches

E) Total Outlet Area — A_{ot} = 1.11 square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 4.2 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 40 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) — *Other (Please describe below)*

Other (Y/N): Y

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio = 0.6

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 67 sq. in. **Based on type 'Other' screen ratio**

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 2.25 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 55 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: R. Schindler
Company: Core Engineering Group
Date: January 6, 2022
Project: Hillside at Lorson Ranch
Location: Pond G - WQ pond

10. Overflow Embankment

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

TRM added to emergency overflow. All of 100-year flows will enter outlet structure before entering emergency overflow.

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

Ze = 4.00 ft / ft

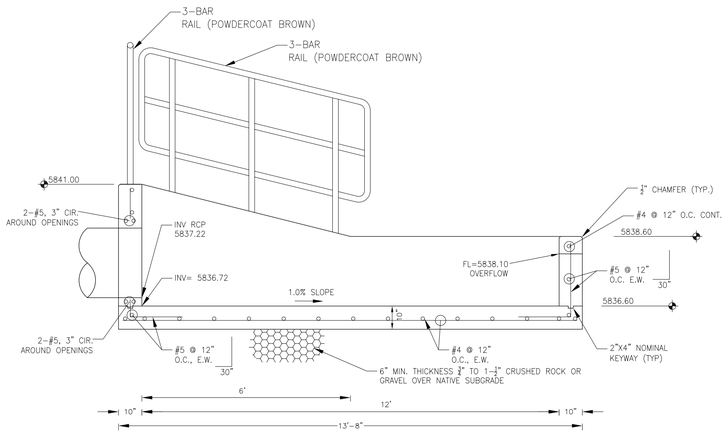
11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

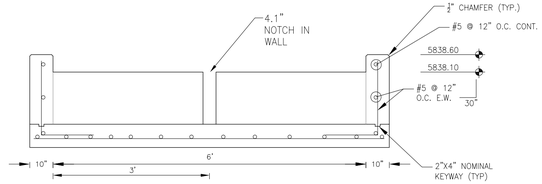
12. Access

A) Describe Sediment Removal Procedures

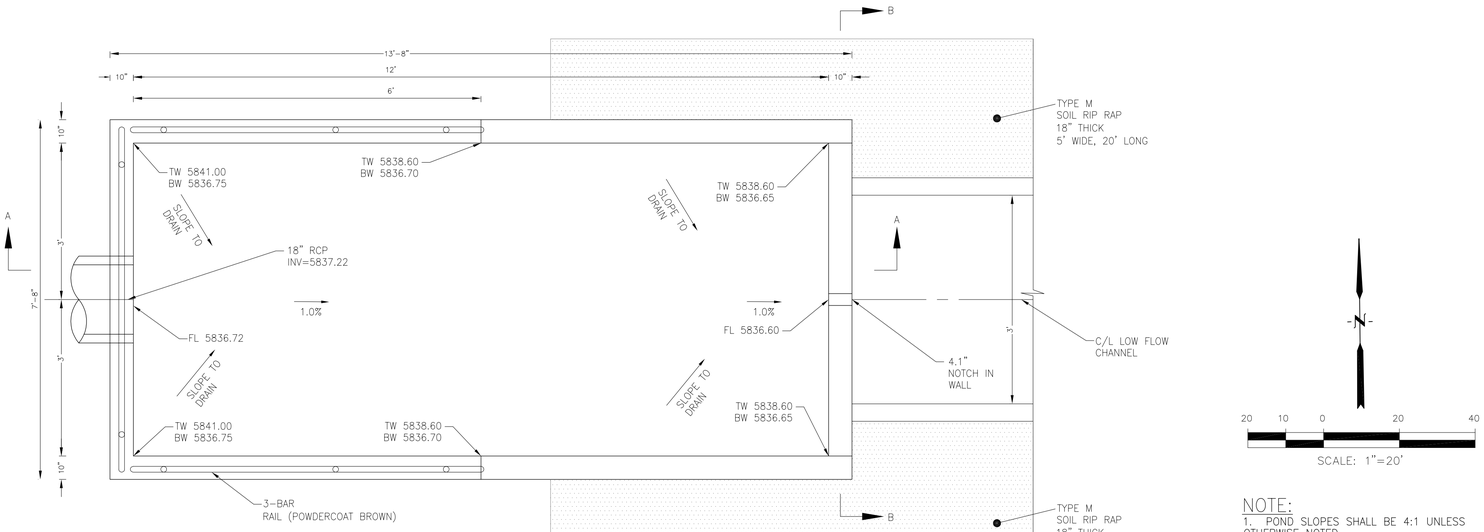
Notes:



FOREBAY SECTION A–A
NO SCALE



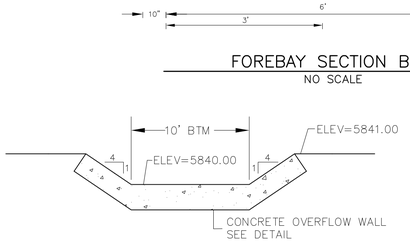
FOREBAY SECTION B–B
NO SCALE



FOREBAY DETAIL
NO SCALE

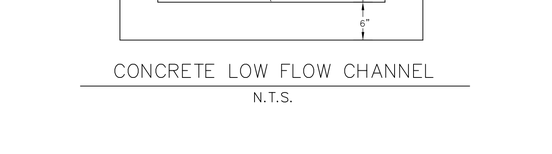
SCALE: 1"=20'

NOTE:
1. POND SLOPES SHALL BE 4:1 UNLESS OTHERWISE NOTED
2. STRAW ECB SHALL BE PLACED ON ALL POND SIDE SLOPES UNLESS NOTED OTHERWISE

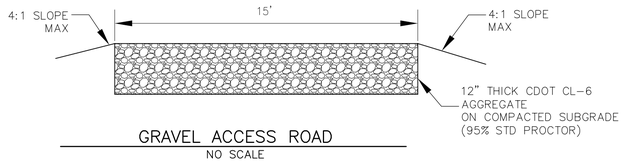


POND G
EMERGENCY OVERFLOW
BTM=5840.00, TOP=5841.00
WIDTH=10', 4:1 SIDE SLOPES
FLOW DEPTH=0.50', Q100=12.5cfs

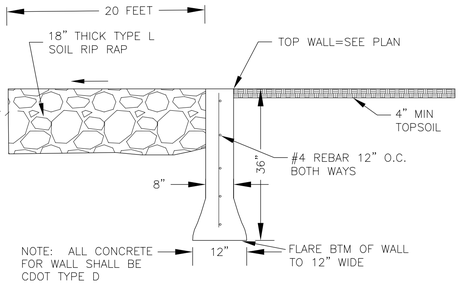
WQ POND G
EMERGENCY OVERFLOW
PROFILE
SCALE: NTS



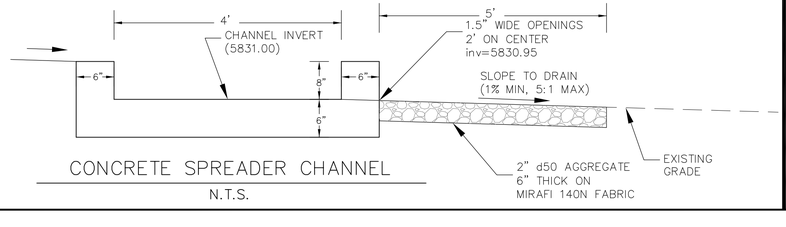
CONCRETE LOW FLOW CHANNEL
N.T.S.



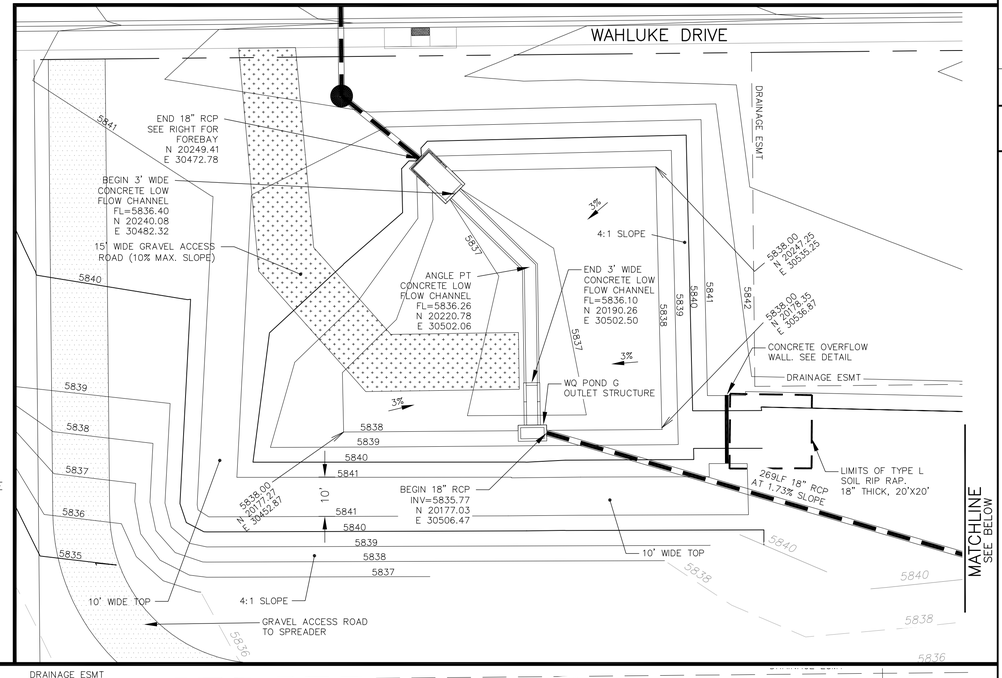
GRAVEL ACCESS ROAD
NO SCALE

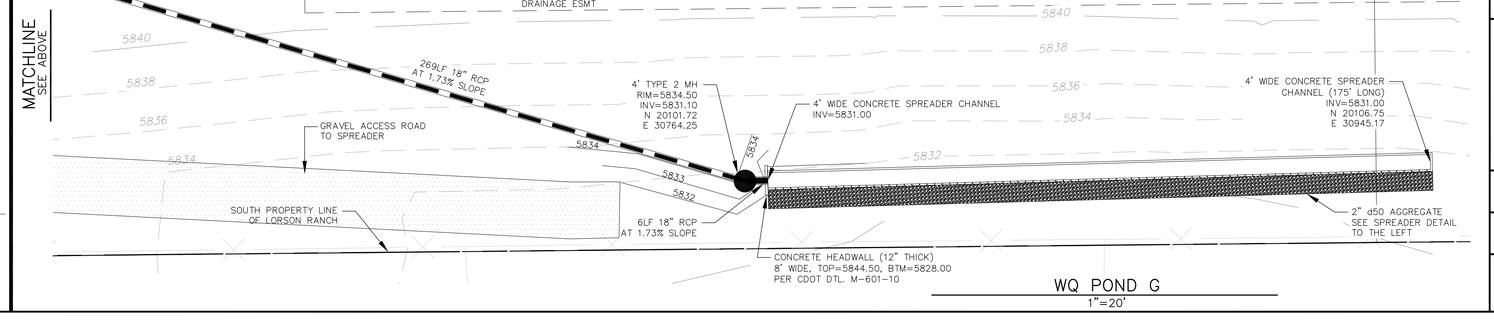


POND CONCRETE OVERFLOW WALL
NO SCALE



CONCRETE SPREADER CHANNEL
N.T.S.





WQ POND G
1"=20'

CORE
ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlschindler@ceg1.com

NO.	DESCRIPTION	DATE
1.	MODIFY CONCRETE SPREADER CHANNEL	NOV 30, 2021

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

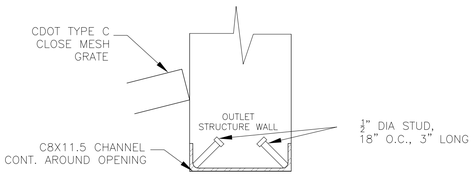
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G
POND DETAILS
AND TRICKLE CHANNEL

DATE:
JULY, 2022

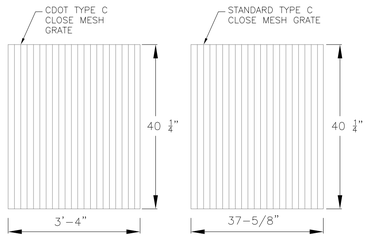
PROJECT NO.
100.065

SHEET NUMBER
C9.4
TOTAL SHEETS: 20



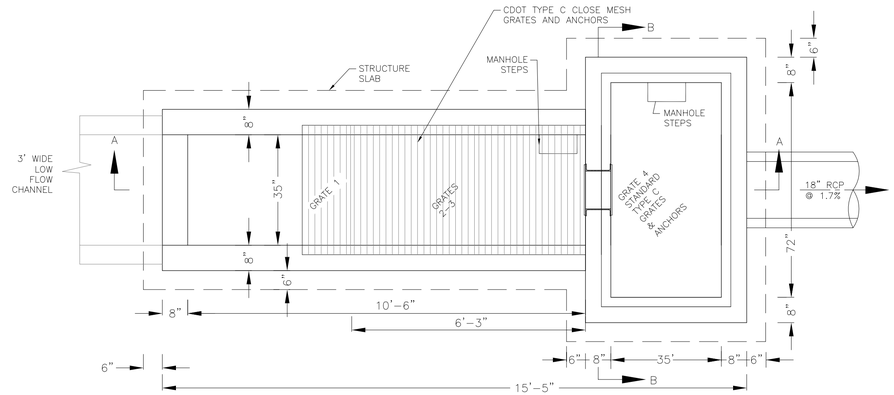
DETAIL A
NO SCALE

NOTE:
AFTER CONCRETE STRUCTURE HAS BEEN POURED ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO GRATE CONSTRUCTION

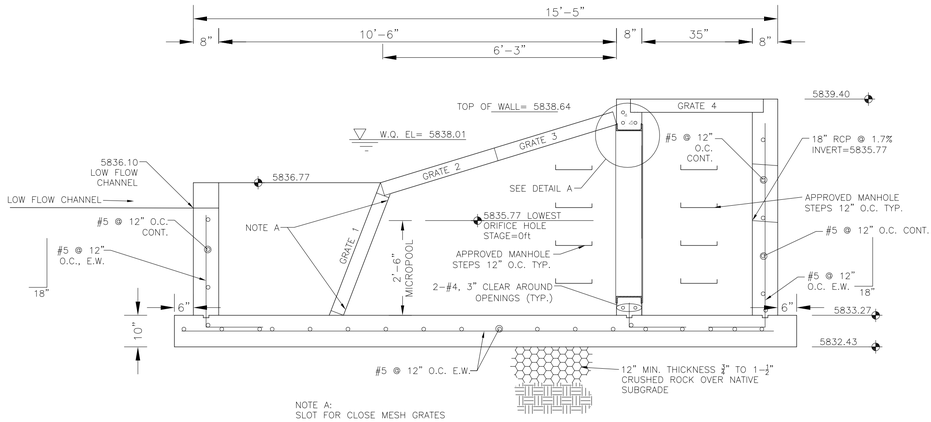


GRATE 1
NO SCALE

GRATES 2 & 3
NO SCALE

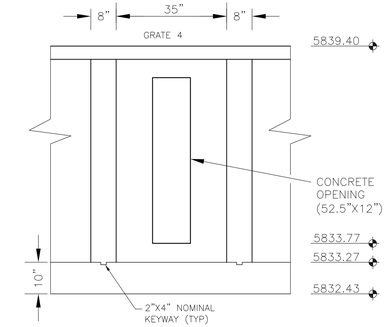


OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

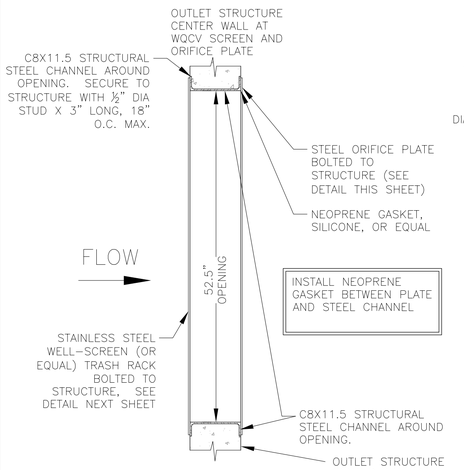


NOTE A:
SLOT FOR CLOSE MESH GRATES

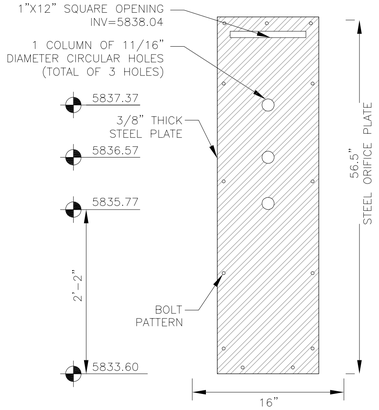
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO–INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.

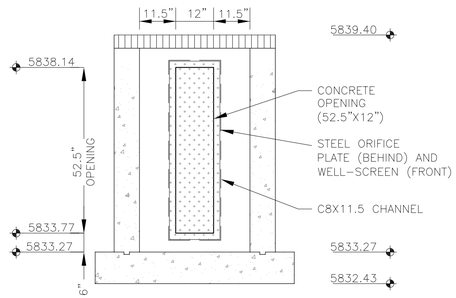
BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'–3"	1'–7"	2'–0"

3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M–213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A ¾" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL–SCREEN NOTES:

1. Well–Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.

2. WQCV Well Screen
- Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
- Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
- Type and Size of Support Rod: TE 0.074"X0.50"
- Spacing of Support Rod (O.C.): 1.0 Inch
- Total Screen Thickness: 0.655"
- Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

CORE
ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlschindler@coreeg.com

NO.	DESCRIPTION	DATE
1.	MODIFY CIRCULAR HOLES IN ORIFICE PLATE	NOV 30, 2021

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G
FULL SPECTRUM / WQ POND
OUTLET STRUCTURE DETAILS

DATE:
JULY, 2022

PROJECT NO.
100.065

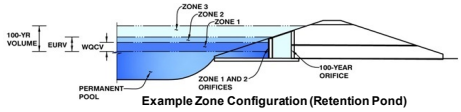
SHEET NUMBER
C9.5
TOTAL SHEETS: 20

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Hillside at Lorson Ranch

Basin ID: Pond H



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	10.41	acres
Watershed Length =	1,700	ft
Watershed Length to Centroid =	800	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.191	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.617	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.578	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.811	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	1.014	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.278	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	1.496	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.769	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	2.330	acre-feet	inches
Approximate 2-yr Detention Volume =	0.470	acre-feet	
Approximate 5-yr Detention Volume =	0.639	acre-feet	
Approximate 10-yr Detention Volume =	0.834	acre-feet	
Approximate 25-yr Detention Volume =	0.907	acre-feet	
Approximate 50-yr Detention Volume =	0.947	acre-feet	
Approximate 100-yr Detention Volume =	1.044	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.191	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.426	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	0.523	acre-feet
Total Detention Basin Volume =	1.140	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

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

micropool=5804.4

Depth Increment = 0.20 ft

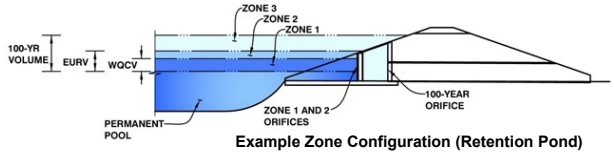
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	30	0.001		
5805	--	0.60	--	--	--	160	0.004	57	0.001
5806	--	1.60	--	--	--	2,527	0.058	1,400	0.032
5807	--	2.60	--	--	--	6,488	0.149	5,908	0.136
5808	--	3.60	--	--	--	9,136	0.210	13,720	0.315
5809	--	4.60	--	--	--	11,649	0.267	24,112	0.554
5810	--	5.60	--	--	--	14,272	0.328	37,073	0.851
5811	--	6.60	--	--	--	16,928	0.389	52,673	1.209
5812	--	7.60	--	--	--	19,738	0.453	71,006	1.630
5813	--	8.60	--	--	--	21,198	0.487	91,474	2.100
5814	--	9.60	--	--	--	23,500	0.539	113,823	2.613

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Hillside at Lorson Ranch

Basin ID: Pond H



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.95	0.191	Orifice Plate
Zone 2 (EURV)	4.84	0.426	Rectangular Orifice
Zone 3 (100+1/2WQCV)	6.42	0.523	Weir&Pipe (Restrict)
Total (all zones)		1.140	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.375E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.95	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	11.80	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.63	sq. inches (diameter = 7/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.98	1.97					
Orifice Area (sq. inches)	0.63	0.63	0.63					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.95	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.21	N/A
Depth at top of Zone using Vertical Orifice =	4.84	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.13	N/A
Vertical Orifice Height =	3.00	N/A	inches			
Vertical Orifice Width =	10.00		inches			

Calculated Parameters for Vertical Orifi

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	5.42	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.42	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	Overflow Weir Slope Length =	3.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	7.09	N/A
Horiz. Length of Weir Sides =	3.00	N/A	feet	Overflow Grate Open Area w/o Debris =	12.53	N/A
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	6.26	N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow We

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.75	N/A
Restrictor Plate Height Above Pipe Invert =	18.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	7.50	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.58	feet
Spillway Crest Length =	15.00	feet	Stage at Top of Freeboard =	8.58	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.49	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	2.09	acre-ft

micropool=5804.40=stage 0

Calculated Parameters for Spillway

Routed Hydrograph Results

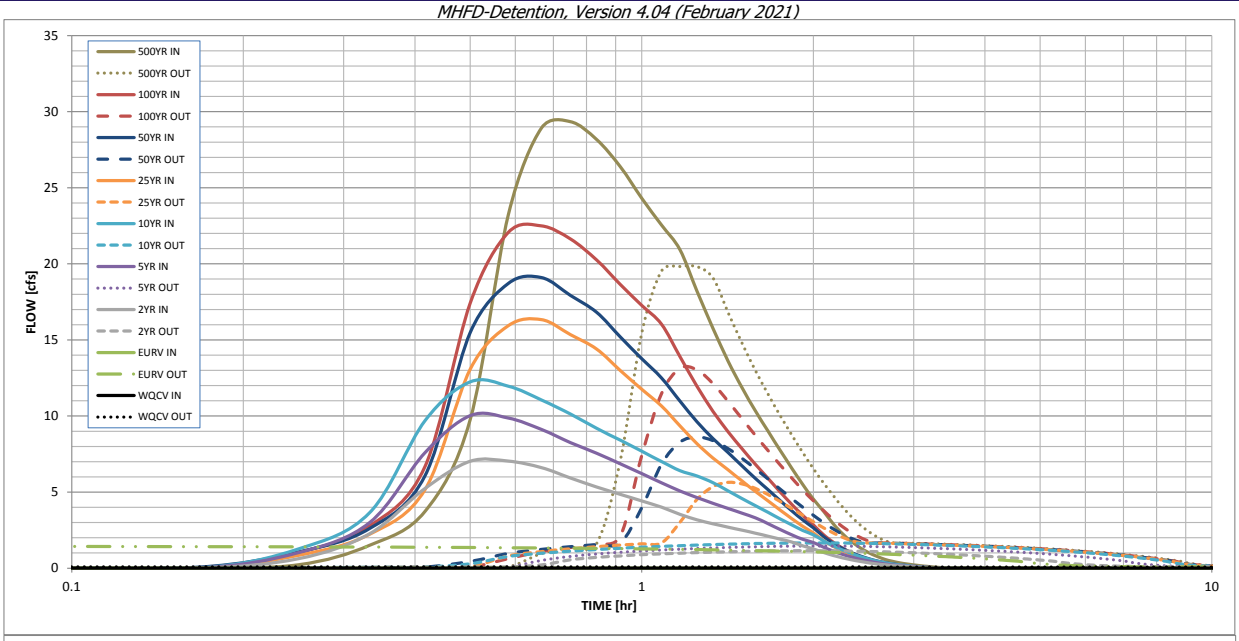
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF)

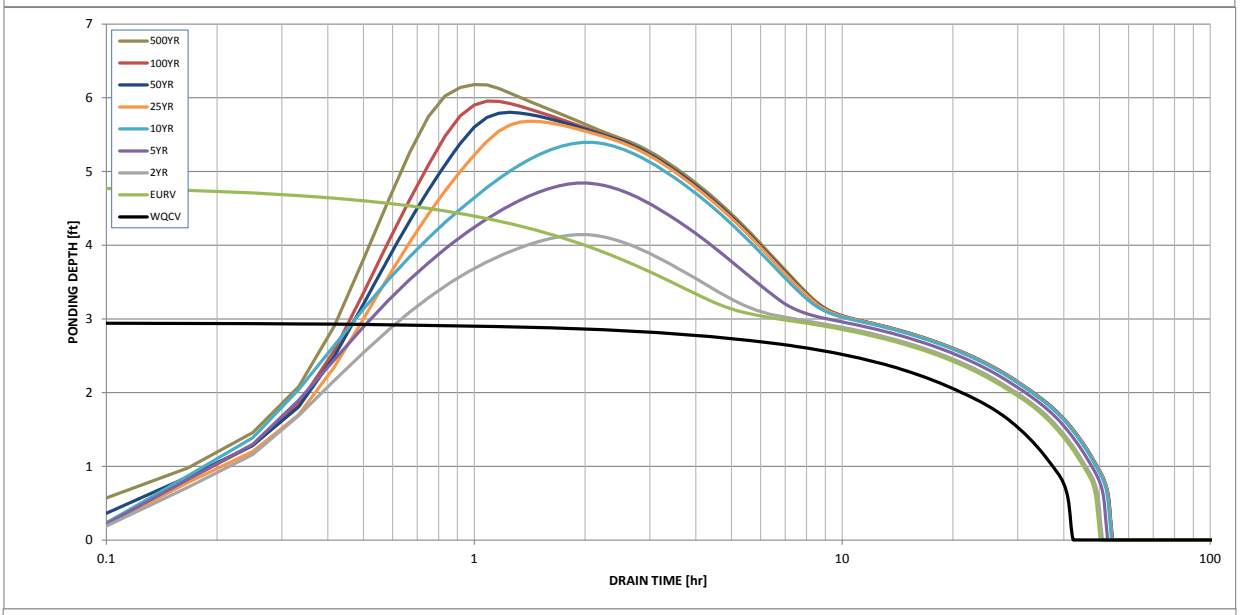
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.191	0.617	0.578	0.811	1.014	1.278	1.496	1.769
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.578	0.811	1.014	1.278	1.496	1.769
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.8	2.2	3.3	6.2	7.8	9.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.21	0.32	0.59	0.75	0.96
Peak Inflow Q (cfs) =	N/A	N/A	7.0	10.0	12.2	16.3	19.1	22.5
Peak Outflow Q (cfs) =	0.1	1.4	1.1	1.5	1.7	5.6	8.6	13.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	0.5	0.9	1.1	1.3
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.5	0.9
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	41	42	42	41	39	37	35
Time to Drain 99% of Inflow Volume (hours) =	**41**	46	47	47	48	47	46	45
Maximum Ponding Depth (ft) =	2.95	4.84	4.14	4.84	5.39	5.68	5.80	5.95
Area at Maximum Ponding Depth (acres) =	0.17	0.28	0.24	0.28	0.31	0.33	0.34	0.35
Maximum Volume Stored (acre-ft) =	0.191	0.619	0.437	0.619	0.784	0.877	0.918	0.969

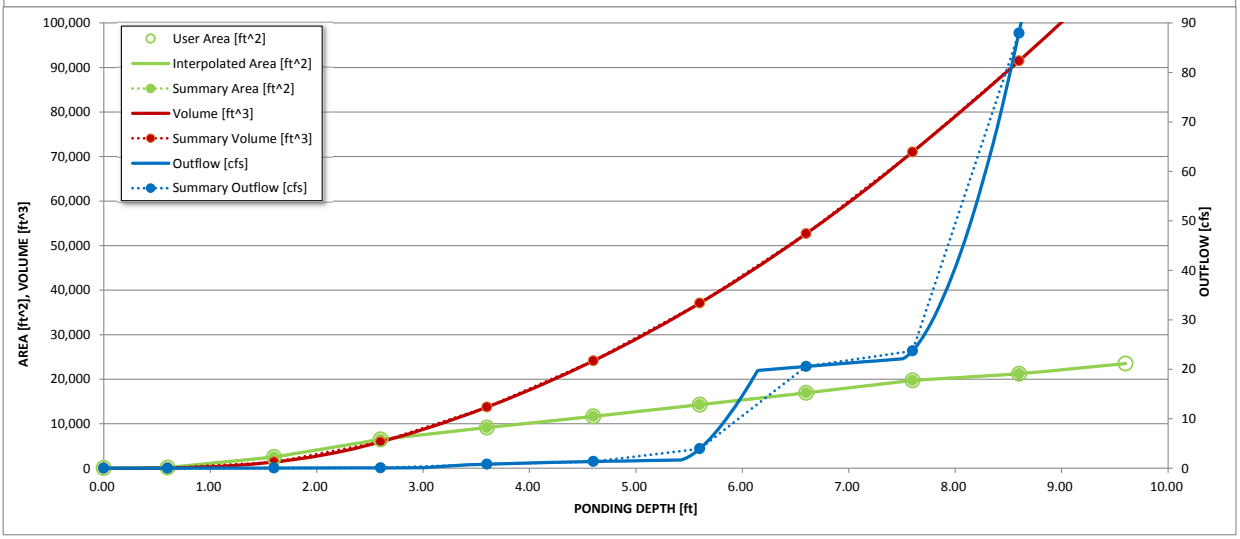
SEE DESIGN POINT 5b FOR DISCUSSION OF OFFSITE FLOWS MEETING EXISTING CONDITIONS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.01	0.23
	0:15:00	0.00	0.00	0.63	1.02	1.27	0.85	1.07	1.04	1.51
	0:20:00	0.00	0.00	2.27	3.00	3.65	2.23	2.61	2.78	3.73
	0:25:00	0.00	0.00	5.24	7.60	9.69	5.17	6.09	6.69	9.77
	0:30:00	0.00	0.00	7.03	10.02	12.24	13.07	15.48	17.41	23.21
	0:35:00	0.00	0.00	7.04	9.87	11.96	15.94	18.71	22.06	28.92
	0:40:00	0.00	0.00	6.61	9.12	11.06	16.33	19.10	22.49	29.34
	0:45:00	0.00	0.00	5.92	8.25	10.13	15.34	17.92	21.63	28.17
	0:50:00	0.00	0.00	5.33	7.55	9.19	14.40	16.82	20.26	26.38
	0:55:00	0.00	0.00	4.85	6.86	8.41	12.99	15.19	18.64	24.31
	1:00:00	0.00	0.00	4.42	6.21	7.69	11.76	13.77	17.27	22.55
	1:05:00	0.00	0.00	4.01	5.61	7.01	10.66	12.50	16.03	20.93
	1:10:00	0.00	0.00	3.53	5.08	6.41	9.35	10.98	13.90	18.21
	1:15:00	0.00	0.00	3.18	4.64	6.06	8.18	9.63	11.96	15.77
	1:20:00	0.00	0.00	2.92	4.27	5.62	7.24	8.52	10.31	13.62
	1:25:00	0.00	0.00	2.70	3.93	5.08	6.47	7.60	8.98	11.85
	1:30:00	0.00	0.00	2.50	3.61	4.57	5.72	6.71	7.84	10.33
	1:35:00	0.00	0.00	2.30	3.31	4.10	5.04	5.89	6.82	8.98
	1:40:00	0.00	0.00	2.10	2.92	3.66	4.41	5.14	5.89	7.73
	1:45:00	0.00	0.00	1.91	2.54	3.24	3.82	4.43	5.00	6.57
	1:50:00	0.00	0.00	1.72	2.19	2.85	3.26	3.77	4.19	5.49
	1:55:00	0.00	0.00	1.46	1.89	2.48	2.75	3.17	3.46	4.54
	2:00:00	0.00	0.00	1.27	1.69	2.20	2.32	2.66	2.84	3.75
	2:05:00	0.00	0.00	1.03	1.38	1.81	1.82	2.09	2.20	2.92
	2:10:00	0.00	0.00	0.84	1.12	1.47	1.43	1.64	1.71	2.26
	2:15:00	0.00	0.00	0.68	0.90	1.19	1.13	1.29	1.32	1.75
	2:20:00	0.00	0.00	0.55	0.73	0.96	0.89	1.02	1.01	1.34
	2:25:00	0.00	0.00	0.44	0.59	0.77	0.70	0.80	0.77	1.03
	2:30:00	0.00	0.00	0.35	0.47	0.61	0.55	0.63	0.59	0.78
	2:35:00	0.00	0.00	0.28	0.37	0.47	0.43	0.48	0.44	0.59
	2:40:00	0.00	0.00	0.22	0.28	0.36	0.33	0.37	0.34	0.45
	2:45:00	0.00	0.00	0.18	0.22	0.28	0.25	0.29	0.27	0.35
	2:50:00	0.00	0.00	0.14	0.17	0.22	0.20	0.23	0.21	0.28
	2:55:00	0.00	0.00	0.11	0.13	0.17	0.16	0.17	0.17	0.22
	3:00:00	0.00	0.00	0.08	0.09	0.12	0.12	0.13	0.12	0.16
	3:05:00	0.00	0.00	0.05	0.07	0.09	0.08	0.09	0.09	0.12
	3:10:00	0.00	0.00	0.03	0.04	0.06	0.06	0.06	0.06	0.08
	3:15:00	0.00	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.05
	3:20:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	3:25:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

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

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

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
top of micropool	0.00	30	0.001	0	0.000	0.00
5805	0.60	160	0.004	57	0.001	0.02
5806	1.60	2,527	0.058	1,400	0.032	0.04
5807	2.60	6,488	0.149	5,908	0.136	0.08
5808	3.60	9,136	0.210	13,720	0.315	0.83
5809	4.60	11,649	0.267	24,112	0.554	1.36
5810	5.60	14,272	0.328	37,073	0.851	3.94
5811	6.60	16,928	0.389	52,673	1.209	20.58
5812	7.60	19,738	0.453	71,006	1.630	23.72
5813	8.60	21,198	0.487	91,474	2.100	87.94

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

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

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: R. Schindler
Company: Core Engineering Group
Date: April 13, 2022
Project: Hillside at Lorson Ranch
Location: Pond H - WQ pond

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 55.0 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.550

C) Contributing Watershed Area — Area = 10.410 ac

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

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
— V_{DESIGN} = 0.191 ac-ft

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

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

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

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

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

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

3. Basin Side Slopes

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

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:
— energy dissipation from storm sewer flow dissipated via a concrete block attenuator located in the forebay.

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)
— V_{FMIN} = 0.006 ac-ft

B) Actual Forebay Volume
— V_F = 0.006 ac-ft

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

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
— Q_{100} = 22.50 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
— Q_F = 0.45 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

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

G) Rectangular Notch Width
— Calculated W_N = 4.5 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: R. Schindler
Company: Core Engineering Group
Date: January 7, 2022
Project: Hillside at Lorson Ranch
Location: Pond H - WQ pond

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 40 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = 0.88 inches

E) Total Outlet Area — A_{ot} = 1.89 square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = 25 cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 13.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = 67 square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) — *Other (Please describe below)*

Other (Y/N): Y

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio = 0.6

D) Total Water Quality Screen Area (based on screen type) — A_{total} = 112 sq. in. **Based on type 'Other' screen ratio**

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= 2.95 feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= 63.4 inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: R. Schindler
Company: Core Engineering Group
Date: January 7, 2022
Project: Hillside at Lorson Ranch
Location: Pond H - WQ pond

10. Overflow Embankment

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

TRM added to emergency overflow. All of 100-year flows will enter outlet structure before entering emergency overflow.

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

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ◉ Not Irrigated

12. Access

A) Describe Sediment Removal Procedures

Notes:

Weir Report

Hydraflow Express by Intelisolve | Wednesday, Apr 13 2022, 9:12 AM

Pond H emergency overflow - type R inlet

Rectangular Weir

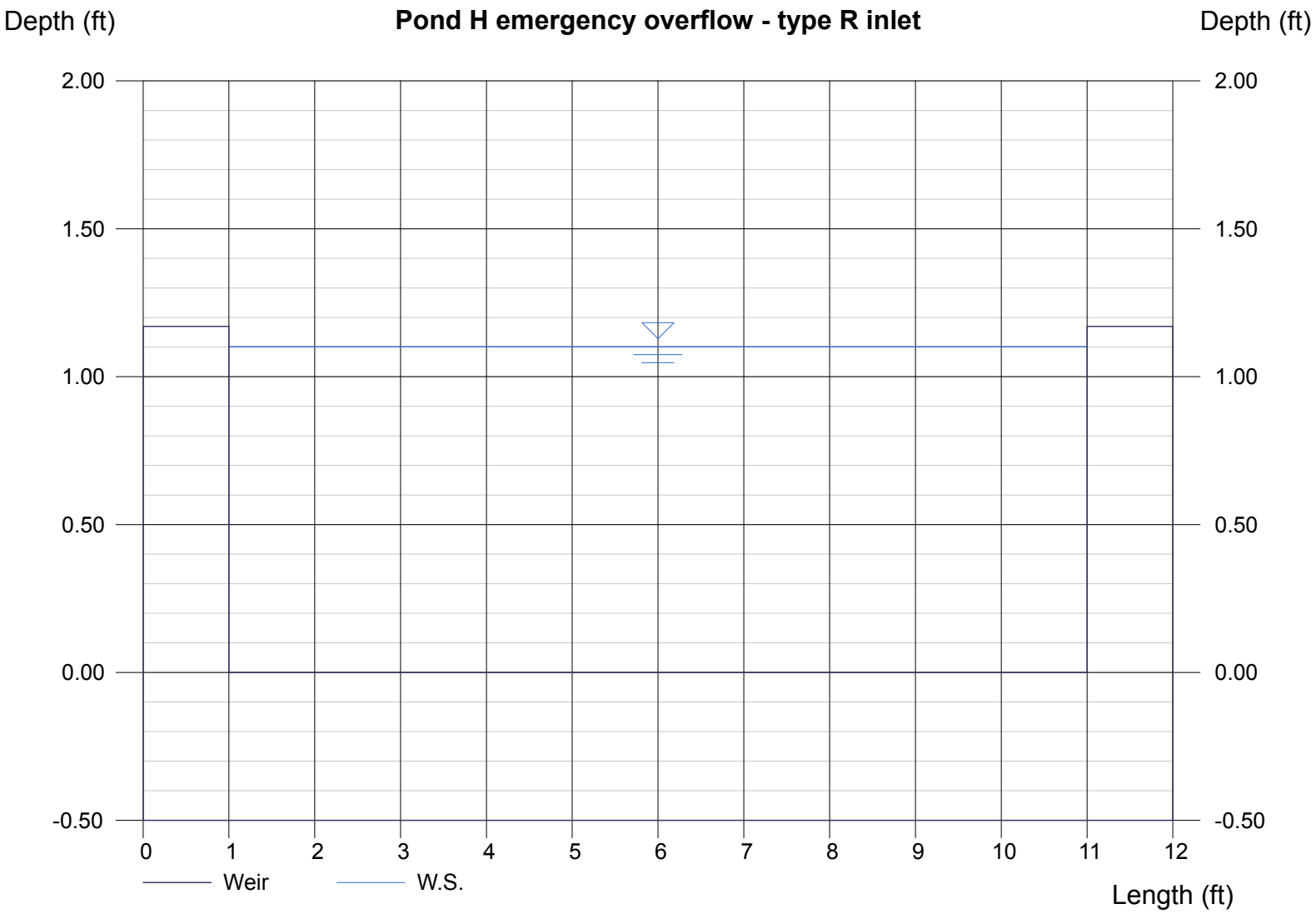
Crest	= Sharp
Bottom Length (ft)	= 10.00
Total Depth (ft)	= 1.17

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 38.50

Highlighted

Depth (ft)	= 1.10
Q (cfs)	= 38.50
Area (sqft)	= 11.02
Velocity (ft/s)	= 3.49
Top Width (ft)	= 10.00



Weir Report

Hydraflow Express by Intelisolve | Friday, Jan 7 2022, 8:10 AM

Pond H emergency overflow - type R inlet

Rectangular Weir

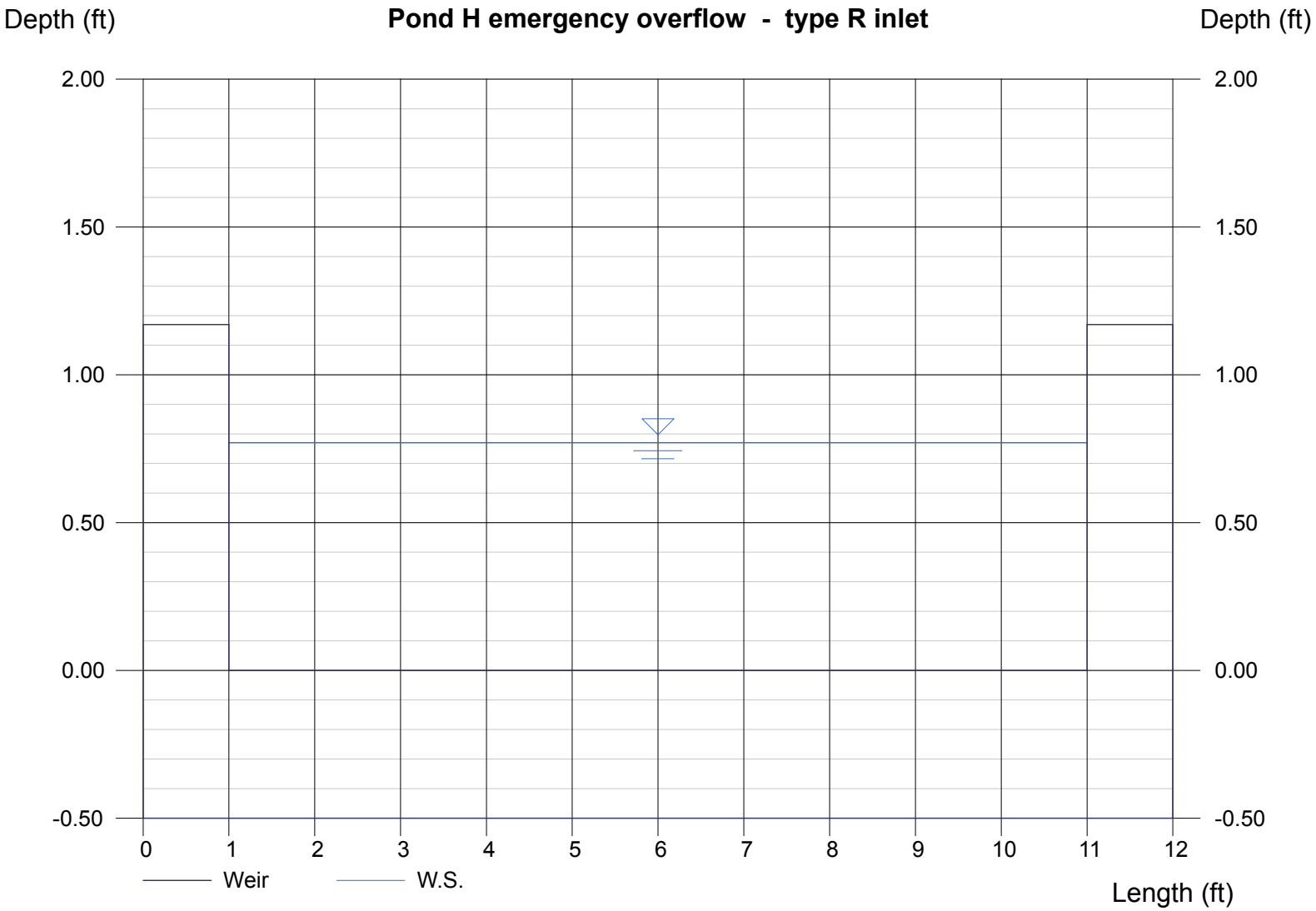
Crest	= Sharp
Bottom Length (ft)	= 10.00
Total Depth (ft)	= 1.17

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 22.50

Highlighted

Depth (ft)	= 0.77
Q (cfs)	= 22.50
Area (sqft)	= 7.70
Velocity (ft/s)	= 2.92
Top Width (ft)	= 10.00



Culvert Report

Hydraflow Express by Intelisolve — Monday, Jan 10 2022, 3:50 PM

Type I spreader Manhole (2 - 6x36 openings)

Invert Elev Dn (ft)	=	100.00
Pipe Length (ft)	=	2.00
Slope (%)	=	0.00
Invert Elev Up (ft)	=	100.00
Rise (in)	=	6.0
Shape	=	Box
Span (in)	=	36.0
No. Barrels	=	2
n-Value	=	0.013
Inlet Edge	=	Sq Edge
Coeff. K,M,c,Y,k	=	0.061, 0.75, 0.04, 0.8, 0.5

Embankment

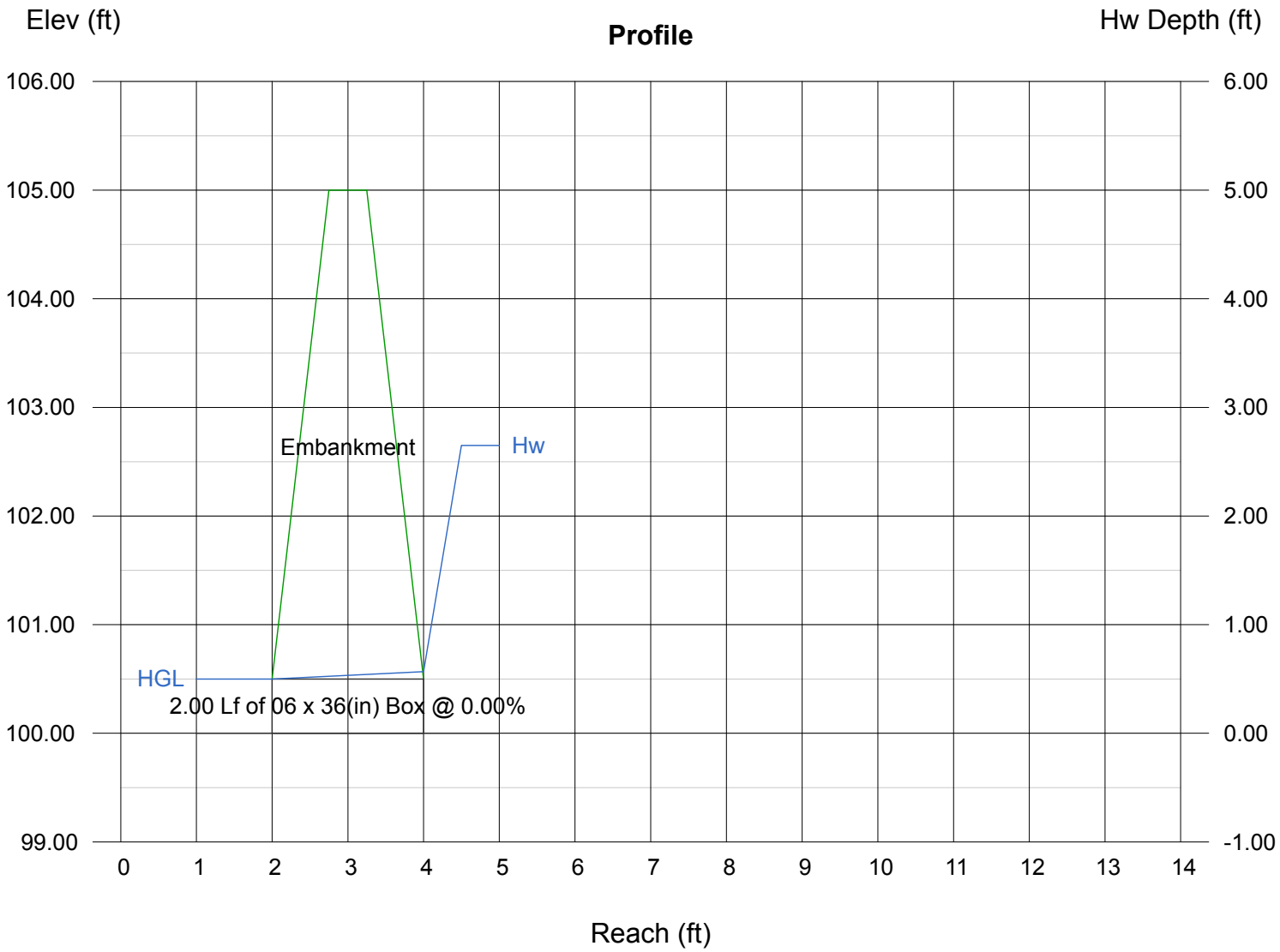
Top Elevation (ft)	=	105.00
Top Width (ft)	=	0.50
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	13.00
Qmax (cfs)	=	23.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	22.50
Qpipe (cfs)	=	22.50
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.67
Veloc Up (ft/s)	=	7.67
HGL Dn (ft)	=	100.50
HGL Up (ft)	=	100.57
Hw Elev (ft)	=	102.65
Hw/D (ft)	=	5.30
Flow Regime	=	Inlet Control



SAWTOOTH RIDGE WAY

WAHLUKE DR

15' WIDE GRAVEL ACCESS ROAD (10% MAX. SLOPE)

WQ POND G OUTLET STRUCTURE

BEGIN 18" RCP INV=5804.40 N 20260.74 E 29620.90

END 18" RCP 10' TYPE R INLET SEE DETAIL FOR THROAT OPENING RIM= 5811.77, INV=5803.88 N 20227.40 E 29593.74

BEGIN 24" RCP INV=5803.00 N 20226.17 E 29587.80

45LF 18" RCP AT 1.2% SLOPE

END 3' WIDE CONCRETE LOW FLOW CHANNEL FL=5804.73 N 20253.55 E 29635.67

4:1 SLOPE

ANGLE PT CONCRETE LOW FLOW CHANNEL FL=5805.00 N 20244.41 E 29679.67

END 24" RCP SEE DETAIL FOR FOREBAY N 20235.26 E 29759.28

POND H CONCRETE OVERFLOW WALL AND CHANNEL. SEE SHEET C9.7 FOR DETAIL

LIMITS OF SOIL RIP RAP. SEE POND H DETAILS

ANGLE PT CONCRETE LOW FLOW CHANNEL FL=5806.38 N 20221.41 E 29748.89

BEGIN CONCRETE LOW FLOW CHANNEL FL=5806.48 N 20225.13 E 29751.68

24" CONCRETE PREFAB RCP BEND INV=5793.94 N 20195.87 E 29464.48

127LF 24" RCP (CL 4) AT 7.13% SLOPE

23 LF 24" RCP (CL 4) AT 7.13% SLOPE

S88°18'47"E 35.22'

TYPE 1 MH WITH OPENINGS SEE DETAIL BELOW RIM = 5796.50, INV=5792.30 N 20175.32 E 29454.79

N40°18'35"E 37.68'

C/L CURVE 35' R, L=31.38' DELTA: 51°22'37"

C/L CURVE 35' R, L=28.79' DELTA: 47°08'04"

S41°10'44"E 45.11'

C/L CURVE 50' R, L=11.33' DELTA: 12°59'00"

N59°40'31"E 15.08'

C/L CURVE 50' R, L=16.90' DELTA: 19°21'56"

EXTEND RIP RAP 5' BEYOND TOE OF SLOPE

4:1 SLOPE

S54°09'44"E 48.35'

BEGIN CONCRETE SPREADER CHANNEL SEE DETAIL INV=5792.30 N 20117.93 E 29326.62

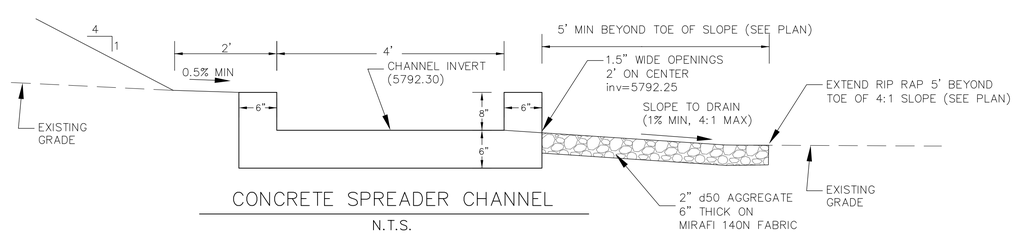
END CONCRETE SPREADER CHANNEL SEE DETAIL INV=5792.30 N 20094.58 E 29542.39

SOUTH PROPERTY LINE OF LORSON RANCH

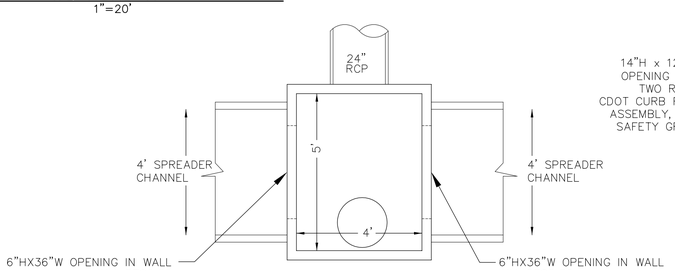
DRAINAGE ESMT.

DRAINAGE ESMT.

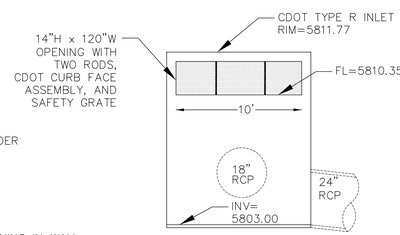
WQ POND H
1"=20'



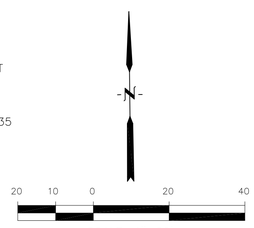
CONCRETE SPREADER CHANNEL
N.T.S.



TYPE 1 MH OPENINGS
(top view) N.T.S.



TYPE R INLET OPENING
(side view) N.T.S.



NOTE:
1. POND SLOPES SHALL BE 4:1 UNLESS OTHERWISE NOTED
2. STRAW ECB SHALL BE PLACED ON ALL POND SIDE SLOPES UNLESS NOTED OTHERWISE

CORE ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlschindler@ceg1.com

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD - WALLEYE DR
COLORADO SPRINGS, COLORADO

NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

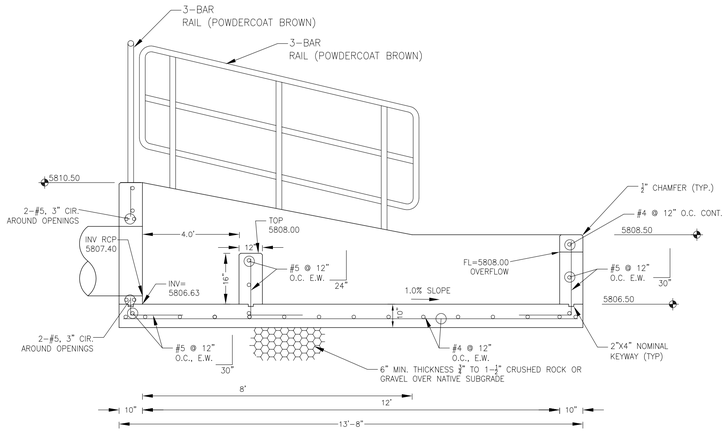
POND H
POND GRADING AND CONCRETE SPREADER CHANNEL

DATE: JULY, 2022

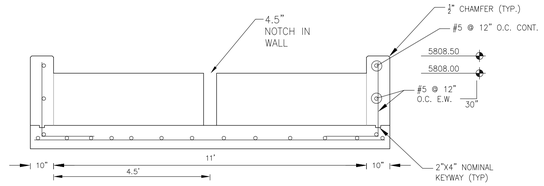
PROJECT NO. 100.065

SHEET NUMBER C9.6

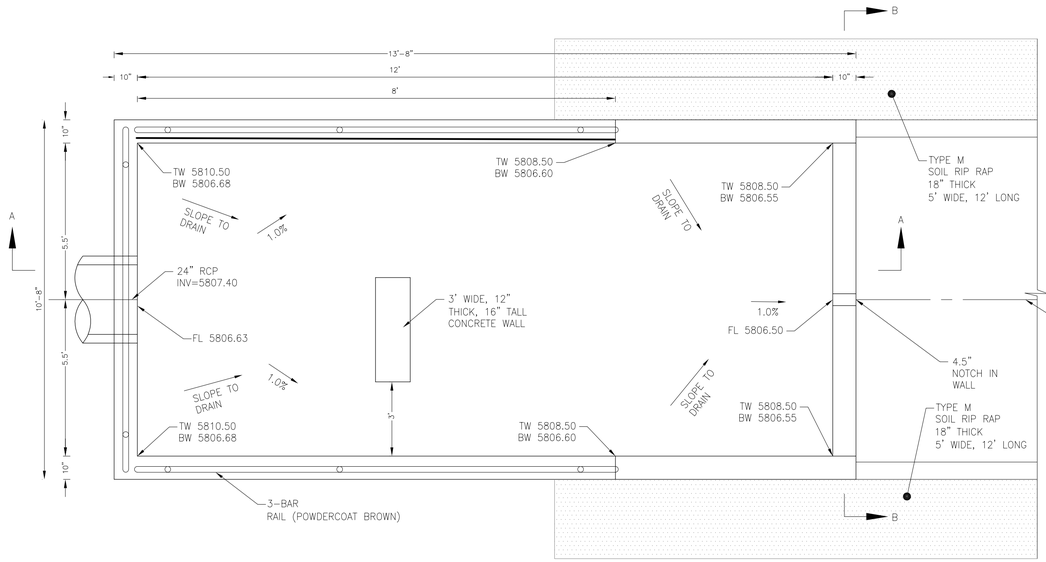
TOTAL SHEETS: 20



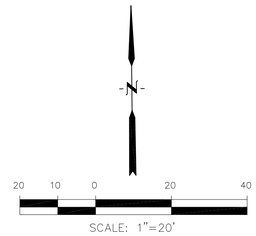
FOREBAY SECTION A–A
NO SCALE



FOREBAY SECTION B–B
NO SCALE



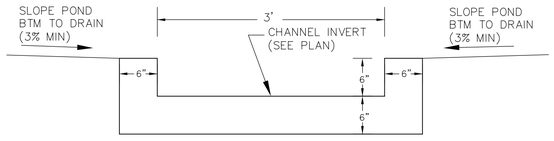
FOREBAY DETAIL
NO SCALE



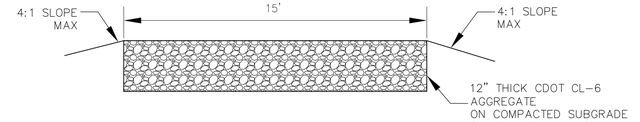
SCALE: 1"=20'

NOTE:
1. POND SLOPES SHALL BE 4:1 UNLESS OTHERWISE NOTED
2. STRAW ECB SHALL BE PLACED ON ALL POND SIDE SLOPES UNLESS NOTED OTHERWISE

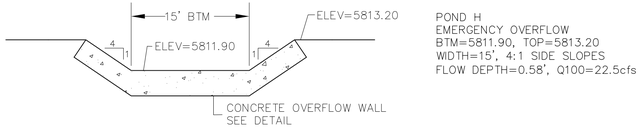
WAHLUKE DRIVE



CONCRETE LOW FLOW CHANNEL
N.T.S.

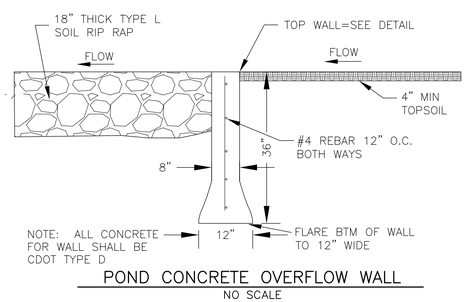


GRAVEL ACCESS ROAD
NO SCALE



POND H
EMERGENCY OVERFLOW
BTM=5811.90, TOP=5813.20
WIDTH=15', 4:1 SIDE SLOPES
FLOW DEPTH=0.58', Q100=22.5cfs

WQ POND H
EMERGENCY OVERFLOW
PROFILE
SCALE: NTS



POND CONCRETE OVERFLOW WALL
NO SCALE

CORE
ENGINEERING GROUP
15004 1ST AVENUE S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlschindler@coregi.com

NO.	DESCRIPTION	DATE
1.	MODIFY CONCRETE SPREADER CHANNEL	NOV 30, 2021

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

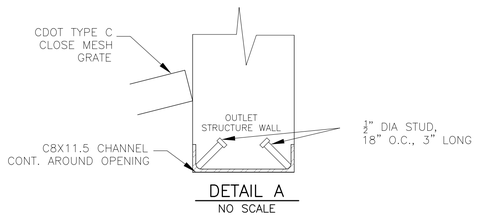
DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND H
POND DETAILS
AND TRICKLE CHANNEL

DATE:
JULY, 2022

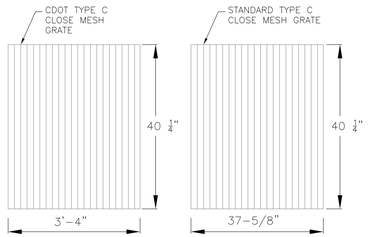
PROJECT NO.
100.065

SHEET NUMBER
C9.7
TOTAL SHEETS: 20



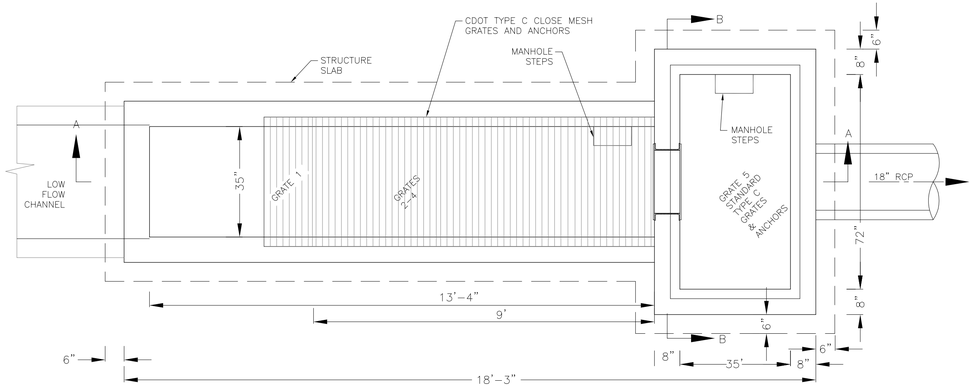
DETAIL A
NO SCALE

NOTE:
AFTER CONCRETE STRUCTURE HAS BEEN POURED ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED PRIOR TO GRATE CONSTRUCTION

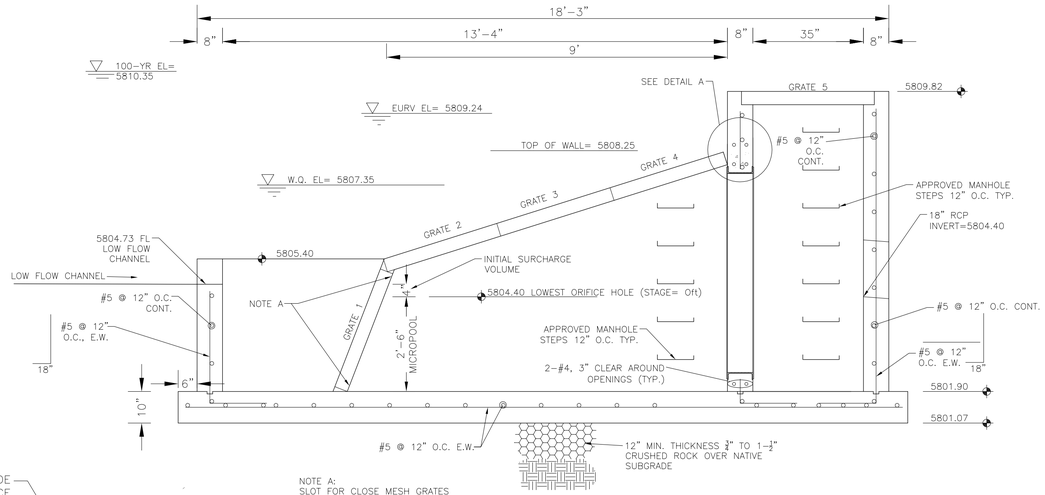


GRATE 1
NO SCALE

GRATES 2,3,4
NO SCALE

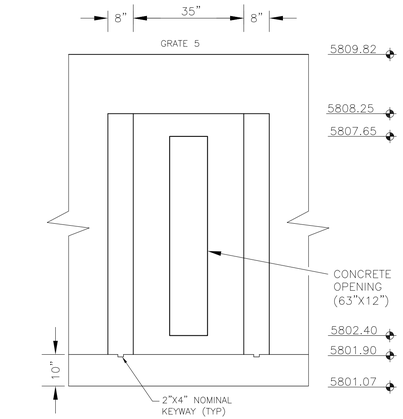


OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

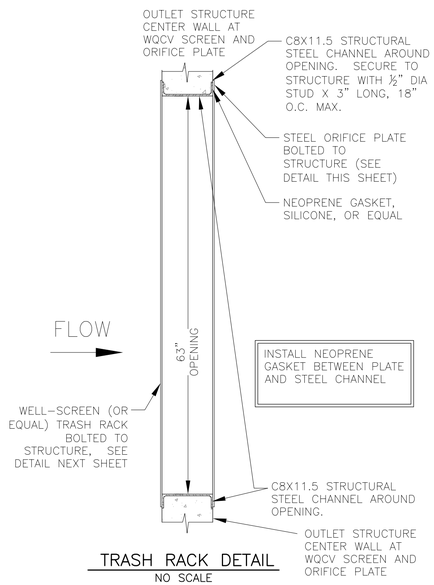


NOTE A:
SLOT FOR CLOSE MESH GRATES

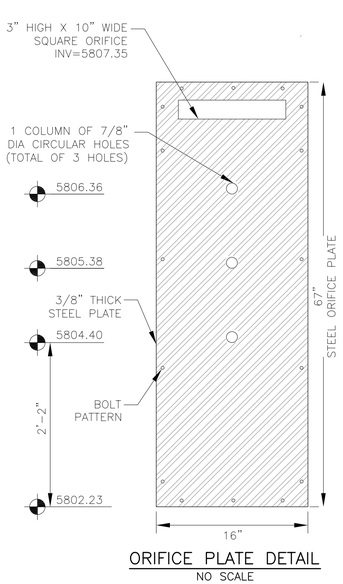
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO–INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.

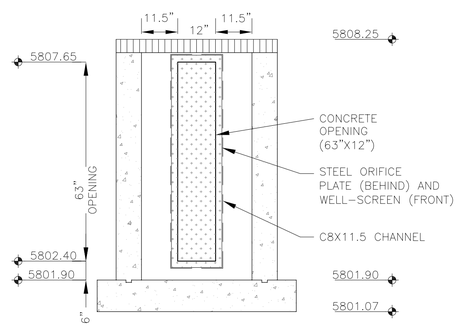
BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'–3"	1'–7"	2'–0"

3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M–213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A ¾" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL–SCREEN NOTES:

1. Well–Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.

2. WQCV Well Screen
- Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
- Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
- Type and Size of Support Rod: TE 0.074"X0.50"
- Spacing of Support Rod (O.C.): 1.0 Inch
- Total Screen Thickness: 0.655"
- Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

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CONTACT: RICHARD L. SCHINDLER, P.E.
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NO.	DESCRIPTION	DATE

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE. SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND H
FULL SPECTRUM / WQ POND
OUTLET STRUCTURE DETAILS

DATE:
JULY, 2022

PROJECT NO.
100.065

SHEET NUMBER
C9.8
TOTAL SHEETS: 20

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**January 12, 2022**
Project:	**Hillside at Lorson Ranch**
Location:	**Runoff South to Peaceful Valley Estates (50' deep RPA)**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA											
Area ID	res. Lot											
Downstream Design Point ID	1											
Downstream BMP Type	None											
DCIA (ft^2)	--											
UIA (ft^2)	9,500											
RPA (ft^2)	5,000											
SPA (ft^2)	--											
HSG A (%)	0%											
HSG B (%)	100%											
HSG C/D (%)	0%											
Average Slope of RPA (ft/ft)	0.030											
UIA:RPA Interface Width (ft)	100.00											

CALCULATED RUNOFF RESULTS

Area ID	res. Lot											
UIA:RPA Area (ft^2)	14,500											
L / W Ratio	1.45											
UIA / Area	0.6552											
Runoff (in)	0.00											
Runoff (ft^3)	0											
Runoff Reduction (ft^3)	396											

CALCULATED WQCV RESULTS

Area ID	res. Lot											
WQCV (ft^3)	396											
WQCV Reduction (ft^3)	396											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	1											
DCIA (ft^2)	0											
UIA (ft^2)	9,500											
RPA (ft^2)	5,000											
SPA (ft^2)	0											
Total Area (ft^2)	14,500											
Total Impervious Area (ft^2)	9,500											
WQCV (ft^3)	396											
WQCV Reduction (ft^3)	396											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	14,500
Total Impervious Area (ft^2)	9,500
WQCV (ft^3)	396
WQCV Reduction (ft^3)	396
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer:	**Richard Schindler**
Company:	**Core Engineering Group**
Date:	**April 13, 2022**
Project:	**Hillside at Lorson Ranch**
Location:	**Basin F**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA											
Area ID	res. Lot											
Downstream Design Point ID	1											
Downstream BMP Type	None											
DCIA (ft^2)	--											
UIA (ft^2)	4,500											
RPA (ft^2)	7,250											
SPA (ft^2)	--											
HSG A (%)	0%											
HSG B (%)	100%											
HSG C/D (%)	0%											
Average Slope of RPA (ft/ft)	0.060											
UIA:RPA Interface Width (ft)	125.00											

CALCULATED RUNOFF RESULTS

Area ID	res. Lot											
UIA:RPA Area (ft^2)	11,750											
L / W Ratio	0.75											
UIA / Area	0.3830											
Runoff (in)	0.00											
Runoff (ft^3)	0											
Runoff Reduction (ft^3)	188											

CALCULATED WQCV RESULTS

Area ID	res. Lot											
WQCV (ft^3)	188											
WQCV Reduction (ft^3)	188											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

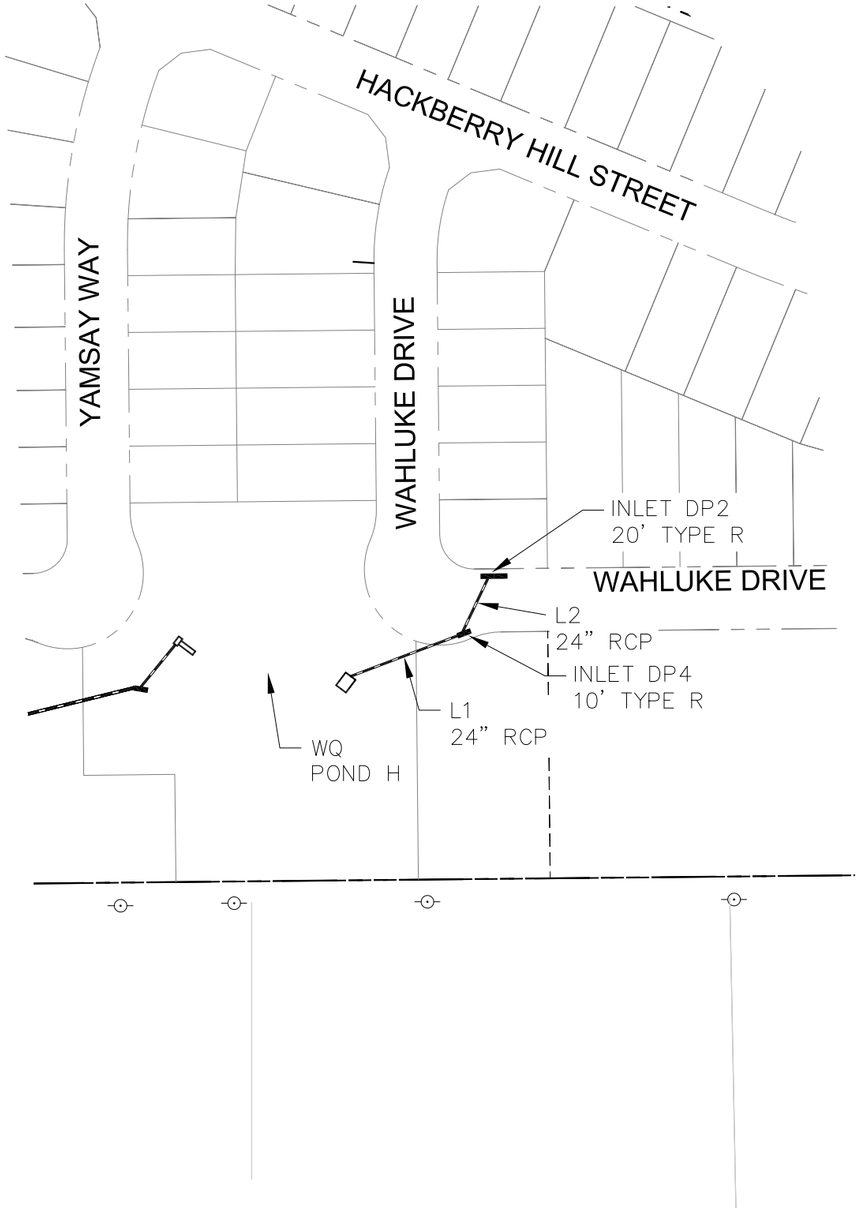
Downstream Design Point ID	1											
DCIA (ft^2)	0											
UIA (ft^2)	4,500											
RPA (ft^2)	7,250											
SPA (ft^2)	0											
Total Area (ft^2)	11,750											
Total Impervious Area (ft^2)	4,500											
WQCV (ft^3)	188											
WQCV Reduction (ft^3)	188											
WQCV Reduction (%)	100%											
Untreated WQCV (ft^3)	0											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

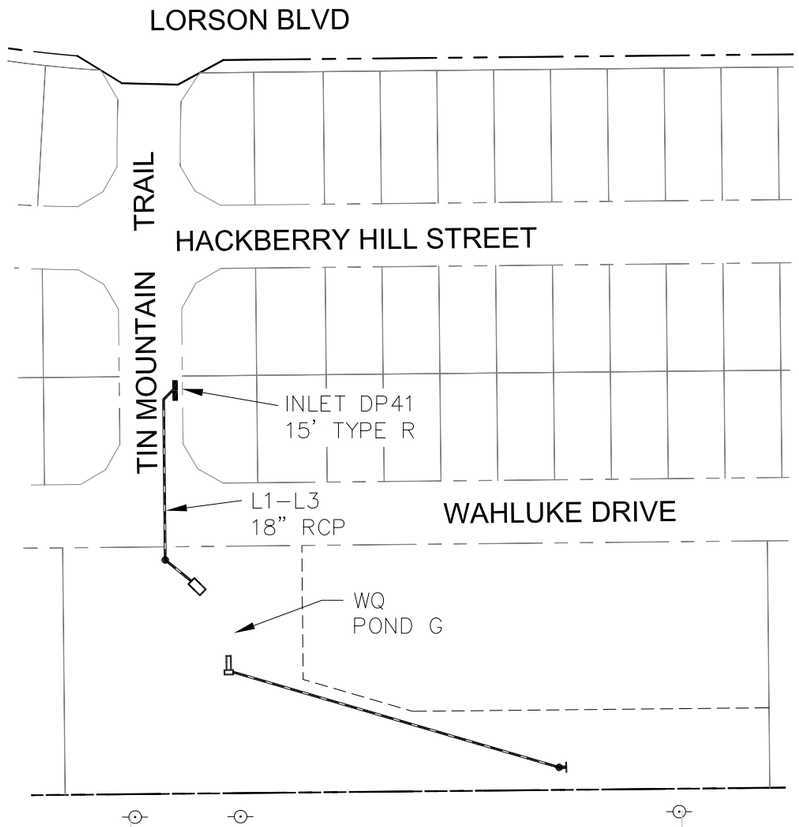
Total Area (ft^2)	11,750
Total Impervious Area (ft^2)	4,500
WQCV (ft^3)	188
WQCV Reduction (ft^3)	188
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

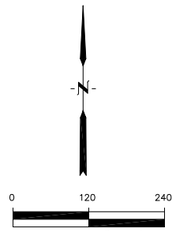
APPENDIX E– STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

BASINS B STORM SCHEMATIC



BASINS G STORM SCHEMATIC





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(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS B & G
HILLSIDE AT LORSON RANCH

DATE
JAN, 2022

PROJECT NO.
100.065

SHEET NUMBER
1

TOTAL SHEETS: 1

P:\100\100.065\drainage\100.065-storm schematic.dwg Jan 14, 2022 - 11:53am

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	15.70	24 c	93.6	5807.40	5812.83	5.804	5808.80	5814.23	n/a	5814.23	End
2	2	11.40	24 c	49.7	5813.64	5814.14	1.005	5814.72	5815.34	n/a	5815.34	1

hillside B basins -5yr | Number of lines: 2 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	38.50	24 c	93.6	5807.40	5812.83	5.804	5809.35	5814.78	n/a	5814.78 j	End
2	2	25.40	24 c	49.7	5813.64	5814.14	1.005	5816.12*	5816.74*	1.02	5817.76	1

hillside B basins -100yr | Number of lines: 2 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		7.80	18 c	25.0	5837.50	5837.75	1.000	5838.57	5838.82	n/a	5838.82	End
2	(2)	7.80	18 c	128.0	5837.75	5839.03	1.000	5839.04	5840.10	n/a	5840.10 j	1
3	3	7.80	18 c	11.7	5839.03	5839.15	1.024	5840.32	5840.30	0.45	5840.75	2

hillside G basins -5yr | Number of lines: 3 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

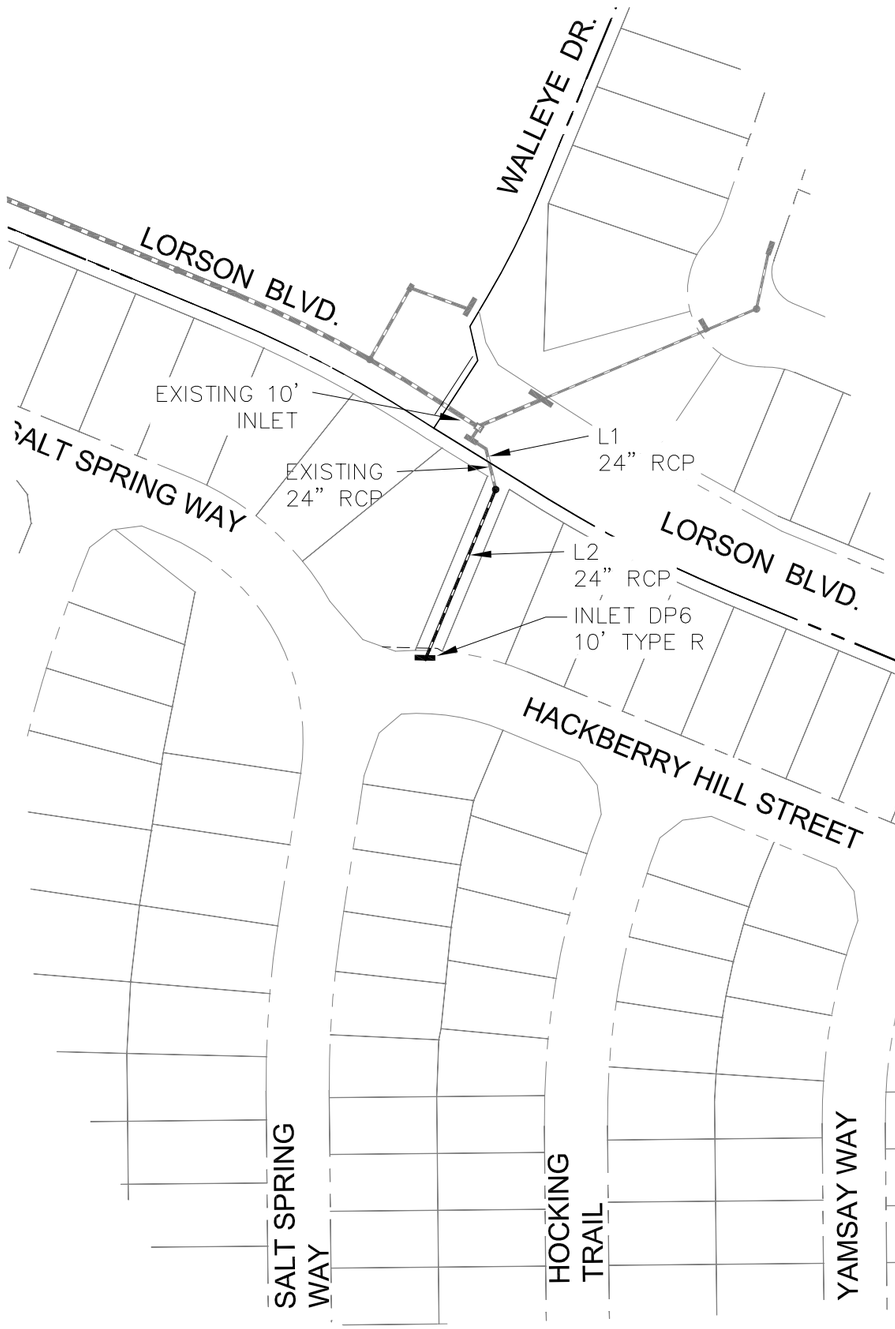
Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	13.00	18 c	25.0	5837.50	5837.75	1.000	5838.85	5839.24	0.71	5839.95	End
2	2	13.00	18 c	128.0	5837.75	5839.03	1.000	5839.95*	5841.91*	0.64	5842.55	1
3	3	13.00	18 c	11.7	5839.03	5839.15	1.024	5842.55*	5842.73*	0.84	5843.58	2

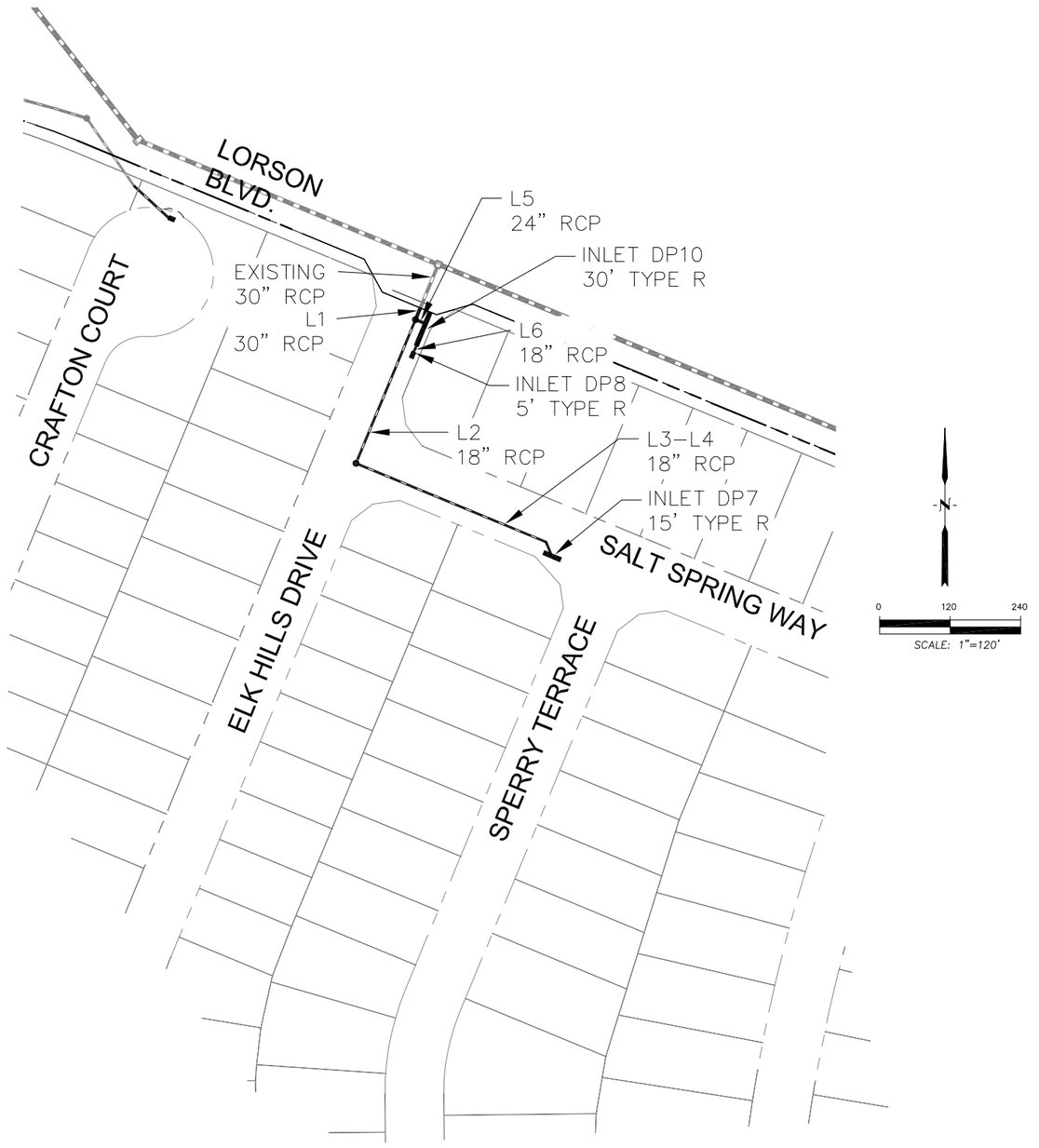
hillside G basins -100yr | Number of lines: 3 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown).

BASINS C1 STORM SCHEMATIC



BASINS C4 STORM SCHEMATIC



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CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS C1 & C4
HILLSIDE AT LORSON RANCH

DATE
JULY, 2022

PROJECT NO.
100.065

SHEET NUMBER
1

TOTAL SHEETS: 1

P:\100.065 drainage\100.065-storm schematic.dwg Jun 29, 2022 - 12:38pm

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	5.90	24 c	42.0	5800.16	5800.58	1.000	5801.02	5801.44	0.30	5801.44	End
2	2	5.90	24 c	142.6	5801.08	5812.82	8.233	5801.71	5813.68	0.32	5813.68	1

hillside C1 basins -5yr | Number of lines: 2 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	10.90	24 c	42.0	5800.16	5800.58	1.000	5801.33	5801.75	0.47	5801.75	End
2	2	10.90	24 c	142.6	5801.08	5812.82	8.233	5802.07	5813.99	0.51	5813.99	1

hillside C1 basins -100yr | Number of lines: 2 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	15.70	30 c	10.9	5788.53	5788.62	0.832	5789.92	5789.95	0.54	5790.49	End
2	2	7.20	18 c	130.3	5789.60	5790.77	0.898	5790.78	5791.79	n/a	5791.79 j	1
3		7.20	18 c	175.0	5790.87	5795.51	2.651	5792.02	5796.53	n/a	5796.53 j	2
4	4	7.20	18 c	10.2	5795.51	5795.78	2.639	5796.76	5796.80	0.49	5796.80	3
5	5	10.10	24 c	7.5	5789.10	5789.17	0.933	5790.82	5790.82	0.31	5791.13	1
6		2.80	18 c	5.0	5789.88	5789.93	0.996	5791.28	5791.28	0.04	5791.33	5

hillside c4 basins -5yr | Number of lines: 6 | Run Date: 06-29-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

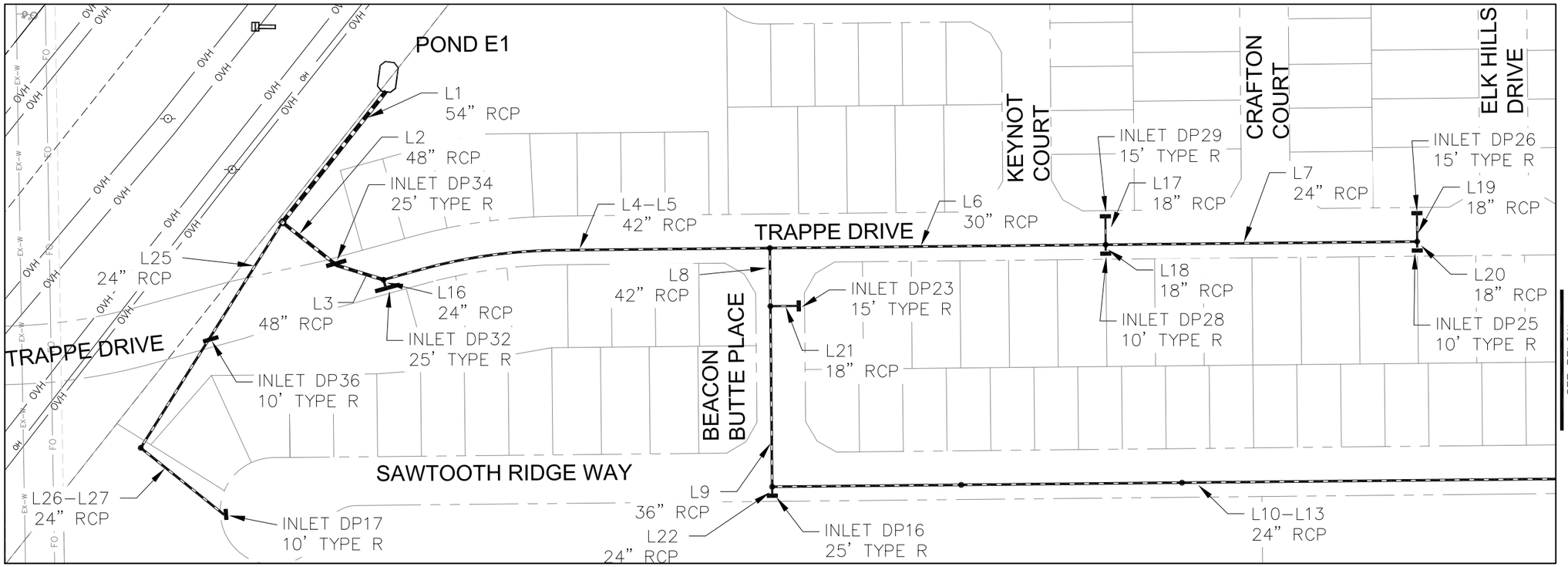
Storm Sewer Summary Report

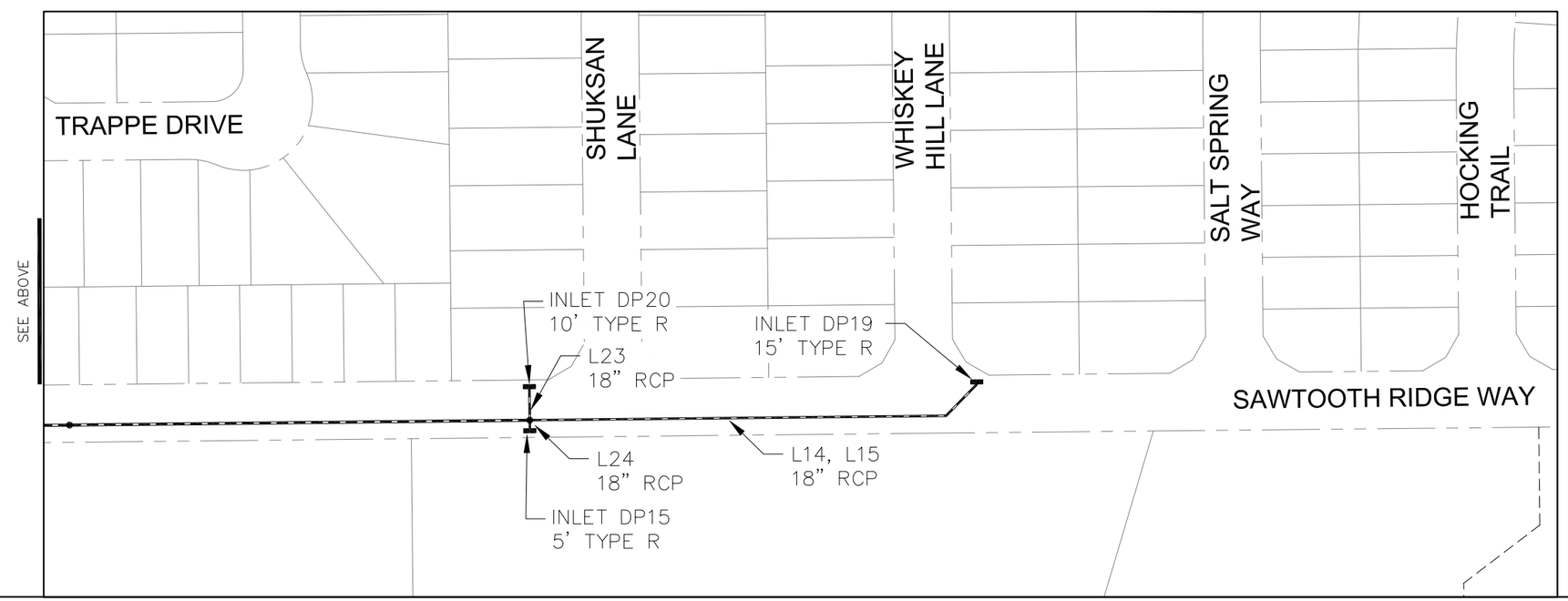
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	37.60	30 c	10.9	5788.53	5788.62	0.832	5790.58	5790.70	0.92	5791.62	End
2	2	12.50	18 c	130.3	5789.60	5790.77	0.898	5792.00*	5793.84*	0.39	5794.23	1
3		12.50	18 c	175.0	5790.87	5795.51	2.651	5794.23	5796.85	n/a	5796.85 j	2
4	4	12.50	18 c	10.2	5795.51	5795.78	2.639	5796.95	5797.12	n/a	5797.12 j	3
5	5	28.60	24 c	7.5	5789.11	5789.18	0.933	5791.62*	5791.74*	0.64	5792.39	1
6		4.70	18 c	5.0	5789.88	5789.93	1.006	5793.57*	5793.58*	0.05	5793.63	5

hillside c4 basins -100yr | Number of lines: 6 | Run Date: 06-29-2022

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

BASINS E STORM SCHEMATIC





N

0 120 240

SCALE: 1"=120'

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PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS E
HILLSIDE AT LORSON RANCH

DATE
JAN, 2022

PROJECT NO.
100.065

SHEET NUMBER
1

TOTAL SHEETS: 1

P:\100 100.065 drainage 100.065–storm schematic.dwg Jan 14, 2022 – 12:44pm

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	75.60	54 c	171.9	5730.40	5731.43	0.599	5732.89	5733.92	1.09	5733.92	End
2	2	73.10	48 c	69.6	5731.92	5736.80	7.007	5734.48	5739.33	0.73	5739.33	1
3		65.80	48 c	48.1	5737.50	5738.46	1.998	5740.09	5740.86	0.95	5740.86	2
4		60.40	42 c	150.3	5739.01	5741.51	1.663	5741.33	5743.89	0.28	5743.89	3
5		60.40	42 c	250.7	5741.51	5745.67	1.659	5744.45	5748.05	1.17	5748.05	4
6	6	26.70	30 c	345.0	5746.68	5757.48	3.131	5748.76	5759.21	n/a	5759.21 j	5
7		14.90	24 c	319.5	5757.98	5769.00	3.449	5759.70	5770.37	n/a	5770.37 j	6
8	8	33.70	42 c	61.2	5745.78	5746.27	0.803	5748.93	5748.92	0.29	5749.21	5
9	9	26.50	36 c	184.7	5746.77	5752.47	3.085	5749.28	5754.11	n/a	5754.11 j	8
10	10	19.50	24 c	194.1	5753.48	5757.00	1.813	5754.64	5758.56	n/a	5758.56	9
11	11	19.50	24 c	226.2	5757.20	5763.74	2.892	5758.82	5765.30	n/a	5765.30 j	10
12	12	19.50	24 c	400.3	5763.95	5778.16	3.550	5765.56	5779.72	n/a	5779.72 j	11
13	13	19.50	24 c	400.4	5778.36	5785.89	1.880	5779.98	5787.45	n/a	5787.45 j	12
14	14	8.70	18 c	360.2	5786.40	5796.99	2.940	5787.93	5798.12	n/a	5798.12 j	13
15	15	8.70	18 c	38.5	5796.99	5798.12	2.938	5798.32	5799.25	n/a	5799.25 j	14
16	16	5.40	24 c	10.2	5740.51	5741.22	6.995	5741.90	5742.04	n/a	5742.04 j	3
17	17	7.30	18 c	26.0	5758.48	5758.74	1.001	5759.79	5759.78	0.49	5760.27	6
18	18	4.50	18 c	7.3	5758.48	5758.77	3.981	5759.89	5759.84	0.17	5760.01	6
19	19	8.00	18 c	27.6	5769.75	5770.03	1.015	5770.73	5771.11	0.53	5771.65	7
20		6.90	18 c	8.2	5769.75	5770.02	3.278	5770.79	5771.02	n/a	5771.02	7
21	21	7.20	18 c	27.2	5748.77	5749.35	2.134	5749.49	5750.68	0.29	5750.98	8
22	22	7.00	24 c	8.2	5753.49	5754.15	8.020	5754.73	5755.09	n/a	5755.09 j	9
23	23	8.00	18 c	25.8	5786.90	5787.12	0.854	5787.99	5788.20	0.53	5788.74	13
24	24	2.80	18 c	11.3	5786.90	5787.08	1.597	5788.24	5788.23	0.06	5788.29	13
25	25	2.50	24 c	134.7	5733.92	5735.67	1.300	5735.00	5736.23	n/a	5736.23 j	1
26	26	1.10	24 c	137.1	5735.84	5737.49	1.204	5736.42	5737.86	n/a	5737.86 j	25
27	27	1.10	24 c	108.5	5737.62	5739.36	1.604	5737.98	5739.73	0.12	5739.73	26

hillside E basins -5yr | Number of lines: 27 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

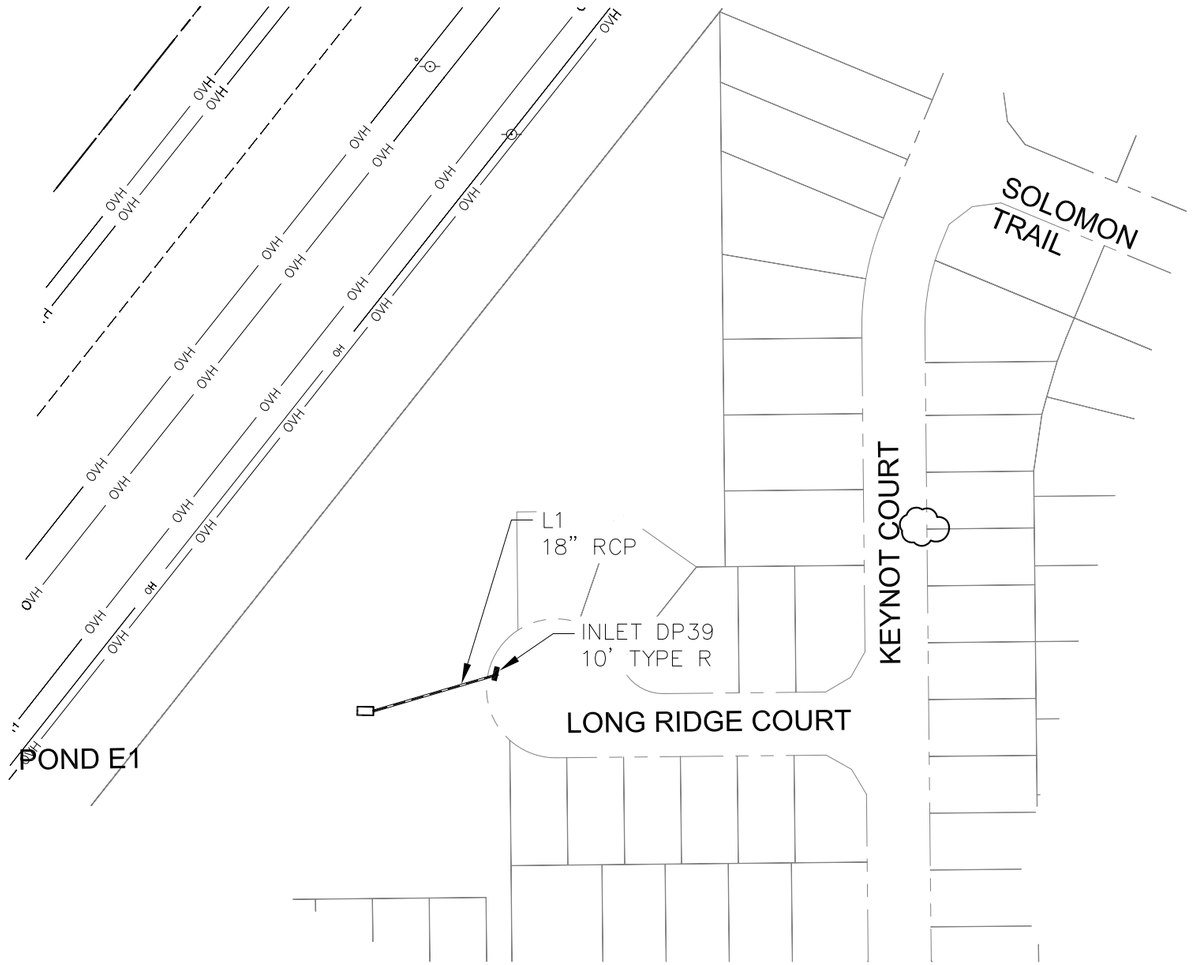
Storm Sewer Summary Report

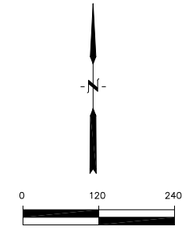
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	164.2	54 c	171.9	5730.40	5731.43	0.599	5734.37	5735.51	1.83	5737.33	End
2	2	157.9	48 c	69.6	5731.92	5736.80	7.007	5737.33	5740.46	1.65	5740.46	1
3	3	144.1	48 c	48.1	5737.50	5738.46	1.998	5741.08	5742.01	2.02	5742.01	2
4	4	120.2	42 c	150.3	5739.01	5741.51	1.663	5742.01	5744.76	n/a	5744.76	3
5	5	120.2	42 c	250.7	5741.51	5745.67	1.659	5744.92	5748.92	n/a	5748.92	4
6	6	46.90	30 c	345.0	5746.68	5757.48	3.131	5750.09	5759.74	n/a	5759.74	5
7	7	23.50	24 c	319.5	5757.98	5769.00	3.449	5760.44	5770.72	n/a	5770.72 j	6
8	8	73.30	42 c	61.2	5745.78	5746.29	0.834	5750.61*	5750.93*	0.90	5751.83	5
9	9	57.20	36 c	184.7	5746.87	5752.47	3.032	5751.83	5754.88	n/a	5754.88	8
10	10	30.50	24 c	194.1	5753.49	5757.00	1.808	5755.14	5758.99	0.22	5759.21	9
11	11	30.50	24 c	226.2	5757.20	5763.74	2.892	5759.21	5765.61	n/a	5765.61 j	10
12	12	30.50	24 c	400.3	5763.95	5778.16	3.550	5765.69	5780.03	0.23	5780.03	11
13	13	30.50	24 c	400.4	5778.36	5785.89	1.880	5780.11	5787.76	1.55	5787.76	12
14	14	14.10	18 c	360.0	5786.40	5796.99	2.942	5788.32	5798.38	n/a	5798.38 j	13
15	15	14.10	18 c	38.5	5796.99	5798.12	2.938	5798.45	5799.51	n/a	5799.51 j	14
16	16	23.90	24 c	10.2	5740.51	5741.22	6.995	5743.43*	5743.55*	0.90	5744.45	3
17	17	14.40	18 c	26.0	5758.48	5758.74	1.001	5760.28*	5760.77*	1.03	5761.80	6
18	18	9.00	18 c	7.3	5758.48	5758.77	3.981	5760.91*	5760.96*	0.40	5761.36	6
19	19	13.30	18 c	27.6	5769.75	5770.03	1.015	5771.25*	5771.69*	0.88	5772.57	7
20	20	10.20	18 c	8.2	5769.75	5770.02	3.278	5771.24	5771.24	0.68	5771.24	7
21	21	16.10	18 c	27.2	5748.27	5748.85	2.134	5751.83*	5752.47*	1.29	5753.76	8
22	22	26.70	24 c	8.2	5753.48	5754.14	8.037	5755.13	5755.94	1.25	5755.94	9
23	23	12.40	18 c	25.8	5786.90	5787.12	0.854	5788.54*	5788.90*	0.77	5789.67	13
24	24	4.00	18 c	11.3	5786.90	5787.08	1.597	5789.23*	5789.25*	0.08	5789.33	13
25	25	18.40	24 c	134.7	5733.92	5735.67	1.300	5738.63*	5739.52*	0.27	5739.79	1
26	26	12.40	24 c	137.1	5735.84	5737.49	1.204	5740.08*	5740.49*	0.24	5740.73	25
27	27	12.40	24 c	108.5	5737.62	5739.36	1.604	5740.73	5740.98	0.32	5741.30	26

hillside E basins -100yr | Number of lines: 27 | Run Date: 04-13-2022

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

BASINS E14 STORM SCHEMATIC





CORE ENGINEERING GROUP
15004 1ST AVE. S.
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CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DR
EL PASO COUNTY, COLORADO

NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASINS E14
HILLSIDE AT LORSON RANCH

DATE
JAN, 2022

PROJECT NO.
100.065

SHEET NUMBER
1

TOTAL SHEETS: 1

P:\100 100.065 drainage 100.065-storm schematic.dwg Jan 14, 2022 - 12:14pm

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	4.70	18 c	102.6	5731.10	5747.51	15.995	5731.93	5748.34	n/a	5748.34 j	End

hillside e14 basins -5yr | Number of lines: 1 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	10.30	18 c	102.6	5731.10	5747.51	15.995	5732.33	5748.74	n/a	5748.74 j	End

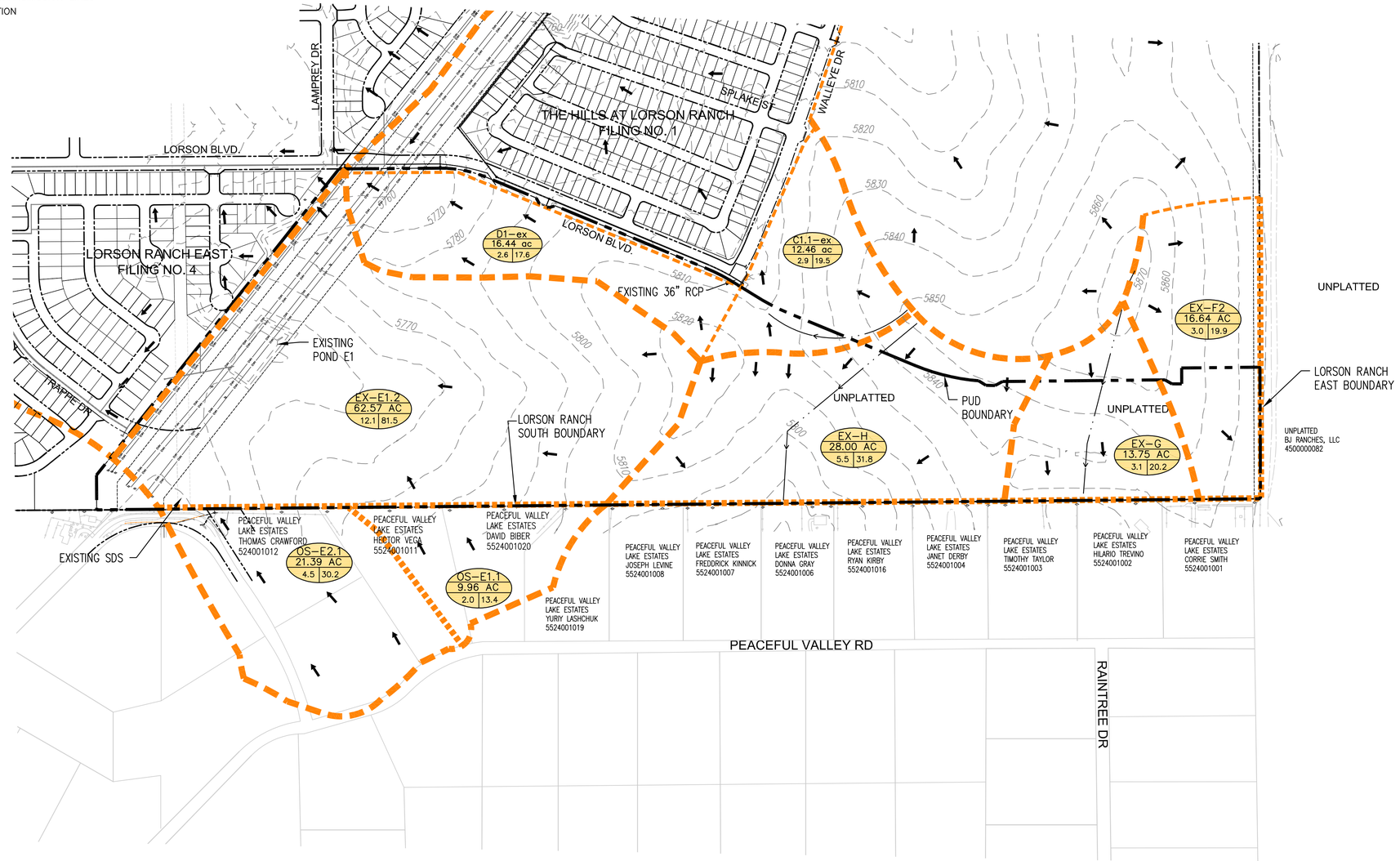
hillside e14 basins -100yr | Number of lines: 1 | Run Date: 01-14-2022

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

MAP POCKET

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY–MAJOR
- BASIN BOUNDARY–MINOR
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS
- DIRECTION OF FLOW
- EXISTING CONTOUR
- EXISTING ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- TIME OF CONCENTRATION

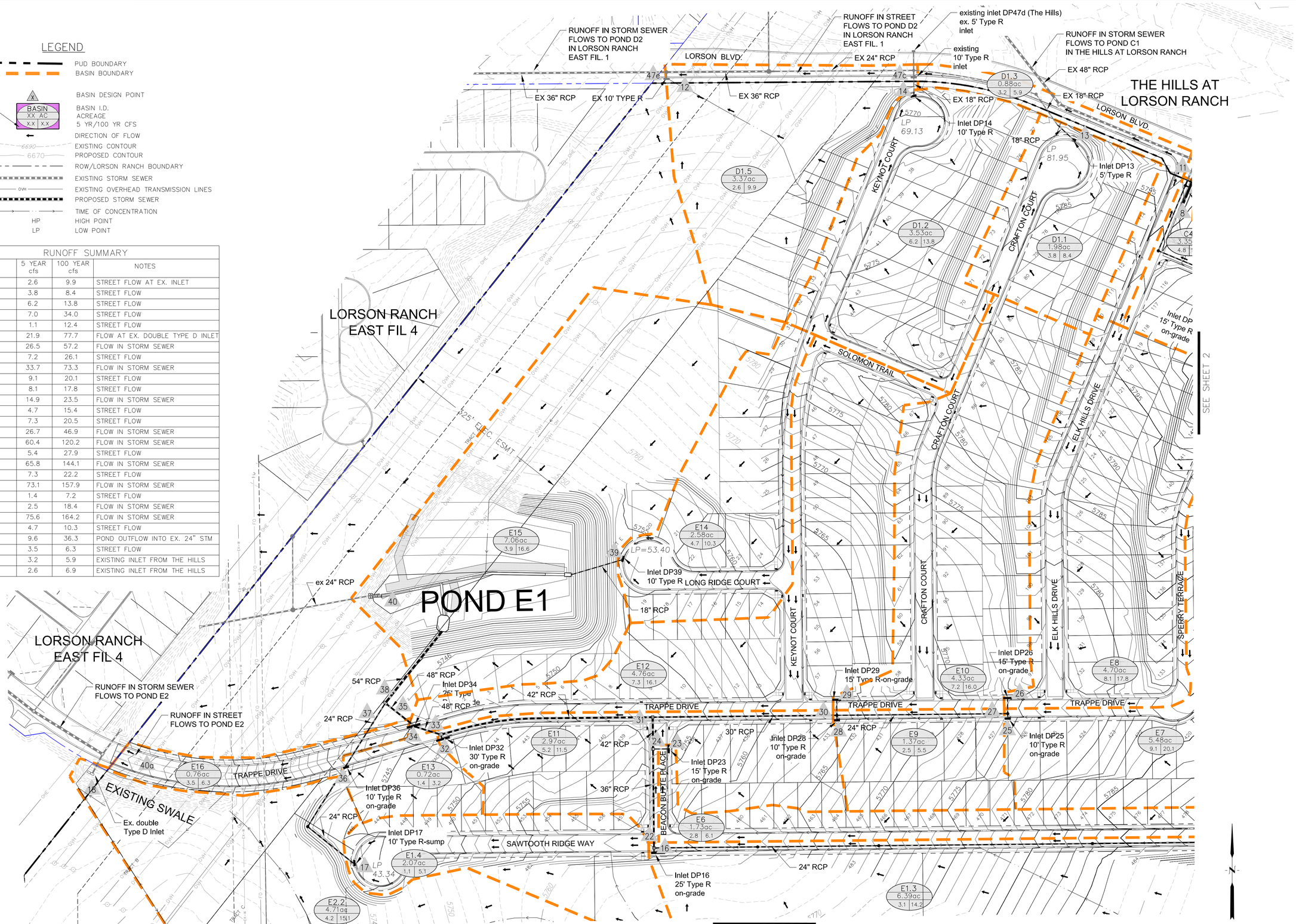

LAMPREY DR
LORSON BLVD
THE HILLS AT LORSON RANCH FILING NO. 1
SPLAKE ST
WALLEYE DR
LORSON RANCH EAST FILING NO. 4
D1–ex 16.44 ac 2.6 | 17.6
C1.1–ex 12.46 ac 2.9 | 19.5
EXISTING 36" RCP
EXISTING POND E1
TRAPPE DR
EX–E1.2 62.57 AC 12.1 | 81.5
LORSON RANCH SOUTH BOUNDARY
EX–H 28.00 AC 5.5 | 31.8
EX–F2 16.64 AC 3.0 | 19.9
EX–G 13.75 AC 3.1 | 20.2
UNPLATTED
PUD BOUNDARY
LORSON RANCH EAST BOUNDARY
UNPLATTED BJ RANCHES, LLC 4500000082
EXISTING SDS
OS–E2.1 21.39 AC 4.5 | 30.2
OS–E1.1 9.96 AC 2.0 | 13.4
PEACEFUL VALLEY LAKE ESTATES THOMAS CRAWFORD 524001012
PEACEFUL VALLEY LAKE ESTATES HECTOR VEGA 5524001011
PEACEFUL VALLEY LAKE ESTATES DAVID BIBER 5524001020
PEACEFUL VALLEY LAKE ESTATES YURIY LASHCHUK 5524001019
PEACEFUL VALLEY LAKE ESTATES JOSEPH LEVINE 5524001008
PEACEFUL VALLEY LAKE ESTATES FREDDRICK KINNICK 5524001007
PEACEFUL VALLEY LAKE ESTATES DONNA GRAY 5524001006
PEACEFUL VALLEY LAKE ESTATES RYAN KIRBY 5524001016
PEACEFUL VALLEY LAKE ESTATES JANET DERBY 5524001004
PEACEFUL VALLEY LAKE ESTATES TIMOTHY TAYLOR 5524001003
PEACEFUL VALLEY LAKE ESTATES HILARIO TREVINO 5524001002
PEACEFUL VALLEY LAKE ESTATES CORRIE SMITH 5524001001
PEACEFUL VALLEY RD
RAINTREE DR
5770
5780
5790
5800
5810
5820
5830
5840
5850
5860
5870
5880
5890
5900
5910
5920
5930
5940
5950
5960
5970
5980
5990
6000
6010
6020
6030
6040
6050
6060
6070
6080
6090
6100
6110
6120
6130
6140
6150
6160

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- DENOTES OVERALL BASIN
- BASIN I.D.
- ACREAGE
- 5 YR/100 YR CFS
- DIRECTION OF FLOW
- 6690 EXISTING CONTOUR
- 6670 PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- OWH EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT

RUNOFF SUMMARY

D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
12		2.6	9.9	STREET FLOW AT EX. INLET
13		3.8	8.4	STREET FLOW
14		6.2	13.8	STREET FLOW
16		7.0	34.0	STREET FLOW
17		1.1	12.4	STREET FLOW
18		21.9	77.7	FLOW AT EX. DOUBLE TYPE D INLET
22		26.5	57.2	FLOW IN STORM SEWER
23		7.2	26.1	STREET FLOW
24		33.7	73.3	FLOW IN STORM SEWER
25		9.1	20.1	STREET FLOW
26		8.1	17.8	STREET FLOW
27		14.9	23.5	FLOW IN STORM SEWER
28		4.7	15.4	STREET FLOW
29		7.3	20.5	STREET FLOW
30		26.7	46.9	FLOW IN STORM SEWER
31		60.4	120.2	FLOW IN STORM SEWER
32		5.4	27.9	STREET FLOW
33		65.8	144.1	FLOW IN STORM SEWER
34		7.3	22.2	STREET FLOW
35		73.1	157.9	FLOW IN STORM SEWER
36		1.4	7.2	STREET FLOW
37		2.5	18.4	FLOW IN STORM SEWER
38		75.6	164.2	FLOW IN STORM SEWER
39		4.7	10.3	STREET FLOW
40		9.6	36.3	POND OUTFLOW INTO EX. 24" STM
40a		3.5	6.3	STREET FLOW
47c		3.2	5.9	EXISTING INLET FROM THE HILLS
47e		2.6	6.9	EXISTING INLET FROM THE HILLS



CORE ENGINEERING GROUP
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PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
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PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

DATE
DESCRIPTION
NO.

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD. & MALLE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS
HILLSIDE AT LORSON RANCH
X

DATE
JULY, 2022

PROJECT NO.
100.065

SHEET NUMBER
1

TOTAL SHEETS: 4

SCALE: 1"=80'

THE HILLS AT LORSON RANCH

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT

RUNOFF SUMMARY

D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
1		8.9	19.5	STREET FLOW
2		11.3	29.0	STREET FLOW
3		11.3	25.4	FLOW IN STORM SEWER
4		4.3	13.1	STREET FLOW
5		15.6	38.5	FLOW IN STORM SEWER
5a		1.5	13.1	FLOW FROM POND H
5b		5.5	31.8	SHEET FLOW LEAVING LORSON
6		5.9	12.9	STREET FLOW
6a		5.9	12.9	FLOW INTO EX. 24" STM
7		7.2	15.9	STREET FLOW
8		4.8	15.9	STREET FLOW FROM SOUTH
9		5.3	12.7	STREET FLOW FROM LORSON BLVD.
9a		3.2	7.0	STREET FLOW AT EX. INLET
10		7.3	23.9	STREET FLOW INTO INLET
11		15.7	37.6	FLOW IN EX. 30" STM
13		3.8	8.4	STREET FLOW
15		4.7	10.4	STREET FLOW
19		9.1	20.0	STREET FLOW
20		12.4	32.4	STREET FLOW
21		19.5	30.5	FLOW IN STORM SEWER
25		9.1	20.1	STREET FLOW
26		8.1	17.8	STREET FLOW
27		14.9	23.5	FLOW IN STORM SEWER

EX 48" RCP
EX 18" RCP
LORSON BLVD
18" RCP
LP 81.95
Inlet DP13 5' Type R
CRAFTON COURT
ELK HILLS DRIVE
SPERRY TERRACE
SHUKSAN LANE
WHISKEY HILL LANE
SALT SPRING WAY
HOCKING TRAIL
YAMSAY WAY
WAHLUKE DRIVE
TRAPPE DRIVE
SAWTOOTH RIDGE WAY
HACKBERRY HILL STREET
ASPEN BUTTE TER
WALLEE DR.
TRACT J
LP 93.55
Inlet DP10 30' Type R-sump
Inlet DP8 5' Type R on-grade
Inlet DP7 15' Type R on-grade
Inlet DP26 15' Type R on-grade
Inlet DP25 10' Type R on-grade
Inlet DP20 10' Type R-on-grade
Inlet DP19 15' Type R on-grade
Inlet DP15 5' Type R on-grade
Inlet DP6 15' Type R
Inlet DP2 20' Type R-su
Inlet DP4 10' Type R-su
EX 5' TYPE R INLET
EX 10' INLET
EX 24" RCP STUB
24" RCP
EX 15' TYPE R
ex 10' TYPE "R"
type 1 distribution MH
POND 'H'
type R overflow inlet
emergency overflow
50' WIDE RUNOFF REDUCTION AREA
270LF CONCRETE SPREADER CHANNEL
D1.1 1.98ac 3.8 8.4
C4 3.35ac 4.8 10.5
C6 3.45ac 5.3 11.6
C3 4.44ac 7.2 15.9
C5 1.68ac 3.2 7.0
C2 1.89ac 3.9 8.5
E10 4.33ac 7.2 16.0
E8 4.70ac 8.1 17.8
E9 1.37ac 2.5 5.5
E7 5.48ac 9.1 20.1
E5 7.27ac 12.0 26.5
E4 1.59ac 3.0 6.7
E3 3.89ac 6.9 15.3
E1.2 3.07ac 4.7 10.4
E1.3 6.39ac 3.1 14.2
OS-E1.1 9.96ac 2.0 13.4
H1 7.44ac 4.0 18.7
B4 2.96ac 4.3 9.5
B 10.39ac 15.2 33.4
B3 1.55ac 3.0 6.5
LP 119.97

PEACEFUL VALLEY LAKE ESTATES
DAVID BIBER
5524001020

PEACEFUL VALLEY LAKE ESTATES
JOSEPH LEVINE
5524001008

PEACEFUL VALLEY LAKE ESTATES
FREDDRICK KINNICK
5524001007

PEACEFUL VALLEY LAKE ESTATES
DONNA GRAY

PEACEFUL VALLEY LAKE ESTATES
RYAN KIRBY
5524001016

SEE SHEET 1
SEE SHEET 3
SEE SHEET 4

SCALE: 1"=80'

CORE ENGINEERING GROUP
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PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@coreg1.com

DATE
DESCRIPTION
NO.

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD. WALLEE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS
HILLSIDE AT LORSON RANCH
X

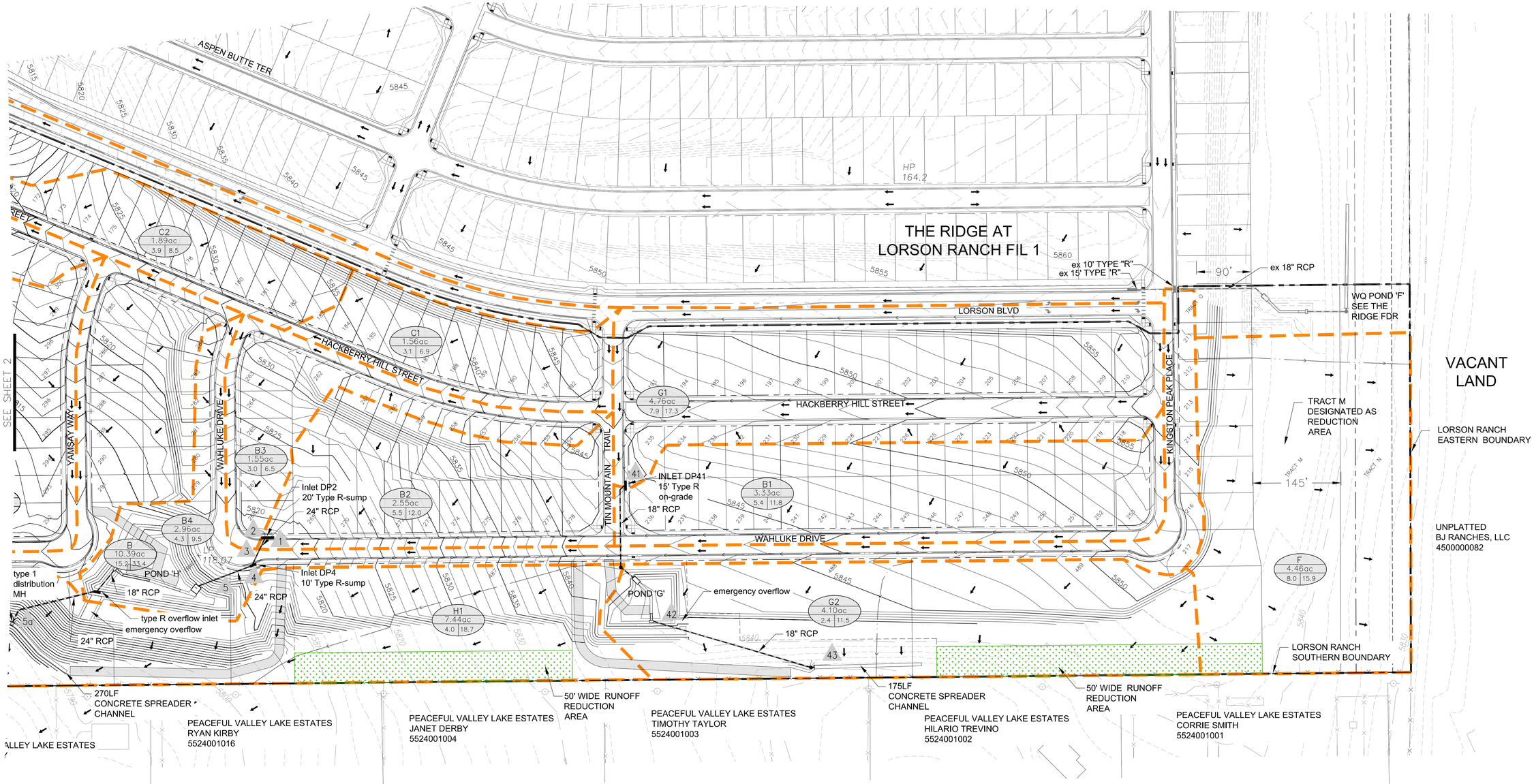
DATE
JULY, 2022

PROJECT NO.
100.065

SHEET NUMBER
2

TOTAL SHEETS: 4

P:\100.065 drainage\100.065-DevCondition.dwg, Jun 29, 2022 - 9:30am



RUNOFF SUMMARY

D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
1		8.9	19.5	STREET FLOW
2		11.3	29.0	STREET FLOW
3		11.3	25.4	FLOW IN STORM SEWER
4		4.3	13.1	STREET FLOW
5		15.6	38.5	FLOW IN STORM SEWER
5a		1.5	13.1	FLOW FROM POND H
41		7.9	17.3	STREET FLOW
42		0.7	8.7	POND G OUTFLOW
43		3.1	20.2	SHEET FLOW LEAVING LORSON

LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. ACREAGE 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT

SCALE: 1"=80'

CORE ENGINEERING GROUP
15004 1ST AVE. S.
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PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: Rich@ceg1.com

PREPARED FOR: LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT: HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DRIVE
EL PASO COUNTY, COLORADO

NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

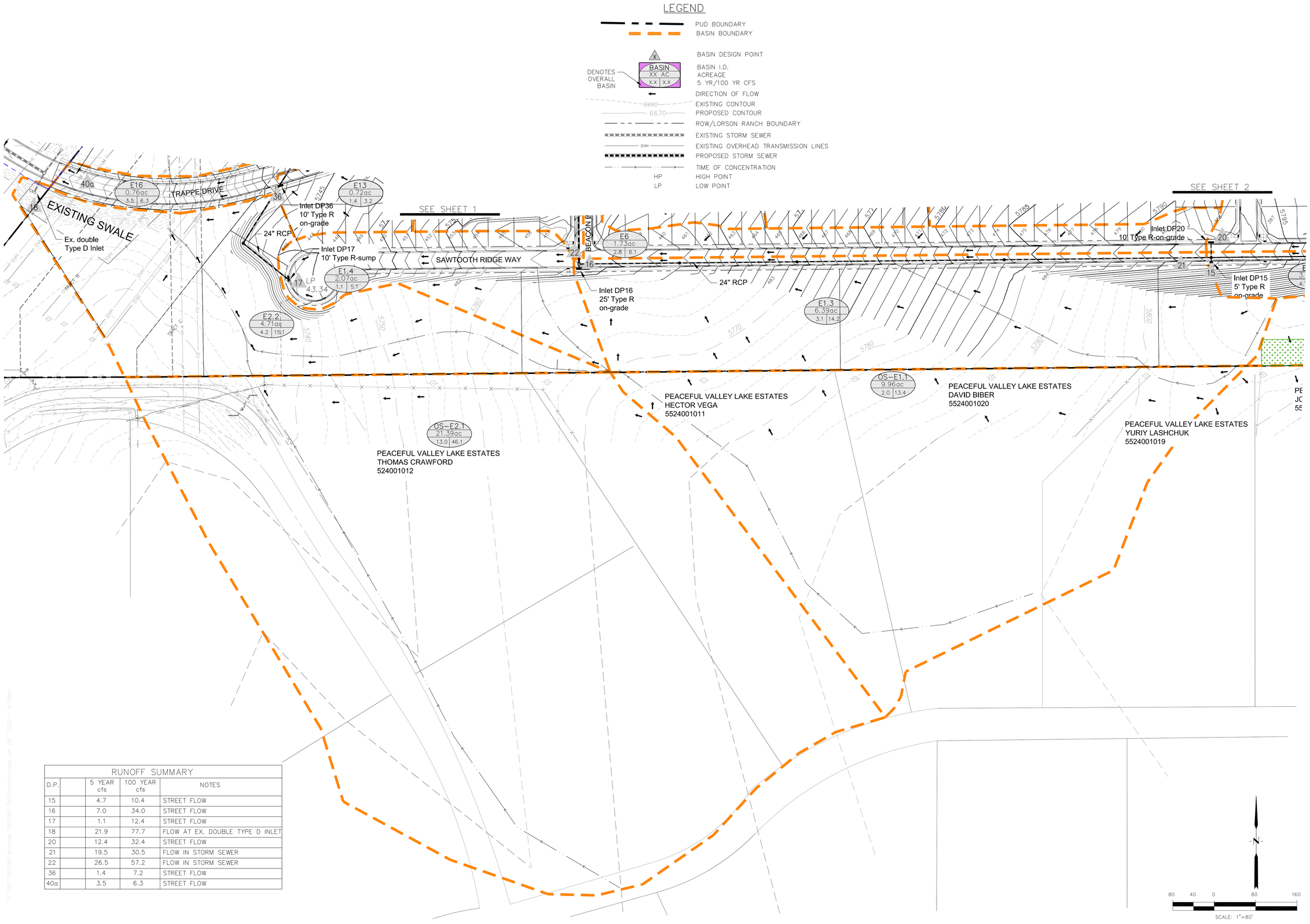
DEVELOPED CONDITIONS HILLSIDE AT LORSON RANCH X

DATE: JULY, 2022

PROJECT NO. 100.065

SHEET NUMBER 3

TOTAL SHEETS: 4



RUNOFF SUMMARY

D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
15		4.7	10.4	STREET FLOW
16		7.0	34.0	STREET FLOW
17		1.1	12.4	STREET FLOW
18		21.9	77.7	FLOW AT EX. DOUBLE TYPE D INLET
20		12.4	32.4	STREET FLOW
21		19.5	30.5	FLOW IN STORM SEWER
22		26.5	57.2	FLOW IN STORM SEWER
36		1.4	7.2	STREET FLOW
40a		3.5	6.3	STREET FLOW

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NO.	DESCRIPTION	DATE

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PROJECT:
HILLSIDE AT LORSON RANCH
LORSON BLVD – WALLEYE DRIVE
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

DEVELOPED CONDITIONS
HILLSIDE AT LORSON RANCH
X

DATE
JULY, 2022

PROJECT NO.
100.065

SHEET NUMBER
4

TOTAL SHEETS: 4