

# PRELIMINARY DRAINAGE PLAN PUD/SP 22-X

PUDSP221

## HILLSIDE AT LORSON RANCH

**JANUARY, 2022**

***Prepared for:***

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Project No. 100.065



**CORE**  
**ENGINEERING GROUP**

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## TABLE OF CONTENTS

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<i>ENGINEER'S STATEMENT</i> .....	1
<i>OWNER'S STATEMENT</i> .....	1
<i>FLOODPLAIN STATEMENT</i> .....	1
<i>1.0 LOCATION and DESCRIPTION</i> .....	2
<i>2.0 DRAINAGE CRITERIA</i> .....	2
<i>3.0 EXISTING HYDROLOGICAL CONDITIONS</i> .....	3
<i>4.0 DEVELOPED HYDROLOGICAL CONDITIONS</i> .....	4
<i>5.0 HYDRAULIC SUMMARY</i> .....	10
<i>6.0 DETENTION and WATER QUALITY PONDS</i> .....	25
<i>7.0 DRAINAGE and BRIDGE FEES</i> .....	27
<i>8.0 FOUR STEP PROCESS</i> .....	28
<i>9.0 CONCLUSIONS</i> .....	28
<i>10.0 REFERENCES</i> .....	29

### **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*

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**ENGINEER'S STATEMENT**

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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.

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Richard L. Schindler, P.E. #33997

Date

For and on Behalf of Core Engineering Group, LLC

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**OWNER'S STATEMENT**

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

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Lorson, LLC

Date

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By  
Jeff Mark

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Title  
Manager

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

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**FLOODPLAIN STATEMENT**

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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)

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Richard L. Schindler, #33997

Date

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**EL PASO COUNTY**

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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.

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Jennifer Irvine  
County Engineer/ECM Administrator

Date

Conditions: \_\_\_\_\_

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## 1.0 LOCATION and DESCRIPTION

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**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 6<sup>th</sup> 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 1<sup>st</sup> 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 Detention/WQ Ponds C1, E1, G and H. 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. 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.

Mention C1 and D2  
construction timing

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.

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## 2.0 DRAINAGE CRITERIA

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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.

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### 3.0 EXISTING HYDROLOGICAL CONDITIONS

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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. not found? →

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-year 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.

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## **4.0 DEVELOPED HYDROLOGICAL CONDITIONS**

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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.

show on plan

#### 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.

at-grade?

#### 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 and 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 sump 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

delete?

This basin consists of runoff from residential development, Hackberry Hill Street, Yamsay Way, Hocking Trail 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 4.5cfs and 30.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

13/46?

#### Basin E2.2

This basin consists of runoff from large lot residential lots located to the south and westerly 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 2.5cfs and 11.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

4.2/15.1?

### 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

Keynot 

This basin consists of runoff from residential development, Crafton 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.

State which FSD pond this flows to

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. 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. 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

and ROW tract for future Meridian Road



from this basin is 8.0cfs and 15.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

↖ State that the future Meridian Road drains to the east and WQ 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 4.4cfs and 18.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

verify ↗

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.

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**5.0 HYDRAULIC SUMMARY**

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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)

Street Slope	Residential Local		Residential Collector		Principal Arterial	
	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	29.7
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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> B1+B2+B3	<b>Inlet/MH Number:</b> Inlet DP2
<b>Upstream flowby:</b> 0.1cfs from Des. Pt 41	<b>Total Street Flow:</b> 11.3cfs
<b>Flow Intercepted:</b> 11.3cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 20' type R, sump	
<b>Street Capacity:</b> Street slope = 1.8%, capacity = 12.0cfs, okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> B1+B2+B3	<b>Inlet/MH Number:</b> Inlet DP2
<b>Upstream flowby:</b> 4.3cfs from Des. Pt 41	<b>Total Street Flow:</b> 29.0cfs
<b>Flow Intercepted:</b> 25.4cfs	<b>Flow Bypassed:</b> 3.6cfs to Des.Pt 4
<b>Inlet Size:</b> 20' type R, sump	
<b>Street Capacity:</b> 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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> B4	<b>Inlet/MH Number:</b> Inlet DP2
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 4.3cfs
<b>Flow Intercepted:</b> 4.3cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> Street slope = 1.8%, capacity = 12.0cfs, okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> B4	<b>Inlet/MH Number:</b> Inlet DP2
<b>Upstream flowby:</b> 3.6cfs from Des. Pt 2	<b>Total Street Flow:</b> 13.1cfs
<b>Flow Intercepted:</b> 13.1cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> 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) before flowing over the emergency overflow weir. 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. 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.

38.5 per  
DP 5?

#### 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  $(1.5+4.0) = 5.5$ cfs in the 5-year storm event and  $(13.1+18.7) = 31.8$ cfs 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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> C1,C2	<b>Inlet/MH Number:</b> Inlet DP6
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 5.9cfs
<b>Flow Intercepted:</b> 5.9cfs	<b>Flow Bypassed:</b>
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1%, capacity = 9.0cfs, okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> C1,C2	<b>Inlet/MH Number:</b> Inlet DP6
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 12.9cfs
<b>Flow Intercepted:</b> 10.9cfs	<b>Flow Bypassed:</b> 2.0cfs to Inlet DP10
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> 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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> C3	<b>Inlet/MH Number:</b> Inlet DP7
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 7.2cfs
<b>Flow Intercepted:</b> 6.0cfs	<b>Flow Bypassed:</b> 1.2cfs to Inlet DP10
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> Street slope = 3.6%, capacity = 16.7cfs, okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> C3	<b>Inlet/MH Number:</b> Inlet DP7
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 15.9cfs
<b>Flow Intercepted:</b> 9.1cfs	<b>Flow Bypassed:</b> 6.8cfs to Inlet DP10
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> 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  $(0+1.2+4.8) = 6.0$ cfs in the 5-year storm event and  $(2+6.8+10.5) = 19.3$ cfs in the 100-year storm event flowing from the south. The street capacity at 1% is okay for minor and major storm events.

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  $(0+5.3) = 5.3\text{cfs}$  in the 5-year storm event and  $(1.1+11.6) = 12.7\text{cfs}$  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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> C5	<b>Inlet/MH Number:</b> existing 10' inlet
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 3.2cfs
<b>Flow Intercepted:</b> 3.2cfs	<b>Flow Bypassed:</b>
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1%, capacity = 9.0cfs, okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> C5	<b>Inlet/MH Number:</b> existing 10' inlet
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 7.0cfs
<b>Flow Intercepted:</b> 5.9cfs	<b>Flow Bypassed:</b> 1.1cfs to Des. Pt 9
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> 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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b>	<b>Inlet/MH Number:</b> Inlet DP10
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 11.3cfs
<b>Flow Intercepted:</b> 11.3cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 25' type R, sump	
<b>Notes:</b>	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b>	<b>Inlet/MH Number:</b> Inlet DP10
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 32.0cfs
<b>Flow Intercepted:</b> 32.0cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 25' type R, sump	
<b>Notes:</b>	

State that any overflows will flow to the west in Lorson Blvd.

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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> D1.1	<b>Inlet/MH Number:</b> Inlet DP13
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 3.8cfs
<b>Flow Intercepted:</b> 3.8cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 5' type R, sump	
<b>Street Capacity:</b> Street slope = 1%, capacity = 9.0cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> D1.1	<b>Inlet/MH Number:</b> Inlet DP13
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 8.4cfs
<b>Flow Intercepted:</b> 8.4cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 5' type R, sump	
<b>Street Capacity:</b> Street slope = 1%, capacity = 37.3cfs (half street) is okay	

Describe the emergency overflow path

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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> D1.2	<b>Inlet/MH Number:</b> Inlet DP14
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 6.2cfs
<b>Flow Intercepted:</b> 6.2cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> Street slope = 1%, capacity = 9.0cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> D1.2	<b>Inlet/MH Number:</b> Inlet DP14
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 13.8cfs
<b>Flow Intercepted:</b> 13.8cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> Street slope = 1%, capacity = 37.3cfs (half street) is okay	

Design Point 15

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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E1.2	<b>Inlet/MH Number:</b> Inlet DP15
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 4.7cfs
<b>Flow Intercepted:</b> 2.8cfs	<b>Flow Bypassed:</b> 1.9cfs to Des. Pt 16
<b>Inlet Size:</b> 5' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1.9%, capacity = 12.0cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E1.2	<b>Inlet/MH Number:</b> Inlet DP15
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 10.4cfs
<b>Flow Intercepted:</b> 4.0cfs	<b>Flow Bypassed:</b> 6.4cfs to Des. Pt 16
<b>Inlet Size:</b> 5' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1.9%, capacity = 45.4cfs (half street) is okay	

Describe the emergency overflow path

Design Point 16

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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E1.3 + OS-E1.1	<b>Inlet/MH Number:</b> Inlet DP16
<b>Upstream flowby:</b> 1.9cfs from Des.Pt.15	<b>Total Street Flow:</b> 7.0cfs
<b>Flow Intercepted:</b> 7.0cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 25' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1.3%, capacity = 10.4cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E1.3 + OS-E1.1	<b>Inlet/MH Number:</b> Inlet DP16
<b>Upstream flowby:</b> 6.4cfs from Des.Pt.15	<b>Total Street Flow:</b> 34.0cfs
<b>Flow Intercepted:</b> 26.7cfs	<b>Flow Bypassed:</b> 7.3cfs to Des. Pt 17
<b>Inlet Size:</b> 25' type R, on-grade	
<b>Street Capacity:</b> 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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E1.4	<b>Inlet/MH Number:</b> Inlet DP17
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 1.1cfs
<b>Flow Intercepted:</b> 1.1cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> Street slope = 1.3%, capacity = 10.4cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E1.4	<b>Inlet/MH Number:</b> Inlet DP17
<b>Upstream flowby:</b> 7.3cfs from Des.Pt.16	<b>Total Street Flow:</b> 12.4cfs
<b>Flow Intercepted:</b> 12.4cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> Street slope = 1.3%, capacity = 44.0cfs (half street) is okay	

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.

Describe the emergency overflow path

Design Point 19

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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E3 + E4	<b>Inlet/MH Number:</b> Inlet DP19
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 9.1cfs
<b>Flow Intercepted:</b> 8.7cfs	<b>Flow Bypassed:</b> 0.4cfs to Des. Pt 20
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> Street slope = 2.7%, capacity = 14.4cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E3 + E4	<b>Inlet/MH Number:</b> Inlet DP19
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 20.0cfs
<b>Flow Intercepted:</b> 14.1cfs	<b>Flow Bypassed:</b> 5.9cfs to Des. Pt 20
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> 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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E5	<b>Inlet/MH Number:</b> Inlet DP20
<b>Upstream flowby:</b> 0.4cfs from Des.Pt.19	<b>Total Street Flow:</b> 12.4cfs
<b>Flow Intercepted:</b> 8.0cfs	<b>Flow Bypassed:</b> 4.4cfs to Des. Pt 23
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1.9%, capacity = 12.5cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E5	<b>Inlet/MH Number:</b> Inlet DP20
<b>Upstream flowby:</b> 5.9cfs from Des.Pt.19	<b>Total Street Flow:</b> 32.4cfs
<b>Flow Intercepted:</b> 12.4cfs	<b>Flow Bypassed:</b> 20.0cfs to Des. Pt 23
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> 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  
**Upstream flowby:** 4.4cfs from Des.Pt.20

**Inlet/MH Number:** Inlet DP23  
**Total Street Flow:** 7.2cfs

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

**Flow Bypassed:**

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

(100-year storm)

**Tributary Basins:** E6  
**Upstream flowby:** 20.0cfs from Des.Pt.20

**Inlet/MH Number:** Inlet DP23  
**Total Street Flow:** 26.1cfs

**Flow Intercepted:** 16.1cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 10.0cfs to Des. Pt 32

**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  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP25  
**Total Street Flow:** 9.1cfs

**Flow Intercepted:** 6.9 cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 2.2cfs to Des. Pt 28

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

(100-year storm)

**Tributary Basins:** E7  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP25  
**Total Street Flow:** 20.1cfs

**Flow Intercepted:** 10.2cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 9.9cfs to Des. Pt 28

**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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E8	<b>Inlet/MH Number:</b> Inlet DP26
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 8.1cfs
<b>Flow Intercepted:</b> 8.0cfs	<b>Flow Bypassed:</b> 0.1cfs to Des. Pt 29
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> Street slope = 4.3%, capacity = 18.0cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E8	<b>Inlet/MH Number:</b> Inlet DP26
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 17.8cfs
<b>Flow Intercepted:</b> 13.3cfs	<b>Flow Bypassed:</b> 4.5cfs to Des. Pt 29
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> 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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E9	<b>Inlet/MH Number:</b> Inlet DP28
<b>Upstream flowby:</b> 2.2cfs from Des.Pt.25	<b>Total Street Flow:</b> 4.7cfs
<b>Flow Intercepted:</b> 4.5cfs	<b>Flow Bypassed:</b> 0.2cfs to Des. Pt 32
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> Street slope = 4.3%, capacity = 18.0cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E9	<b>Inlet/MH Number:</b> Inlet DP28
<b>Upstream flowby:</b> 9.9cfs from Des.Pt.25	<b>Total Street Flow:</b> 15.4cfs
<b>Flow Intercepted:</b> 9.0cfs	<b>Flow Bypassed:</b> 6.4cfs to Des. Pt 32
<b>Inlet Size:</b> 10' type R, on-grade	
<b>Street Capacity:</b> 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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E10	<b>Inlet/MH Number:</b> Inlet DP29
<b>Upstream flowby:</b> 0.1cfs from Des.Pt.26	<b>Total Street Flow:</b> 7.3cfs
<b>Flow Intercepted:</b> 7.3cfs	<b>Flow Bypassed:</b> 0cfs to Des. Pt 34
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> Street slope = 3.8%, capacity = 16.7cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E10	<b>Inlet/MH Number:</b> Inlet DP29
<b>Upstream flowby:</b> 4.5cfs from Des.Pt.26	<b>Total Street Flow:</b> 20.5cfs
<b>Flow Intercepted:</b> 14.4cfs	<b>Flow Bypassed:</b> 6.1cfs to Des. Pt 34
<b>Inlet Size:</b> 15' type R, on-grade	
<b>Street Capacity:</b> 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

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E11	<b>Inlet/MH Number:</b> Inlet DP32
<b>Upstream flowby:</b> 0.2cfs from Des.Pt.23 & 28	<b>Total Street Flow:</b> 5.4cfs
<b>Flow Intercepted:</b> 5.4cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 30' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1.5%, capacity = 10.6cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E11	<b>Inlet/MH Number:</b> Inlet DP32
<b>Upstream flowby:</b> 16.4cfs from Des.Pt.23 & 28	<b>Total Street Flow:</b> 27.9cfs
<b>Flow Intercepted:</b> 26.2cfs	<b>Flow Bypassed:</b> 1.7cfs to Des.Pt.36
<b>Inlet Size:</b> 30' type R, on-grade	
<b>Street Capacity:</b> Street slope = 1.5%, capacity = 44.2cfs (half street) is okay	

25'?

23.9?

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/146.4cfs 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  
**Upstream flowby:** 0

**Inlet/MH Number:** Inlet DP34  
**Total Street Flow:** 7.3cfs

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

**Flow Bypassed:** 0

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

(100-year storm)

**Tributary Basins:** E12  
**Upstream flowby:** 6.1cfs from Des. Pt. 29

**Inlet/MH Number:** Inlet DP34  
**Total Street Flow:** 22.2cfs

**Flow Intercepted:** 20.6cfs  
**Inlet Size:** 25' type R, on-grade

**Flow Bypassed:** 1.6cfs to LRE4 in Trappe

**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  
**Upstream flowby:** 0

**Inlet/MH Number:** Inlet DP36  
**Total Street Flow:** 1.4cfs

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

**Flow Bypassed:** 0

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

(100-year storm)

**Tributary Basins:** E13  
**Upstream flowby:** 4.0cfs from Des.Pt.32

**Inlet/MH Number:** Inlet DP36  
**Total Street Flow:** 7.2cfs

**Flow Intercepted:** 6.0cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 1.2cfs to LRE4 in Trappe

**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.

<u>(5-year storm)</u>	
<b>Tributary Basins:</b> E14	<b>Inlet/MH Number:</b> Inlet DP39
<b>Upstream flowby:</b> 0	<b>Total Street Flow:</b> 4.7cfs
<b>Flow Intercepted:</b> 4.7cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> Street slope = 1%, capacity = 9.0cfs (half street) is okay	
<u>(100-year storm)</u>	
<b>Tributary Basins:</b> E14	<b>Inlet/MH Number:</b> Inlet DP39
<b>Upstream flowby:</b>	<b>Total Street Flow:</b> 10.3cfs
<b>Flow Intercepted:</b> 10.3cfs	<b>Flow Bypassed:</b> 0
<b>Inlet Size:</b> 10' type R, sump	
<b>Street Capacity:</b> 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

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP41

**Total Street Flow:** 7.9cfs

**Flow Intercepted:** 7.8cfs to Pond G

**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 0.1cfs to Des. Pt. 2

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

(100-year storm)

**Tributary Basins:** G1

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP41

**Total Street Flow:** 17.3cfs

**Flow Intercepted:** 13.0cfs to Pond G

**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 4.3cfs to Des. Pt. 2

**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  $(0.7+2.4) = 3.1$ cfs in the 5-year storm event and  $(8.7+11.5) = 20.2$ cfs 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.

Add text: "and one existing pond (Pond C1) will also be utilized."  
Since part of this PUDSP will be conveyed to it.

## 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. There are three permanent full spectrum ponds proposed for this development which will incorporate storm water quality features and comply with the Lorson Ranch East MDDP. The ponds 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 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, 3'x6' 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 5809.60, 3'x6' 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

82?





existing?

And mention that all of the "C" basins within this PUDSP are tributary to Pond C1 (per map on pdf pg 108 of PDR)

Water Quality Design

Water quality will be provided by three permanent extended detention basins for the almost all of the PUD area with the exception of Basin H1 and Basin G2 which flow south offsite of Lorson Ranch

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

Also address flows to the east

**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.

Lorson Ranch Metro District will compile and submit to the county on a yearly basis the Drainage and bridge fees for the approved plats and shall show all credits they have received for the same yearly time frame.

Please include in the appendix

**Table 7.1: 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 7.2: 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

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## 8.0 FOUR STEP PROCESS

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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.

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## 9.0 CONCLUSIONS

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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

← Add a statement about matching existing flows to Upper Williams Creek basin.

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## 10.0 REFERENCES

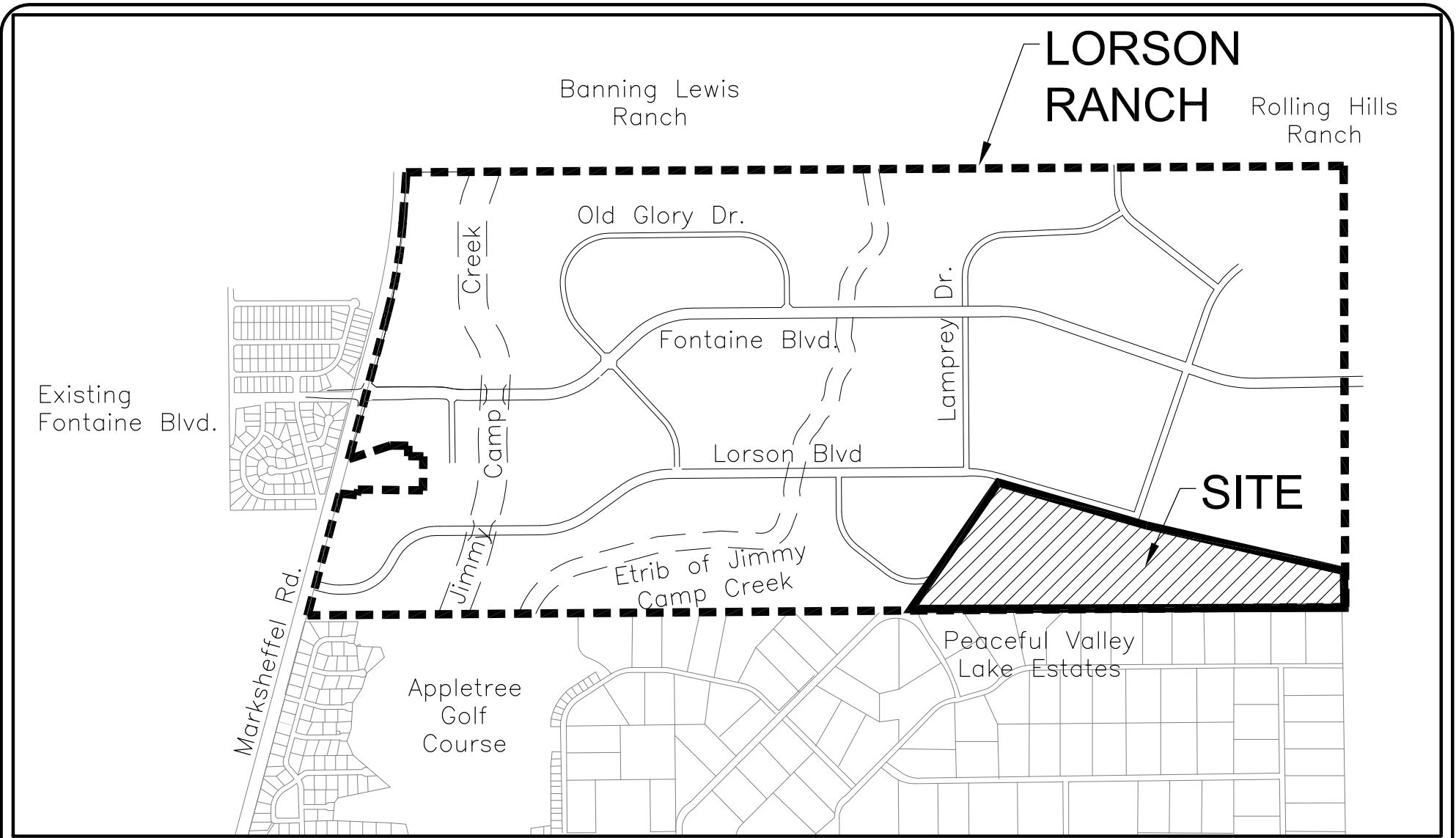
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1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering 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

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**APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP**

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**VICINITY MAP**  
NO SCALE



**CORE**  
ENGINEERING GROUP

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

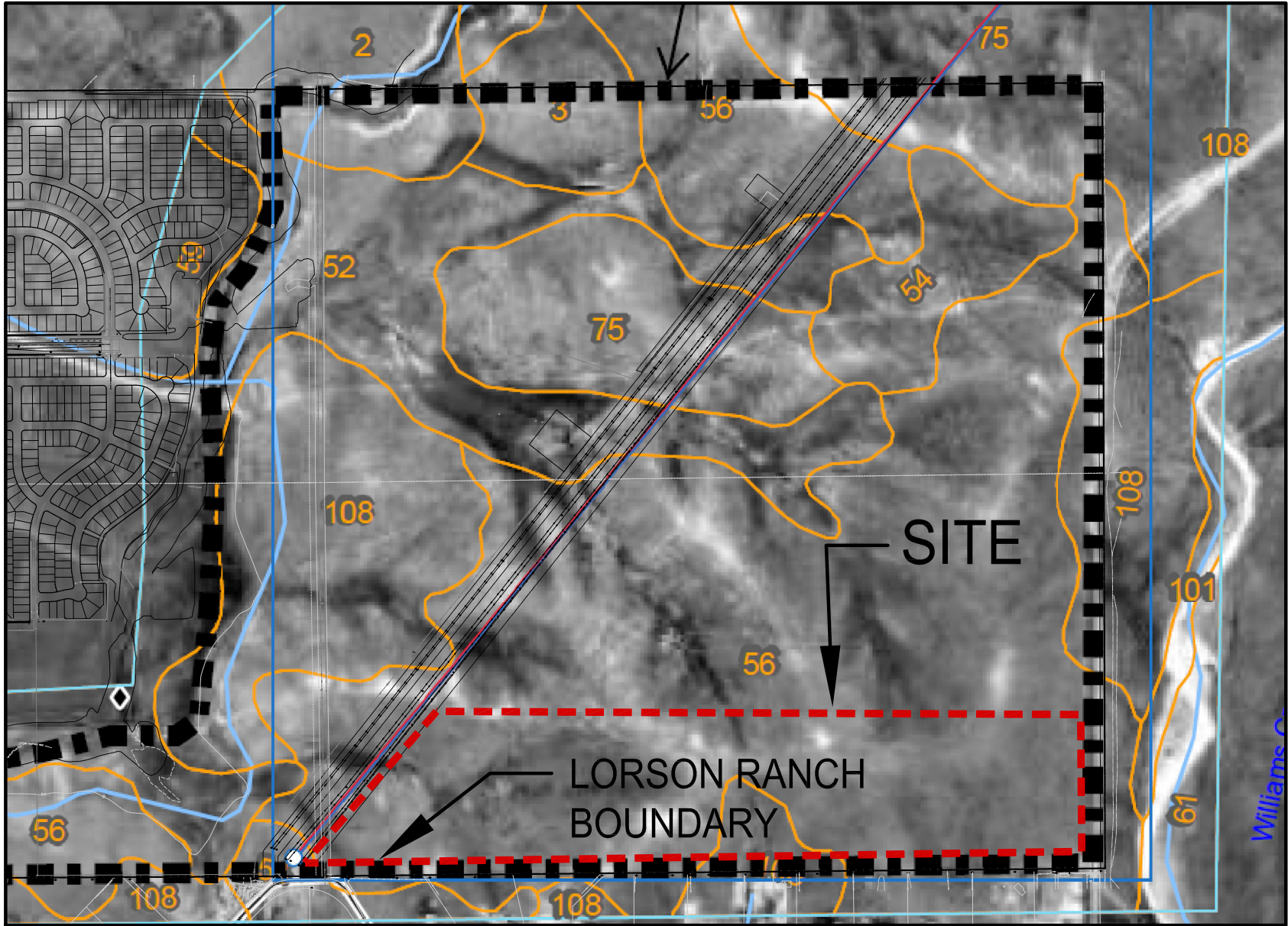
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

**HILLSIDE AT LORSON RANCH**  
**VICINITY MAP**

SCALE:  
NTS

DATE:  
AUGUST 27, 2021

FIGURE NO.  
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**CORE**  
**ENGINEERING GROUP**

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

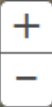
**HILLSIDE AT LORSON RANCH  
SOILS MAP**

SCALE:  
NTS

DATE:  
JANUARY, 2022

FIGURE NO.  
--





HILLSIDE AT  
LORSON RANCH

EL PASO  
COUNTY  
080059

08041C0957C  
eff. 12/7/2018

08041C0976G  
eff. 12/7/2018

FEMA FLOODMAP

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**APPENDIX B – HYDROLOGY CALCULATIONS**

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**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 <sub>c</sub>	CA	i	Q	t <sub>c</sub>	Σ(CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity		t <sub>t</sub>
			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)	<b>1E</b>	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													



**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	$t_c$	$\Sigma$ (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)	<b>1E</b>	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													



**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 <sub>c</sub>	CA	i	Q	t <sub>c</sub>	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity		t
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	<b>1</b>	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	<b>2</b> (I-2)	7.43							16.8	3.34	3.35	11.2									
B4	<b>4</b> (I-4)		2.96	0.45	18.0	1.33	3.24	4.3													
B1-B4	<b>5</b>	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	<b>6</b> (I-6)	3.45							12.6	1.55	3.78	5.9									
C3	<b>7</b> (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	<b>8</b> (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	<b>9</b> (I-10)	5.13							19.1	2.31	3.16	7.3									
C3, C4, C6	<b>11</b>								19.9	5.06	3.10	15.7									



**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 <sub>c</sub>	CA	i	Q	t <sub>c</sub>	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity		t
			ac.			min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft		ft/sec
D1.1	<b>13</b>		1.98	0.45	9.1	0.89	4.27	3.8													
D1.2	<b>14</b>		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	<b>47</b> (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	<b>15</b> (I-15)		3.07	0.45	16.2	1.38	3.41	4.7													
E1.3	<b>16</b> (I-16)		6.39	0.15	18.3	0.96	3.22	3.1													
OS-E1.1,E1.3	<b>16</b> (I-16)	16.35							25.4	1.85	2.73	5.1									
E1.4	<b>17</b> (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	<b>18</b>	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													



**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)	tc	CA	i	Q	tc	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t	
E3-E4	<b>19</b> (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	<b>20</b> (I-20)	12.75						15.4	5.74	3.48	20.0										
E1.2, E3 - E5	<b>21</b>	15.82						16.2	9.28	3.41	31.7										
E6	<b>23</b> (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	<b>25</b> (I-25)		5.48	0.45	13.3	2.47	3.70	9.1													
E8	<b>26</b> (I-26)		4.70	0.45	12.2	2.12	3.83	8.1													
E7-E8	<b>27</b>	10.18						9.5	4.58	4.20	19.3										
E9	<b>28</b> (I-28)		1.37	0.45	10.3	0.62	4.09	2.5													
E10	<b>29</b> (I-29)		4.33	0.45	13.1	1.95	3.72	7.2													
E7-E10	<b>30</b>	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	<b>32</b> (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	<b>34</b> (I-34)		4.76	0.45	16.0	2.14	3.42	7.3													
OS-E1.1, E1.2, E3 - E12	<b>35</b>	57.51						20.1	20.38	3.08	62.9										



**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	$t_c$	$\Sigma$ (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	
E13	<b>36</b> (I-36)		0.72	0.45	8.1	0.32	4.44	1.4													
OS-E1.1- E1.4, E3 - E13	<b>38</b>	60.30							20.1	21.01	3.08	64.7									
E14	<b>39</b> (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	<b>41</b> (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													



**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	$t_c$	$\Sigma(CA)$	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
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	<b>1</b>	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	<b>2</b> (I-2)	7.43							16.8	4.38	5.62	24.7									
B4	<b>4</b> (I-4)		2.96	0.59	18.0	1.75	5.45	9.5													
B1-B4	<b>5</b>	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	<b>6</b> (I-6)	3.45							12.6	2.04	6.34	12.9									
C3	<b>7</b> (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	<b>8</b> (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	<b>9</b> (I-10)	5.13							19.1	3.03	5.30	16.0									



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

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 Date: Nov. 23, 2021  
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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	$t_c$	$\Sigma(CA)$	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	
C3, C4, C6	<b>11</b>							19.9	6.63	5.20	34.5										
D1.1	<b>13</b>		1.98	0.59	9.1	1.17	7.16	8.4													
D1.2	<b>14</b>		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	<b>47</b> (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	<b>15</b> (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	<b>16</b> (I-16)	16.35							25.4	6.21	4.44	27.6									
E1.4	<b>17</b> (I-17)		2.07	0.41	14.4	0.85	6.02	5.1													
OS-E1.1-E1.4		21.49	<b>21.49</b>				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	<b>18</b>	26.10							18.3	14.36	5.41	77.7									





**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	$t_c$	$\Sigma(CA)$	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	
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	<b>19</b> (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	<b>20</b> (I-20)	12.75							15.4	7.52	5.84	44.0									
E1.2, E3 - E5	<b>21</b>	15.82							16.2	16.39	5.72	93.8									
E6	<b>23</b> (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	<b>25</b> (I-25)		5.48	0.59	13.3	3.23	6.21	20.1													
E8	<b>26</b> (I-26)		4.70	0.59	12.2	2.77	6.43	17.8													
E7-E8	<b>27</b>	10.18							9.5	6.01	7.06	42.4									
E9	<b>28</b> (I-28)		1.37	0.59	10.3	0.81	6.87	5.5													
E10	<b>29</b> (I-29)		4.33	0.59	13.1	2.55	6.25	16.0													
E7-E10	<b>30</b>	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	<b>32</b> (I-32)		2.97	0.59	11.5	1.75	6.59	11.5													



**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 <sub>c</sub>	CA	i	Q	t <sub>c</sub>	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity		t
			ac.			min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft		ft/sec
OS-E1.1, E1.2, E3 - E11		52.75						20.0	25.87	5.19	134.2										
E12	<b>34</b> (I-34)		4.76	0.59	16.0	2.81	5.74	16.1													
OS-E1.1, E1.2, E3 - E12		57.51						20.1	30.49	5.18	157.9										
E13	<b>36</b> (I-36)		0.72	0.59	8.1	0.42	7.46	3.2													
OS-E1.1, E1.2, E3 - E13		60.30						20.1	31.76	5.17	164.2										
E14	<b>39</b> (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	<b>41</b> (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													





**Standard Form SF-1. Time of Concentration-Current**

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

Job No: 100.065  
 Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					Final t <sub>c</sub>
BASIN or DESIGN	C <sub>s</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	USDCM Recommended t <sub>c</sub> =t <sub>i</sub> +t <sub>t</sub> (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



**Standard Form SF-1. Time of Concentration-Current**

Calculated By: Leonard Beasley

Job No: 100.065

Date: Nov. 22, 2021

Project: Hillside at Lorson Ranch

Checked By: Leonard Beasley

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					Final tc
BASIN or DESIGN	C <sub>s</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	ti minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	tt minutes	Computed tc Minutes	USDCM Recommended tc=ti+tt (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



**Standard Form SF-1. Time of Concentration-Current**

Calculated By: Leonard Beasley

Job No: 100.065

Date: Nov. 22, 2021

Project: Hillside at Lorson Ranch

Checked By: Leonard Beasley

Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended Tc=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	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



**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 <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended Tc=Ti+Tt (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				



**Standard Form SF-1. Time of Concentration-Proposed**

Calculated By: Leonard Beasley  
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Job No: 100.065  
 Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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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 Project: Hillside at Lorson Ranch

Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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 <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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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Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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				



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Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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



**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 <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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



**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 <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (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



**Standard Form SF-1. Time of Concentration-Proposed**

Calculated By: Leonard Beasley

Job No: 100.065

Date: Nov. 23, 2021

Project: Hillside at Lorson Ranch

Checked By: Leonard Beasley

Sub-Basin Data				Initial Overland Time (t <sub>i</sub> )				Travel Time (t <sub>t</sub> )					t <sub>c</sub> Check (urbanized Basins)		Final t <sub>c</sub>
BASIN or DESIGN	C <sub>5</sub>	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>i</sub> minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	t <sub>t</sub> minutes	Computed t <sub>c</sub> Minutes	TOTAL LENGTH (L) feet	Regional t <sub>c</sub> tc=(L/180)+10 minutes	USDCM Recommended Tc=ti+tt (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
<sup>(G1)</sup> 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

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## APPENDIX C – HYDRAULIC CALCULATIONS

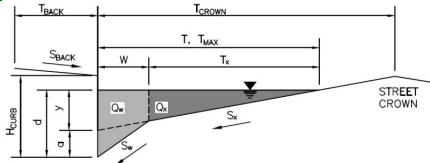
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**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**

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

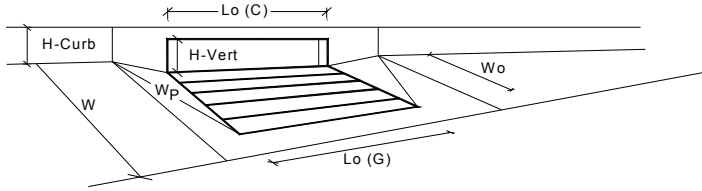
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-2, DP-2 (B2&B3)



<b>Gutter Geometry (Enter data in the blue cells)</b>									
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft								
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.015"/>								
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches								
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="17.0"/> ft								
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft								
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft								
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft								
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft								
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.017"/>								
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> <tr> <td style="padding: 5px;"><math>T_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="16.5"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="17.0"/></td> <td style="text-align: right;">ft</td> </tr> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="16.5"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft
	Minor Storm	Major Storm							
$T_{MAX} = $	<input style="width: 40px;" type="text" value="16.5"/>	<input style="width: 40px;" type="text" value="17.0"/>	ft						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> <tr> <td style="padding: 5px;"><math>d_{MAX} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="7.7"/></td> <td style="text-align: right;">inches</td> </tr> </table>		Minor Storm	Major Storm		$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="7.7"/>	inches
	Minor Storm	Major Storm							
$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="7.7"/>	inches						
Check boxes are not applicable in SUMP conditions	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;"><input type="checkbox"/></td> <td style="width: 50%; text-align: center;"><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>						
<input type="checkbox"/>	<input type="checkbox"/>								
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>									
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>									
$Q_{allow} = $	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> <tr> <td style="padding: 5px;"><math>Q_{allow} = </math></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="SUMP"/></td> <td style="border: 1px solid black; text-align: center;"><input style="width: 40px;" type="text" value="SUMP"/></td> <td style="text-align: right;">cfs</td> </tr> </table>		Minor Storm	Major Storm		$Q_{allow} = $	<input style="width: 40px;" type="text" value="SUMP"/>	<input style="width: 40px;" type="text" value="SUMP"/>	cfs
	Minor Storm	Major Storm							
$Q_{allow} = $	<input style="width: 40px;" type="text" value="SUMP"/>	<input style="width: 40px;" type="text" value="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		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.8	7.9	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	20.00	20.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.32	0.49	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.55	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	0.78	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
$Q_a$	11.4	25.4	cfs
$Q_{PEAK\ REQUIRED}$	11.3	29.0	cfs

WARNING: Inlet Capacity less than Q Peak for Major Storm

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

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

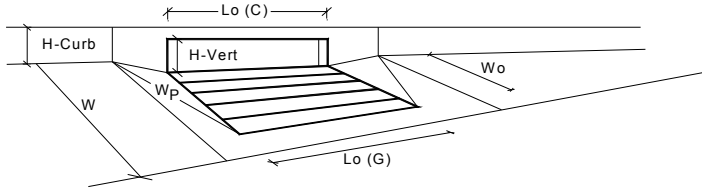
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-4, DP-4 (B4)



<b>Gutter Geometry (Enter data in the blue cells)</b>													
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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Minor Storm</th> <th style="width: 50%;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>T_{MAX} = 16.5</math></td> <td style="text-align: center;"><math>17.0</math></td> <td style="text-align: right;">ft</td> </tr> <tr> <td style="text-align: center;"><math>d_{MAX} = 6.0</math></td> <td style="text-align: center;"><math>7.9</math></td> <td style="text-align: right;">inches</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm		$T_{MAX} = 16.5$	$17.0$	ft	$d_{MAX} = 6.0$	$7.9$	inches	<input type="checkbox"/>	<input type="checkbox"/>	
Minor Storm	Major Storm												
$T_{MAX} = 16.5$	$17.0$	ft											
$d_{MAX} = 6.0$	$7.9$	inches											
<input type="checkbox"/>	<input type="checkbox"/>												
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Check boxes are not applicable in SUMP conditions													
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Minor Storm</th> <th style="width: 50%;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>Q_{allow} = \text{SUMP}</math></td> <td style="text-align: center;"><math>\text{SUMP}</math></td> <td style="text-align: right;">cfs</td> </tr> </tbody> </table>	Minor Storm	Major Storm		$Q_{allow} = \text{SUMP}$	$\text{SUMP}$	cfs						
Minor Storm	Major Storm												
$Q_{allow} = \text{SUMP}$	$\text{SUMP}$	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		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	4.8	7.2	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.23	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.45	0.68	
Curb Opening Performance Reduction Factor for Long Inlets	0.85	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	4.3	13.1	cfs
Q PEAK REQUIRED =	4.3	13.1	cfs

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

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

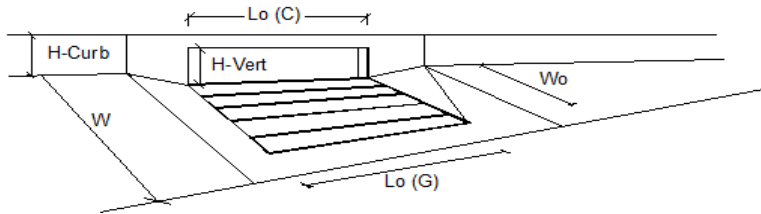
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-6, DP-6 (C2)



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)	$n_{STREET} = 0.017$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> <tr> <td><math>T_{MAX} = 17.0</math></td> <td><math>T_{MAX} = 17.0</math></td> <td></td> </tr> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 17.0$	$T_{MAX} = 17.0$	
Minor Storm	Major Storm	ft					
$T_{MAX} = 17.0$	$T_{MAX} = 17.0$						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> <tr> <td><math>d_{MAX} = 6.0</math></td> <td><math>d_{MAX} = 7.9</math></td> <td></td> </tr> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 6.0$	$d_{MAX} = 7.9$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 6.0$	$d_{MAX} = 7.9$						
Allow Flow Depth at Street Crown (leave blank for no)	<table border="1"> <tr> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>check = yes</td> </tr> </table>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes			
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes					
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>							
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>							
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	<table border="1"> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> <tr> <td><math>Q_{allow} = 12.9</math></td> <td><math>Q_{allow} = 31.5</math></td> <td></td> </tr> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = 12.9$	$Q_{allow} = 31.5$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = 12.9$	$Q_{allow} = 31.5$						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	5.9	10.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	2.0	cfs
Capture Percentage = $Q_i/Q_c$ =	100	85	%

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

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

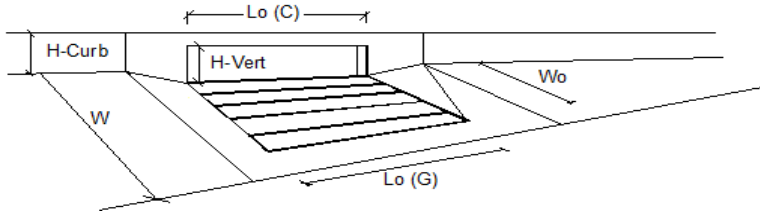
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-7, DP-7 (C3)



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)	$n_{STREET} = 0.017$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = 17.0</math></td> <td><math>T_{MAX} = 17.0</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 17.0$	$T_{MAX} = 17.0$	
Minor Storm	Major Storm	ft					
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td><math>d_{MAX} = 6.0</math></td> <td><math>d_{MAX} = 7.9</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 6.0$	$d_{MAX} = 7.9$	
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Allow Flow Depth at Street Crown (leave blank for no)	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>check = yes</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	check = yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Minor Storm	Major Storm	check = yes					
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>							
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Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td><math>Q_{allow} = 15.8</math></td> <td><math>Q_{allow} = 31.2</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = 15.8$	$Q_{allow} = 31.2$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = 15.8$	$Q_{allow} = 31.2$						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	6.0	9.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	1.2	6.8	cfs
Capture Percentage = $Q_i/Q_c$ =	84	57	%



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

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

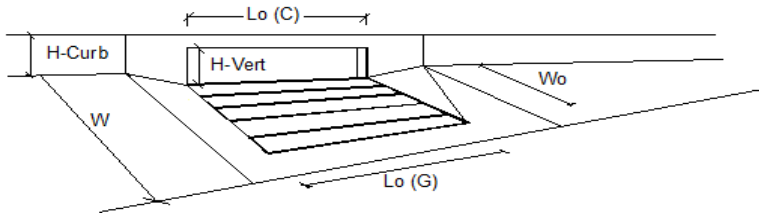
Project: Hillside at Lorson Ranch  
 Inlet ID: ex inlet dp9a



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>18.5</td> <td>22.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>6.0</td> <td>8.4</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	18.5	22.0	ft	$d_{MAX} =$	6.0	8.4	inches
	Minor Storm	Major Storm											
$T_{MAX} =$	18.5	22.0	ft										
$d_{MAX} =$	6.0	8.4	inches										
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>													
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	$Q_{allow} = 18.4$ cfs												
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	$Q_{allow} = 46.7$ cfs												

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

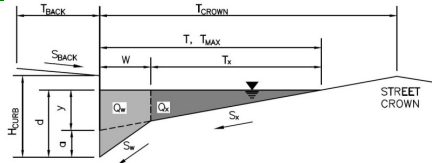


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	3.2	5.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	1.1	cfs
Capture Percentage = $Q_i/Q_c$ =	100	84	%

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

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

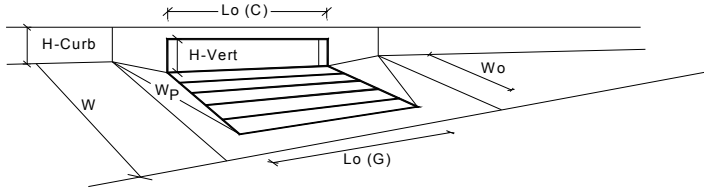
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-10, DP-10 (C4)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Minor Storm</th> <th style="text-align: center;">Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>T_{MAX} = 17.0</math></td> <td style="text-align: center;"><math>17.0</math></td> <td style="text-align: center;">ft</td> </tr> <tr> <td style="text-align: center;"><math>d_{MAX} = 5.6</math></td> <td style="text-align: center;"><math>7.9</math></td> <td style="text-align: center;">inches</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm		$T_{MAX} = 17.0$	$17.0$	ft	$d_{MAX} = 5.6$	$7.9$	inches	<input type="checkbox"/>	<input type="checkbox"/>	
Minor Storm	Major Storm												
$T_{MAX} = 17.0$	$17.0$	ft											
$d_{MAX} = 5.6$	$7.9$	inches											
<input type="checkbox"/>	<input type="checkbox"/>												
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Check boxes are not applicable in SUMP conditions													
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>	<table border="1" style="display: inline-table; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Minor Storm</th> <th style="text-align: center;">Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><math>Q_{allow} = \text{SUMP}</math></td> <td style="text-align: center;"><math>\text{SUMP}</math></td> <td style="text-align: center;">cfs</td> </tr> </tbody> </table>	Minor Storm	Major Storm		$Q_{allow} = \text{SUMP}$	$\text{SUMP}$	cfs						
Minor Storm	Major Storm												
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## INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Will this overtop and flow west at 3.6 inches?

Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.5	8.1	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	25.00	25.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.29	0.51	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.52	0.76	
Curb Opening Performance Reduction Factor for Long Inlets	0.75	0.90	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
<b>Q<sub>a</sub></b>	11.7	32.7	cfs
<b>Q<sub>PEAK REQUIRED</sub></b>	11.3	32.0	cfs

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

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

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

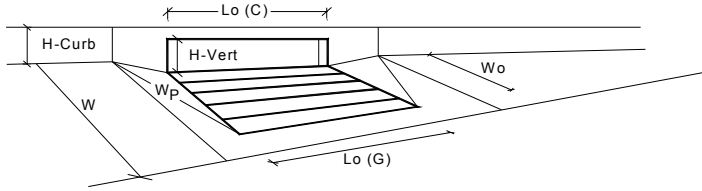
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-13, DP-13 (D1.1)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>24.5</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>6.0</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	24.5	ft	$d_{MAX} =$	6.0	7.9	inches
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Check boxes are not applicable in SUMP conditions	<input type="checkbox"/> <input type="checkbox"/>												
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	Minor Storm	Major Storm											
$Q_{allow} =$	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		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.2	7.4	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.27	0.45	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.66	0.95	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
<b>Q<sub>a</sub></b>	<b>3.8</b>	<b>8.4</b>	<b>cfs</b>
Q <sub>PEAK REQUIRED</sub>	3.8	8.4	cfs

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

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

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

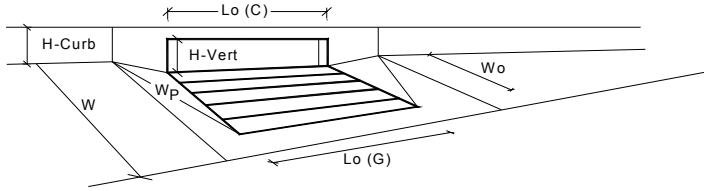
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-14, DP-14 (D1.2)



<b>Gutter Geometry (Enter data in the blue cells)</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.015"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="47.0"/> ft												
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft												
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.017"/>												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="16.5"/></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="24.5"/></td> <td style="text-align: right;">ft</td> </tr> <tr> <td><math>d_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="7.9"/></td> <td style="text-align: right;">inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 50px;" type="text" value="16.5"/>	<input style="width: 50px;" type="text" value="24.5"/>	ft	$d_{MAX} = $	<input style="width: 50px;" type="text" value="6.0"/>	<input style="width: 50px;" type="text" value="7.9"/>	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<input type="checkbox"/>												
Check boxes are not applicable in SUMP conditions	<input type="checkbox"/>												
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td><math>Q_{allow} = </math></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="SUMP"/></td> <td style="text-align: center;"><input style="width: 50px;" type="text" value="SUMP"/></td> <td style="text-align: right;">cfs</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$Q_{allow} = $	<input style="width: 50px;" type="text" value="SUMP"/>	<input style="width: 50px;" type="text" value="SUMP"/>	cfs				
	Minor Storm	Major Storm											
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## 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		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	5.4	7.4	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.28	0.45	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.51	0.70	
Curb Opening Performance Reduction Factor for Long Inlets	0.90	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
<b>Q<sub>a</sub></b>	6.2	13.8	cfs
<b>Q<sub>PEAK REQUIRED</sub></b>	6.2	13.8	cfs

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



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

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

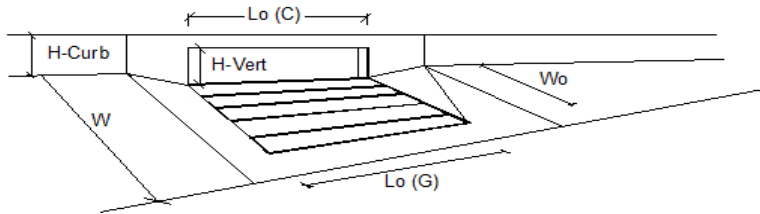
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-15, DP-15 (E1.2)



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)	$n_{STREET} = 0.017$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = 17.0</math></td> <td><math>T_{MAX} = 17.0</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 17.0$	$T_{MAX} = 17.0$	
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td><math>d_{MAX} = 5.6</math></td> <td><math>d_{MAX} = 7.9</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 5.6$	$d_{MAX} = 7.9$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 5.6$	$d_{MAX} = 7.9$						
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> Minor Storm <input checked="" type="checkbox"/> Major Storm    check = yes						
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>							
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>							
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td><math>Q_{allow} = 14.1</math></td> <td><math>Q_{allow} = 37.7</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = 14.1$	$Q_{allow} = 37.7$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = 14.1$	$Q_{allow} = 37.7$						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	2.8	4.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	1.9	6.4	cfs
Capture Percentage = $Q_i/Q_c$ =	60	38	%

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

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

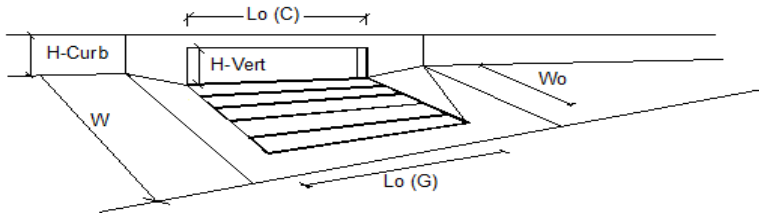
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-16, DP-16 (E1.3)



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)	$n_{STREET} = 0.017$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = 17.0</math></td> <td><math>T_{MAX} = 17.0</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 17.0$	$T_{MAX} = 17.0$	
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td><math>d_{MAX} = 5.6</math></td> <td><math>d_{MAX} = 7.9</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 5.6$	$d_{MAX} = 7.9$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 5.6$	$d_{MAX} = 7.9$						
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> Minor Storm <input checked="" type="checkbox"/> Major Storm    check = yes						
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>							
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>							
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td><math>Q_{allow} = 11.5</math></td> <td><math>Q_{allow} = 35.5</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = 11.5$	$Q_{allow} = 35.5$	
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Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	25.00	25.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	7.0	26.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	7.3	cfs
Capture Percentage = $Q_i/Q_c$ =	100	78	%

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

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

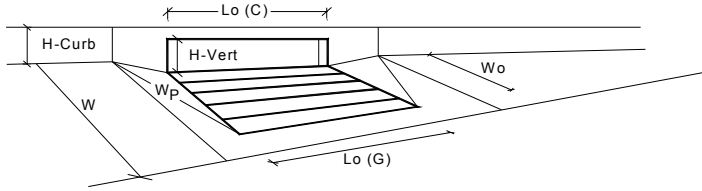
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-17, DP-17 (E1.4)



<b>Gutter Geometry (Enter data in the blue cells)</b>																	
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft																
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.015"/>																
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches																
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="47.0"/> ft																
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft																
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft																
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft																
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft																
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## INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



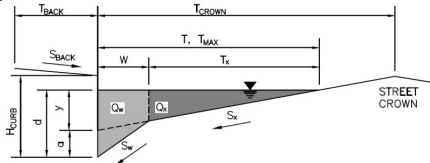
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	3.3	7.7	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.10	0.48	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.31	0.73	
Curb Opening Performance Reduction Factor for Long Inlets	0.71	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
<b>Q<sub>a</sub></b>	1.1	15.1	cfs
<b>Q<sub>PEAK REQUIRED</sub></b>	1.1	12.4	cfs

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

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

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

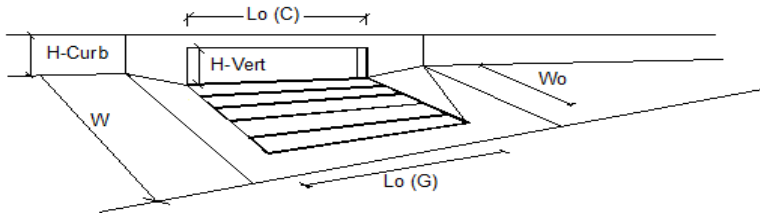
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-19, DP-19 (E4)



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)	$n_{STREET} = 0.017$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = 16.5</math></td> <td><math>T_{MAX} = 17.0</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 16.5$	$T_{MAX} = 17.0$	
Minor Storm	Major Storm	ft					
$T_{MAX} = 16.5$	$T_{MAX} = 17.0$						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td><math>d_{MAX} = 5.6</math></td> <td><math>d_{MAX} = 7.9</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 5.6$	$d_{MAX} = 7.9$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 5.6$	$d_{MAX} = 7.9$						
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> Minor Storm <input checked="" type="checkbox"/> Major Storm    check = yes						
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>							
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>							
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td><math>Q_{allow} = 15.6</math></td> <td><math>Q_{allow} = 34.0</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = 15.6$	$Q_{allow} = 34.0$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = 15.6$	$Q_{allow} = 34.0$						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	8.7	14.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.4	5.9	cfs
Capture Percentage = $Q_i/Q_c$ =	96	71	%



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

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

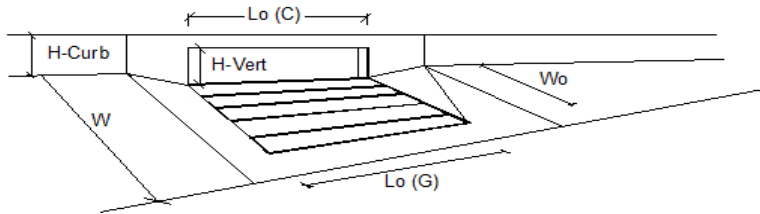
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-20, DP-20 (E5)



Gutter Geometry (Enter data in the blue cells)					
Maximum Allowable Width for Spread Behind Curb	T <sub>BACK</sub> = 8.0 ft				
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S <sub>BACK</sub> = 0.020 ft/ft				
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n <sub>BACK</sub> = 0.015				
Height of Curb at Gutter Flow Line	H <sub>CURB</sub> = 6.00 inches				
Distance from Curb Face to Street Crown	T <sub>CROWN</sub> = 17.0 ft				
Gutter Width	W = 2.00 ft				
Street Transverse Slope	S <sub>x</sub> = 0.020 ft/ft				
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S <sub>w</sub> = 0.083 ft/ft				
Street Longitudinal Slope - Enter 0 for sump condition	S <sub>o</sub> = 0.019 ft/ft				
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n <sub>STREET</sub> = 0.017				
Max. Allowable Spread for Minor & Major Storm	T <sub>MAX</sub> = <table border="1"><tr><th>Minor Storm</th><th>Major Storm</th></tr><tr><td>16.5</td><td>17.0</td></tr></table> ft	Minor Storm	Major Storm	16.5	17.0
Minor Storm	Major Storm				
16.5	17.0				
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d <sub>MAX</sub> = <table border="1"><tr><th>Minor Storm</th><th>Major Storm</th></tr><tr><td>5.6</td><td>7.9</td></tr></table> inches	Minor Storm	Major Storm	5.6	7.9
Minor Storm	Major Storm				
5.6	7.9				
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes				
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>					
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>					
	Q <sub>allow</sub> = <table border="1"><tr><th>Minor Storm</th><th>Major Storm</th></tr><tr><td>13.1</td><td>37.7</td></tr></table> cfs	Minor Storm	Major Storm	13.1	37.7
Minor Storm	Major Storm				
13.1	37.7				
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>					
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## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

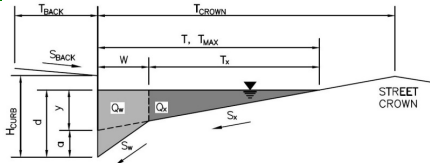


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	8.0	12.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	4.4	20.0	cfs
Capture Percentage = $Q_i/Q_c$ =	65	38	%

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

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

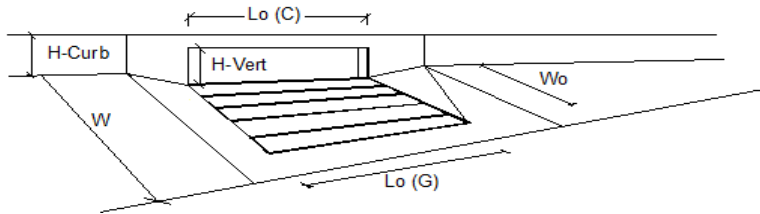
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-23, DP-23 (E6)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>													
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## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	7.2	16.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	10.0	cfs
Capture Percentage = $Q_i/Q_c$ =	100	62	%

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

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

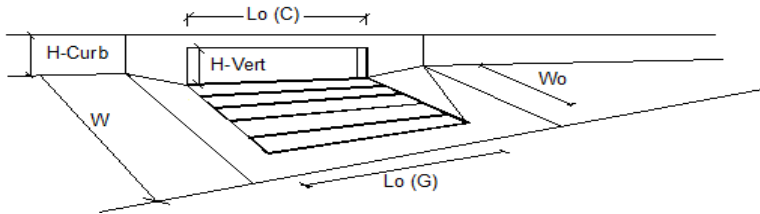
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-25, DP-25 (E7)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
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## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

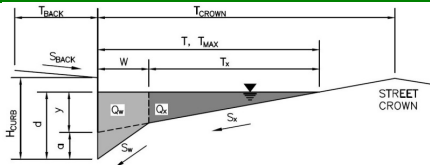


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	6.9	10.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	2.2	9.9	cfs
Capture Percentage = $Q_i/Q_c$ =	76	51	%

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

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

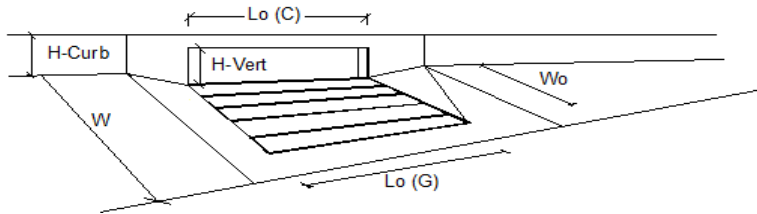
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-26, DP-26 (E8)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
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<p><b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p> <p><b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p>													

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	8.0	13.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.1	4.5	cfs
Capture Percentage = $Q_i/Q_c$ =	98	75	%



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

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

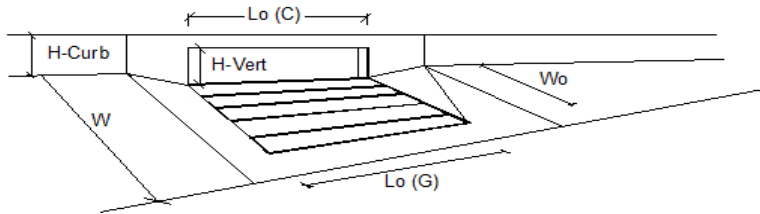
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-28, DP-28 (E9)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
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<p><b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p> <p><b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p>													

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	4.5	9.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.2	6.4	cfs
Capture Percentage = $Q_i/Q_c$ =	97	58	%

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

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

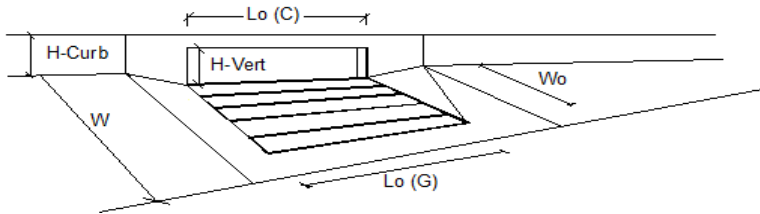
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-29, DP-29 (E10)



Gutter Geometry (Enter data in the blue cells)					
Maximum Allowable Width for Spread Behind Curb	T <sub>BACK</sub> = 8.0 ft				
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S <sub>BACK</sub> = 0.020 ft/ft				
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n <sub>BACK</sub> = 0.015				
Height of Curb at Gutter Flow Line	H <sub>CURB</sub> = 6.00 inches				
Distance from Curb Face to Street Crown	T <sub>CROWN</sub> = 17.0 ft				
Gutter Width	W = 2.00 ft				
Street Transverse Slope	S <sub>x</sub> = 0.020 ft/ft				
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S <sub>w</sub> = 0.083 ft/ft				
Street Longitudinal Slope - Enter 0 for sump condition	S <sub>o</sub> = 0.038 ft/ft				
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n <sub>STREET</sub> = 0.017				
Max. Allowable Spread for Minor & Major Storm	T <sub>MAX</sub> = <table border="1"><tr><th>Minor Storm</th><th>Major Storm</th></tr><tr><td>16.5</td><td>17.0</td></tr></table> ft	Minor Storm	Major Storm	16.5	17.0
Minor Storm	Major Storm				
16.5	17.0				
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d <sub>MAX</sub> = <table border="1"><tr><th>Minor Storm</th><th>Major Storm</th></tr><tr><td>5.6</td><td>7.9</td></tr></table> inches	Minor Storm	Major Storm	5.6	7.9
Minor Storm	Major Storm				
5.6	7.9				
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes				
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>					
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>					
	Q <sub>allow</sub> = <table border="1"><tr><th>Minor Storm</th><th>Major Storm</th></tr><tr><td>15.6</td><td>30.8</td></tr></table> cfs	Minor Storm	Major Storm	15.6	30.8
Minor Storm	Major Storm				
15.6	30.8				
<b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b>					
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## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	7.3	14.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	6.1	cfs
Capture Percentage = $Q_i/Q_c$ =	100	70	%

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

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

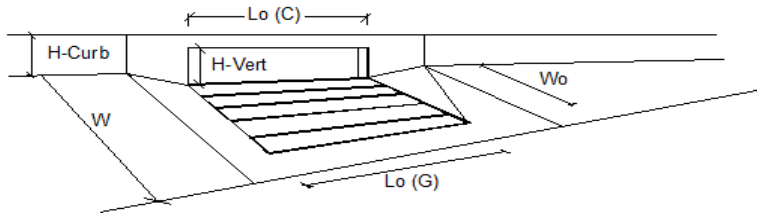
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-32, DP-32 (E11)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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$T_{MAX} =$	16.5	17.0	ft										
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>													
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<p><b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p> <p><b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p>													

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	25.00	25.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>			
Total Inlet Interception Capacity	5.4	23.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	4.0	cfs
Capture Percentage = $Q_i/Q_c$ =	100	86	%

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

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

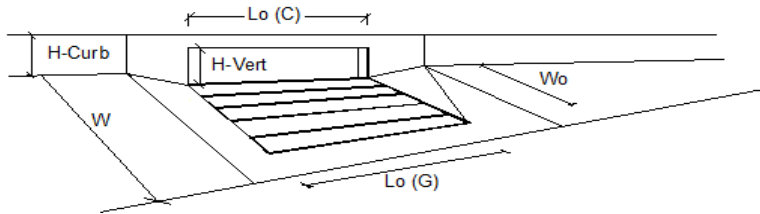
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-34, DP-34 (E12)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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$T_{MAX} =$	16.5	17.0	ft										
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>													
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## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



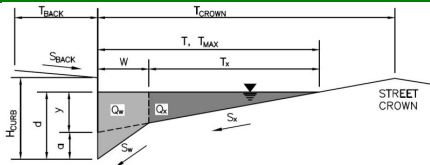
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	25.00	25.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	7.3	20.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	1.6	cfs
Capture Percentage = $Q_i/Q_c$ =	100	93	%



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

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

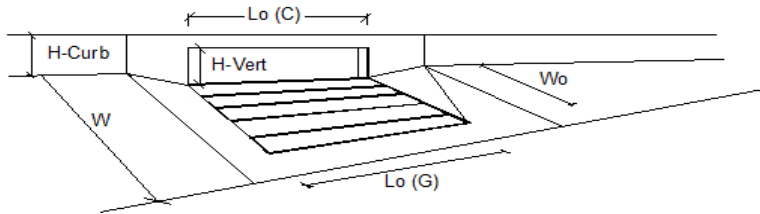
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-36, DP-36 (E13)



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)	$n_{STREET} = 0.017$												
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th></th> <th>Minor Storm</th> <th>Major Storm</th> <th></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} =</math></td> <td>16.5</td> <td>17.0</td> <td>ft</td> </tr> <tr> <td><math>d_{MAX} =</math></td> <td>5.6</td> <td>7.9</td> <td>inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} =$	16.5	17.0	ft	$d_{MAX} =$	5.6	7.9	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> <input checked="" type="checkbox"/> check = yes												
<b>MINOR STORM Allowable Capacity is based on Depth Criterion</b>													
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>													
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<p><b>Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p> <p><b>Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'</b></p>													

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

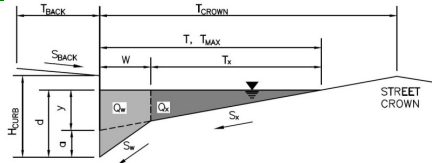


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	1.4	6.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	1.1	cfs
Capture Percentage = $Q_i/Q_c$ =	100	84	%

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

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

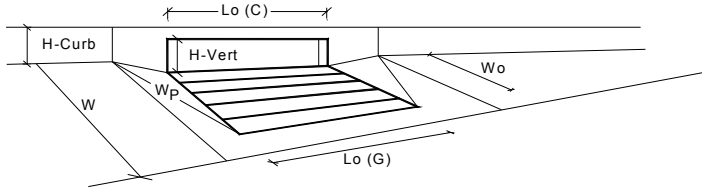
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-39, DP-39 (E14)



<b>Gutter Geometry (Enter data in the blue cells)</b>													
Maximum Allowable Width for Spread Behind Curb	$T_{BACK} = $ <input style="width: 50px;" type="text" value="8.0"/> ft												
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	$S_{BACK} = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	$n_{BACK} = $ <input style="width: 50px;" type="text" value="0.015"/>												
Height of Curb at Gutter Flow Line	$H_{CURB} = $ <input style="width: 50px;" type="text" value="6.00"/> inches												
Distance from Curb Face to Street Crown	$T_{CROWN} = $ <input style="width: 50px;" type="text" value="47.0"/> ft												
Gutter Width	$W = $ <input style="width: 50px;" type="text" value="2.00"/> ft												
Street Transverse Slope	$S_x = $ <input style="width: 50px;" type="text" value="0.020"/> ft/ft												
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	$S_w = $ <input style="width: 50px;" type="text" value="0.083"/> ft/ft												
Street Longitudinal Slope - Enter 0 for sump condition	$S_o = $ <input style="width: 50px;" type="text" value="0.000"/> ft/ft												
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	$n_{STREET} = $ <input style="width: 50px;" type="text" value="0.017"/>												
Max. Allowable Spread for Minor & Major Storm	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"></th> <th style="width: 25%; text-align: center;">Minor Storm</th> <th style="width: 25%; text-align: center;">Major Storm</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="16.5"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="24.5"/></td> <td style="text-align: right;">ft</td> </tr> <tr> <td><math>d_{MAX} = </math></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="6.0"/></td> <td style="text-align: center;"><input style="width: 40px;" type="text" value="7.9"/></td> <td style="text-align: right;">inches</td> </tr> </tbody> </table>		Minor Storm	Major Storm		$T_{MAX} = $	<input style="width: 40px;" type="text" value="16.5"/>	<input style="width: 40px;" type="text" value="24.5"/>	ft	$d_{MAX} = $	<input style="width: 40px;" type="text" value="6.0"/>	<input style="width: 40px;" type="text" value="7.9"/>	inches
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Max. Allowable Depth at Gutter Flowline for Minor & Major Storm													
Check boxes are not applicable in SUMP conditions	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;"><input type="checkbox"/></td> <td style="width: 50%; text-align: center;"><input type="checkbox"/></td> </tr> </table>	<input type="checkbox"/>	<input type="checkbox"/>										
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	Minor Storm	Major Storm											
$Q_{allow} = $	<input style="width: 40px;" type="text" value="SUMP"/>	<input style="width: 40px;" type="text" value="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		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	4.9	6.5	inches
<b>Grate Information</b>	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.24	0.38	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.46	0.62	
Curb Opening Performance Reduction Factor for Long Inlets	0.86	0.96	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>	MINOR	MAJOR	
<b>Q<sub>a</sub></b>	4.7	10.3	cfs
<b>Q<sub>PEAK REQUIRED</sub></b>	4.7	10.3	cfs

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

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

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

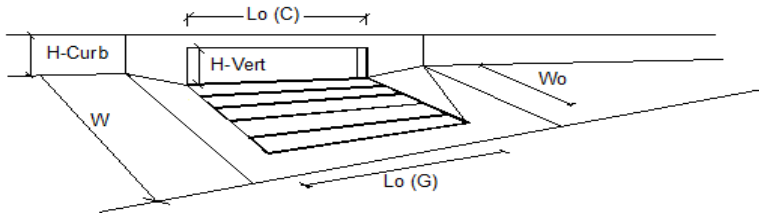
Project: Hillside at Lorson Ranch  
 Inlet ID: Inlet I-41, DP-41 (G1)



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)	$n_{STREET} = 0.017$						
Max. Allowable Spread for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>ft</th> </tr> </thead> <tbody> <tr> <td><math>T_{MAX} = 16.5</math></td> <td><math>T_{MAX} = 17.0</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	ft	$T_{MAX} = 16.5$	$T_{MAX} = 17.0$	
Minor Storm	Major Storm	ft					
$T_{MAX} = 16.5$	$T_{MAX} = 17.0$						
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>inches</th> </tr> </thead> <tbody> <tr> <td><math>d_{MAX} = 5.6</math></td> <td><math>d_{MAX} = 7.9</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	inches	$d_{MAX} = 5.6$	$d_{MAX} = 7.9$	
Minor Storm	Major Storm	inches					
$d_{MAX} = 5.6$	$d_{MAX} = 7.9$						
Allow Flow Depth at Street Crown (leave blank for no)	<input type="checkbox"/> Minor Storm <input checked="" type="checkbox"/> Major Storm    check = yes						
<b>MINOR STORM Allowable Capacity is based on Spread Criterion</b>							
<b>MAJOR STORM Allowable Capacity is based on Depth Criterion</b>							
Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'	<table border="1"> <thead> <tr> <th>Minor Storm</th> <th>Major Storm</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td><math>Q_{allow} = 13.4</math></td> <td><math>Q_{allow} = 37.2</math></td> <td></td> </tr> </tbody> </table>	Minor Storm	Major Storm	cfs	$Q_{allow} = 13.4$	$Q_{allow} = 37.2$	
Minor Storm	Major Storm	cfs					
$Q_{allow} = 13.4$	$Q_{allow} = 37.2$						
Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'							

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity*</b>			
Total Inlet Interception Capacity	7.8	13.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.1	4.3	cfs
Capture Percentage = $Q_i/Q_c$ =	99	75	%

---

## APPENDIX D – POND AND ROUTING CALCULATIONS

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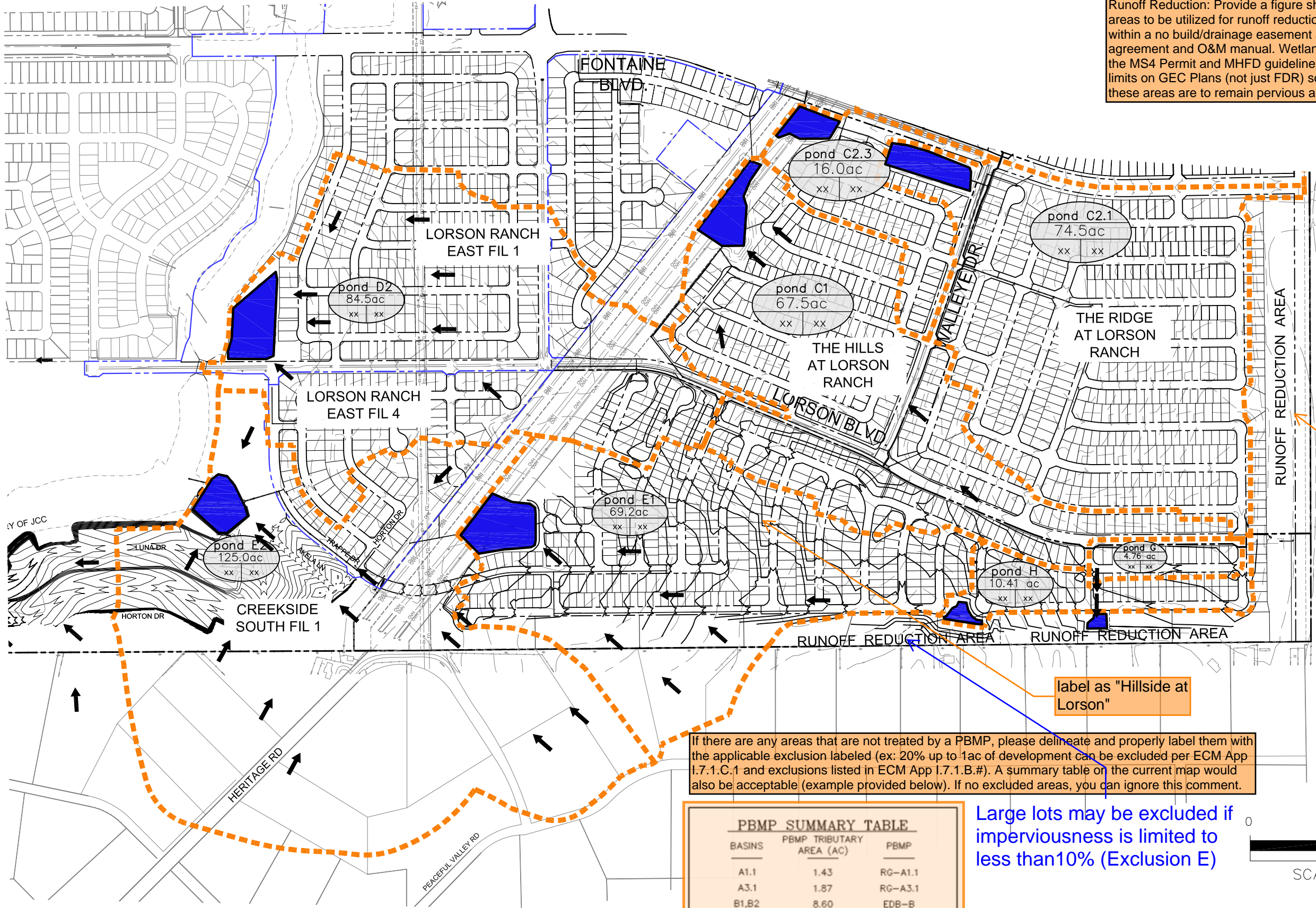
Note: all pond details have been preliminarily reviewed and preliminary comments have been provided as a courtesy. But these details and accompanying calcs in the Drainage Report will need to be reviewed again and approved with the Final Plat submittal.

Subsequently, all comments in this Appendix D do not have to be resolved at this PUDSP stage.



(If storm drain system is being constructed with early grading final details are needed.)

Runoff Reduction: Provide a figure showing all proposed UIA and RPA areas to be utilized for runoff reduction. All RPA areas will need to be within a no build/drainage easement and discussed in the maintenance agreement and O&M manual. Wetlands are not an acceptable RPA per the MS4 Permit and MHFD guidelines. Also make sure to show RPA limits on GEC Plans (not just FDR) so our SW inspectors know that these areas are to remain pervious and vegetated post-construction.



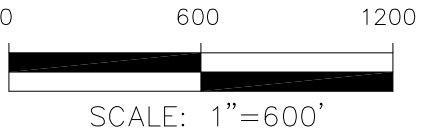
since these areas have separate RPA's they should be shown as separate columns on the runoff reduction calcs (on pdf pg 143)

label as "Hillside at Lorson"

If there are any areas that are not treated by a PBMP, please delineate and properly label them with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 and exclusions listed in ECM App I.7.1.B.#). A summary table on the current map would also be acceptable (example provided below). If no excluded areas, you can ignore this comment.

BASINS	PBMP TRIBUTARY AREA (AC)	PBMP
A1.1	1.43	RG-A1.1
A3.1	1.87	RG-A3.1
B1,B2	8.60	EDB-B
OA2,A2	0.95	EXCLUDED*

Large lots may be excluded if imperviousness is limited to less than 10% (Exclusion E)



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

HILLSIDE AT LORSON RANCH WATER QUALITY & POND TRIBUTARY AREAS

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

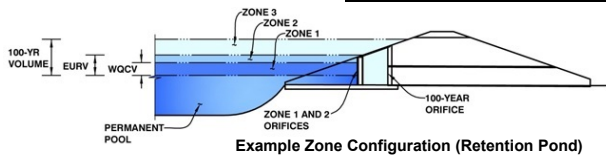




# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

**Project:** Hillside at Lorson Ranch  
**Basin ID:** Pond E1



	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)
<b>Total (all zones)</b>		<b>7.271</b>	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.65	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.60	inches
Orifice Plate: Orifice Area per Row =	3.42	sq. inches (use rectangular openings)

Calculated Parameters for Plate	
WQ Orifice Area per Row =	2.375E-02 ft <sup>2</sup>
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft <sup>2</sup>

**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	
Invert of Vertical Orifice =	3.65	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.62	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	6.00	N/A	inches
Vertical Orifice Width =	15.67	N/A	inches

Calculated Parameters for Vertical Orific	
Zone 2 Rectangular	Not Selected
Vertical Orifice Area =	0.65 N/A
Vertical Orifice Centroid =	0.25 N/A

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.62	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir	
Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H <sub>1</sub> =	5.62 N/A
Overflow Weir Slope Length =	6.00 N/A
Grate Open Area / 100-yr Orifice Area =	8.92 N/A
Overflow Grate Open Area w/o Debris =	25.06 N/A
Overflow Grate Open Area w/ Debris =	12.53 N/A

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	20.10	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	2.81 N/A
Outlet Orifice Centroid =	0.90 N/A
Half-Central Angle of Restrictor Plate on Pipe =	2.31 N/A

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	8.20	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	10.00	H:V
Freeboard above Max Water Surface =	0.50	feet

Calculated Parameters for Spillway	
Spillway Design Flow Depth =	1.02 feet
Stage at Top of Freeboard =	9.72 feet
Basin Area at Top of Freeboard =	2.05 acres
Basin Volume at Top of Freeboard =	11.51 acre-ft

micropool=5728.10=stage 0

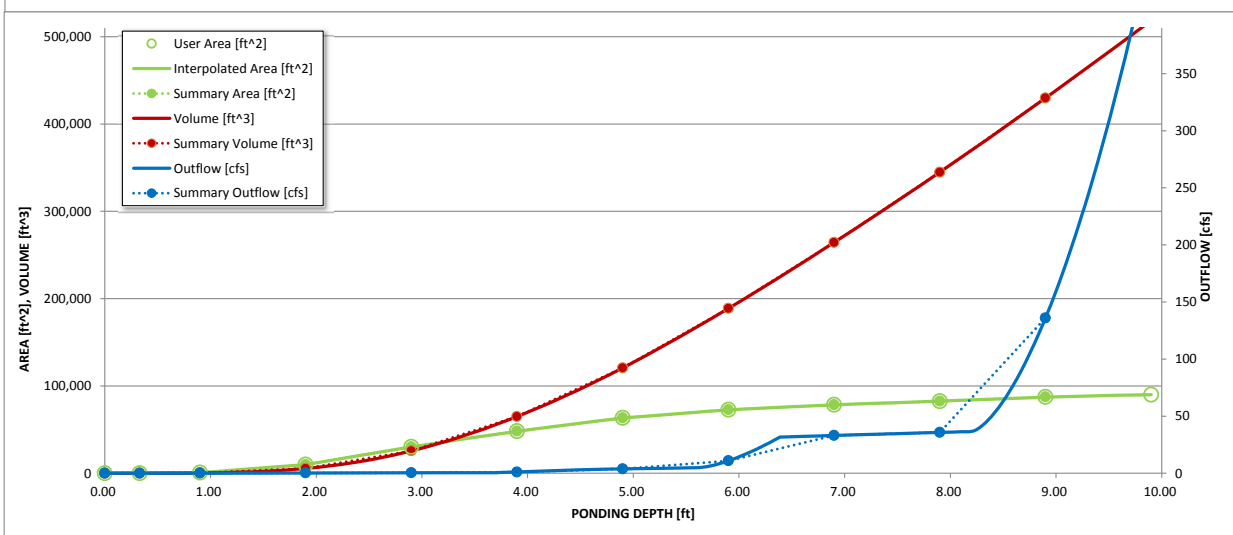
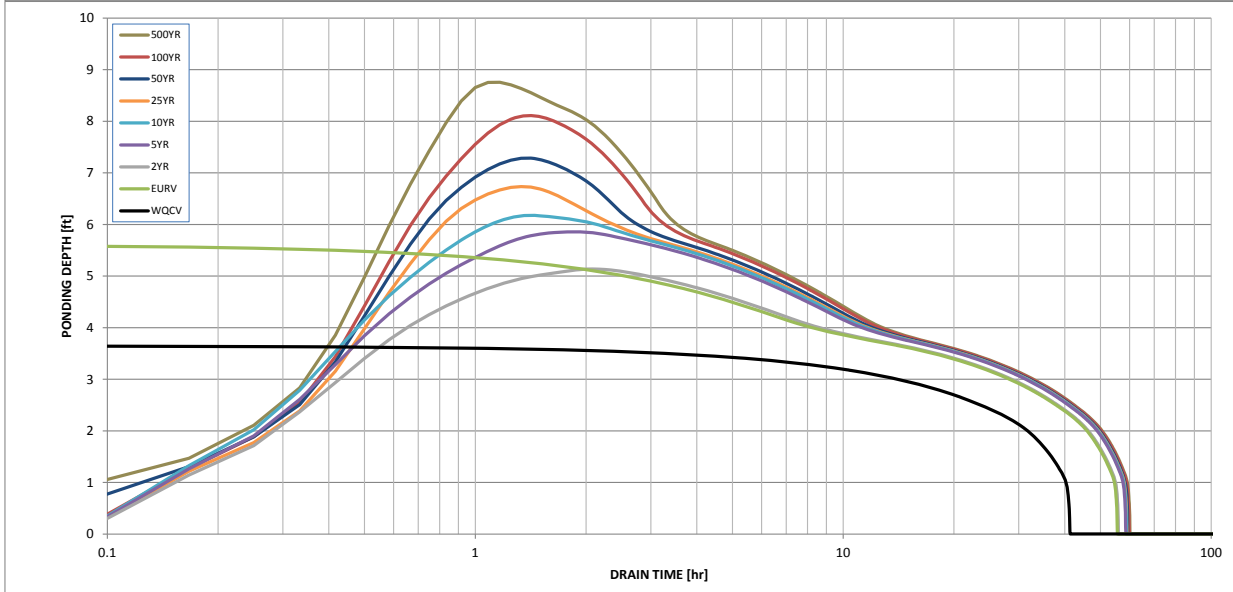
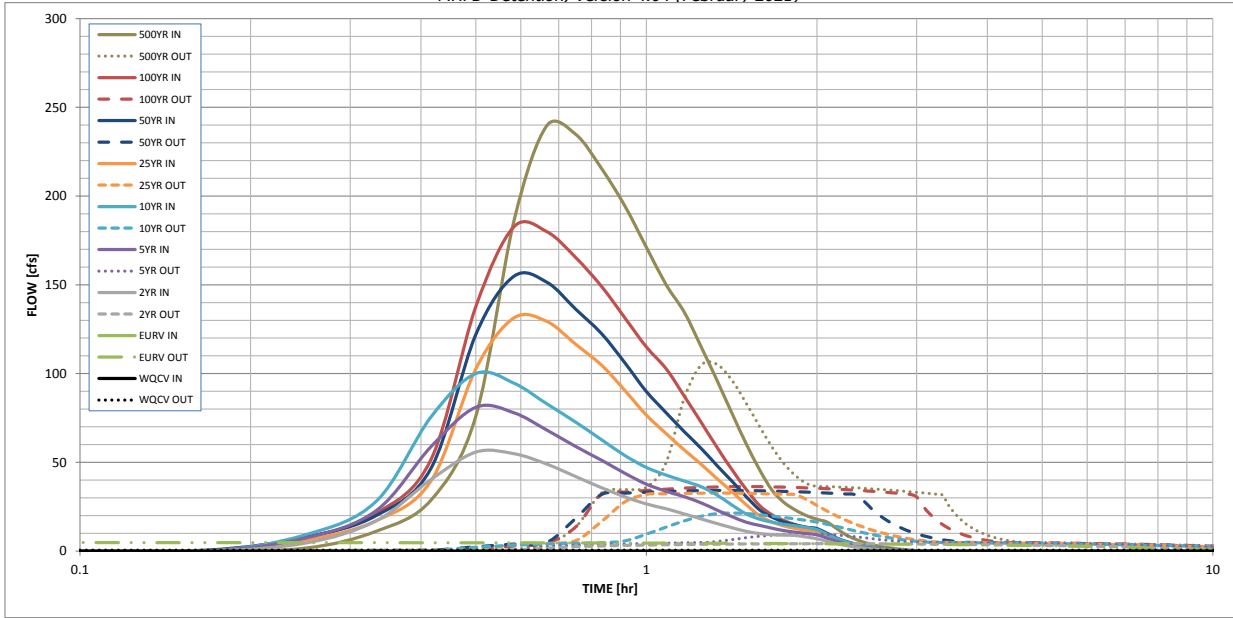
## Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	1.221	3.859	3.655	5.184	6.521	8.294	9.743	11.572
CUHP Runoff Volume (acre-ft) =	N/A	N/A	3.655	5.184	6.521	8.294	9.743	11.572
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.2	20.1	30.5	54.6	68.6	87.1
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.10	0.29	0.44	0.79	0.99	1.26
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	55.7	81.0	100.0	131.3	154.8	182.6
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	4.2	9.6	21.4	32.7	34.2	36.3
Peak Inflow Q (cfs) =	N/A	N/A	N/A	0.5	0.7	0.6	0.5	0.4
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 Gate 1 (fps) =	N/A	N/A	N/A	0.2	0.6	1.1	1.1	1.2
Max Velocity through Gate 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			



**Design Procedure Form: Extended Detention Basin (EDB)**

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

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

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, <math>I_a</math></p> <p>B) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time (<math>V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)</math>)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume (<math>V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} * 0.43))</math>)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) NRCS Hydrologic Soil Groups of Tributary Watershed              i) Percentage of Watershed consisting of Type A Soils              ii) Percentage of Watershed consisting of Type B Soils              iii) Percentage of Watershed consisting of Type C/D Soils</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume              For HSG A: <math>EURV_A = 1.68 * i^{1.28}</math>              For HSG B: <math>EURV_B = 1.36 * i^{1.08}</math>              For HSG C/D: <math>EURV_{C/D} = 1.20 * i^{1.08}</math></p> <p>K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)</p>	<p><math>I_a =</math> <input type="text" value="52.0"/> %</p> <p><math>i =</math> <input type="text" value="0.520"/></p> <p>Area = <input type="text" value="69.200"/> ac</p> <p><math>d_6 =</math> <input type="text" value=""/></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Water Quality Capture Volume (WQCV)</p> <p><input type="radio"/> Excess Urban Runoff Volume (EURV)</p> </div> <p><math>V_{DESIGN} =</math> <input type="text" value=""/> ac-ft</p> <p><math>V_{DESIGN\ OTHER} =</math> <input type="text" value=""/> ac-ft</p> <p><math>V_{DESIGN\ USER} =</math> <input type="text" value="1.220"/> ac-ft</p> <p>HSG <sub>A</sub> = <input type="text" value=""/> %</p> <p>HSG <sub>B</sub> = <input type="text" value=""/> %</p> <p>HSG <sub>C/D</sub> = <input type="text" value=""/> %</p> <p><math>EURV_{DESIGN} =</math> <input type="text" value=""/> ac-ft</p> <p><math>EURV_{DESIGN\ USER} =</math> <input type="text" value=""/> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <input type="text" value="2.0"/> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <input type="text" value="3.00"/> ft / ft</p> <p align="center"><b>DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE</b></p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p>_____</p> <p>_____</p> <p>_____</p>
<p>5. Forebay</p> <p>A) Minimum Forebay Volume (<math>V_{MIN} =</math> <input type="text" value="3%"/> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth (<math>D_F =</math> <input type="text" value="30"/> inch maximum)</p> <p>D) Forebay Discharge</p> <p>i) Undetained 100-year Peak Discharge</p> <p>ii) Forebay Discharge Design Flow (<math>Q_F = 0.02 * Q_{100}</math>)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p><math>V_{MIN} =</math> <input type="text" value="0.037"/> ac-ft</p> <p><math>V_F =</math> <input type="text" value="0.038"/> ac-ft</p> <p><math>D_F =</math> <input type="text" value="24.0"/> in</p> <p><math>Q_{100} =</math> <input type="text" value="182.60"/> cfs</p> <p><math>Q_F =</math> <input type="text" value="3.65"/> cfs</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input type="radio"/> Berm With Pipe</p> <p><input checked="" type="radio"/> Wall with Rect. Notch</p> <p><input type="radio"/> Wall with V-Notch Weir</p> </div> <p>Calculated <math>D_P =</math> <input type="text" value=""/> in</p> <p>Calculated <math>W_N =</math> <input type="text" value="9.5"/> in</p>

**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

<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Concrete  <input type="radio"/> Soft Bottom         </div> <p>S = <input type="text" value="0.0050"/> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-foot minimum)</p> <p>B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>D<sub>M</sub> = <input type="text" value="2.5"/> ft</p> <p>A<sub>M</sub> = <input type="text" value="48"/> sq ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Orifice Plate  <input type="radio"/> Other (Describe):         </div> <hr/> <hr/> <p>D<sub>orifice</sub> = <input type="text" value="1.84"/> inches</p> <p>A<sub>orifice</sub> = <input type="text" value="10.26"/> square inches</p>
<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>D<sub>IS</sub> = <input type="text" value="4"/> in</p> <p>V<sub>IS</sub> = <input type="text" value="159"/> cu ft</p> <p>V<sub>s</sub> = <input type="text" value="16.0"/> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: <math>A_t = A_{ot} * 38.5 * (e^{-0.095D})</math></p> <p>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 area to the total screen area for the material specified.)</p> <p style="margin-left: 40px;">Other (Y/N): <input type="text" value="Y"/></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H<sub>TR</sub>)</p> <p>G) Width of Water Quality Screen Opening (W<sub>opening</sub>) (Minimum of 12 inches is recommended)</p>	<p>A<sub>t</sub> = <input type="text" value="332"/> square inches</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; width: fit-content;">             Other (Please describe below)         </div> <hr/> <hr/> <p>User Ratio = <input type="text" value="0.6"/></p> <p>A<sub>total</sub> = <input type="text" value="553"/> sq. in. <span style="color: blue;">Based on type 'Other' screen ratio</span></p> <p>H = <input type="text" value="3.65"/> feet</p> <p>H<sub>TR</sub> = <input type="text" value="71.8"/> inches</p> <p>W<sub>opening</sub> = <input type="text" value="12.0"/> inches <span style="color: red;">VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.</span></p>

Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 3

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

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>TRM added to emergency overflow. All of 100-year flows will enter outlet structure before entering emergency overflow.</p> <p>Ze = <input type="text" value="4.00"/> ft / ft</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>Notes: _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	

# Channel Report

Hydraflow Express by Intelisolve

Tuesday, Jan 11 2022, 7:38 AM

## LOW FLOW CHANNEL (2 x forebay=7.3cfs)

### Rectangular

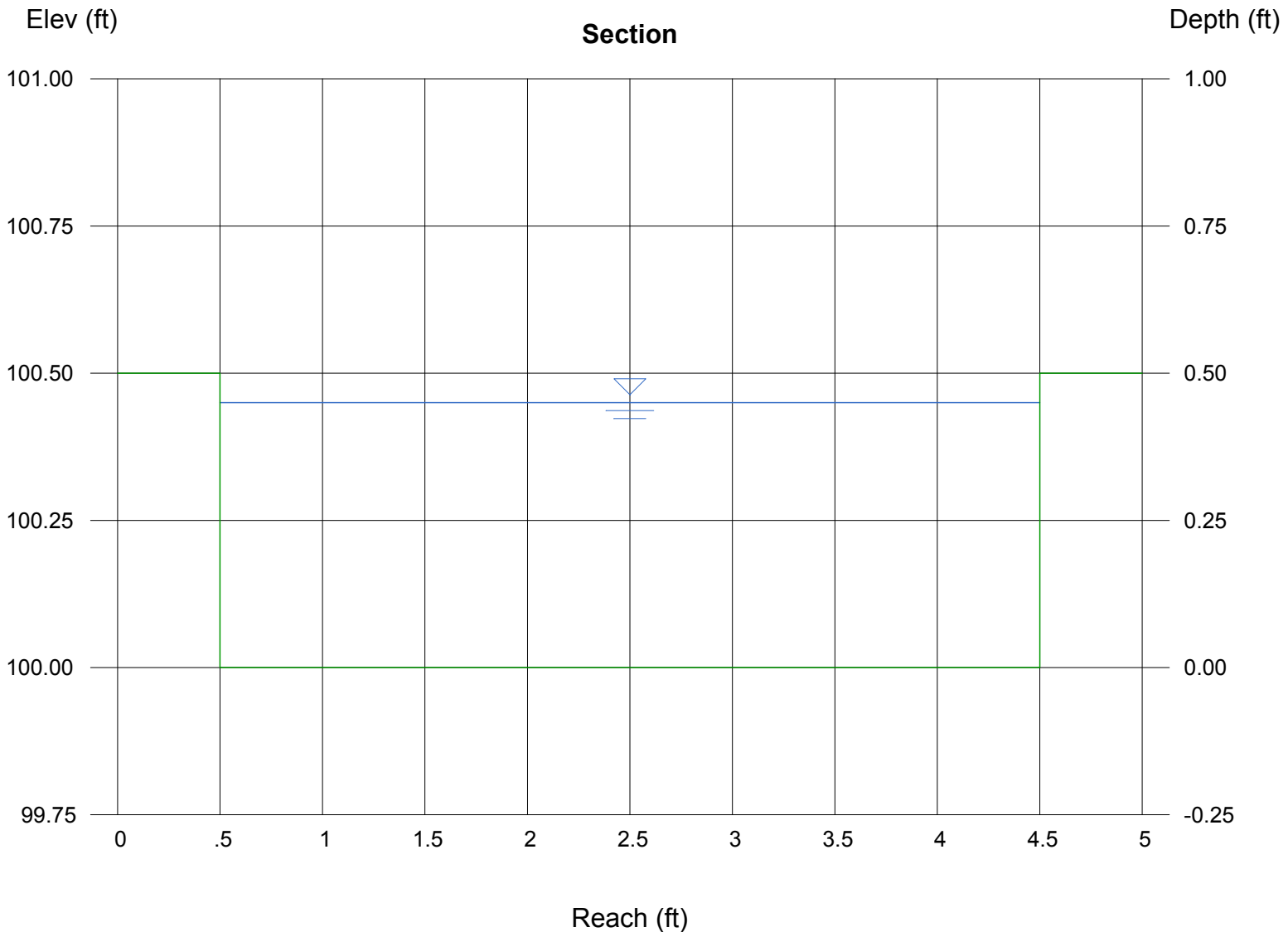
Bottom Width (ft) = 4.00  
Total Depth (ft) = 0.50  
  
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

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

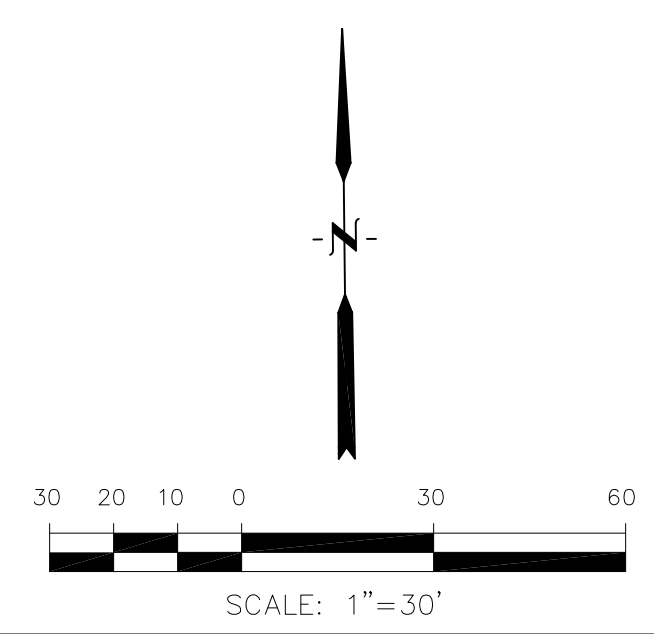
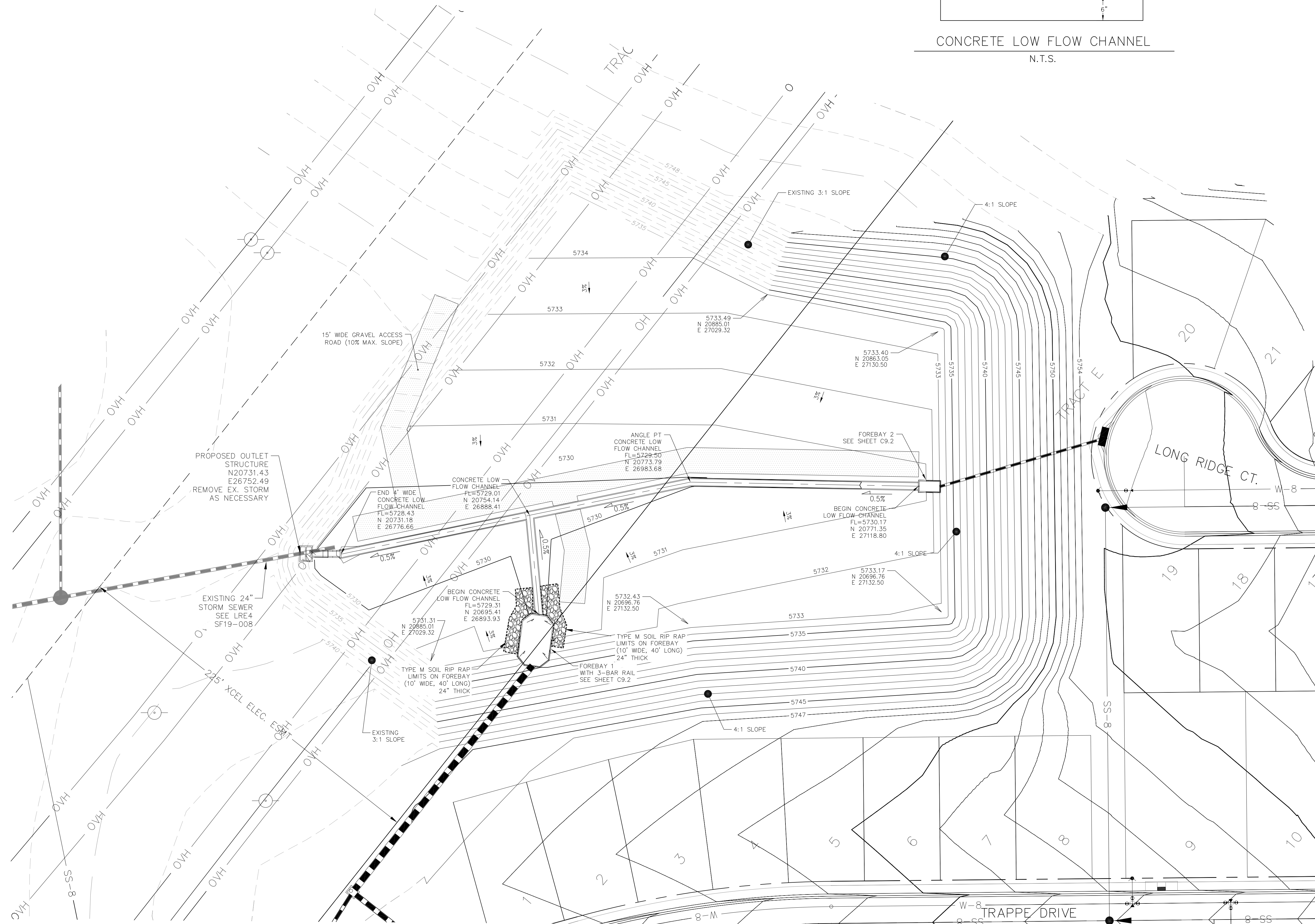
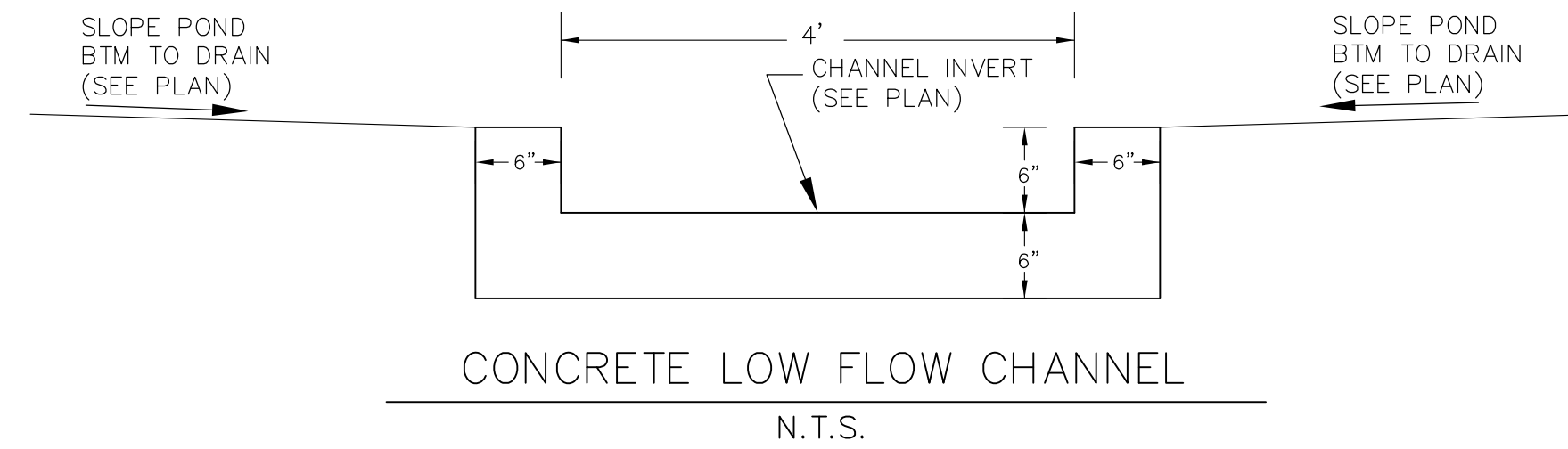
### Highlighted

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





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



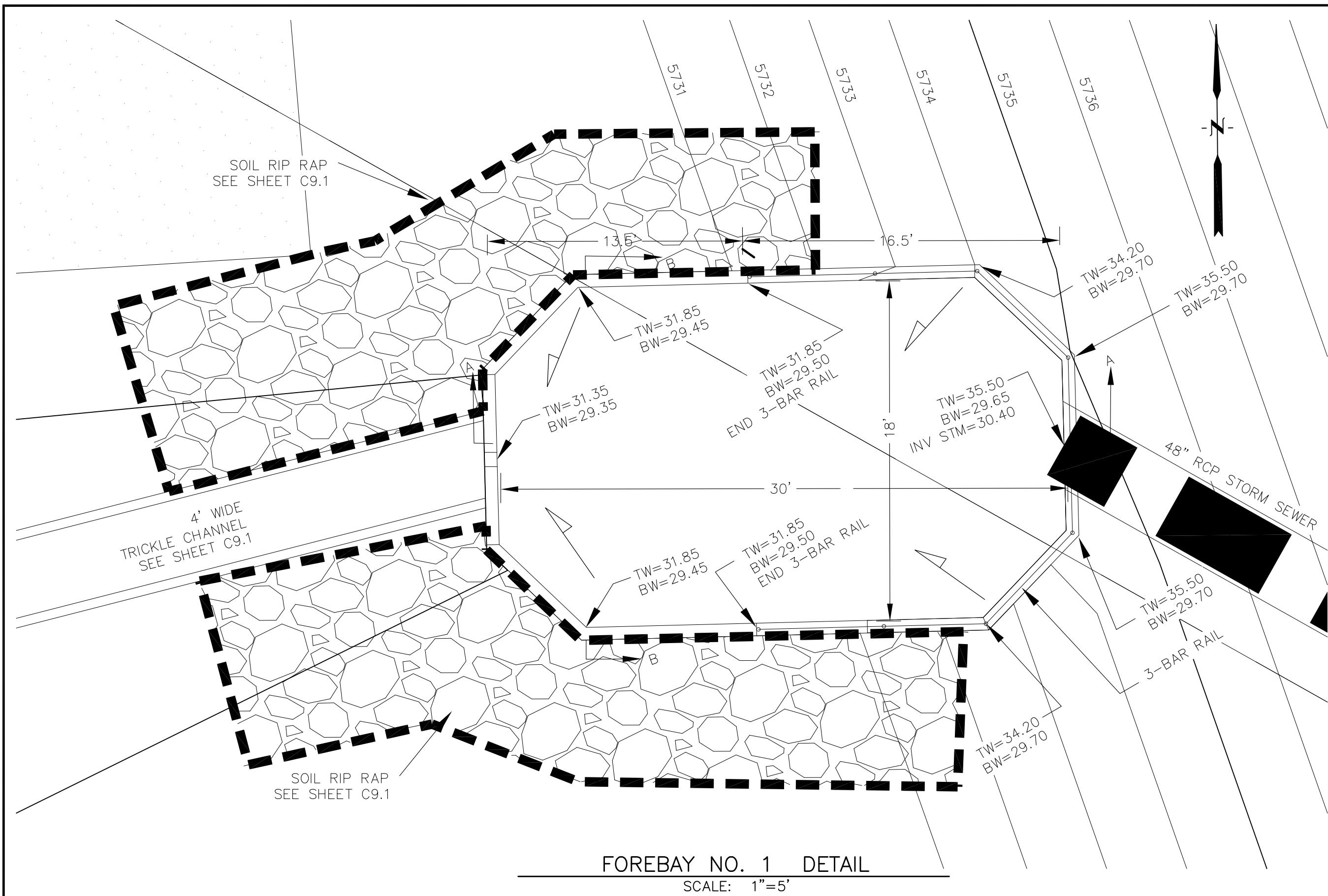
**CORE ENGINEERING GROUP**  
 15004 1ST AVENUE S.  
 BOULDER, CO 80506  
 PH: 719.570.1100  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@ceg1.com

DATE: \_\_\_\_\_  
 NO: \_\_\_\_\_  
 DESCRIPTION: \_\_\_\_\_  
 PREPARED FOR:  
**LORSON, LLC**  
 212 N. WAHSATCH AVE, SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 LORSON BLVD. - WALLEYE DR.  
 COLORADO SPRINGS, COLORADO  
 CONTACT: JEFF MARK

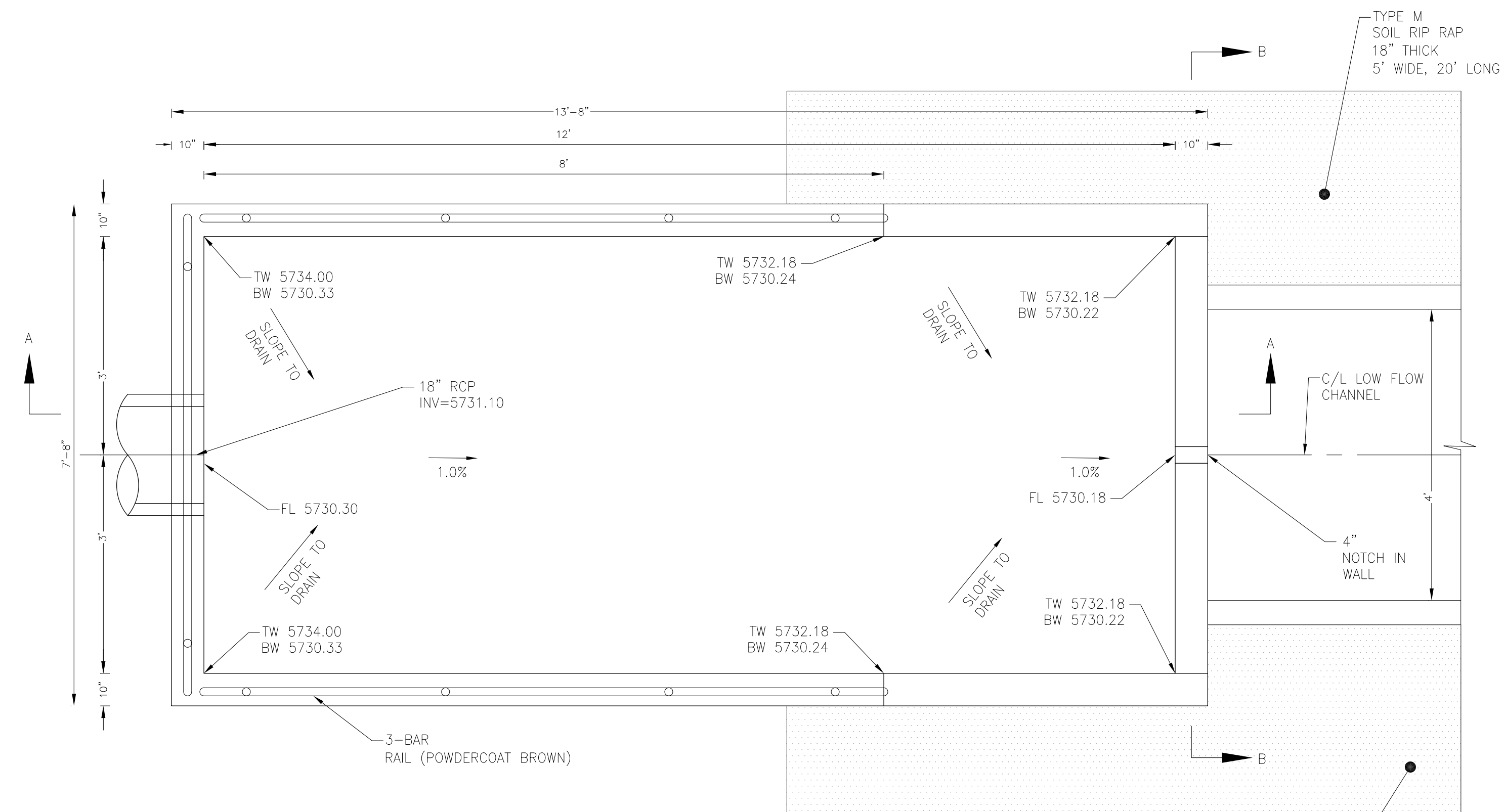
DRAWN: RLS  
 DESIGNED: RLS  
 CHECKED: RLS

**POND E1**  
**POND GRADING AND**  
**TRICKLE CHANNEL**

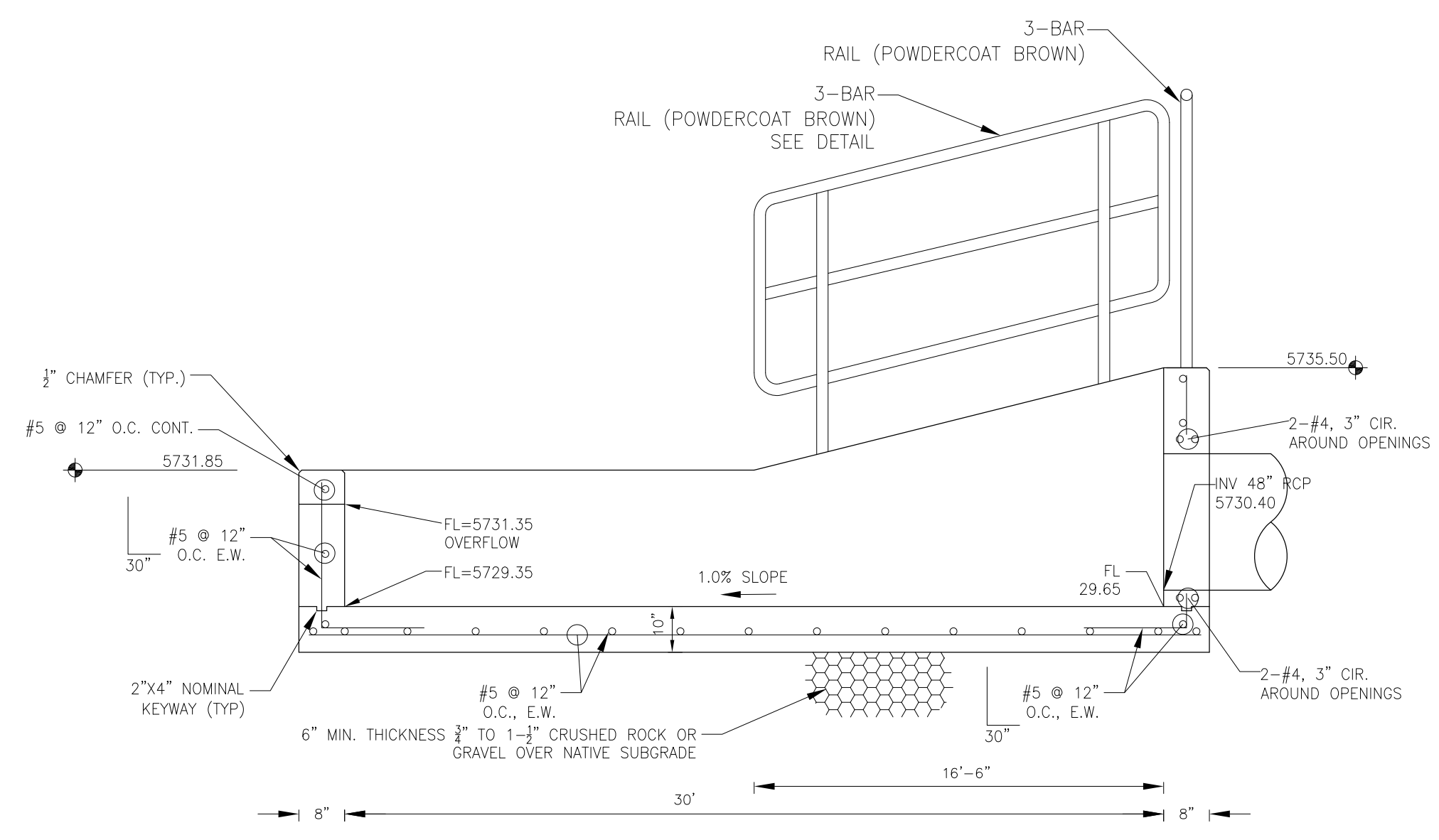
DATE:  
 FEB 5, 2022  
 PROJECT NO.  
 100.065  
 SHEET NUMBER  
**C9.1**  
 TOTAL SHEETS: XX



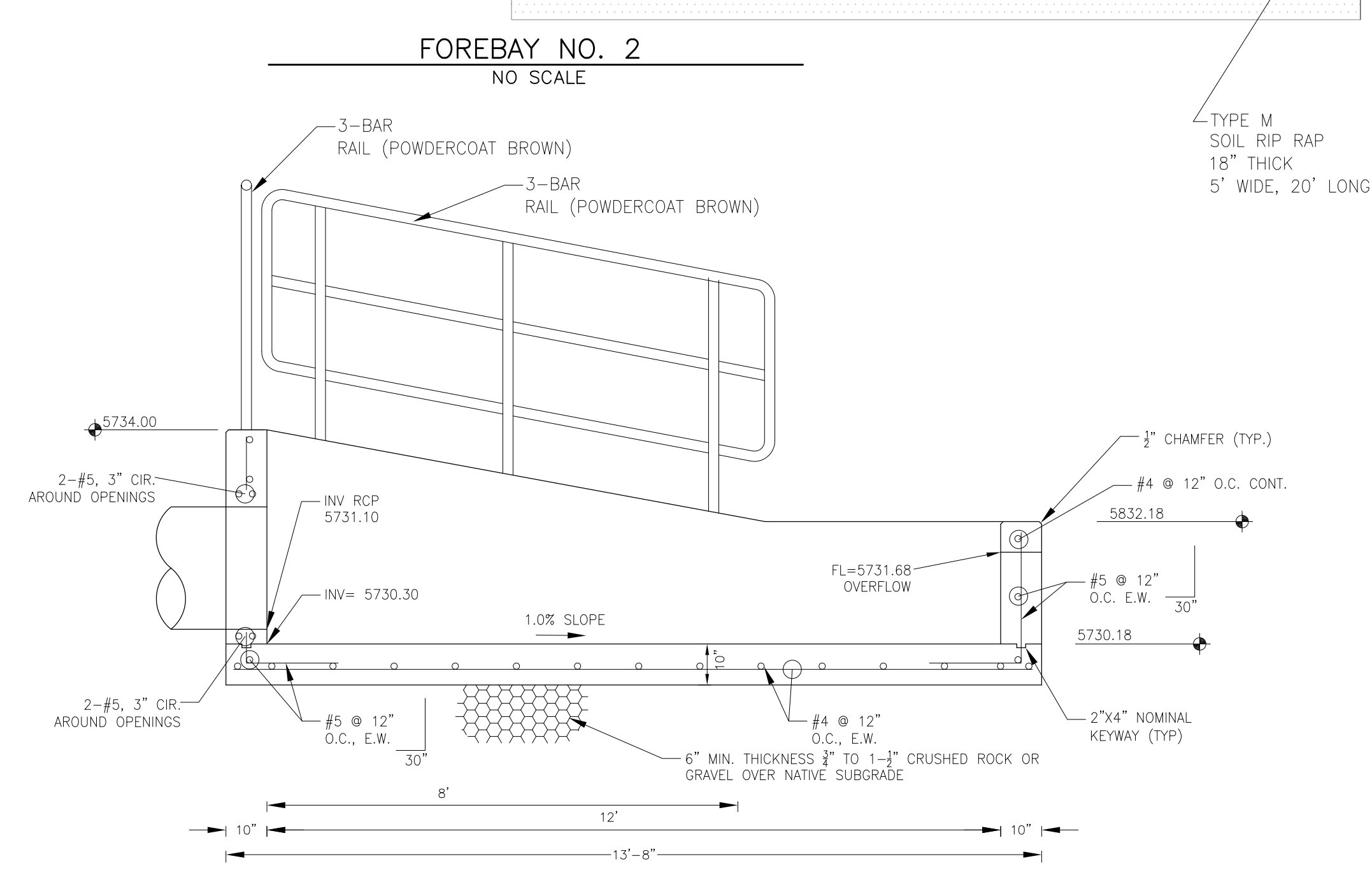
FOREBAY NO. 1 DETAIL  
SCALE: 1"=5'



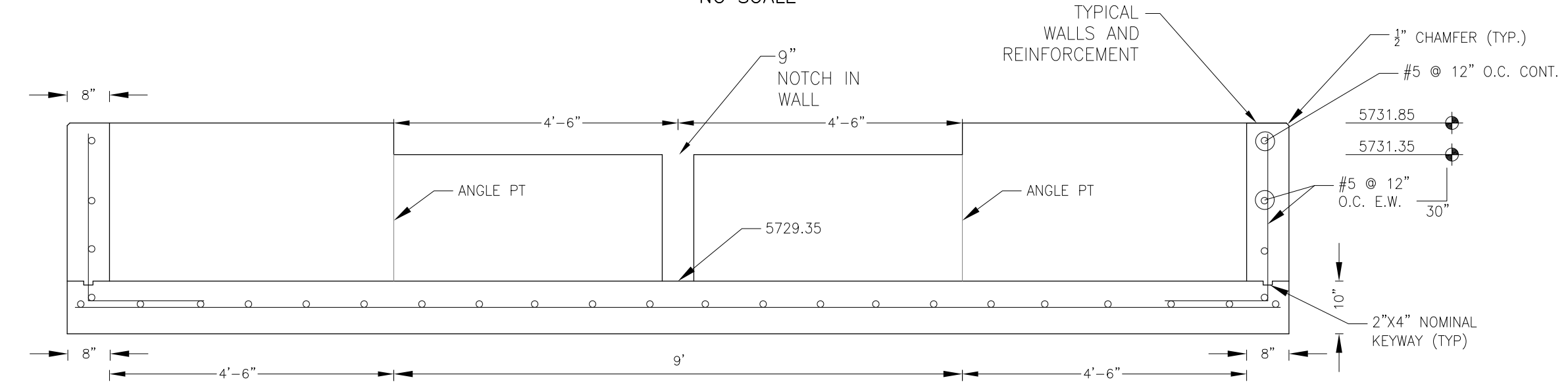
FOREBAY NO. 2  
NO SCALE



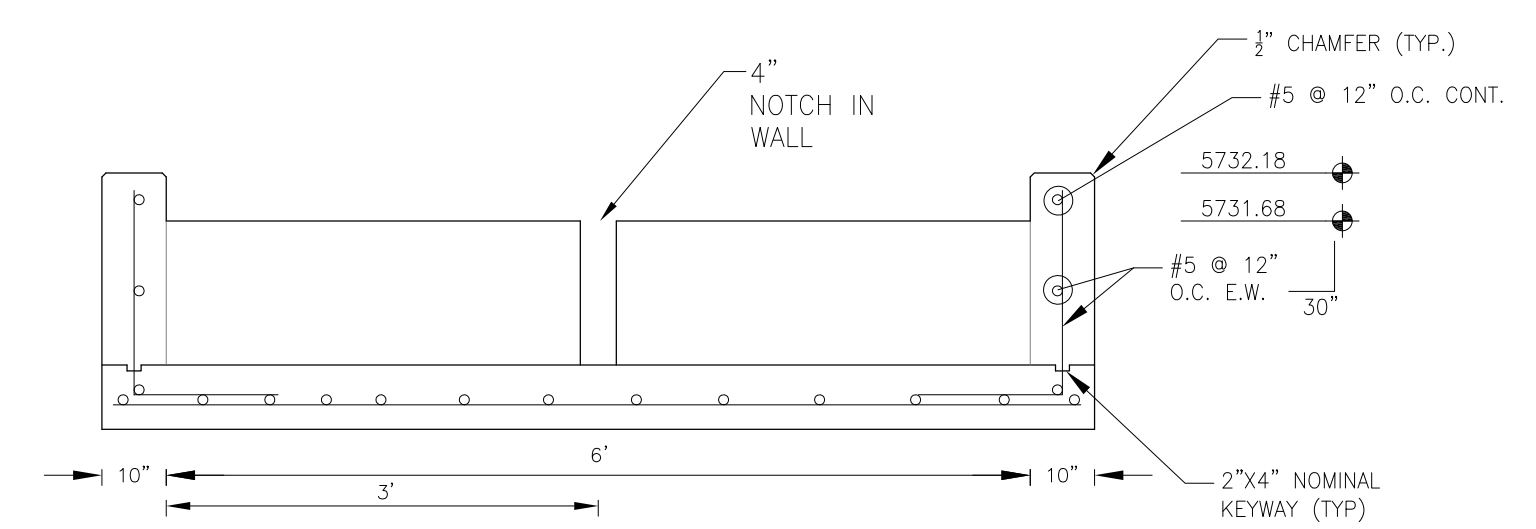
FOREBAY NO. 1 SECTION A-A  
NO SCALE



FOREBAY NO. 2 SECTION A-A  
NO SCALE



FOREBAY NO. 1 SECTION B-B  
NO SCALE



FOREBAY NO. 2 SECTION B-B  
NO SCALE

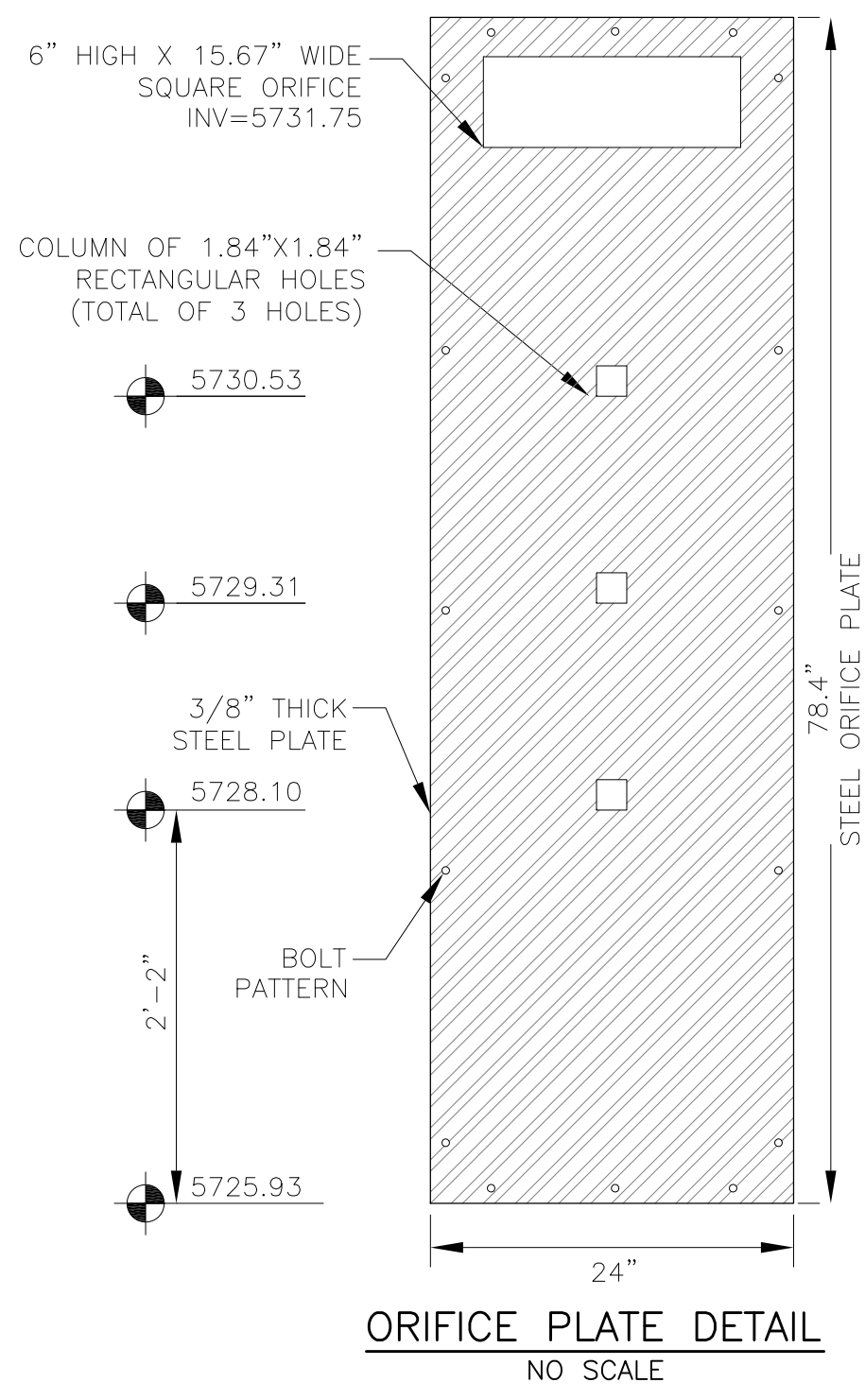
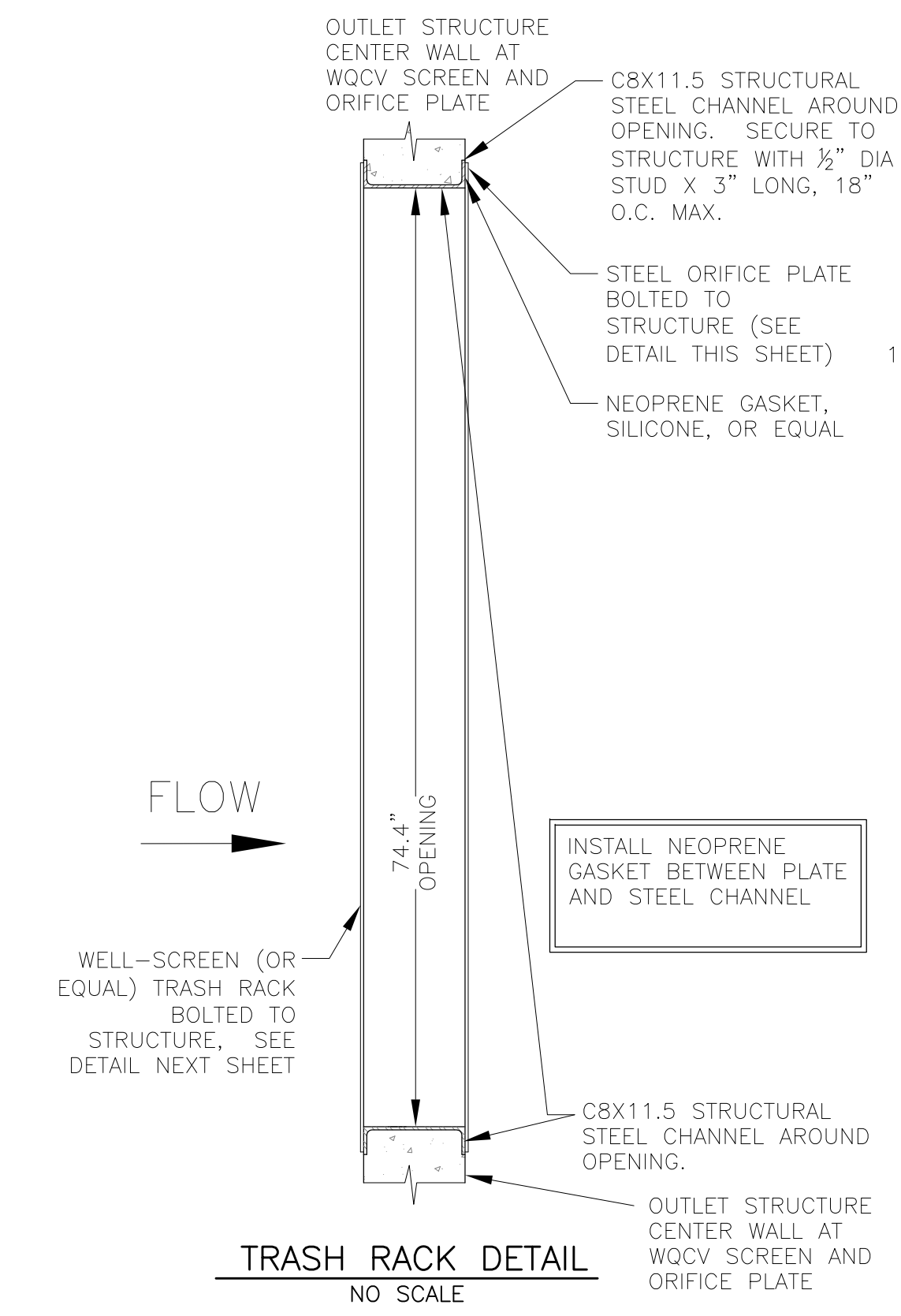
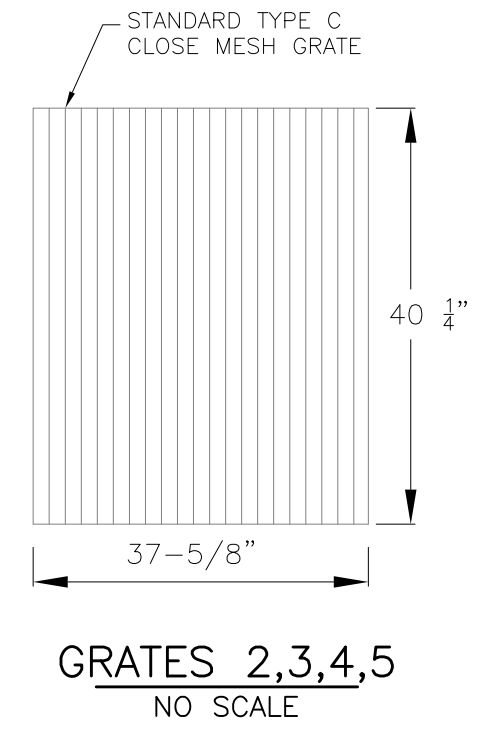
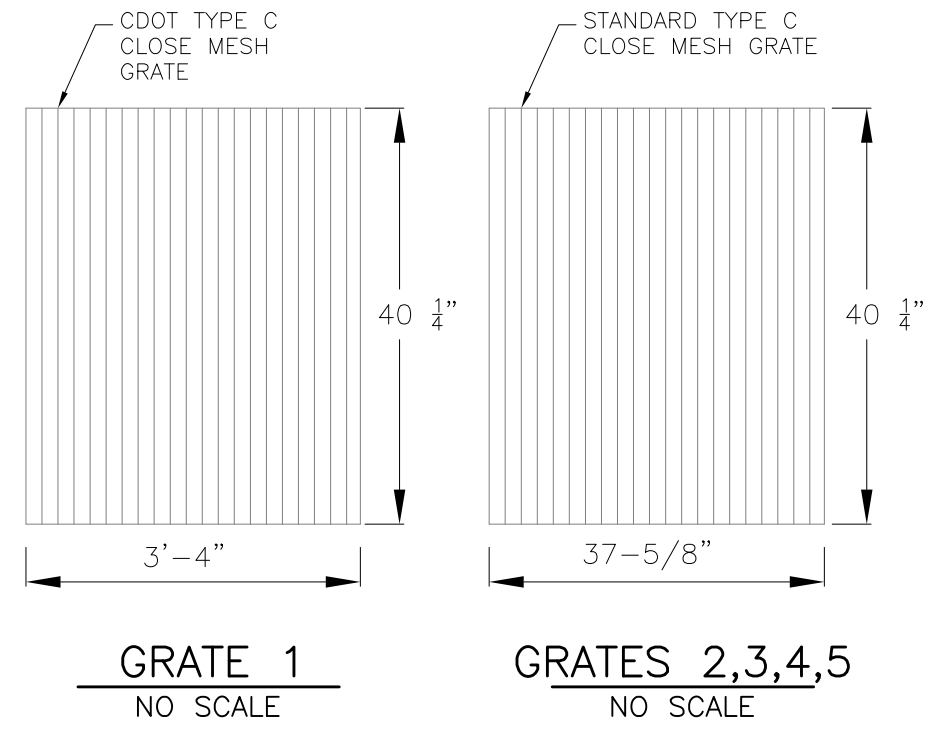
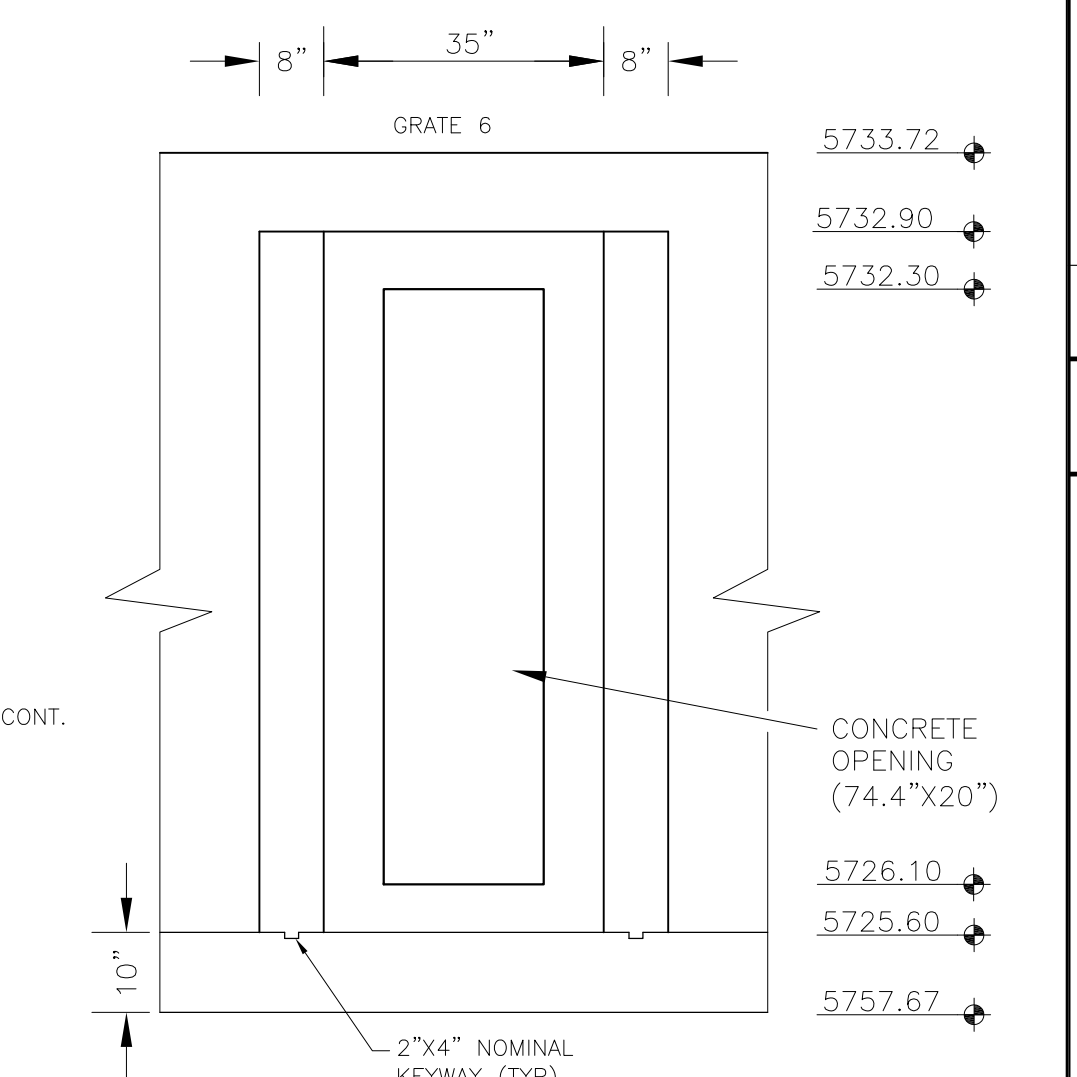
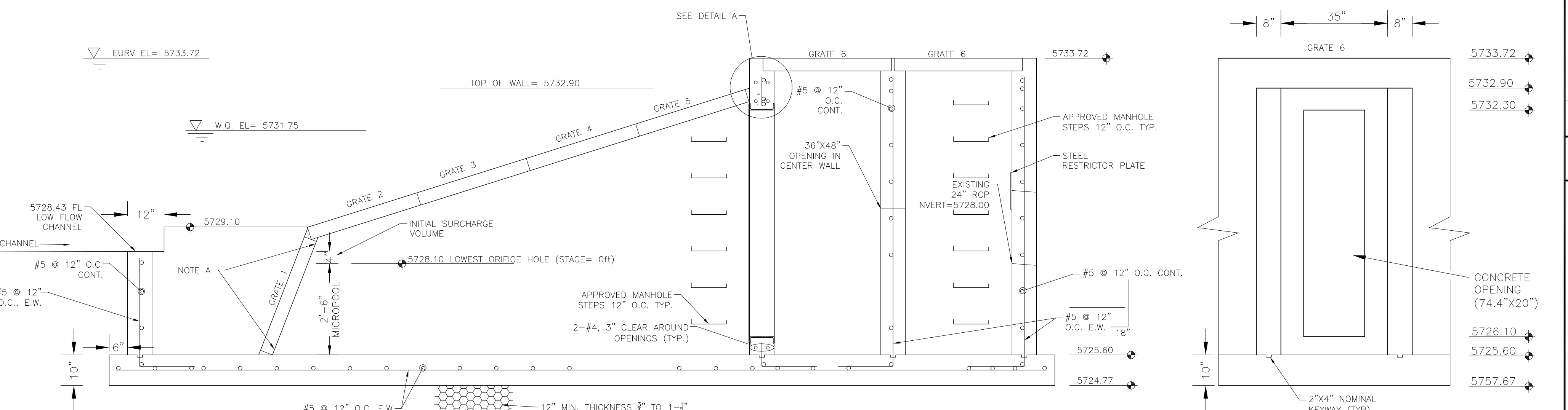
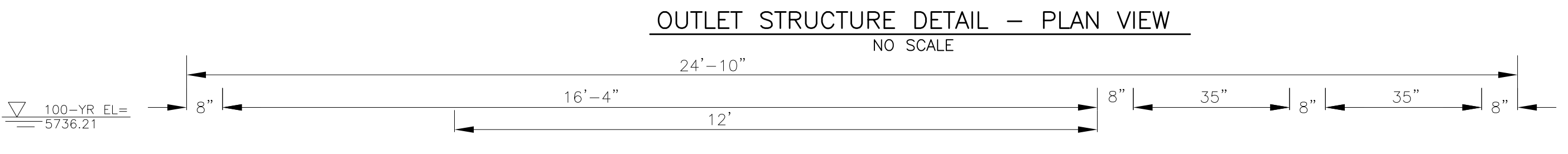
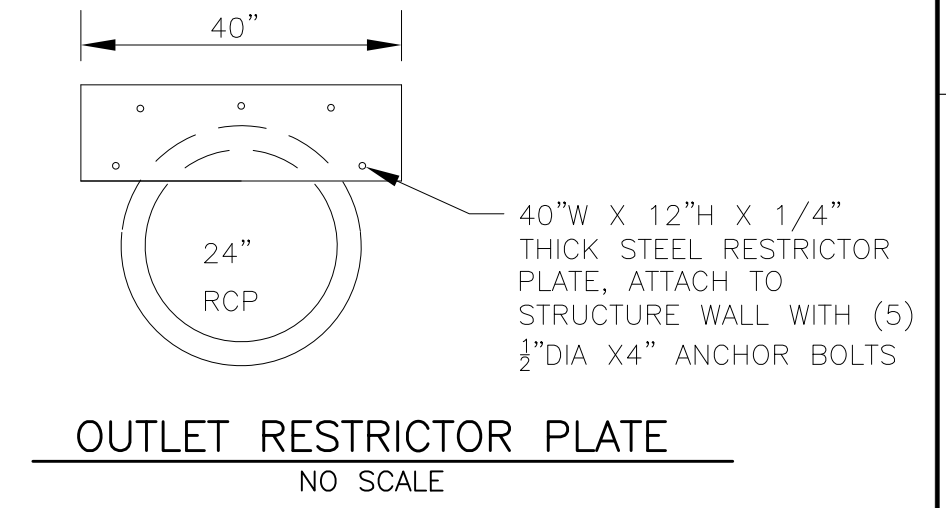
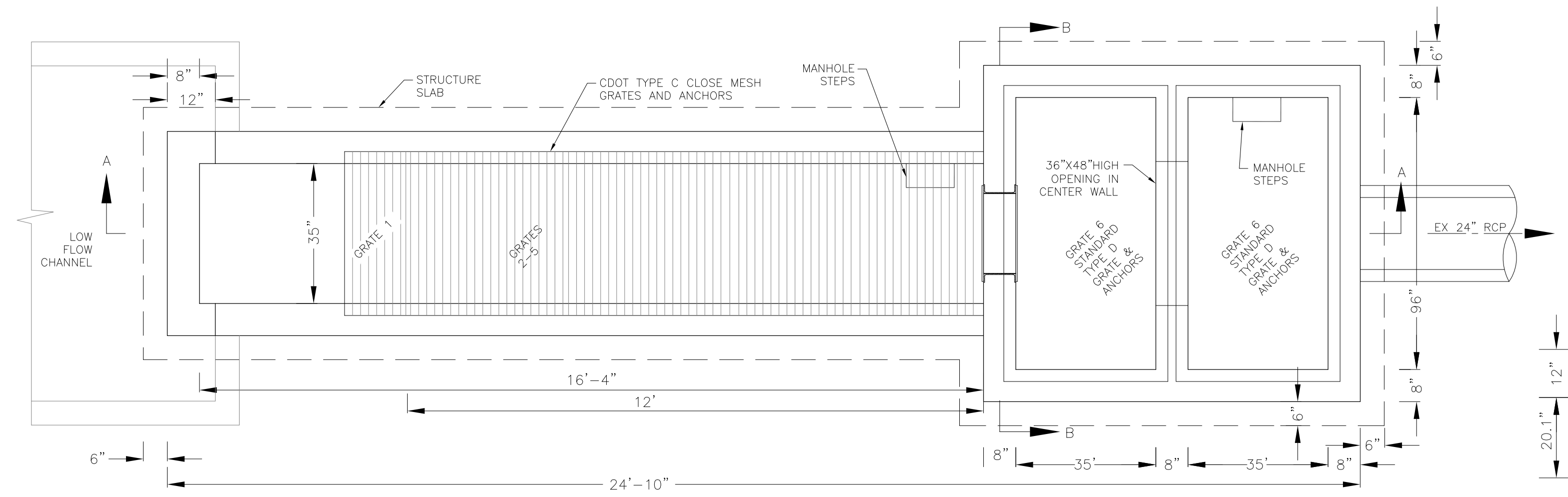
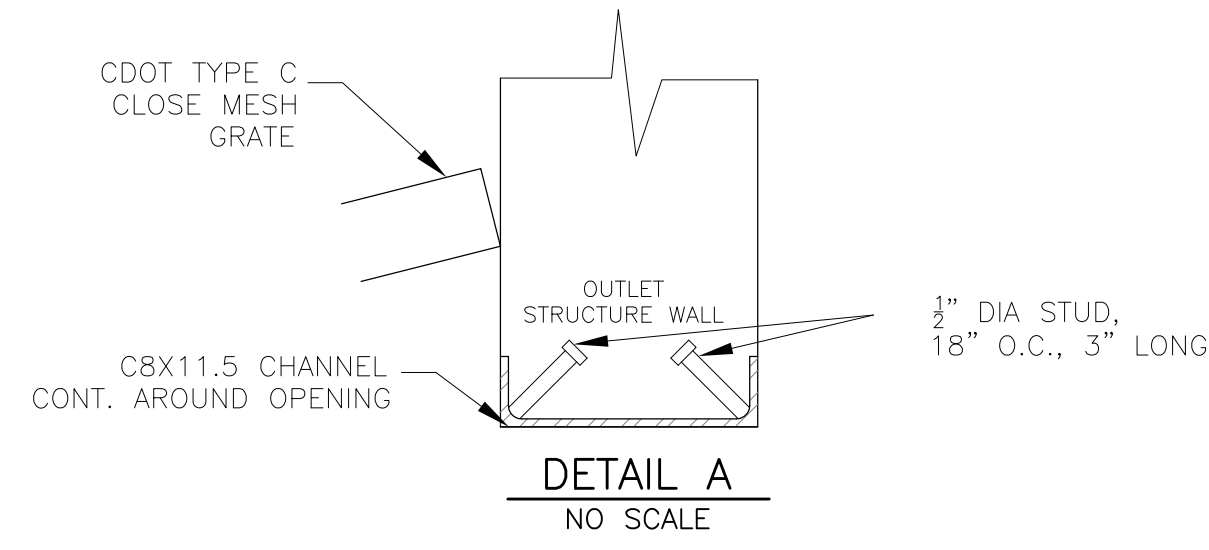
**CORE**  
**ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80202  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
PREPARED FOR:  
**LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND E1**  
**POND FOREBAY DETAILS**

DATE:  
FEB 5, 2022  
PROJECT NO.  
100.065  
SHEET NUMBER  
**C9.2**  
TOTAL SHEETS: XX

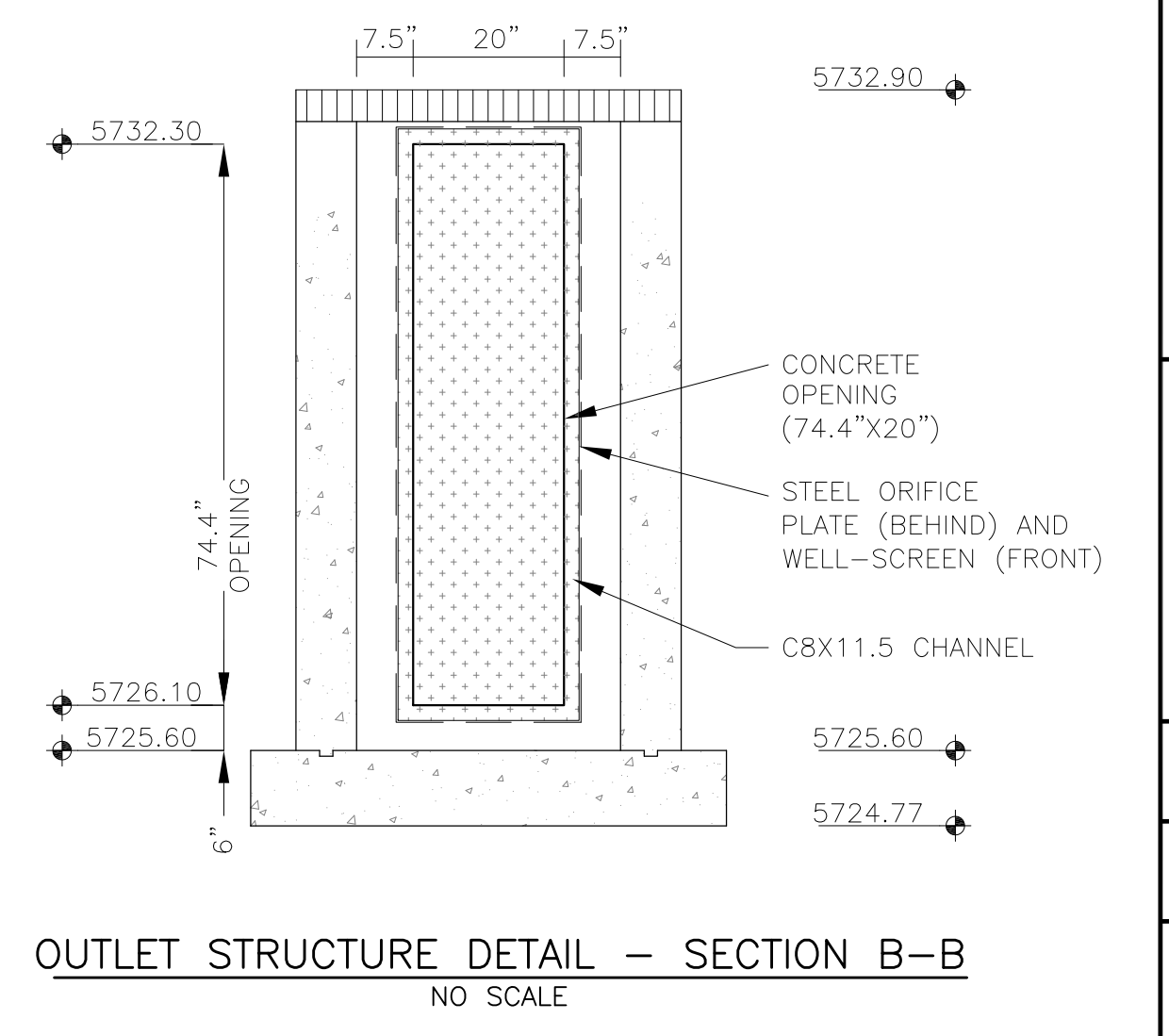


**OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:**

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
- 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.
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
- CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE.
- EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2\"/>

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

- WQCV WELL-SCREEN NOTES:**
- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
  - 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



**CORE ENGINEERING GROUP**  
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 PHOENIX, AZ 85006  
 PH: 602.719.5710  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@ceng.com

DATE: \_\_\_\_\_  
 DESCRIPTION: \_\_\_\_\_  
 NO: \_\_\_\_\_  
 PROJECT: **HILLSIDE AT LORSON RANCH**  
 PREPARED FOR: **LORSON, LLC**  
 212 N. WAHSATCH AVE., SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 LORSON, LLC - WALLEYE DR.  
 COLORADO SPRINGS, COLORADO  
 CONTACT: JEFF MARK

DRAWN: RLS  
 DESIGNED: RLS  
 CHECKED: RLS

**POND E1  
 FULL SPECTRUM  
 OUTLET STRUCTURE DETAILS**

DATE: **FEB 5, 2022**  
 PROJECT NO: **100.065**  
 SHEET NUMBER: **C9.x**  
 TOTAL SHEETS: XX

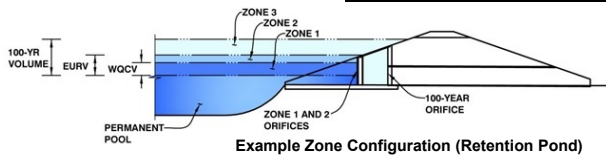




# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

**Project:** Hillside at Lorson Ranch  
**Basin ID:** Pond G



	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 Diameter =	N/A	inches

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	N/A ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.25	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.00	inches
Orifice Plate: Orifice Area per Row =	0.37	sq. inches (diameter = 11/16 inch)

Calculated Parameters for Plate	
WQ Orifice Area per Row =	2.569E-03 ft <sup>2</sup>
Elliptical Half-Width =	N/A feet
Elliptical Slot Centroid =	N/A feet
Elliptical Slot Area =	N/A ft <sup>2</sup>

**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	
Invert of Vertical Orifice =	2.27	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.64	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	1.00	N/A	inches
Vertical Orifice Width =	12.00	N/A	inches

Calculated Parameters for Vertical Orific	
Zone 2 Rectangular	Not Selected
Vertical Orifice Area =	0.08
Vertical Orifice Centroid =	0.04

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.63	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir	
Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H <sub>u</sub> =	3.63
Overflow Weir Slope Length =	6.00
Grate Open Area / 100-yr Orifice Area =	7.09
Overflow Grate Open Area w/o Debris =	12.53
Overflow Grate Open Area w/ Debris =	6.26

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	18.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	1.77
Outlet Orifice Centroid =	0.75
Half-Central Angle of Restrictor Plate on Pipe =	3.14

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	4.23	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	10.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	0.50	feet

Calculated Parameters for Spillway	
Spillway Design Flow Depth =	0.50
Stage at Top of Freeboard =	5.23
Basin Area at Top of Freeboard =	0.22
Basin Volume at Top of Freeboard =	0.59

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)*

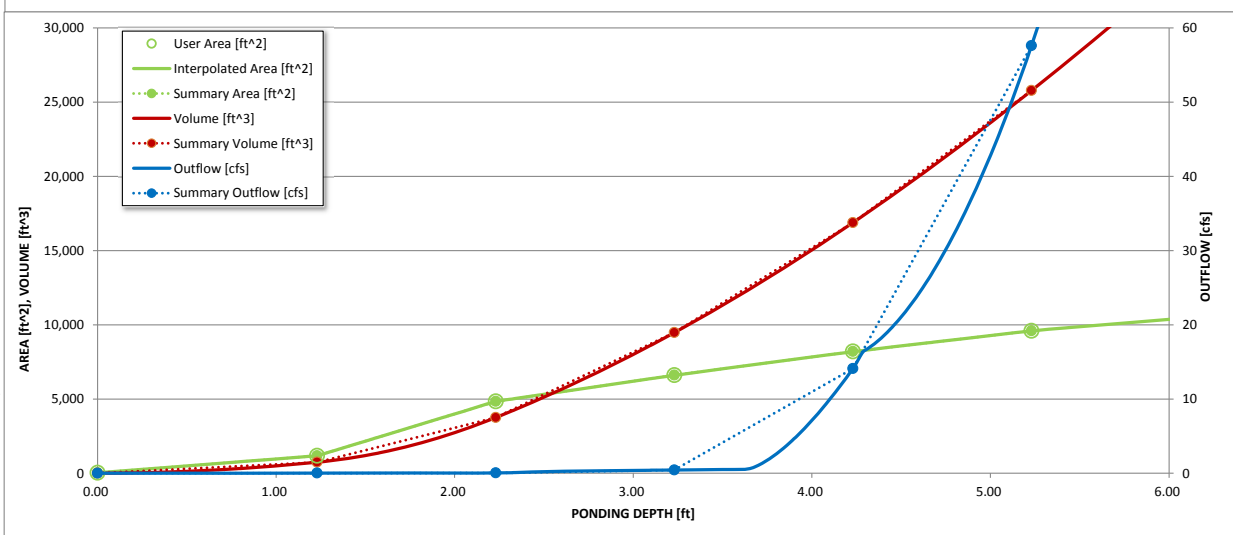
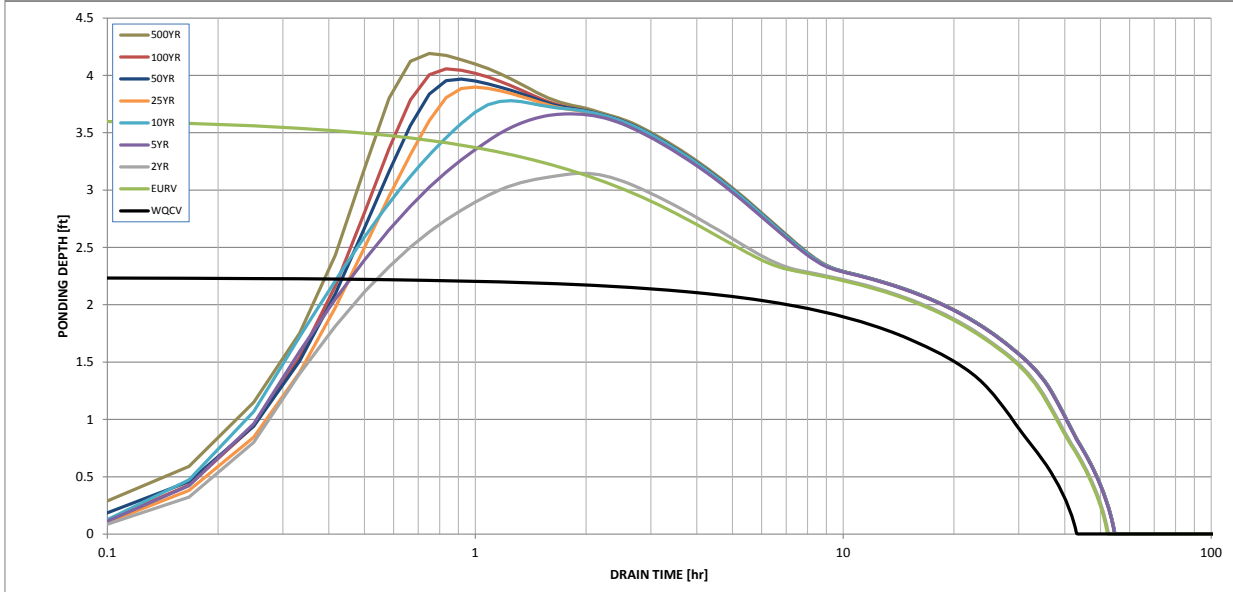
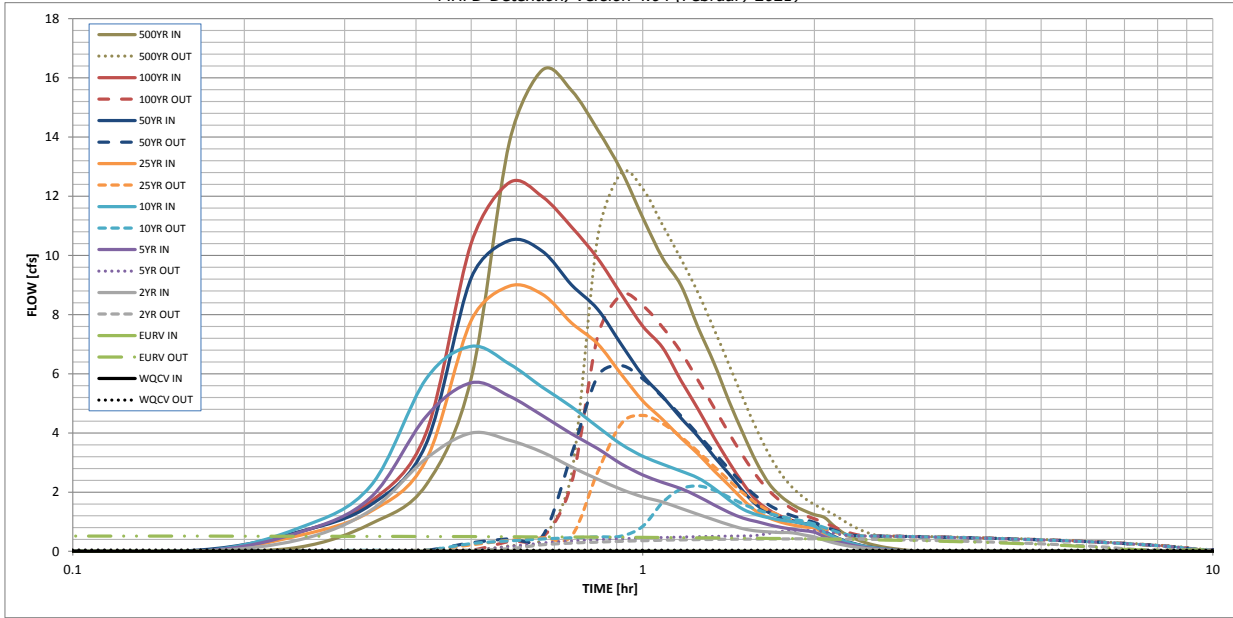
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	0.257	0.361	0.451	0.569	0.666	0.788
CUHP Runoff Volume (acre-ft) =	0.087	0.282	0.257	0.361	0.451	0.569	0.666	0.788
Inflow Hydrograph Volume (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 Gate 1 (fps) =	N/A	0.00	N/A	0.0	0.1	0.3	0.5	0.7
Max Velocity through Gate 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	0.1	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

Add a note on this page to see discussion of DP43.

Per ECM Chap 3.2.8.B, "The proposed project or developed land use shall not change historical runoff values, cause downstream damage, or adversely impact adjacent properties." Increases from the historical flowrates is allowable (with or without full spectrum detention) if it is shown (via text and/or calcs) that the flow increase can be accommodated downstream (ie: show that there is a suitable outfall, per ECM, Chap 3.2.4). If applicable, reference the downstream facilities in a DBPS or MDDP.

# 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.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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	0.00	0.04	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	
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	





## Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

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

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, <math>I_a</math></p> <p>B) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time (<math>V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)</math>)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume (<math>V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} * 0.43))</math>)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) NRCS Hydrologic Soil Groups of Tributary Watershed                      i) Percentage of Watershed consisting of Type A Soils                      ii) Percentage of Watershed consisting of Type B Soils                      iii) Percentage of Watershed consisting of Type C/D Soils</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume                      For HSG A: <math>EURV_A = 1.68 * i^{1.28}</math>                      For HSG B: <math>EURV_B = 1.36 * i^{1.08}</math>                      For HSG C/D: <math>EURV_{C/D} = 1.20 * i^{1.08}</math></p> <p>K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)</p>	<p><math>I_a =</math> <input type="text" value="55.0"/> %</p> <p><math>i =</math> <input type="text" value="0.550"/></p> <p>Area = <input type="text" value="4.760"/> ac</p> <p><math>d_6 =</math> <input type="text" value=""/></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Water Quality Capture Volume (WQCV)</p> <p><input type="radio"/> Excess Urban Runoff Volume (EURV)</p> </div> <p><math>V_{DESIGN} =</math> <input type="text" value=""/> ac-ft</p> <p><math>V_{DESIGN\ OTHER} =</math> <input type="text" value=""/> ac-ft</p> <p><math>V_{DESIGN\ USER} =</math> <input type="text" value="0.120"/> ac-ft</p> <p>HSG <math>A =</math> <input type="text" value=""/> %                      HSG <math>B =</math> <input type="text" value=""/> %                      HSG <math>C/D =</math> <input type="text" value=""/> %</p> <p>EURV<math>_{DESIGN} =</math> <input type="text" value=""/> ac-ft</p> <p>EURV<math>_{DESIGN\ USER} =</math> <input type="text" value=""/> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <input type="text" value="2.0"/> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <input type="text" value="4.00"/> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p>_____</p> <p>_____</p> <p>_____</p>
<p>5. Forebay</p> <p>A) Minimum Forebay Volume (<math>V_{MIN} =</math> <input type="text" value="2%"/> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth (<math>D_F =</math> <input type="text" value="18"/> inch maximum)</p> <p>D) Forebay Discharge</p> <p>i) Undetained 100-year Peak Discharge</p> <p>ii) Forebay Discharge Design Flow (<math>Q_F = 0.02 * Q_{100}</math>)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p><math>V_{MIN} =</math> <input type="text" value="0.002"/> ac-ft</p> <p><math>V_F =</math> <input type="text" value="0.004"/> ac-ft</p> <p><math>D_F =</math> <input type="text" value="18.0"/> in</p> <p><math>Q_{100} =</math> <input type="text" value="12.50"/> cfs</p> <p><math>Q_F =</math> <input type="text" value="0.25"/> cfs</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input type="radio"/> Berm With Pipe</p> <p><input checked="" type="radio"/> Wall with Rect. Notch</p> <p><input type="radio"/> Wall with V-Notch Weir</p> </div> <p>Calculated <math>D_P =</math> <input type="text" value=""/> in</p> <p>Calculated <math>W_N =</math> <input type="text" value="4.1"/> in</p> <p style="color: blue; font-size: small;">Flow too small for berm w/ pipe</p>

**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

<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Concrete  <input type="radio"/> Soft Bottom         </div> <p>S = <input style="width: 50px;" type="text" value="0.0050"/> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-foot minimum)</p> <p>B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>D<sub>M</sub> = <input style="width: 50px;" type="text" value="2.5"/> ft</p> <p>A<sub>M</sub> = <input style="width: 50px;" type="text" value="13"/> sq ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Orifice Plate  <input type="radio"/> Other (Describe):         </div> <hr/> <hr/> <p>D<sub>orifice</sub> = <input style="width: 50px;" type="text" value="0.68"/> inches</p> <p>A<sub>orifice</sub> = <input style="width: 50px;" type="text" value="1.11"/> square inches</p>
<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>D<sub>IS</sub> = <input style="width: 50px;" type="text" value="4"/> in</p> <p>V<sub>IS</sub> = <input style="width: 50px;" type="text" value=""/> cu ft</p> <p>V<sub>s</sub> = <input style="width: 50px;" type="text" value="4.2"/> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: <math>A_t = A_{ot} * 38.5 * (e^{-0.095D})</math></p> <p>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 area to the total screen area for the material specified.)</p> <p style="margin-left: 40px;">Other (Y/N): <input style="width: 80px;" type="text" value="Y"/></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H<sub>TR</sub>)</p> <p>G) Width of Water Quality Screen Opening (W<sub>opening</sub>) (Minimum of 12 inches is recommended)</p>	<p>A<sub>t</sub> = <input style="width: 50px;" type="text" value="40"/> square inches</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; width: 100%;">             Other (Please describe below)         </div> <hr/> <hr/> <p>User Ratio = <input style="width: 50px;" type="text" value="0.6"/></p> <p>A<sub>total</sub> = <input style="width: 50px;" type="text" value="67"/> sq. in. <span style="color: blue;">Based on type 'Other' screen ratio</span></p> <p>H = <input style="width: 50px;" type="text" value="2.25"/> feet</p> <p>H<sub>TR</sub> = <input style="width: 50px;" type="text" value="55"/> inches</p> <p>W<sub>opening</sub> = <input style="width: 50px;" type="text" value="12.0"/> inches <span style="color: red;">VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.</span></p>

Design Procedure Form: Extended Detention Basin (EDB)

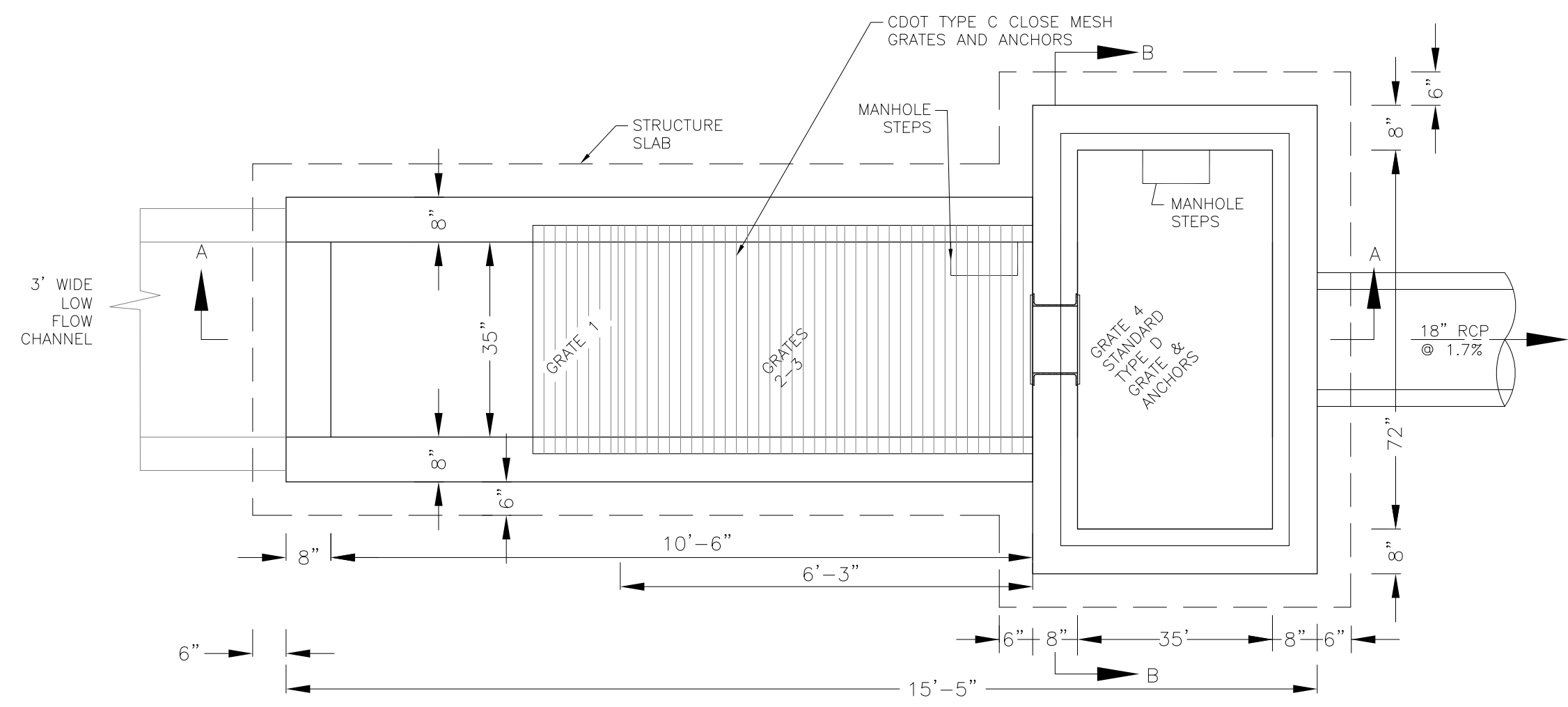
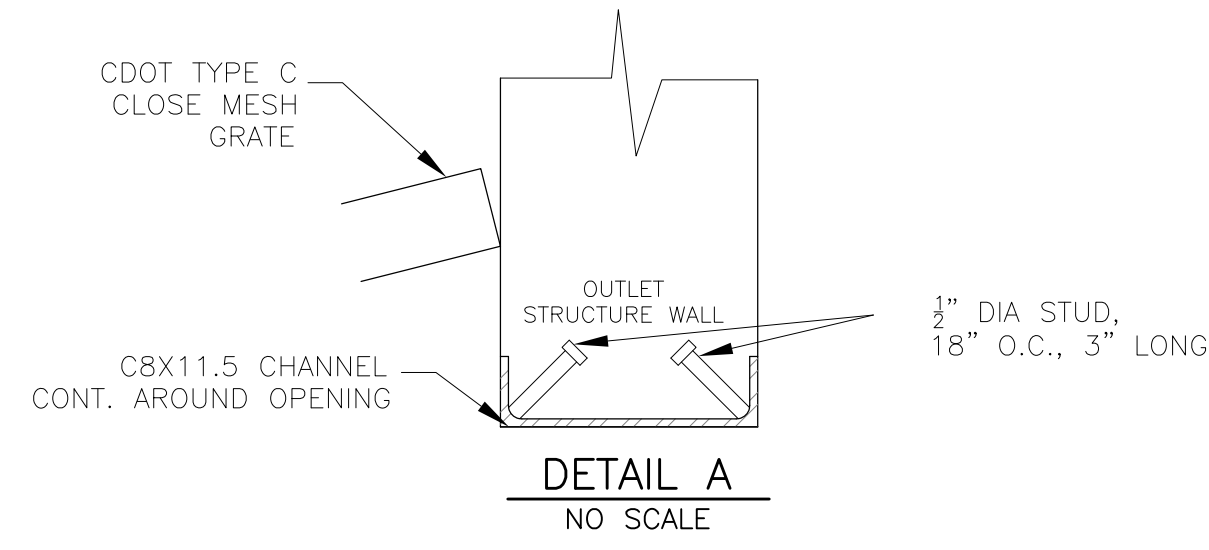
Designer: R. Schindler  
Company: Core Engineering Group  
Date: January 6, 2022  
Project: Hillside at Lorson Ranch  
Location: Pond G - WQ pond

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>TRM added to emergency overflow. All of 100-year flows will enter outlet structure before entering emergency overflow.</p> <p>Ze = <input type="text" value="4.00"/> ft / ft</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

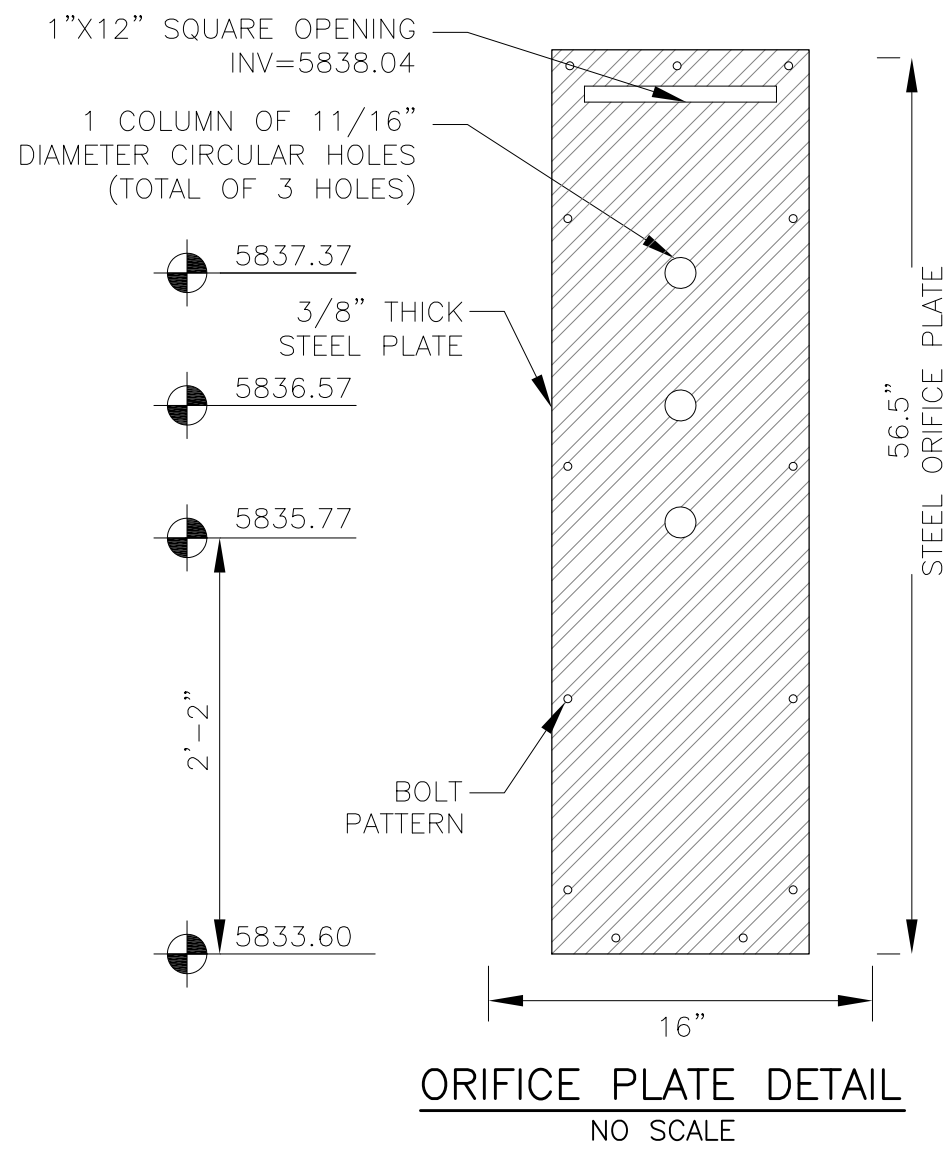
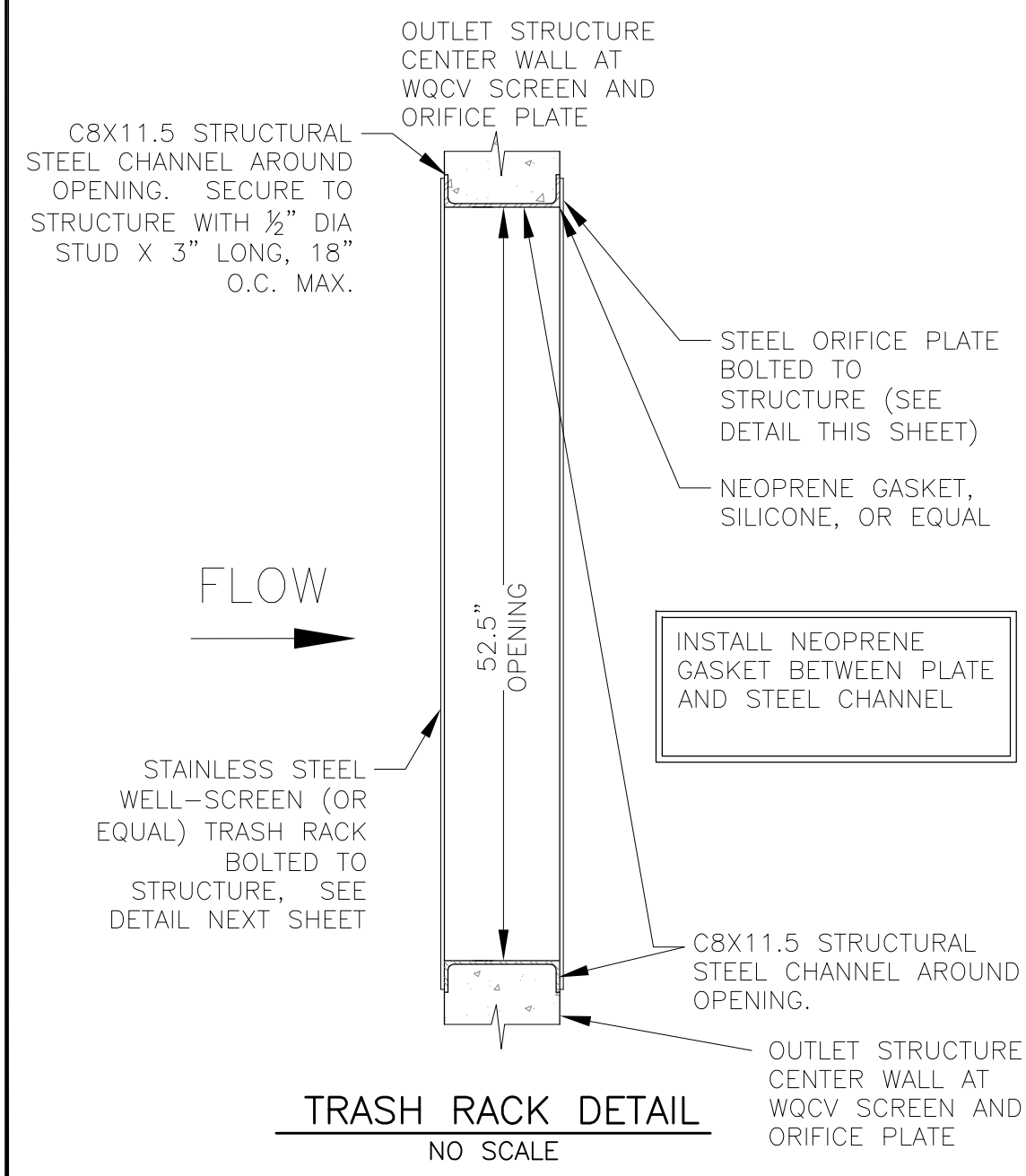
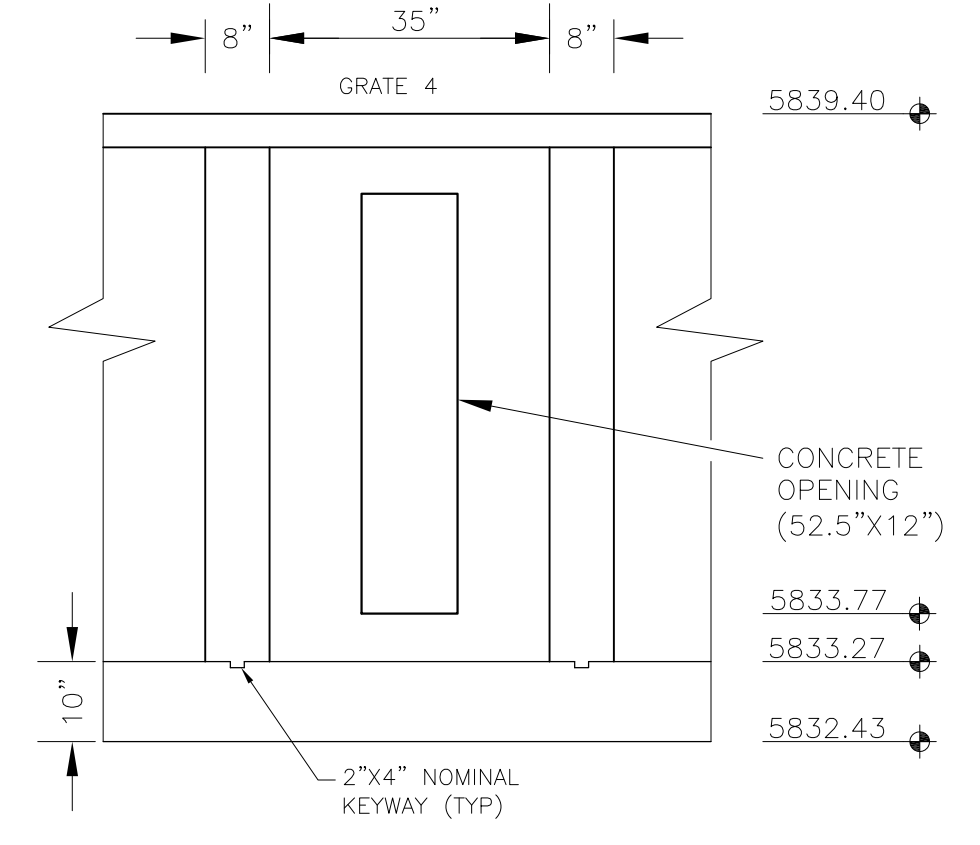
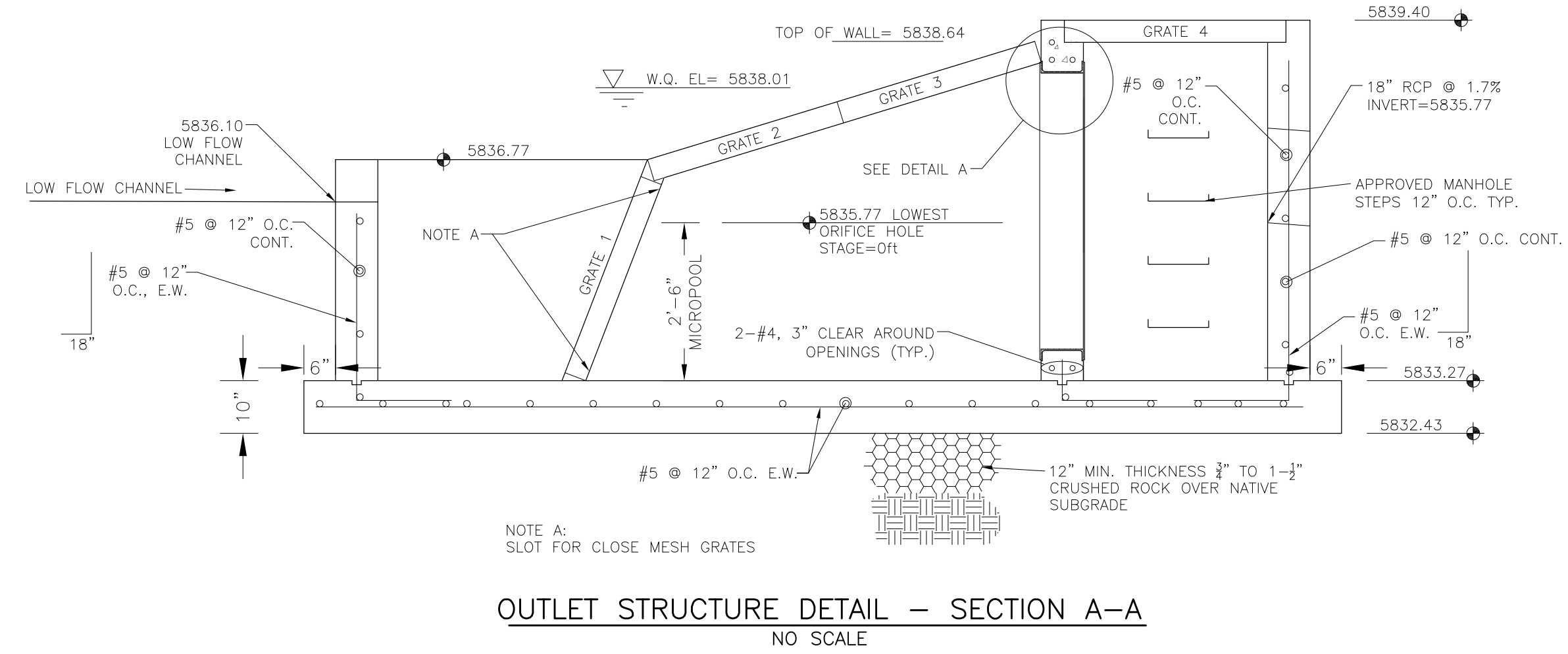
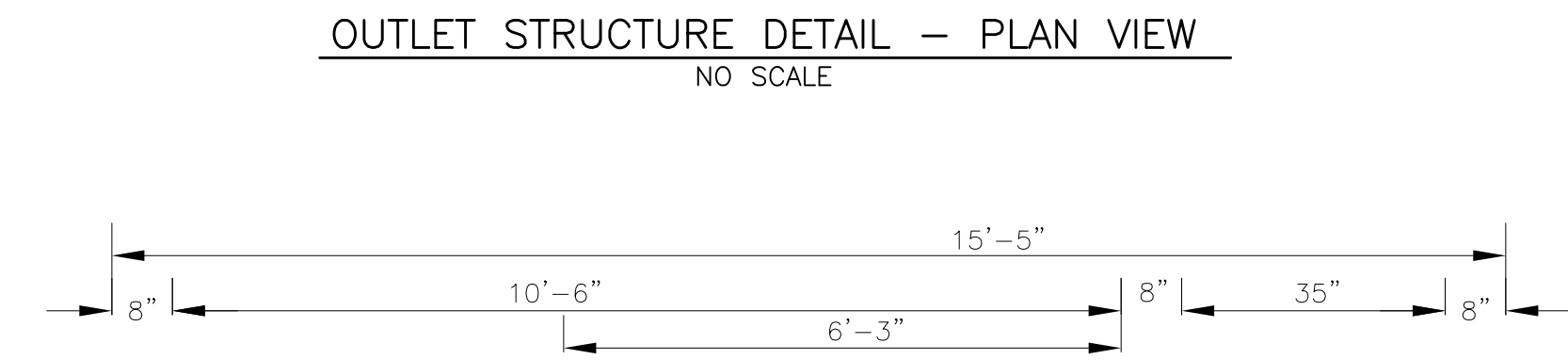
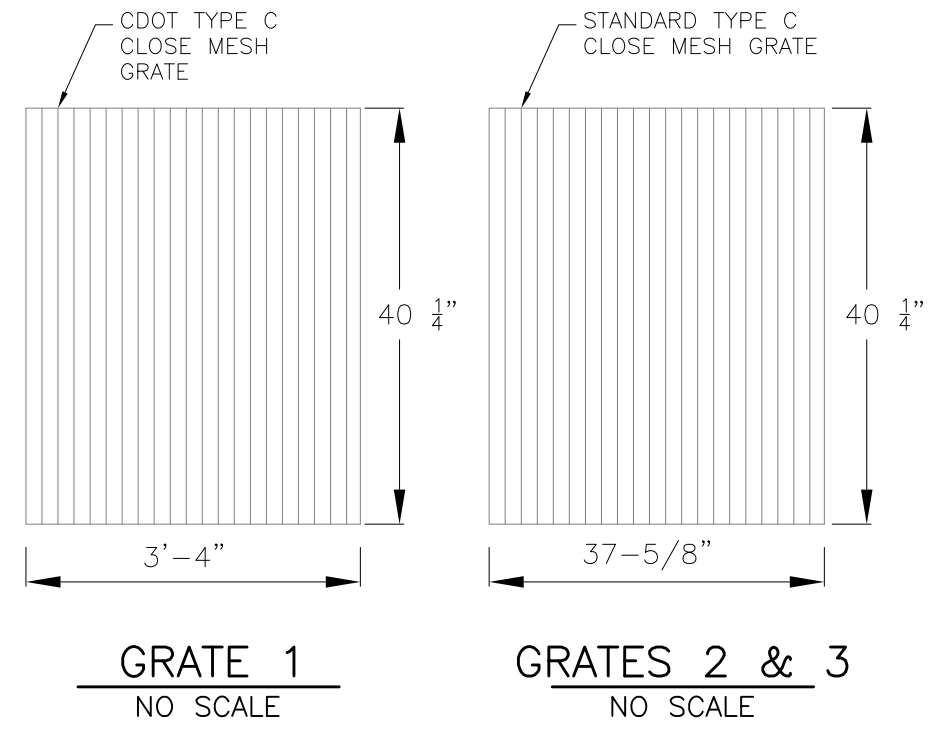
Notes: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



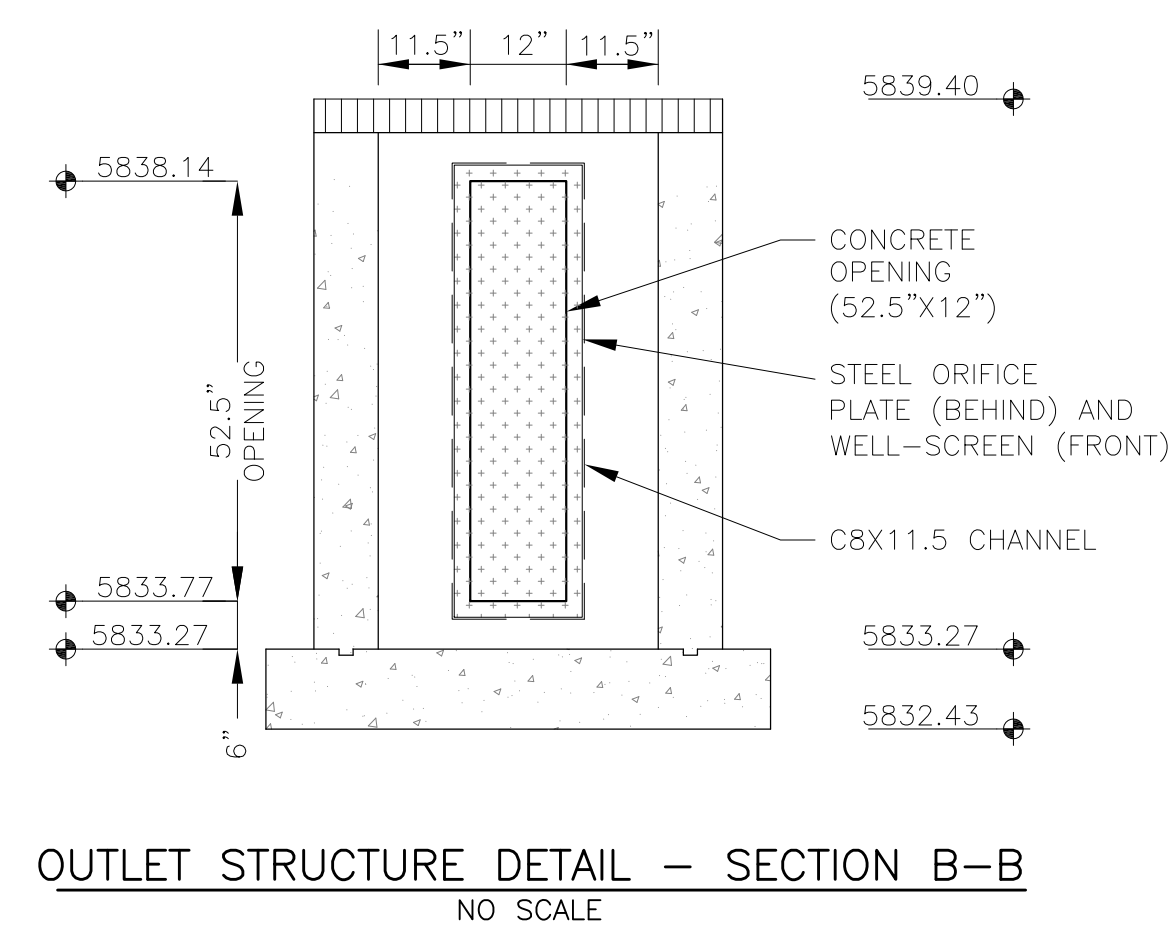
NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION



OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - 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" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

- WQCV WELL-SCREEN NOTES:
- Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
  - 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: 1E 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



**CORE**  
**ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80202  
PH: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cog1.com

DATE: NOV 30, 2021  
DESCRIPTION: MODIFY CIRCULAR HOLES IN ORIFICE PLATE  
PREPARED FOR: **LORSON, LLC**  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

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

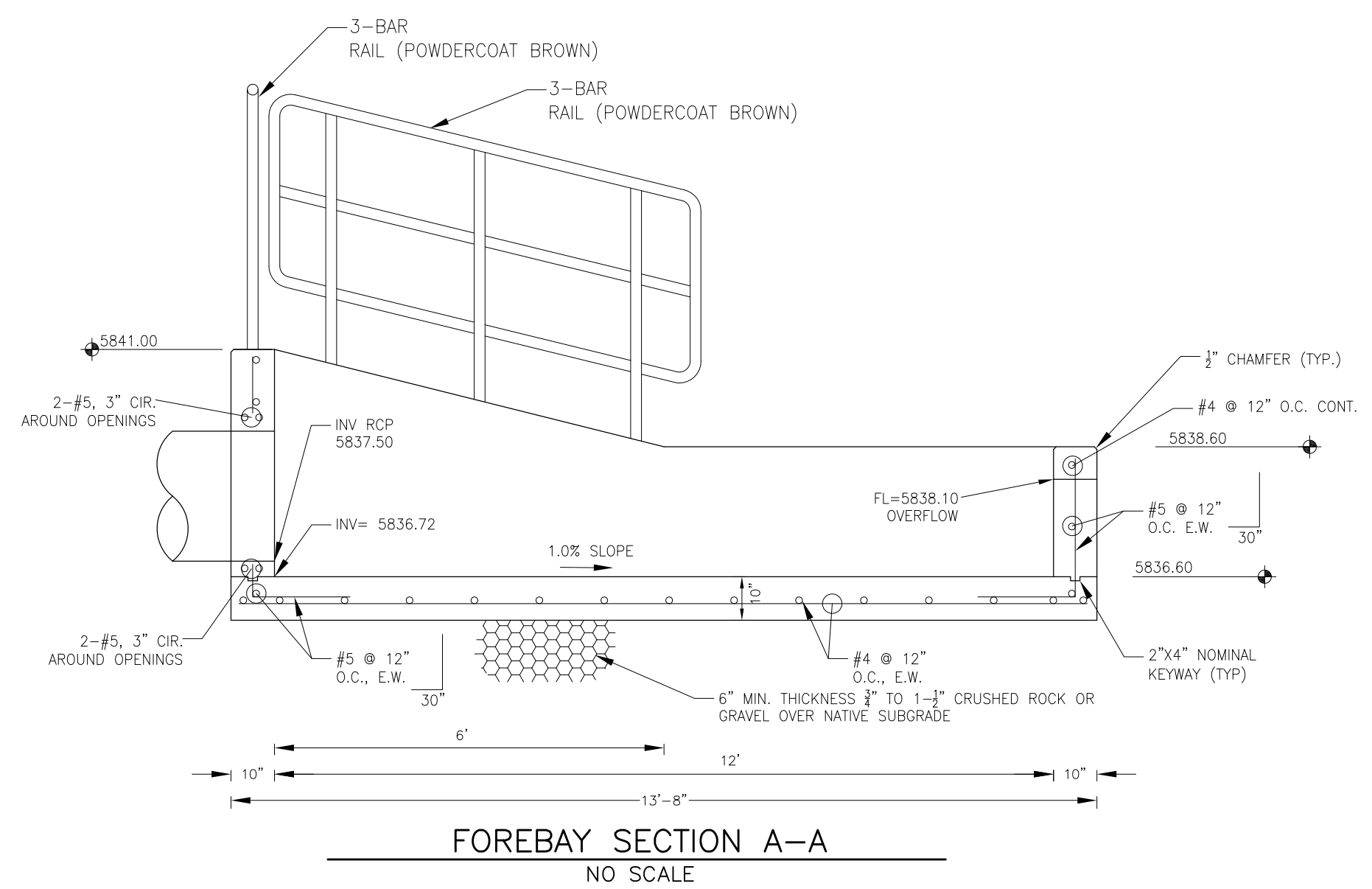
DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**POND G**  
**WQ POND**  
**OUTLET STRUCTURE DETAILS**

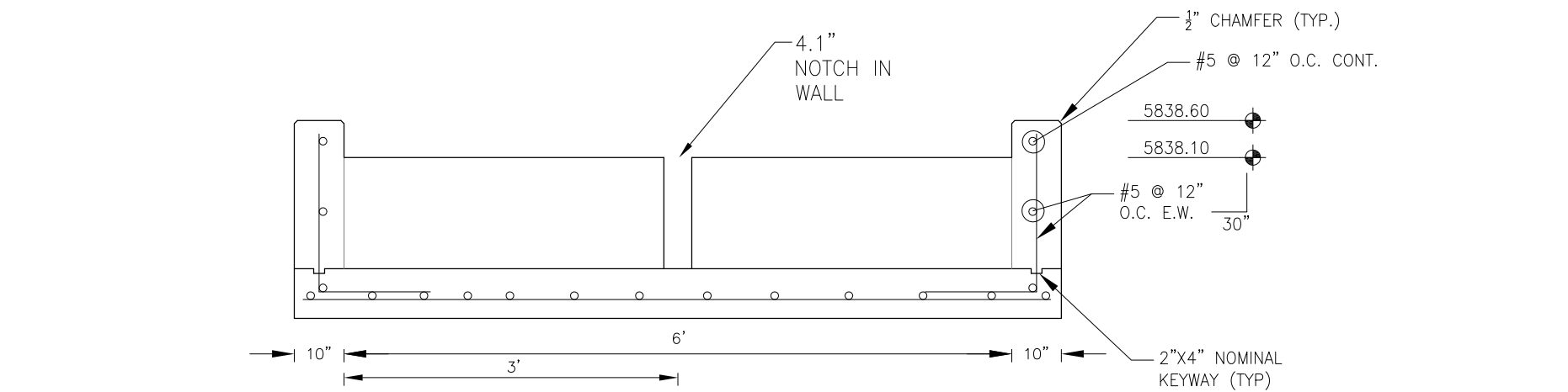
DATE: FEB 5, 2022

PROJECT NO. 100.065

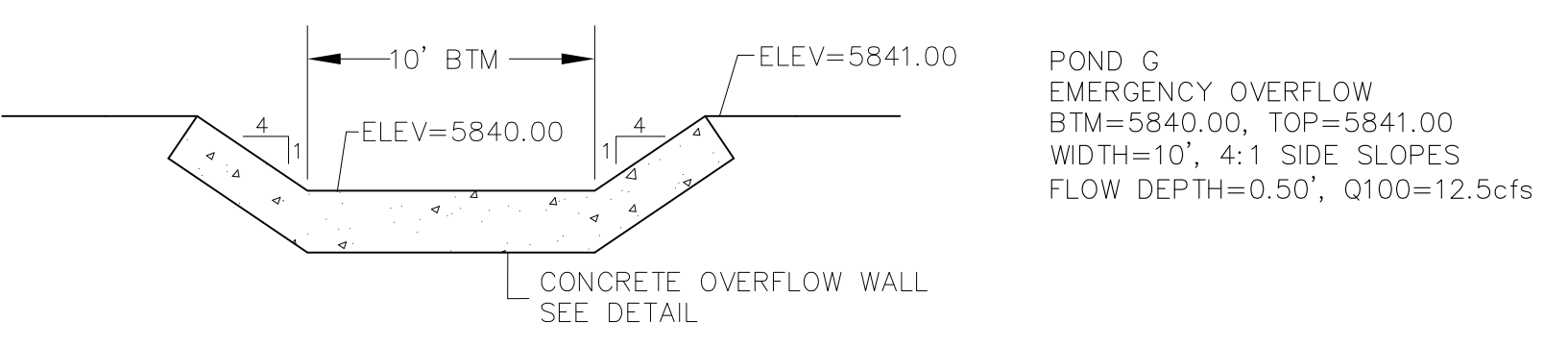
SHEET NUMBER **C9.X**  
TOTAL SHEETS: XX



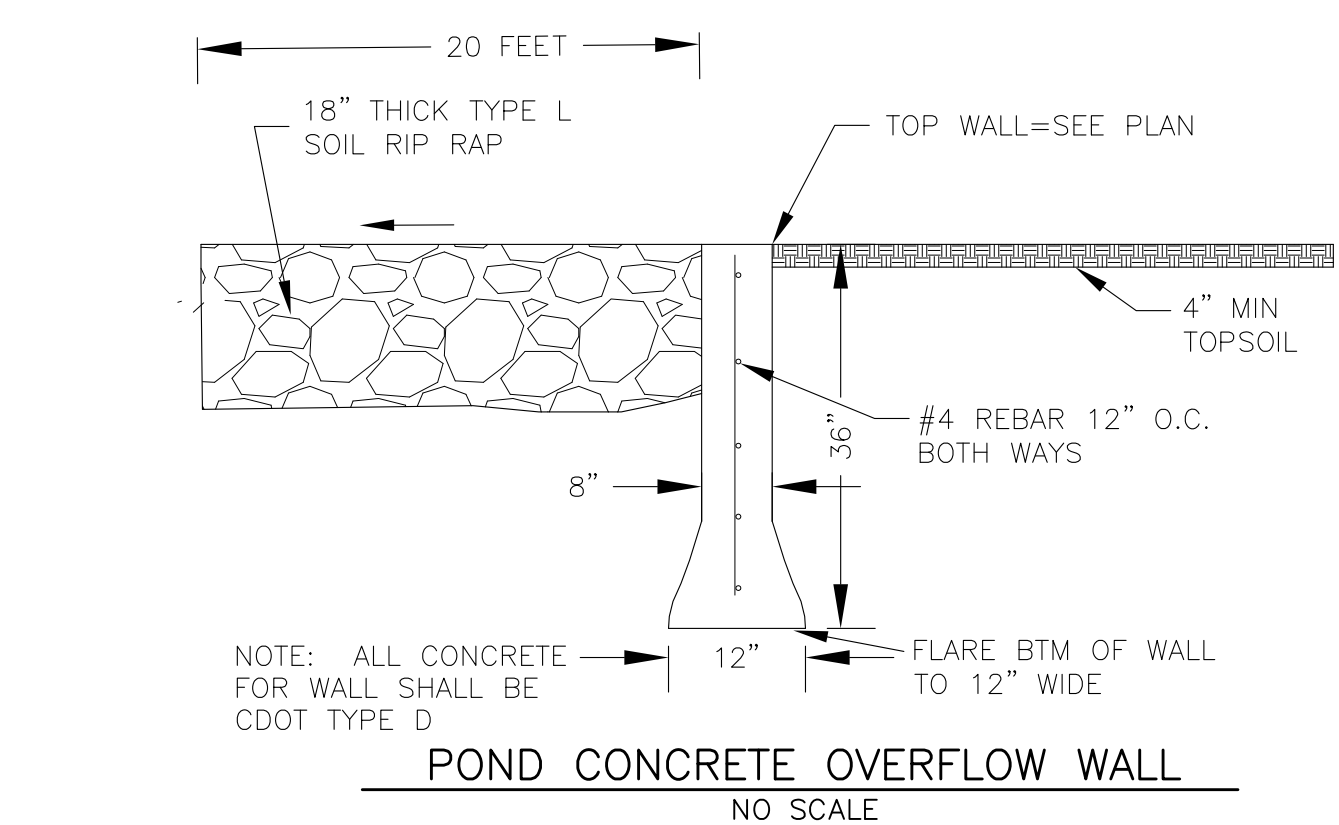
FOREBAY SECTION A-A  
NO SCALE



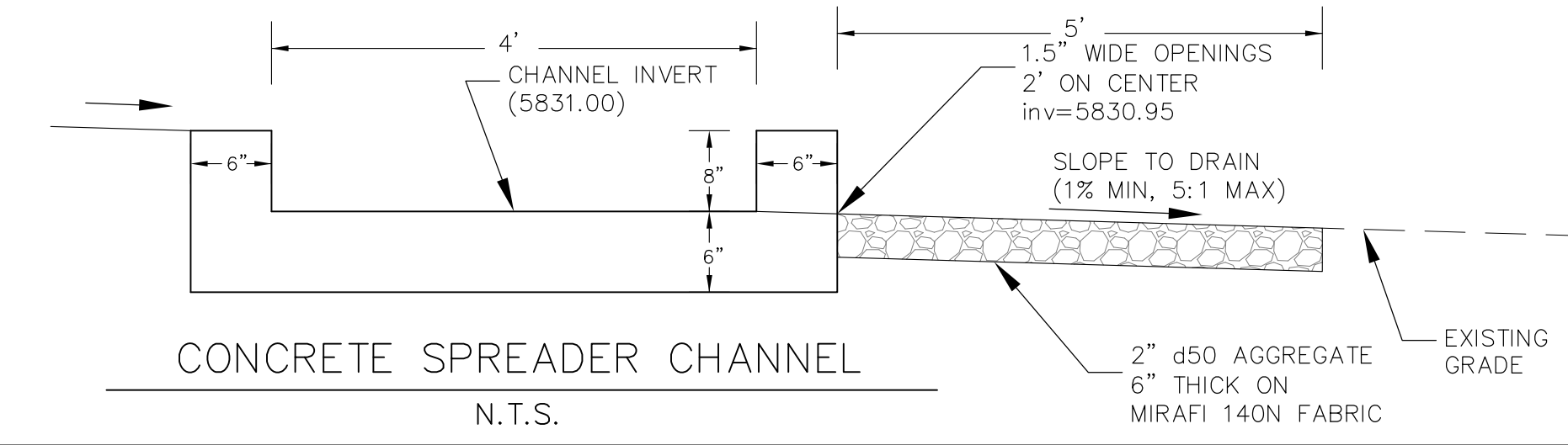
FOREBAY SECTION B-B  
NO SCALE



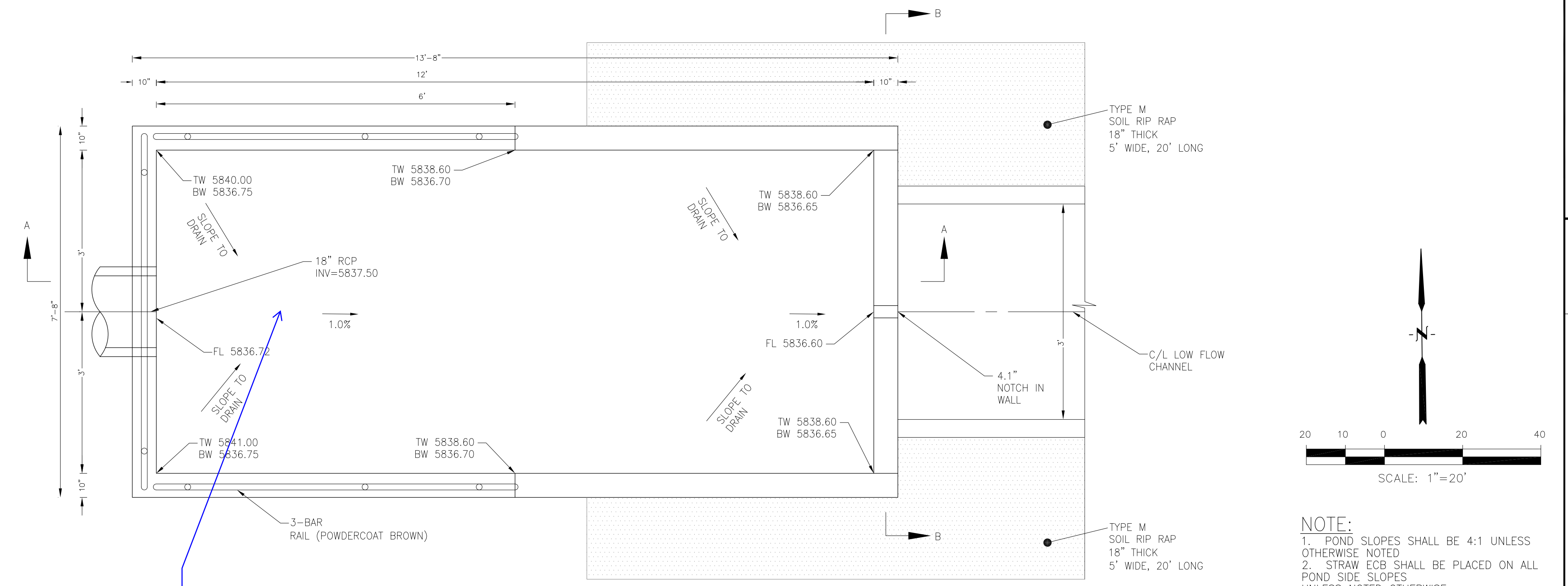
WQ POND G  
EMERGENCY OVERFLOW  
PROFILE  
SCALE: NTS



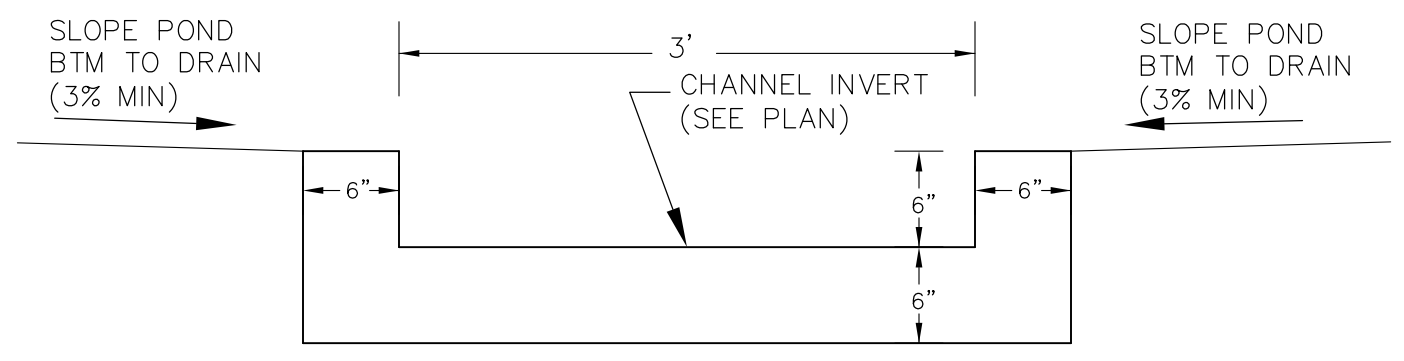
POND CONCRETE OVERFLOW WALL  
NO SCALE



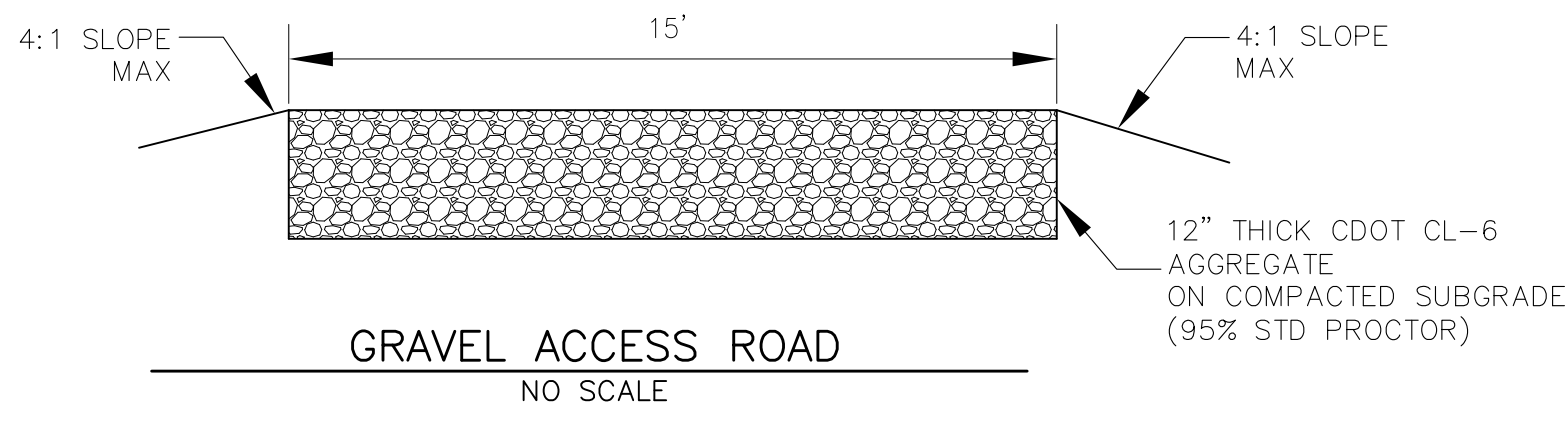
CONCRETE SPREADER CHANNEL  
N.T.S.



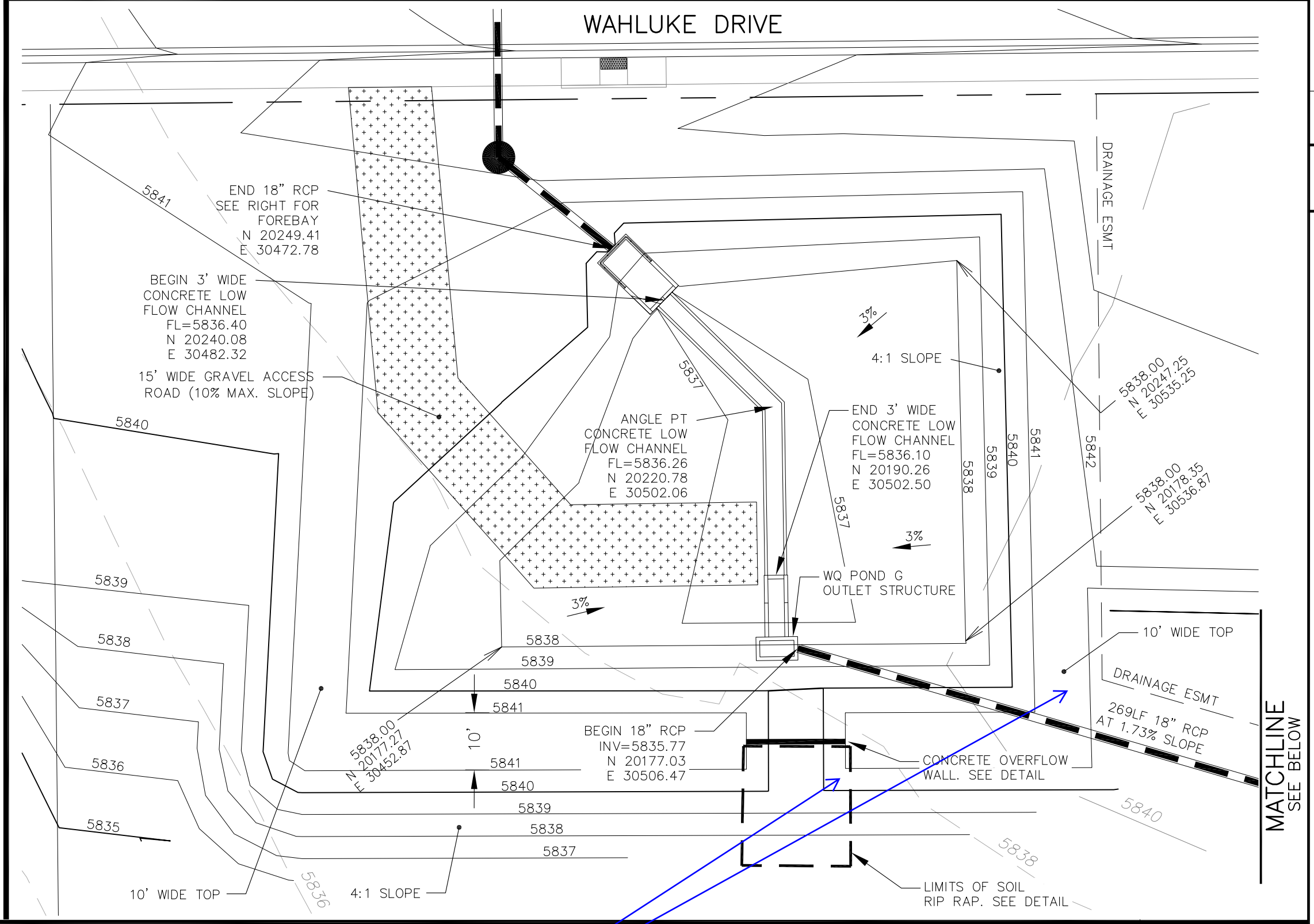
FOREBAY DETAIL  
NO SCALE



CONCRETE LOW FLOW CHANNEL  
N.T.S.



GRAVEL ACCESS ROAD  
NO SCALE



**CORE ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80232  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

DATE: NOV. 30, 2021

DESCRIPTION: MODIFY CONCRETE SPREADER CHANNEL

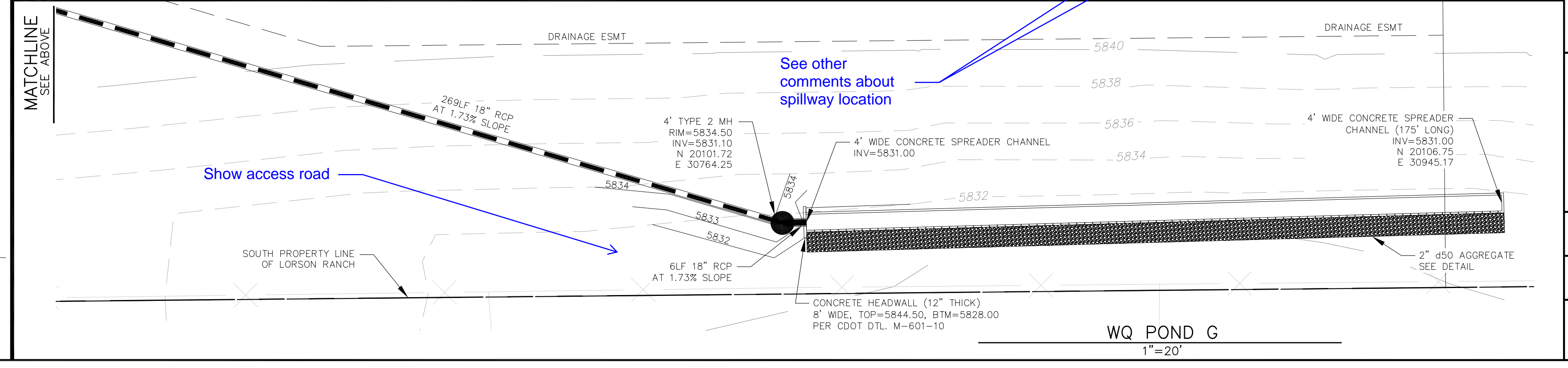
NO. 1

PROJECT: HILLSIDE AT LORSON RANCH  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
LORSON BLVD. - WALLEYE DR.  
COLORADO SPRINGS, COLORADO  
CONTACT: JEFF MARK

PREPARED FOR: LORSON, LLC  
80903

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**WQ POND G  
POND DETAILS  
AND TRICKLE CHANNEL**



WQ POND G  
1"=20'

DATE: FEB 5, 2022

PROJECT NO. 100.065

SHEET NUMBER **C9.X**

TOTAL SHEETS: XX

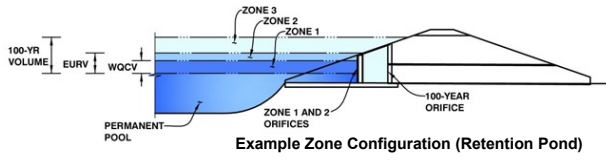




# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

**Project:** Hillside at Lorson Ranch  
**Basin ID:** Pond H



	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)
<b>Total (all zones)</b>		<b>1.140</b>	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

**Calculated Parameters for Underdrain**

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A	feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.95	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	11.80	inches
Orifice Plate: Orifice Area per Row =	0.63	sq. inches (diameter = 7/8 inch)

**Calculated Parameters for Plate**

WQ Orifice Area per Row =	4.375E-03	ft <sup>2</sup>
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft <sup>2</sup>

**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	
Invert of Vertical Orifice =	2.95	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	4.84	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	3.00	N/A	inches
Vertical Orifice Width =	10.00	N/A	inches

**Calculated Parameters for Vertical Orific**

	Zone 2 Rectangular	Not Selected
Vertical Orifice Area =	0.21	N/A
Vertical Orifice Centroid =	0.13	N/A

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.42	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.00	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H <sub>1</sub> =	5.42	N/A
Overflow Weir Slope Length =	6.00	N/A
Grate Open Area / 100-yr Orifice Area =	7.09	N/A
Overflow Grate Open Area w/o Debris =	12.53	N/A
Overflow Grate Open Area w/ Debris =	6.26	N/A

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	18.00	N/A	inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

	Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	1.77	N/A
Outlet Orifice Centroid =	0.75	N/A
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.50	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	15.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	0.50	feet

**Calculated Parameters for Spillway**

Spillway Design Flow Depth =	0.58	feet
Stage at Top of Freeboard =	8.58	feet
Basin Area at Top of Freeboard =	0.49	acres
Basin Volume at Top of Freeboard =	2.09	acre-ft

micropool=5804.40=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)

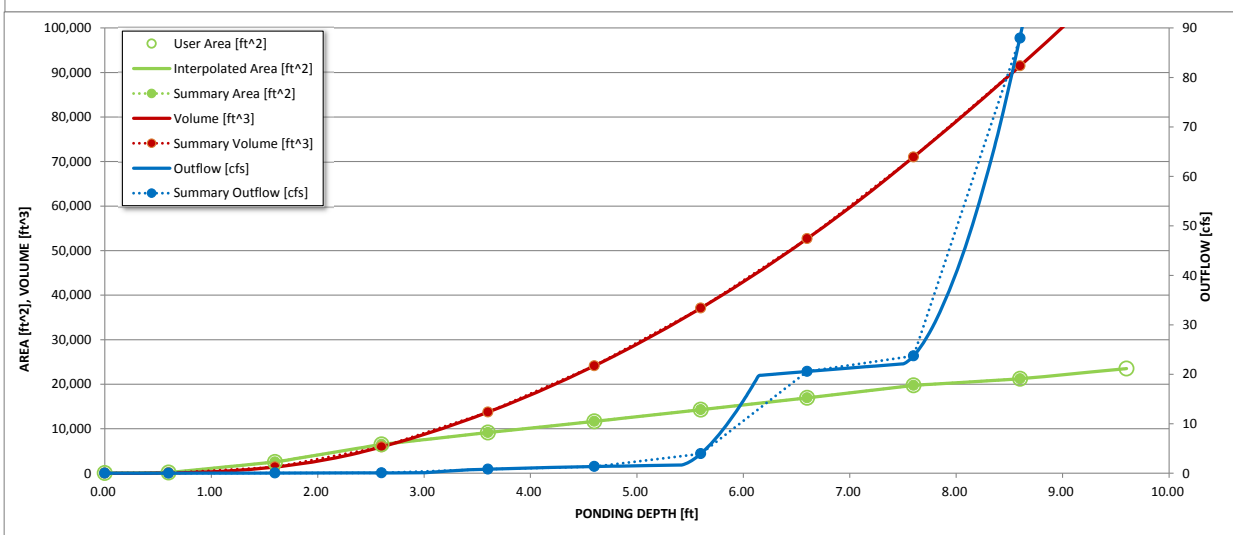
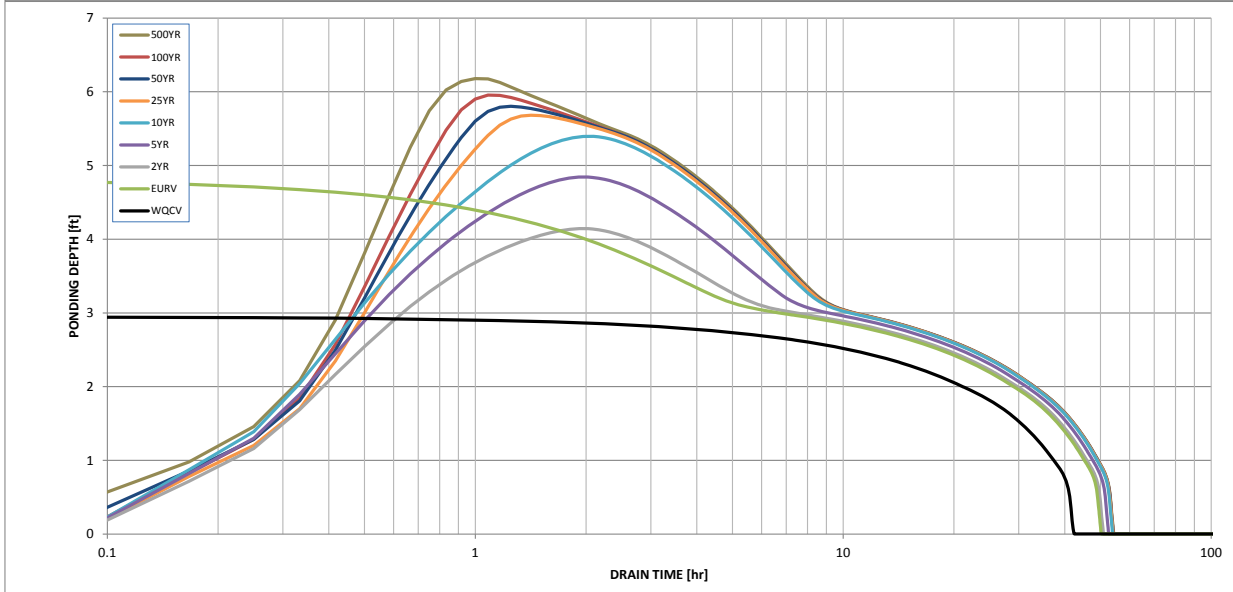
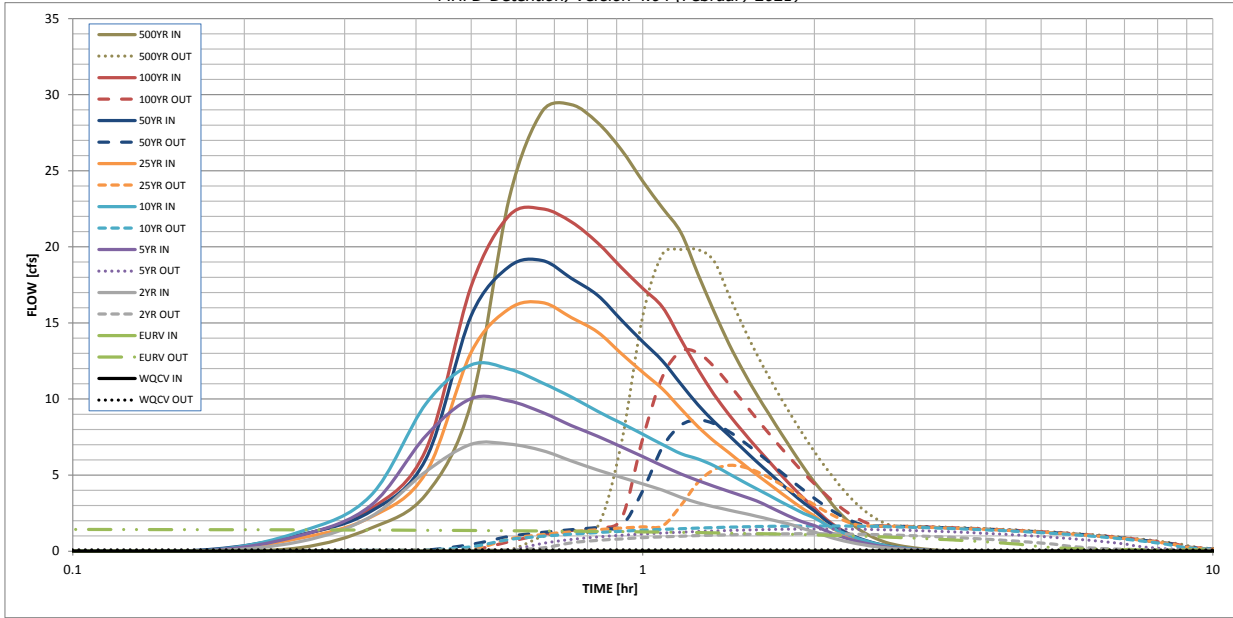
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	N/A	N/A	0.578	0.811	1.014	1.278	1.496	1.769
CUHP Runoff Volume (acre-ft) =	0.191	0.617	0.578	0.811	1.014	1.278	1.496	1.769
Inflow Hydrograph Volume (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 Gate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.5	0.9
Max Velocity through Gate 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

Add a note on this page to see discussion of DP5b.

Per ECM Chap 3.2.8.B, "The proposed project or developed land use shall not change historical runoff values, cause downstream damage, or adversely impact adjacent properties." Increases from the historical flowrates is allowable (with or without full spectrum detention) if it is shown (via text and/or calcs) that the flow increase can be accommodated downstream (ie: show that there is a suitable outfall, per ECM, Chap 3.2.4). If applicable, reference the downstream facilities in a DBPS or MDDP.

# 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.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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



## Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

**Designer:** R. Schindler  
**Company:** Core Engineering Group  
**Date:** January 7, 2022  
**Project:** Hillside at Lorson Ranch  
**Location:** Pond H - WQ pond

<p>1. Basin Storage Volume</p> <p>A) Effective Imperviousness of Tributary Area, <math>I_a</math></p> <p>B) Tributary Area's Imperviousness Ratio (<math>i = I_a / 100</math>)</p> <p>C) Contributing Watershed Area</p> <p>D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm</p> <p>E) Design Concept (Select EURV when also designing for flood control)</p> <p>F) Design Volume (WQCV) Based on 40-hour Drain Time (<math>V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)</math>)</p> <p>G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume (<math>V_{WQCV\ OTHER} = (d_6 * V_{DESIGN} * 0.43)</math>)</p> <p>H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)</p> <p>I) NRCS Hydrologic Soil Groups of Tributary Watershed                      i) Percentage of Watershed consisting of Type A Soils                      ii) Percentage of Watershed consisting of Type B Soils                      iii) Percentage of Watershed consisting of Type C/D Soils</p> <p>J) Excess Urban Runoff Volume (EURV) Design Volume                      For HSG A: <math>EURV_A = 1.68 * i^{1.28}</math>                      For HSG B: <math>EURV_B = 1.36 * i^{1.08}</math>                      For HSG C/D: <math>EURV_{C/D} = 1.20 * i^{1.08}</math></p> <p>K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)</p>	<p><math>I_a =</math> <input type="text" value="55.0"/> %</p> <p><math>i =</math> <input type="text" value="0.550"/></p> <p>Area = <input type="text" value="10.410"/> ac</p> <p><math>d_6 =</math> <input type="text" value=""/></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input checked="" type="radio"/> Water Quality Capture Volume (WQCV)</p> <p><input type="radio"/> Excess Urban Runoff Volume (EURV)</p> </div> <p><math>V_{DESIGN} =</math> <input type="text" value="0.191"/> ac-ft</p> <p><math>V_{DESIGN\ OTHER} =</math> <input type="text" value=""/> ac-ft</p> <p><math>V_{DESIGN\ USER} =</math> <input type="text" value=""/> ac-ft</p> <p>HSG <math>A =</math> <input type="text" value=""/> %                      HSG <math>B =</math> <input type="text" value=""/> %                      HSG <math>C/D =</math> <input type="text" value=""/> %</p> <p>EURV<math>_{DESIGN} =</math> <input type="text" value=""/> ac-ft</p> <p>EURV<math>_{DESIGN\ USER} =</math> <input type="text" value=""/> ac-ft</p>
<p>2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)</p>	<p>L : W = <input type="text" value="2.0"/> : 1</p>
<p>3. Basin Side Slopes</p> <p>A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>Z = <input type="text" value="4.00"/> ft / ft</p>
<p>4. Inlet</p> <p>A) Describe means of providing energy dissipation at concentrated inflow locations:</p>	<p>_____</p> <p>_____</p> <p>_____</p>
<p>5. Forebay</p> <p>A) Minimum Forebay Volume (<math>V_{MIN} =</math> <input type="text" value="3%"/> of the WQCV)</p> <p>B) Actual Forebay Volume</p> <p>C) Forebay Depth (<math>D_F =</math> <input type="text" value="18"/> inch maximum)</p> <p>D) Forebay Discharge</p> <p>i) Undetained 100-year Peak Discharge</p> <p>ii) Forebay Discharge Design Flow (<math>Q_F = 0.02 * Q_{100}</math>)</p> <p>E) Forebay Discharge Design</p> <p>F) Discharge Pipe Size (minimum 8-inches)</p> <p>G) Rectangular Notch Width</p>	<p><math>V_{MIN} =</math> <input type="text" value="0.006"/> ac-ft</p> <p><math>V_F =</math> <input type="text" value="0.006"/> ac-ft</p> <p><math>D_F =</math> <input type="text" value="18.0"/> in</p> <p><math>Q_{100} =</math> <input type="text" value="22.50"/> cfs</p> <p><math>Q_F =</math> <input type="text" value="0.45"/> cfs</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Choose One</p> <p><input type="radio"/> Berm With Pipe</p> <p><input checked="" type="radio"/> Wall with Rect. Notch</p> <p><input type="radio"/> Wall with V-Notch Weir</p> </div> <p>Flow too small for berm w/ pipe</p> <p>Calculated <math>D_P =</math> <input type="text" value=""/> in</p> <p>Calculated <math>W_N =</math> <input type="text" value="4.5"/> in</p>

**Design Procedure Form: Extended Detention Basin (EDB)**

Sheet 2 of 3

**Designer:** R. Schindler  
**Company:** Core Engineering Group  
**Date:** January 7, 2022  
**Project:** Hillside at Lorson Ranch  
**Location:** Pond H - WQ pond

<p>6. Trickle Channel</p> <p>A) Type of Trickle Channel</p> <p>F) Slope of Trickle Channel</p>	<div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Concrete  <input type="radio"/> Soft Bottom         </div> <p>S = <input type="text" value="0.0050"/> ft / ft</p>
<p>7. Micropool and Outlet Structure</p> <p>A) Depth of Micropool (2.5-foot minimum)</p> <p>B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)</p> <p>C) Outlet Type</p> <p>D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)</p> <p>E) Total Outlet Area</p>	<p>D<sub>M</sub> = <input type="text" value="2.5"/> ft</p> <p>A<sub>M</sub> = <input type="text" value="40"/> sq ft</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px;">             Choose One  <input checked="" type="radio"/> Orifice Plate  <input type="radio"/> Other (Describe):         </div> <hr/> <hr/> <p>D<sub>orifice</sub> = <input type="text" value="0.88"/> inches</p> <p>A<sub>orifice</sub> = <input type="text" value="1.89"/> square inches</p>
<p>8. Initial Surcharge Volume</p> <p>A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)</p> <p>B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)</p> <p>C) Initial Surcharge Provided Above Micropool</p>	<p>D<sub>IS</sub> = <input type="text" value="4"/> in</p> <p>V<sub>IS</sub> = <input type="text" value="25"/> cu ft</p> <p>V<sub>s</sub> = <input type="text" value="13.3"/> cu ft</p>
<p>9. Trash Rack</p> <p>A) Water Quality Screen Open Area: <math>A_t = A_{ot} * 38.5 * (e^{-0.095D})</math></p> <p>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 area to the total screen area for the material specified.)</p> <p style="margin-left: 40px;">Other (Y/N): <input type="text" value="Y"/></p> <p>C) Ratio of Total Open Area to Total Area (only for type 'Other')</p> <p>D) Total Water Quality Screen Area (based on screen type)</p> <p>E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)</p> <p>F) Height of Water Quality Screen (H<sub>TR</sub>)</p> <p>G) Width of Water Quality Screen Opening (W<sub>opening</sub>) (Minimum of 12 inches is recommended)</p>	<p>A<sub>t</sub> = <input type="text" value="67"/> square inches</p> <div style="border: 1px solid black; padding: 2px; margin-bottom: 5px; width: fit-content;">             Other (Please describe below)         </div> <hr/> <hr/> <p>User Ratio = <input type="text" value="0.6"/></p> <p>A<sub>total</sub> = <input type="text" value="112"/> sq. in. <span style="color: blue;">Based on type 'Other' screen ratio</span></p> <p>H = <input type="text" value="2.95"/> feet</p> <p>H<sub>TR</sub> = <input type="text" value="63.4"/> inches</p> <p>W<sub>opening</sub> = <input type="text" value="12.0"/> inches <span style="color: red;">VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.</span></p>

**Design Procedure Form: Extended Detention Basin (EDB)**

Sheet 3 of 3

**Designer:** R. Schindler  
**Company:** Core Engineering Group  
**Date:** January 7, 2022  
**Project:** Hillside at Lorson Ranch  
**Location:** Pond H - WQ pond

<p>10. Overflow Embankment</p> <p>A) Describe embankment protection for 100-year and greater overtopping:</p> <p>B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)</p>	<p>TRM added to emergency overflow. All of 100-year flows will enter outlet structure before entering emergency overflow.</p> <hr/> <p>Ze = <input type="text" value="4.00"/> ft / ft</p>
<p>11. Vegetation</p>	<p>Choose One</p> <p><input type="radio"/> Irrigated</p> <p><input checked="" type="radio"/> Not Irrigated</p>
<p>12. Access</p> <p>A) Describe Sediment Removal Procedures</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>Notes: _____</p> <hr/> <hr/> <hr/>	

# Weir Report

## Pond H emergency overflow - type R inlet

### Rectangular Weir

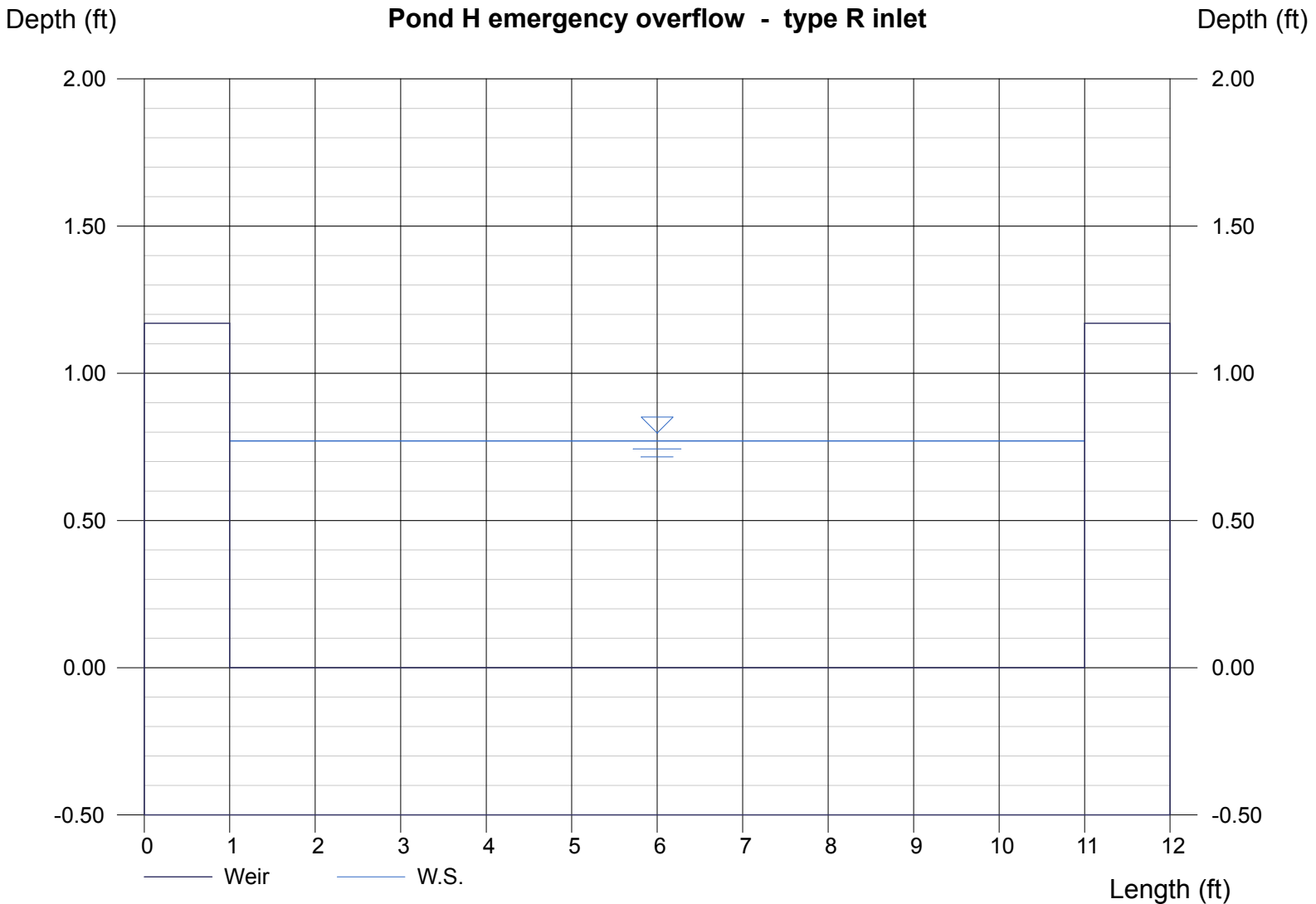
Crest = Sharp  
Bottom Length (ft) = 10.00  
Total Depth (ft) = 1.17

### Highlighted

Depth (ft) = 0.77  
Q (cfs) = 22.50  
Area (sqft) = 7.70  
Velocity (ft/s) = 2.92  
Top Width (ft) = 10.00

### Calculations

Weir Coeff. Cw = 3.33  
Compute by: Known Q  
Known Q (cfs) = 22.50



# 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

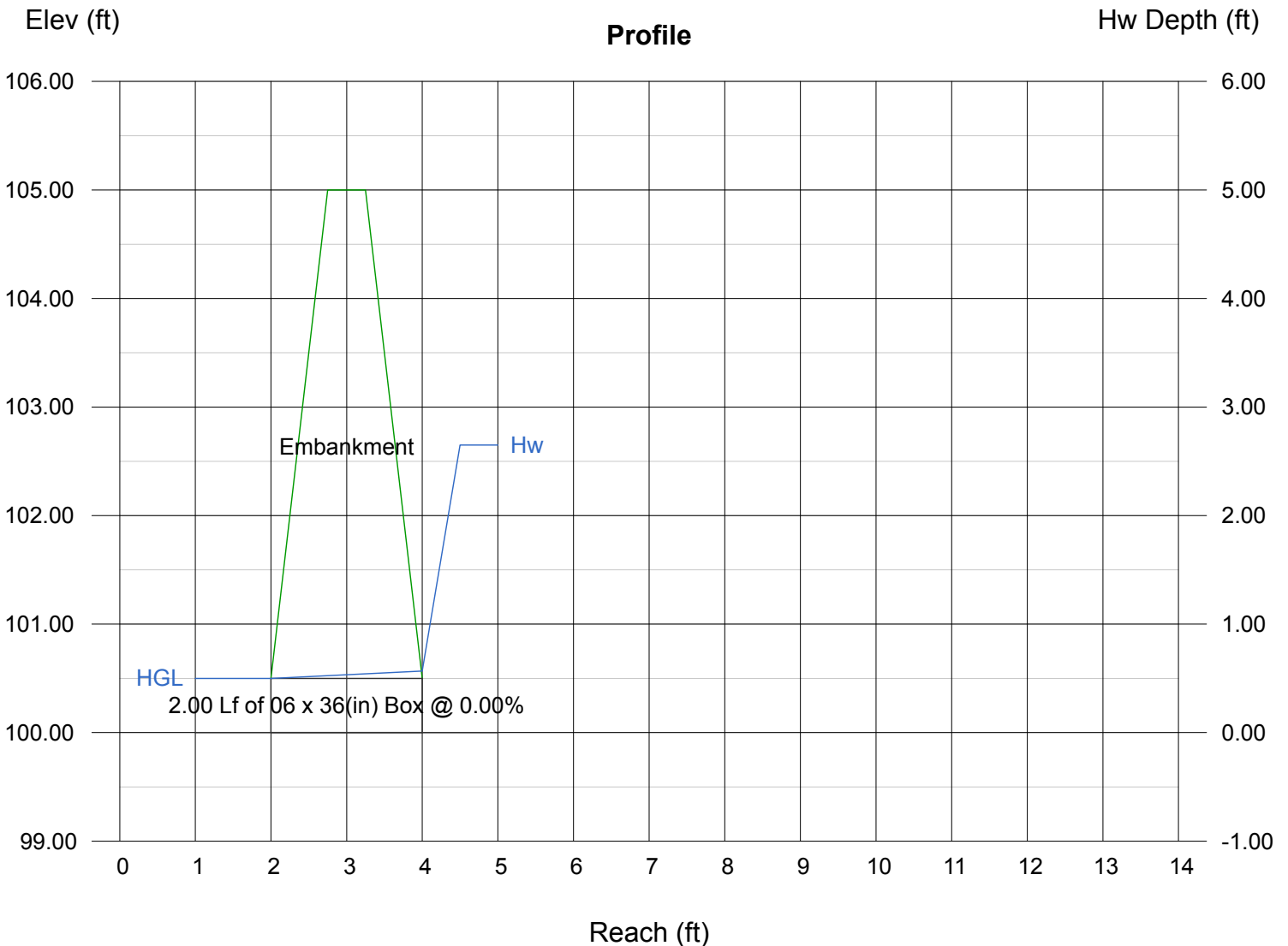
Top Elevation (ft) = 105.00  
 Top Width (ft) = 0.50  
 Crest Width (ft) = 20.00

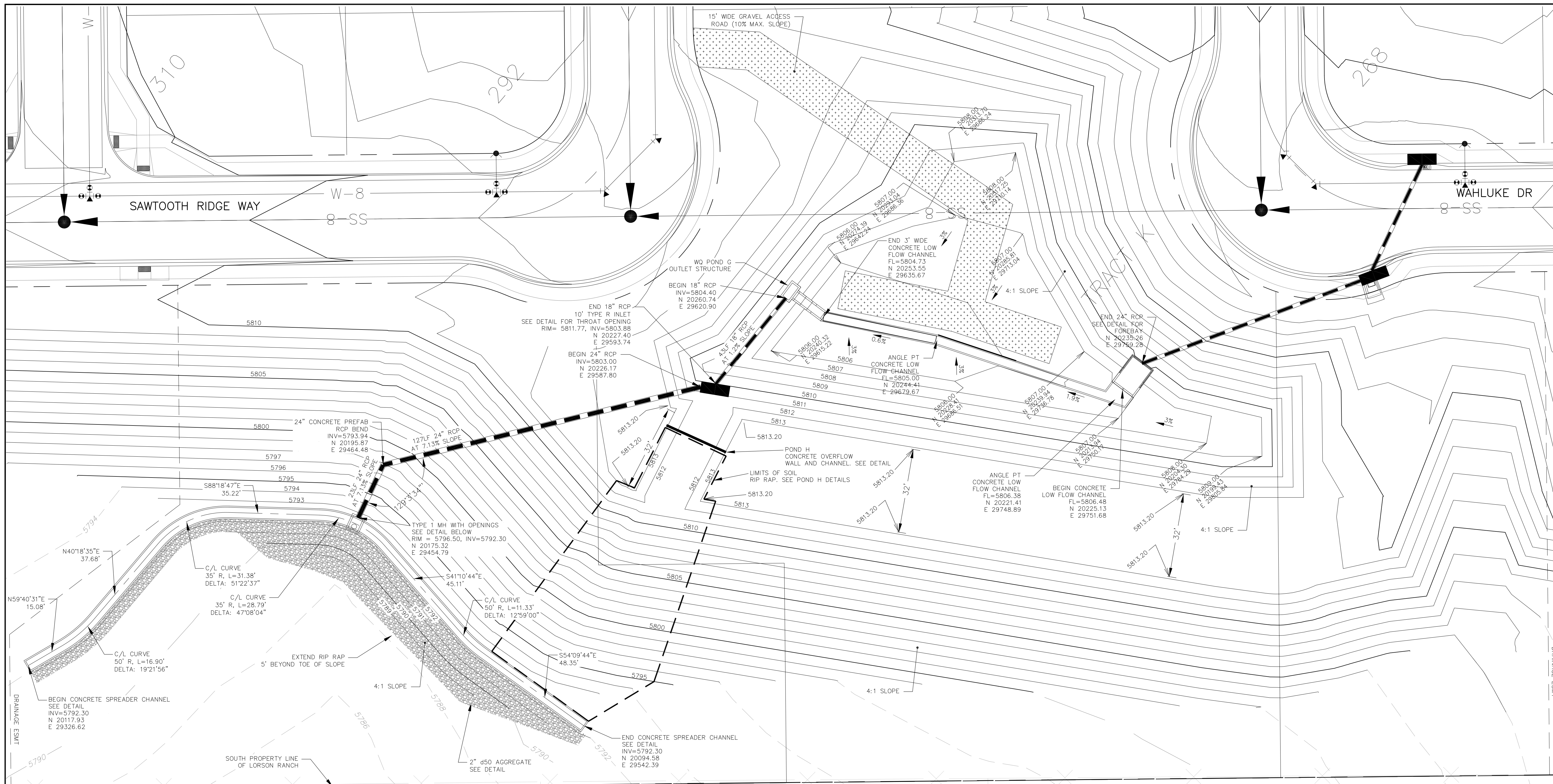
### Calculations

Qmin (cfs) = 13.00  
 Qmax (cfs) = 23.00  
 Tailwater Elev (ft) = (dc+D)/2

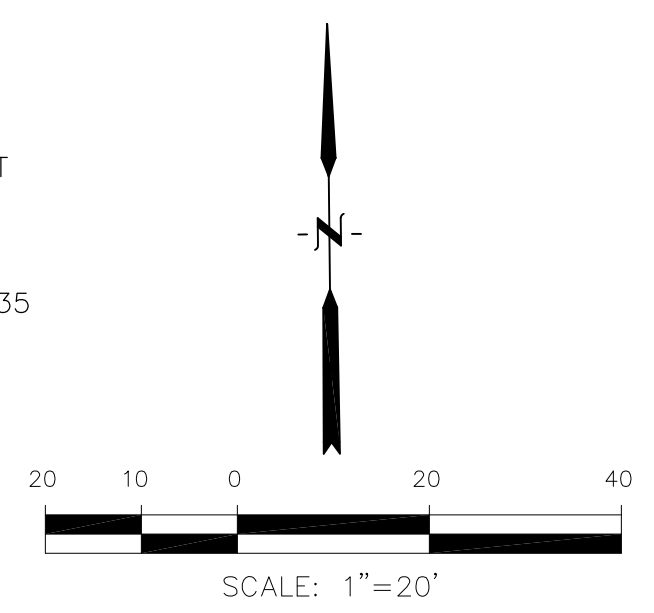
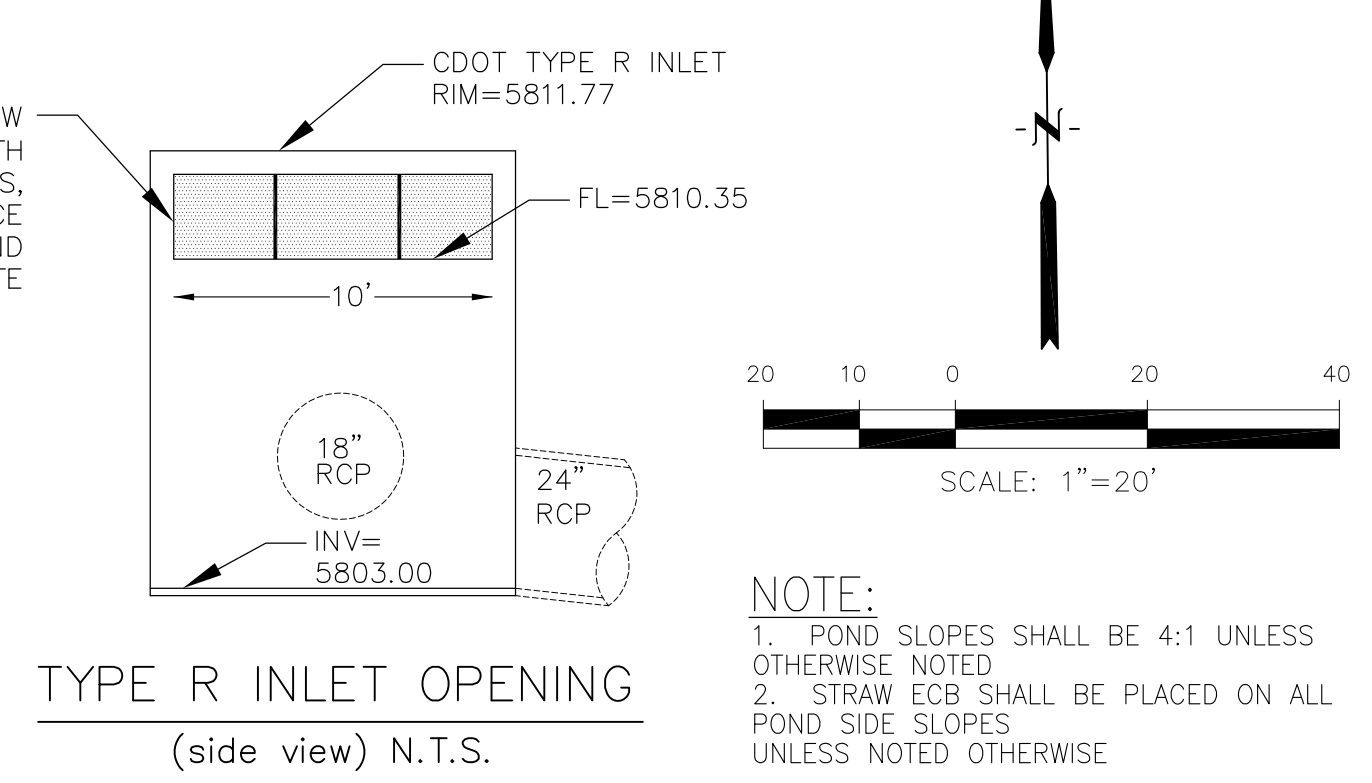
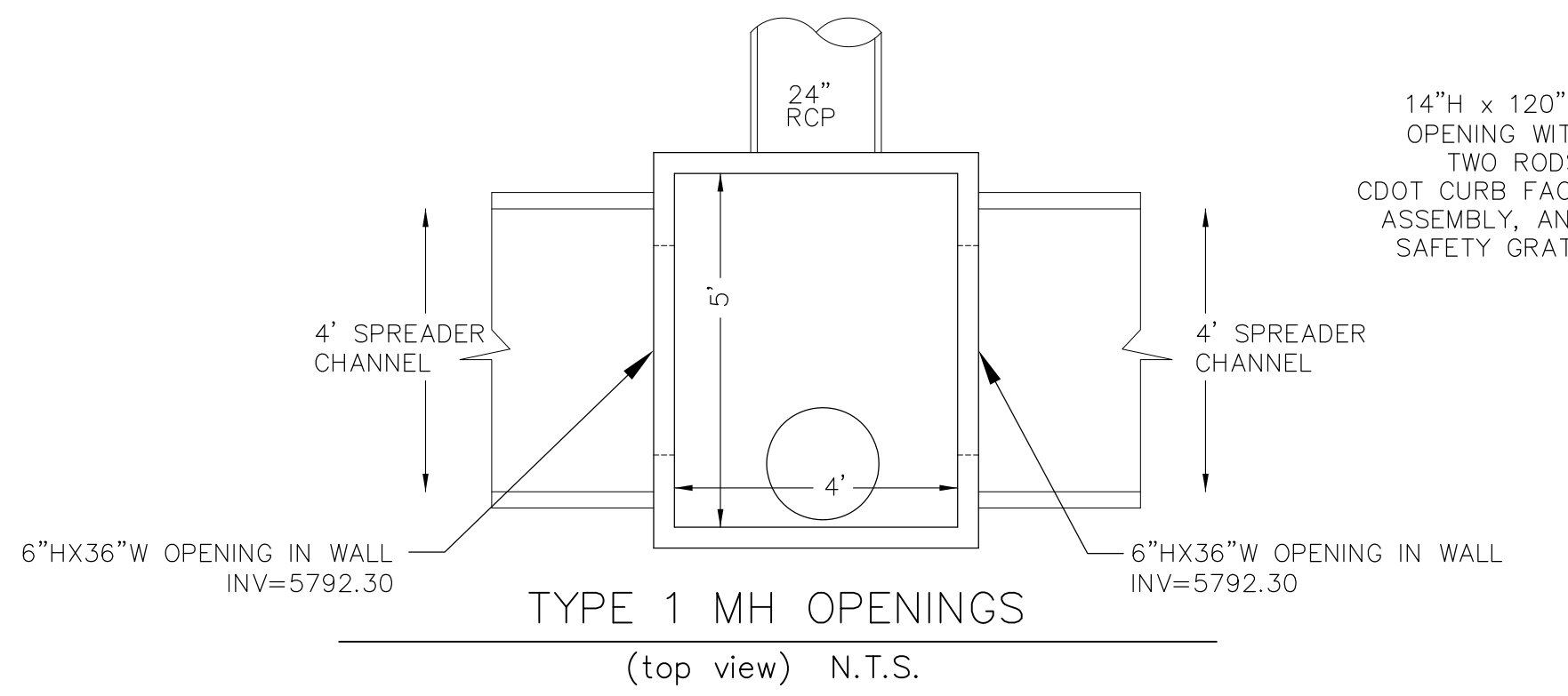
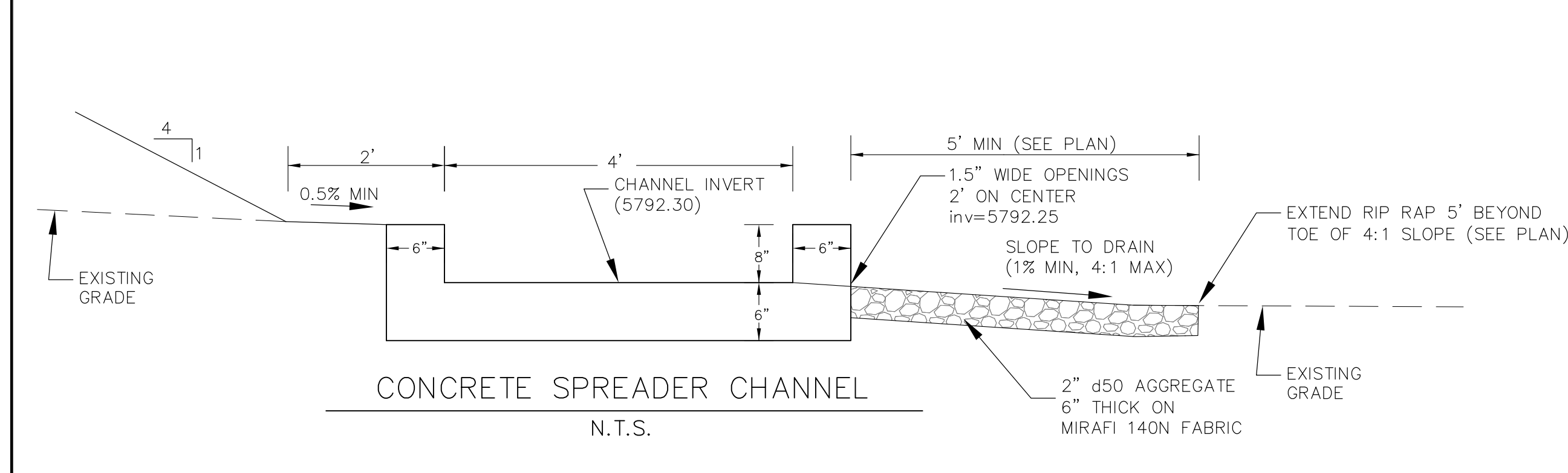
### Highlighted

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





WQ POND H  
1"=20'



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

**CORE**  
**ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80232  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

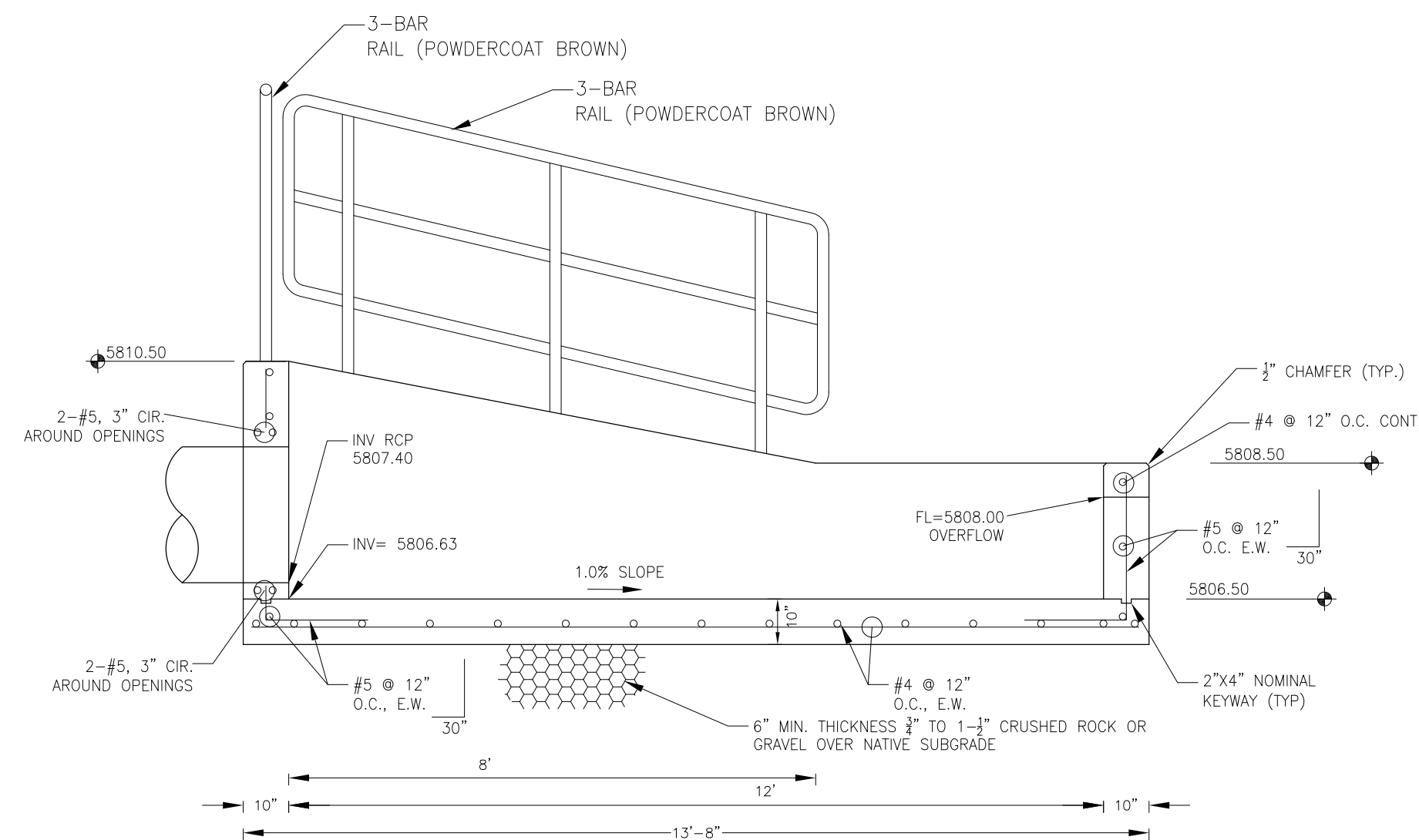
DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

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

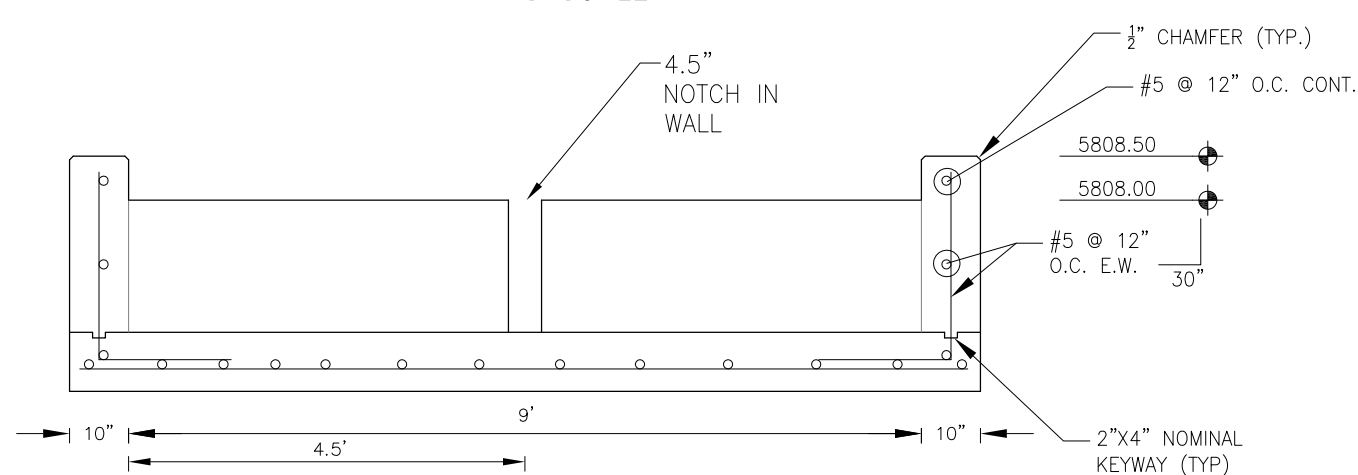
PROJECT:  
**HILLSIDE AT LORSON RANCH**  
WQ POND H  
POND GRADING AND  
CONCRETE SPREADER CHANNEL

DATE:  
FEB 5, 2022  
PROJECT NO.  
100.065  
SHEET NUMBER  
C9.XX  
TOTAL SHEETS: XX

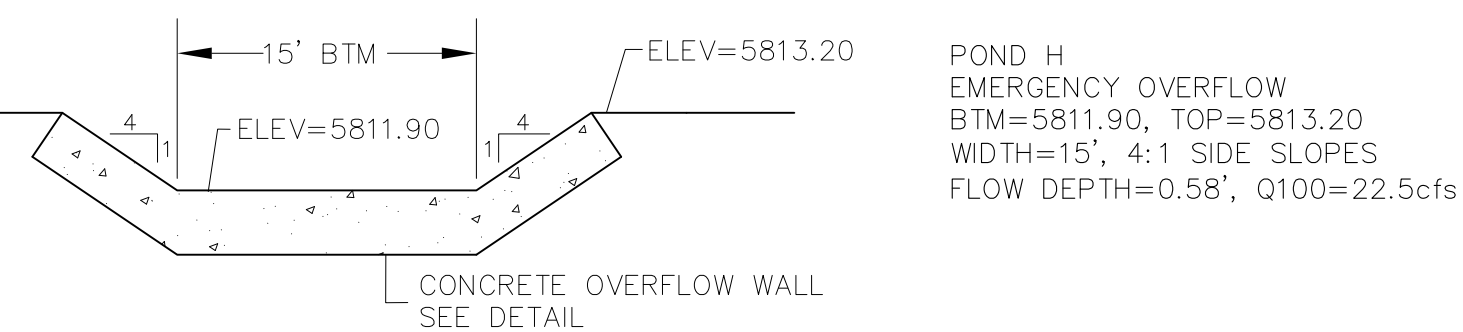




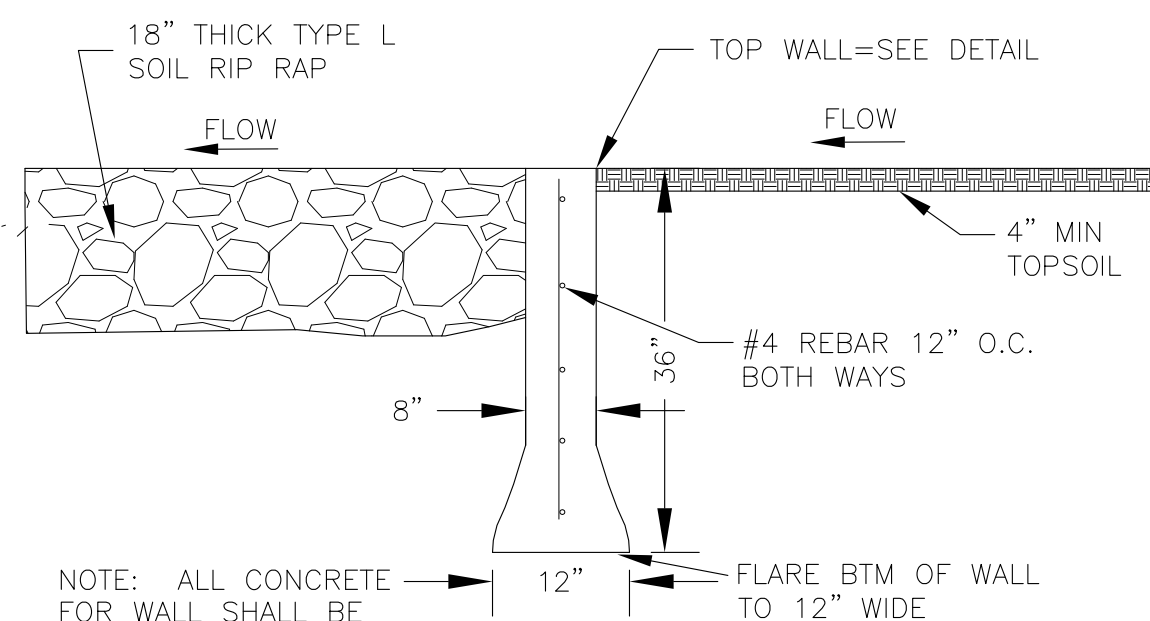
**FOREBAY SECTION A-A**  
NO SCALE



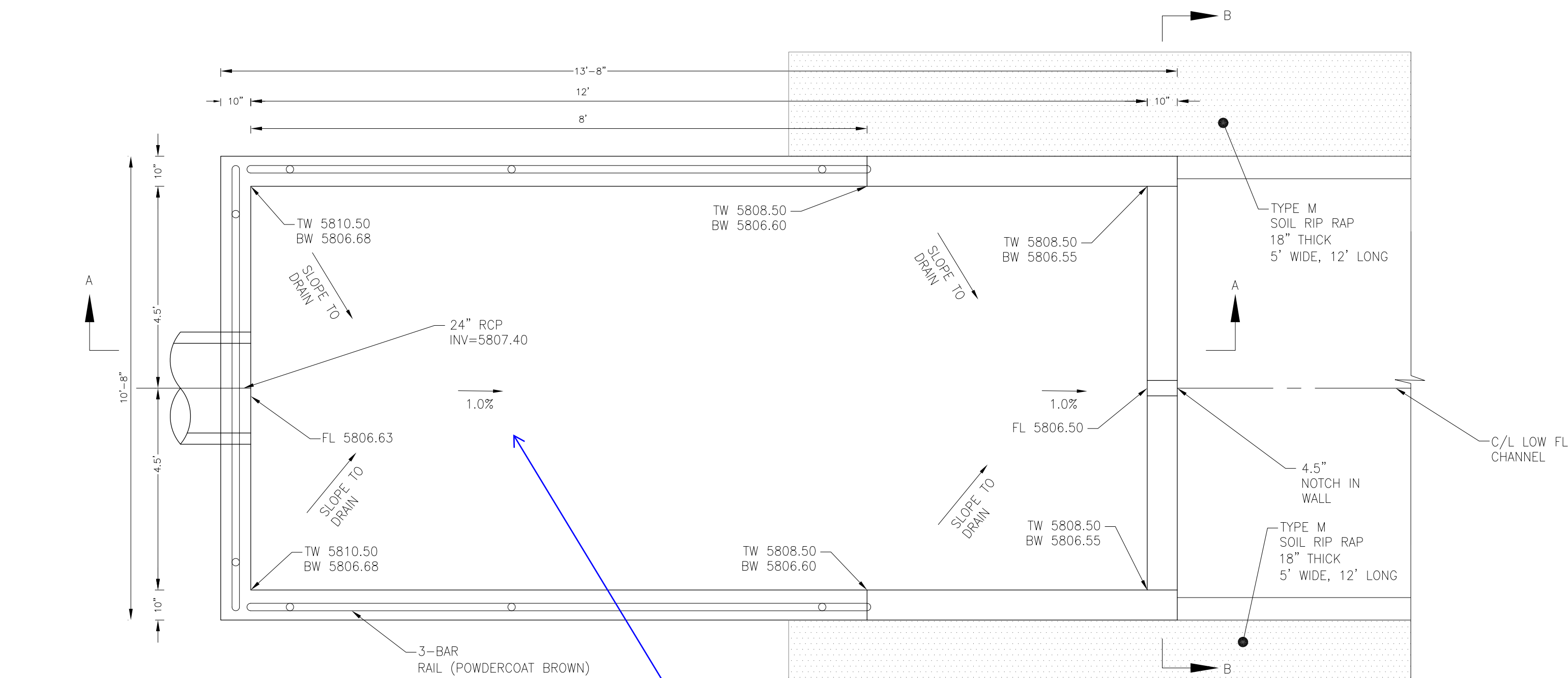
**FOREBAY SECTION B-B**  
NO SCALE



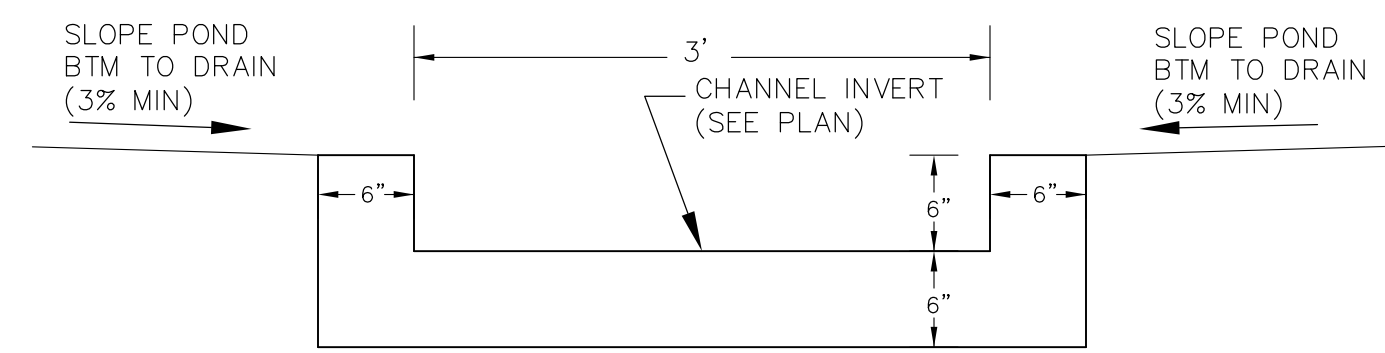
**WQ POND H  
EMERGENCY OVERFLOW  
PROFILE**  
SCALE: NTS



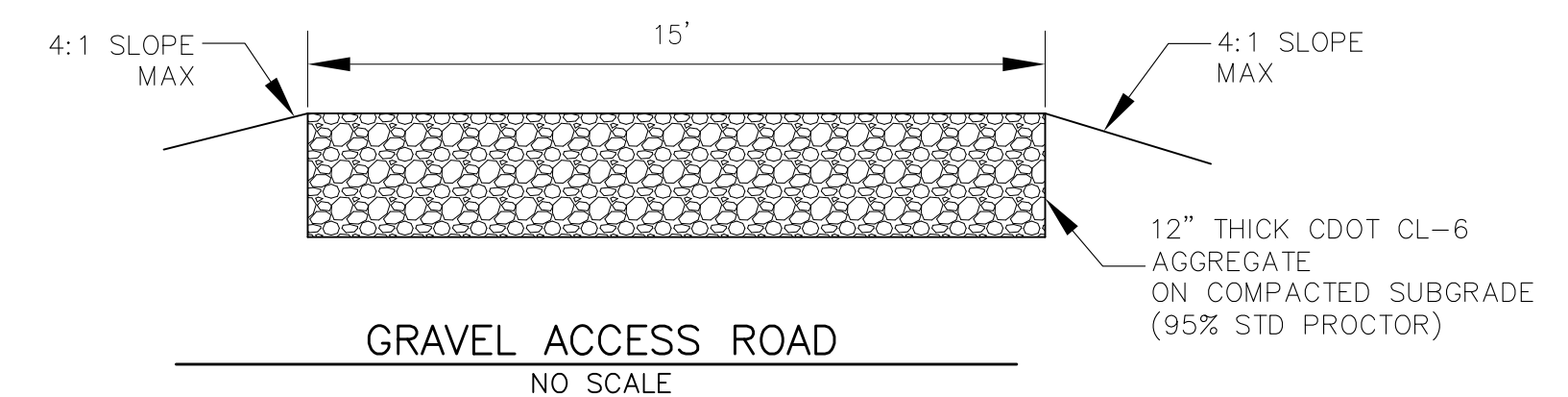
**POND CONCRETE OVERFLOW WALL**  
NO SCALE



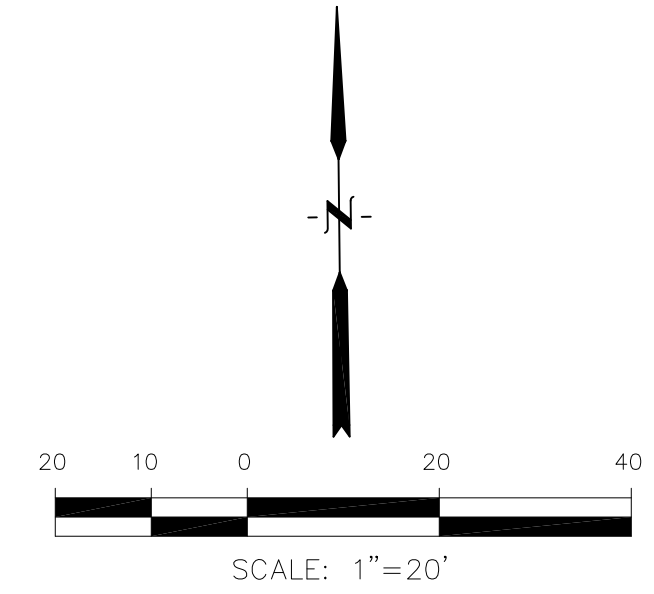
**FOREBAY DETAIL**  
NO SCALE



**CONCRETE LOW FLOW CHANNEL**  
N.T.S.



**GRAVEL ACCESS ROAD**  
NO SCALE



**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

Attenuation?

**CORE ENGINEERING GROUP**  
15004 1ST AVENUE, SUITE 301  
DENVER, CO 80202  
PHONE: 719.570.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@cegi.com

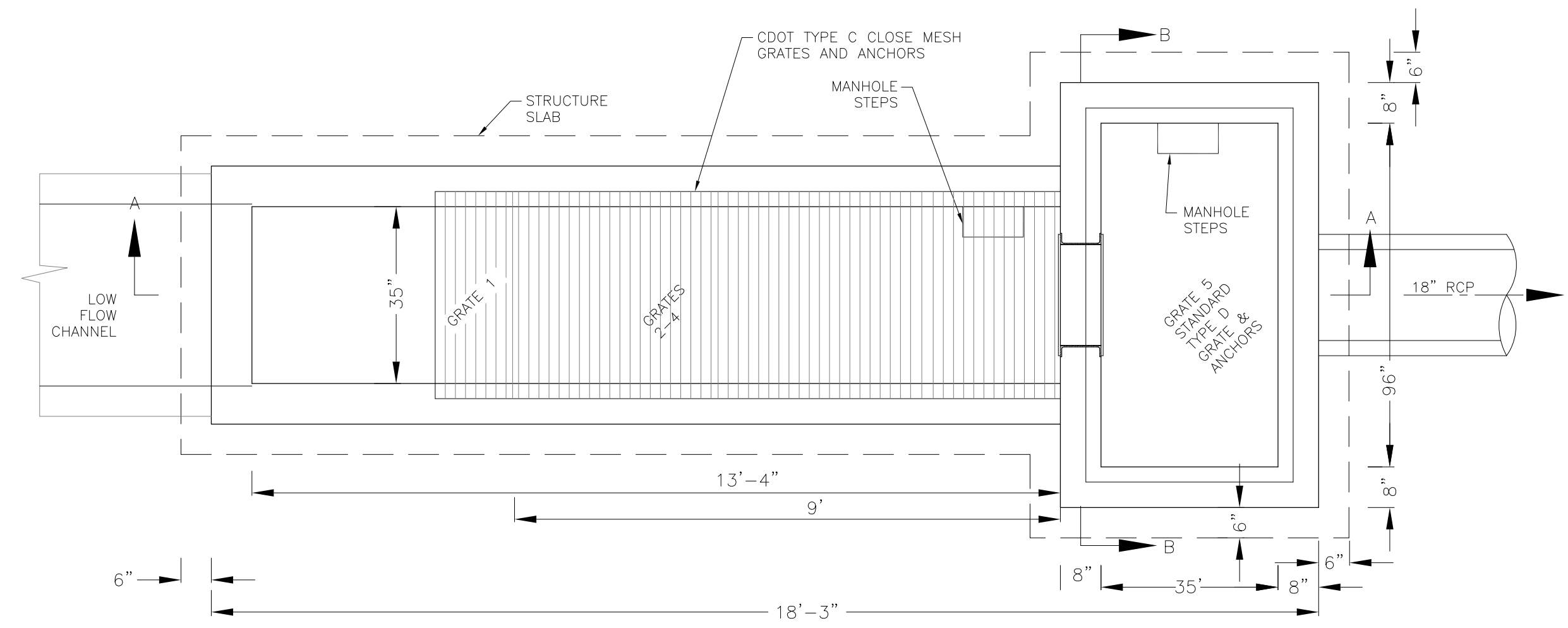
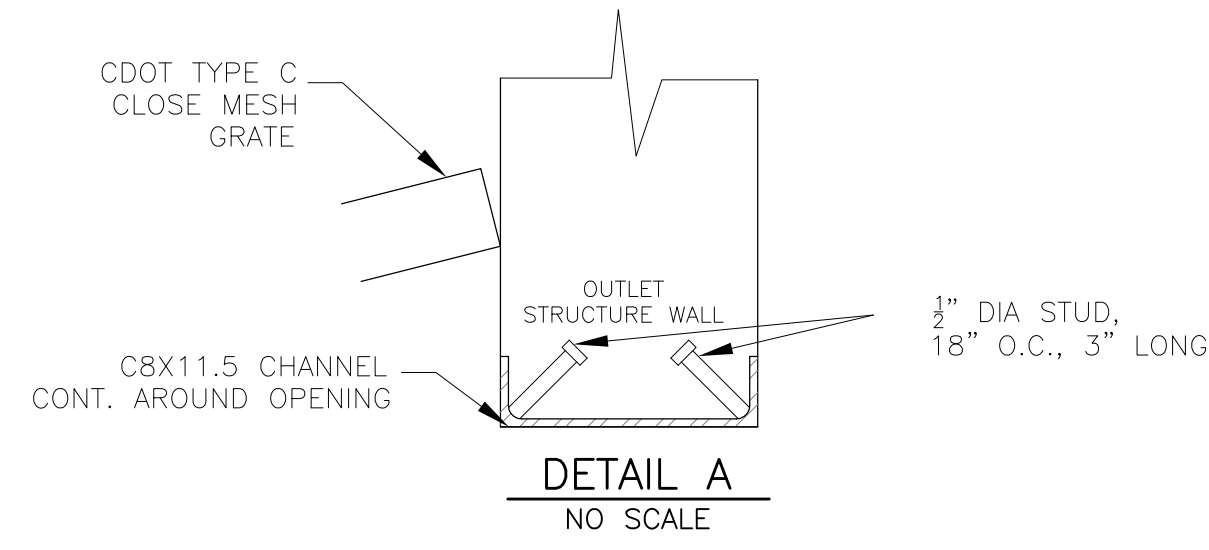
DATE: NOV 30, 2021  
DESCRIPTION: MODIFY CONCRETE SPREADER CHANNEL  
NO. 1.  
PROJECT: HILLSIDE AT LORSON RANCH  
LORSON BLVD. - WALLEYE DR. COLORADO SPRINGS, COLORADO  
PREPARED FOR: LORSON, LLC  
212 N. WAHSATCH AVE, SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

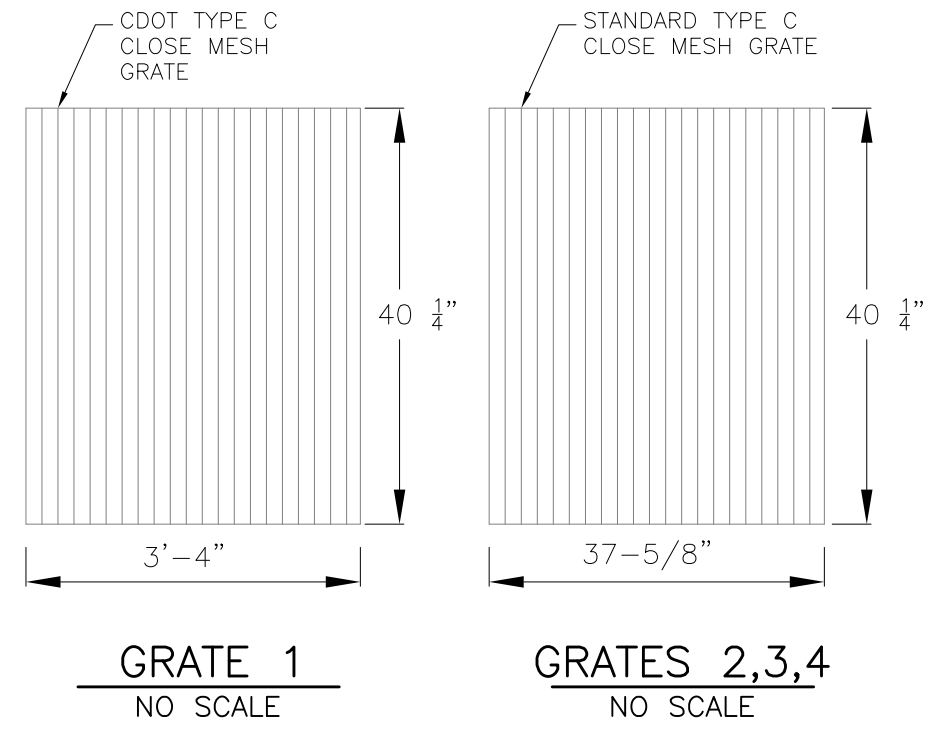
DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

**WQ POND H  
POND DETAILS  
AND TRICKLE CHANNEL**

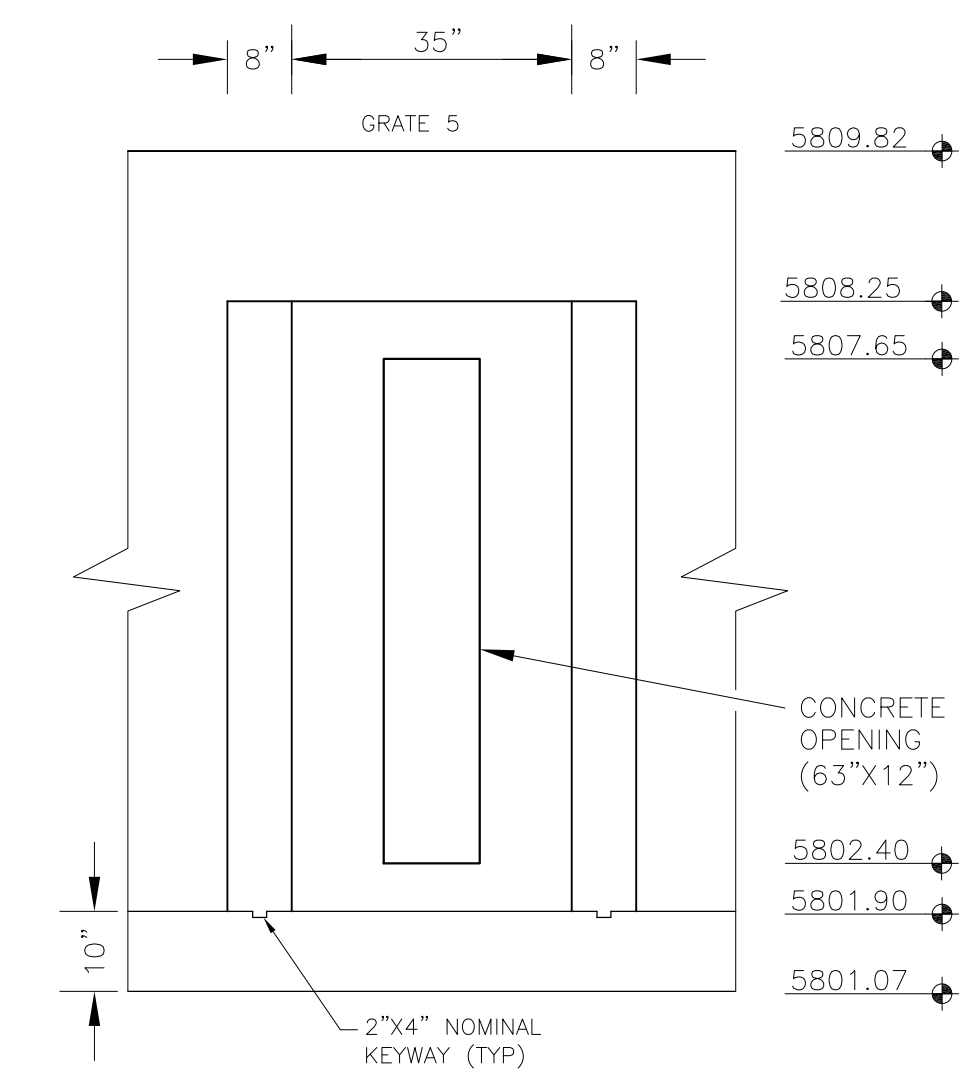
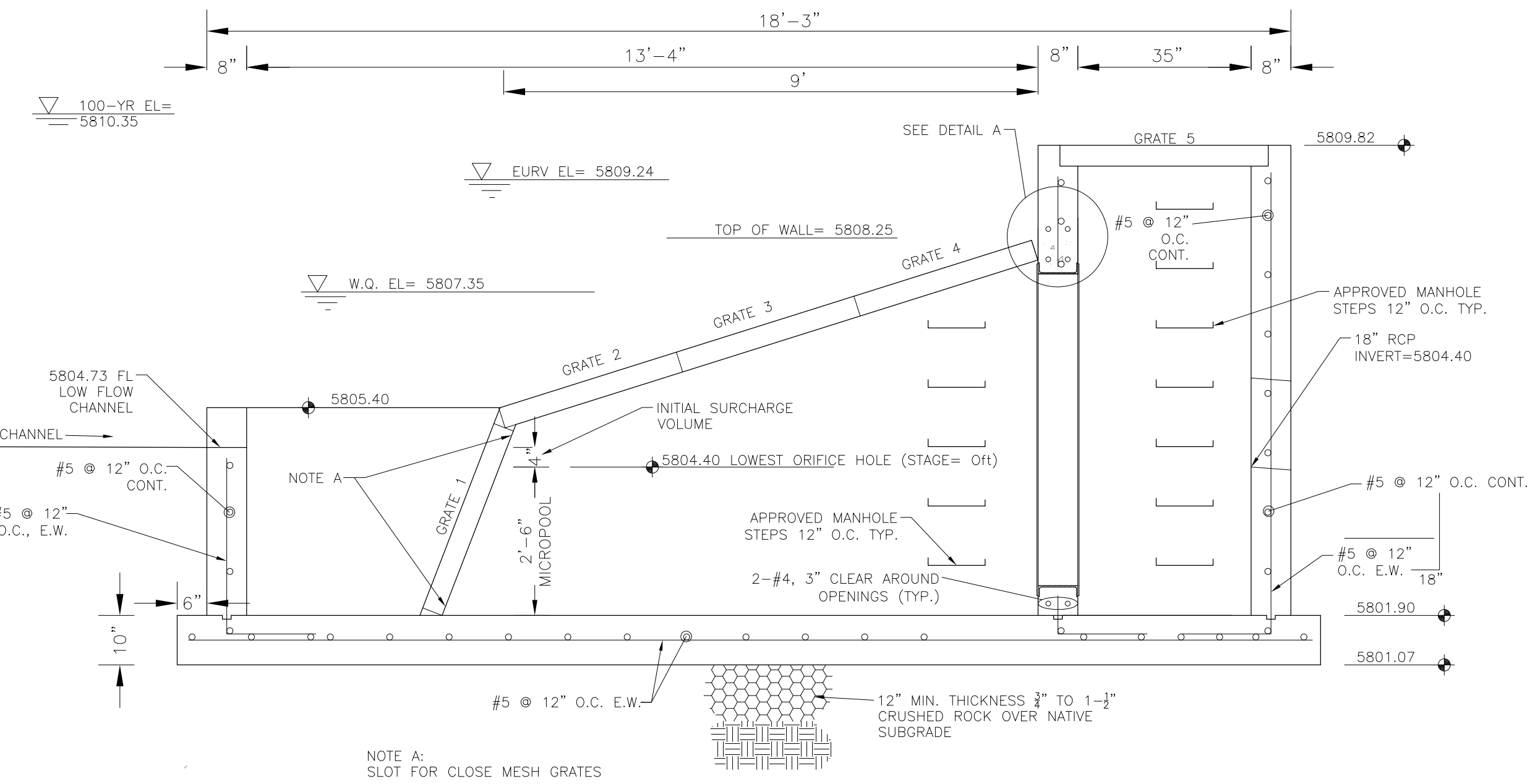
DATE: FEB 5, 2022  
PROJECT NO. 100.065  
SHEET NUMBER C9.Xxx  
TOTAL SHEETS: XX



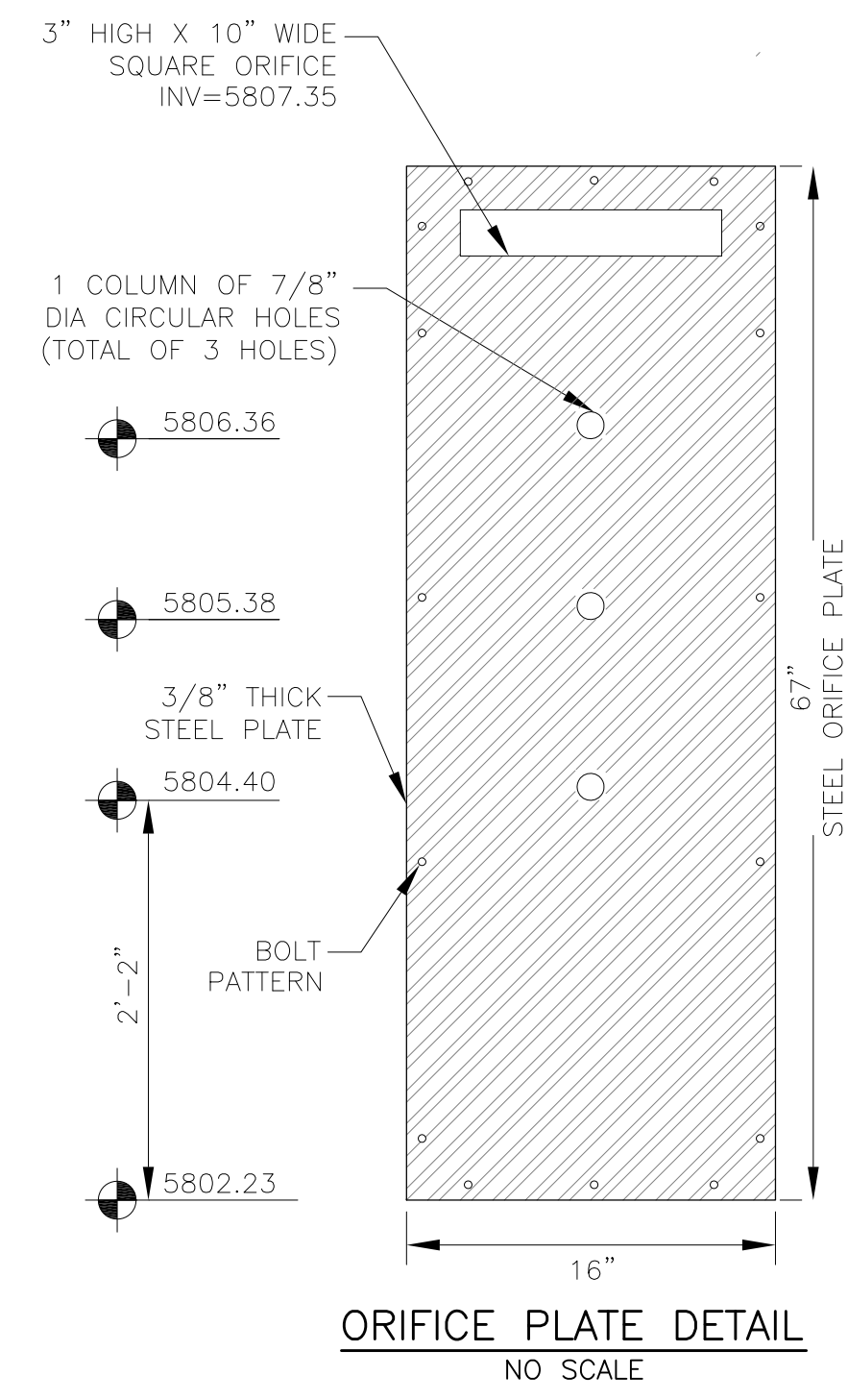
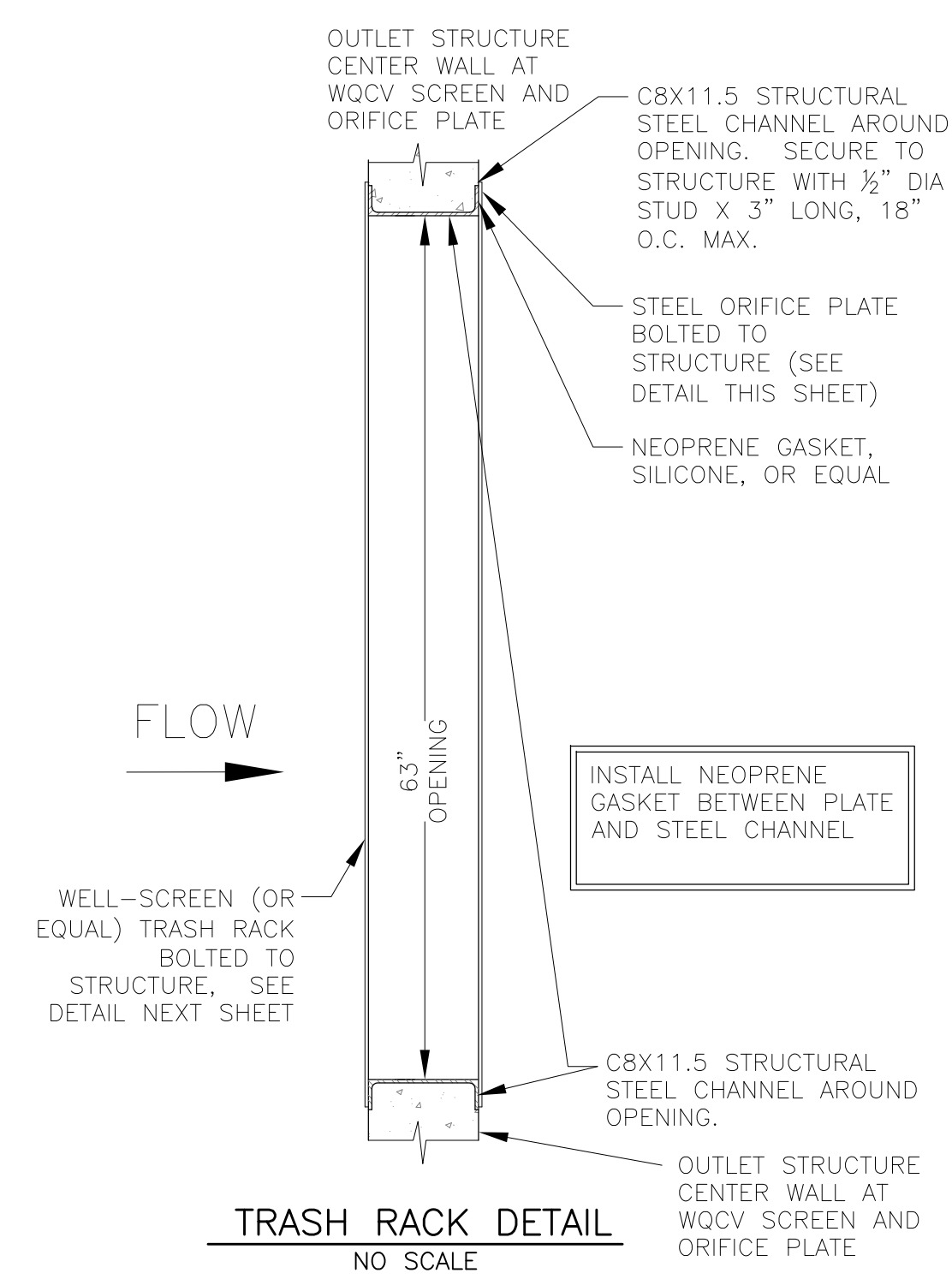
NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION



OUTLET STRUCTURE DETAIL - PLAN VIEW  
NO SCALE



OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE

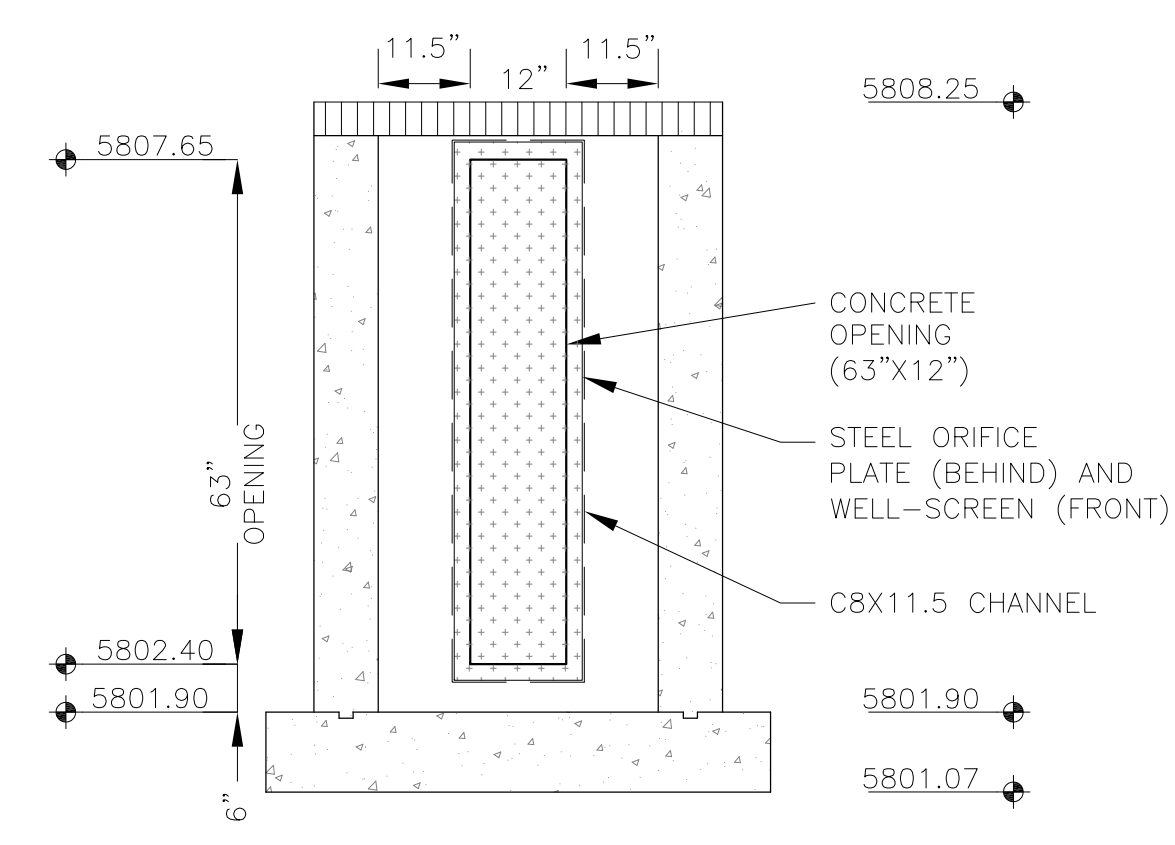


OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
  - 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" |
- CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
  - CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE.
  - EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
  - ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
  - SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
  - REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
  - ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

WQCV WELL-SCREEN NOTES:

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

separate each RPA area into it's own column, unless all the RPA's have the same Width and other inputs.

**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 <sup>2</sup> )	--																			
UIA (ft <sup>2</sup> )	9,500																			
RPA (ft <sup>2</sup> )	5,000																			
SPA (ft <sup>2</sup> )	--																			
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 <sup>2</sup> )	14,500																			
L / W Ratio	1.45																			
UIA / Area	0.6552																			
Runoff (in)	0.00																			
Runoff (ft <sup>3</sup> )	0																			
Runoff Reduction (ft <sup>3</sup> )	396																			

**CALCULATED WQCV RESULTS**

Area ID	res. Lot																			
WQCV (ft <sup>3</sup> )	396																			
WQCV Reduction (ft <sup>3</sup> )	396																			
WQCV Reduction (%)	100%																			
Untreated WQCV (ft <sup>3</sup> )	0																			

**CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)**

Downstream Design Point ID	1																			
DCIA (ft <sup>2</sup> )	0																			
UIA (ft <sup>2</sup> )	9,500																			
RPA (ft <sup>2</sup> )	5,000																			
SPA (ft <sup>2</sup> )	0																			
Total Area (ft <sup>2</sup> )	14,500																			
Total Impervious Area (ft <sup>2</sup> )	9,500																			
WQCV (ft <sup>3</sup> )	396																			
WQCV Reduction (ft <sup>3</sup> )	396																			
WQCV Reduction (%)	100%																			
Untreated WQCV (ft <sup>3</sup> )	0																			

**CALCULATED SITE RESULTS (sums results from all columns in worksheet)**

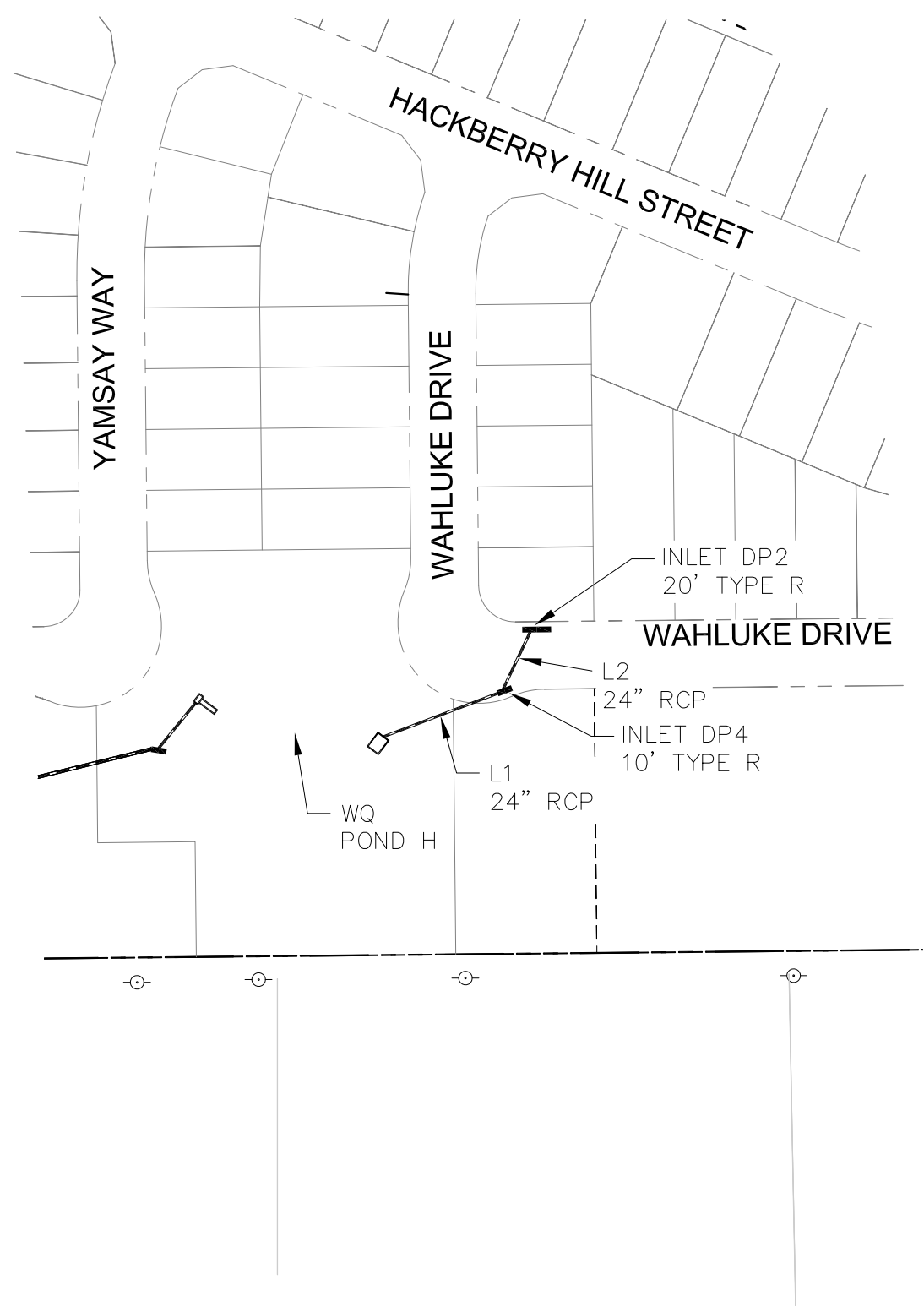
Total Area (ft <sup>2</sup> )	14,500
Total Impervious Area (ft <sup>2</sup> )	9,500
WQCV (ft <sup>3</sup> )	396
WQCV Reduction (ft <sup>3</sup> )	396
WQCV Reduction (%)	100%
Untreated WQCV (ft <sup>3</sup> )	0

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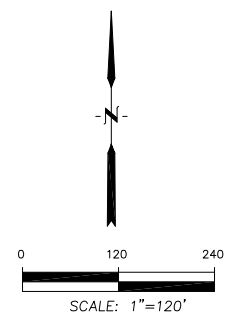
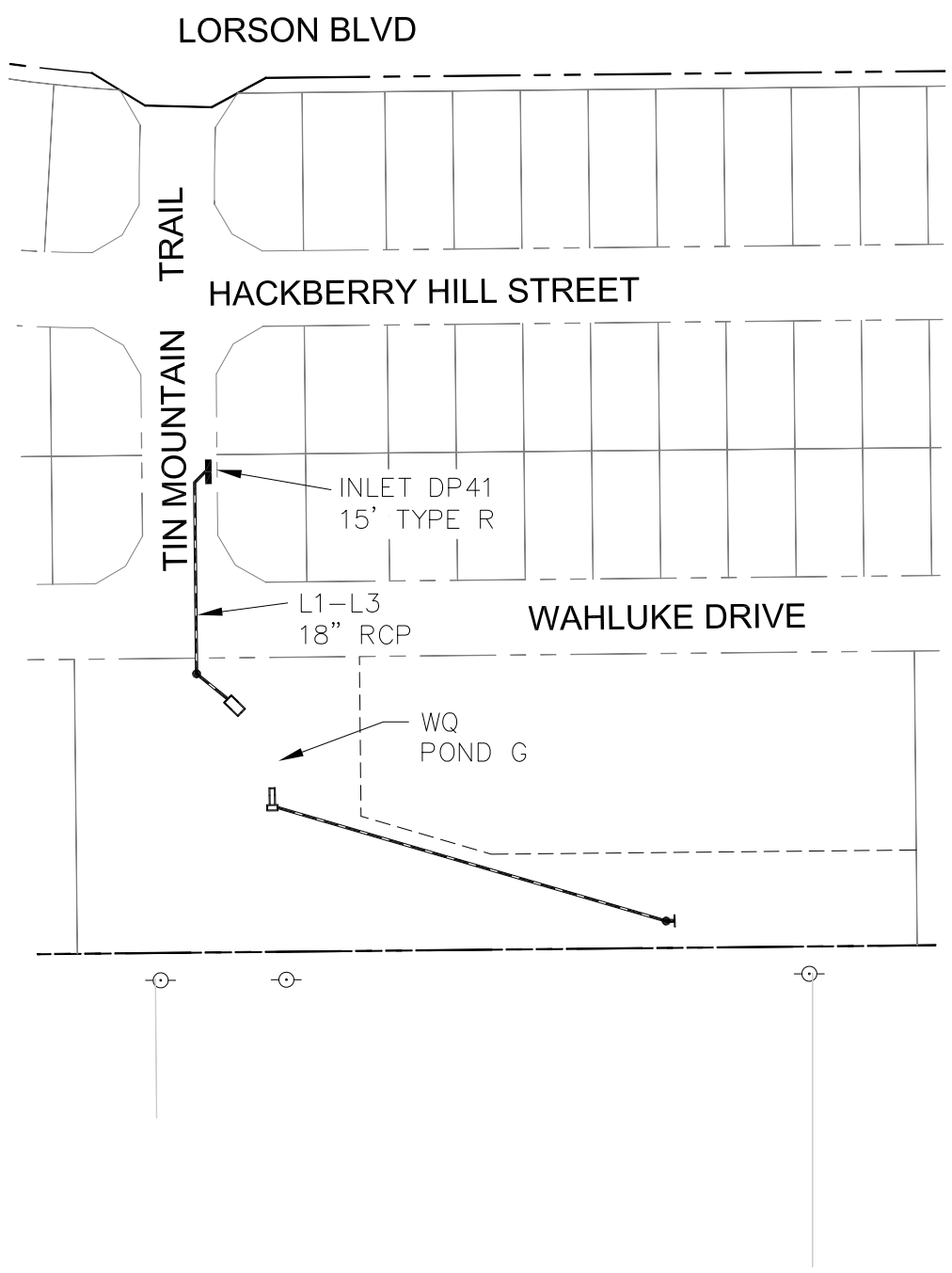
**APPENDIX E- STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS**

---

# BASINS B STORM SCHEMATIC



# BASINS G STORM SCHEMATIC



**CORE ENGINEERING GROUP**  
 15004 1ST AVE. S.  
 BURNSVILLE, MN 55306  
 PH: 719.570.1100  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@cegi.com

NO.	DESCRIPTION	DATE

PREPARED FOR: **LORSON, LLC**  
 212 N. WAHSATCH AVE., SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 CONTRACT: JEFF MARK

PROJECT: **HILLSIDE AT LORSON RANCH**  
 LORSON BLVD AND WAHLUKE DR  
 EL PASO COUNTY, COLORADO

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\Drawings\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

<b>hillside B basins -5yr</b>	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

<b>hillside B basins -100yr</b>	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

<b>hillside G basins -5yr</b>	Number of lines: 3	Run Date: 01-14-2022
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NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.



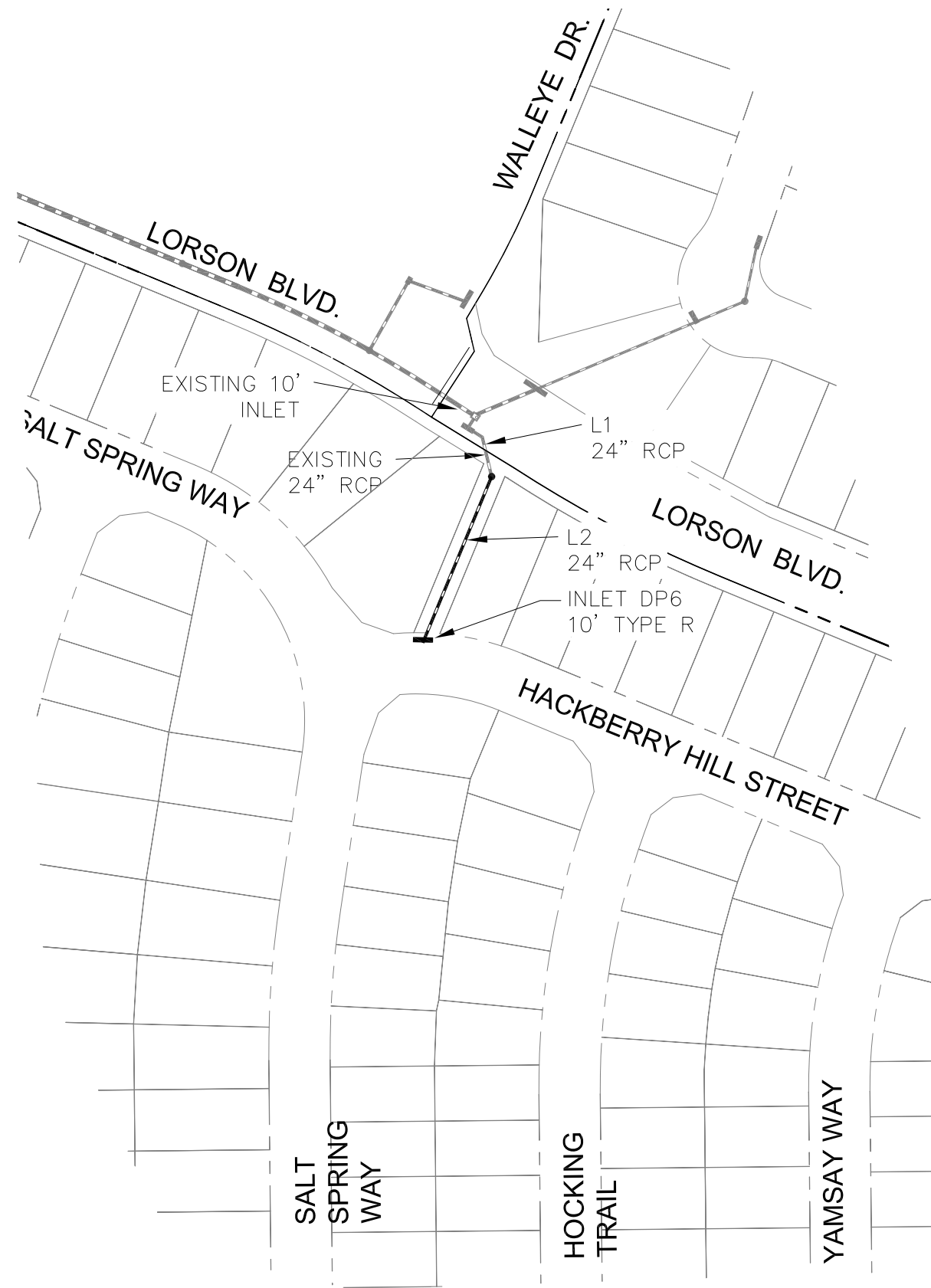
# Storm Sewer Summary Report

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

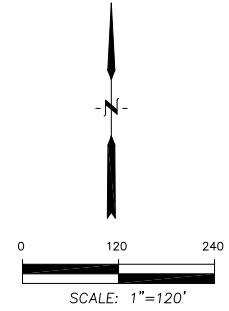
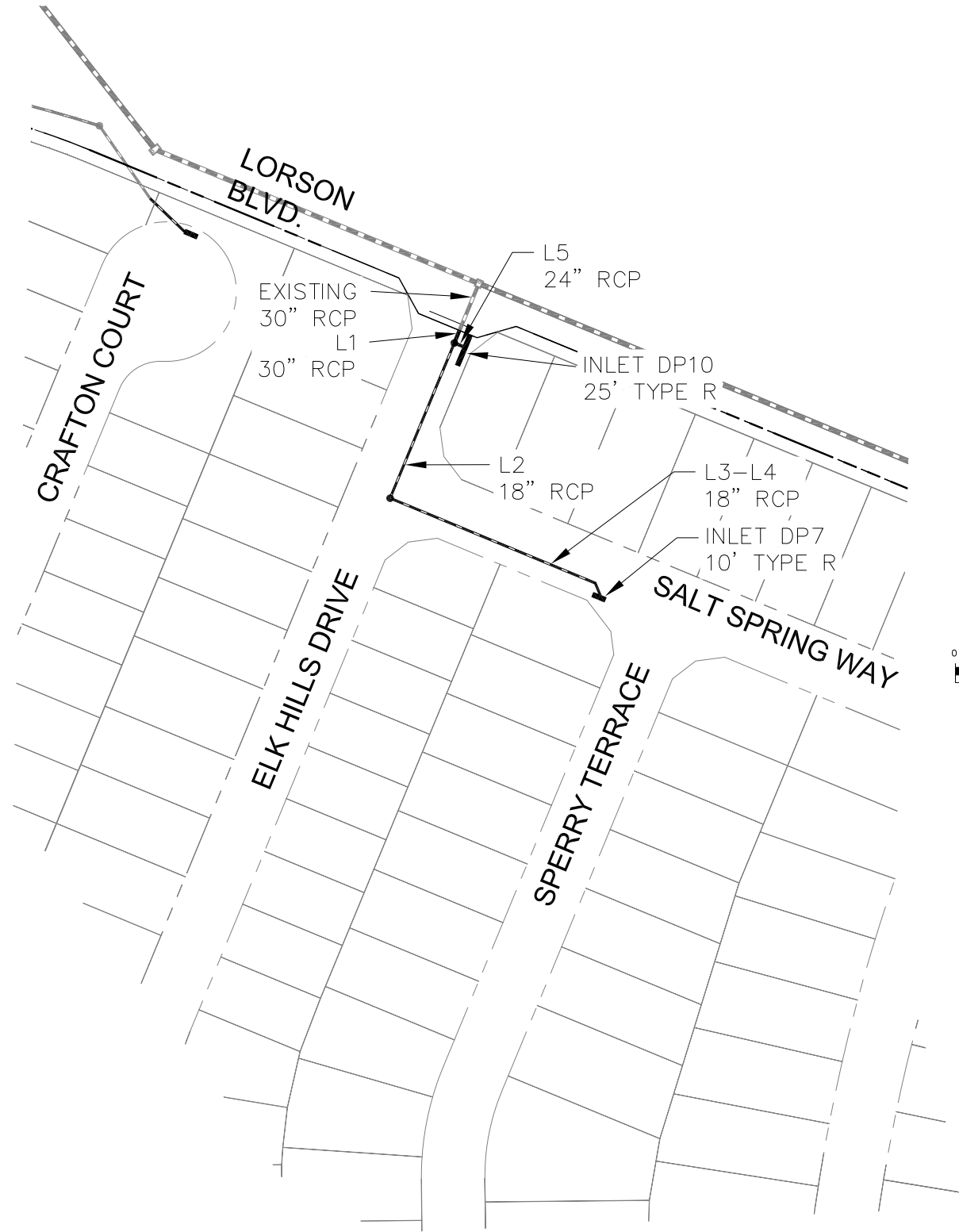
<b>hillside G basins -100yr</b>	Number of lines: 3	Run Date: 01-14-2022
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NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; \*Surcharged (HGL above crown).

# BASINS C1 STORM SCHEMATIC



# BASINS C4 STORM SCHEMATIC



P: 100.100.065\_ebschone-100.065-storm\_schematic.dwg Jan 14, 2022 - 12:09pm

**CORE ENGINEERING GROUP**  
 15004 1ST AVE. S.  
 BURNSVILLE, MN 55306  
 PH: 719.570.1100  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@cegi.com

NO.	DESCRIPTION	DATE

PREPARED FOR: **LORSON, LLC**  
 212 N. WAHSATCH AVE., SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 (719) 570-1100  
 CONTACT: JEFF MARK

DRAWN: RLS  
 DESIGNED: LAB  
 CHECKED: LAB

**STORM SEWER SCHEMATIC**  
**BASINS C1 & C4**  
**HILLSIDE AT LORSON RANCH**

DATE	JAN, 2022
PROJECT NO.	100.065
SHEET NUMBER	1
TOTAL SHEETS:	1

# 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

<b>hillside C1 basins -5yr</b>	Number of lines: 2	Run Date: 01-14-2022
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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

<b>hillside C1 basins -100yr</b>	Number of lines: 2	Run Date: 01-14-2022
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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	6.00	18 c	130.3	5789.60	5790.77	0.898	5790.86	5791.71	n/a	5791.71 j	1
3		6.00	18 c	175.0	5790.87	5795.51	2.651	5791.94	5796.45	n/a	5796.45 j	2
4	4	6.00	18 c	10.2	5795.51	5795.78	2.639	5796.68	5796.72	0.42	5796.72	3
5	5	11.30	24 c	7.5	5789.10	5789.17	0.933	5790.75	5790.74	0.28	5791.03	1

<b>hillside c4 basins -5yr</b>	Number of lines: 5	Run Date: 01-14-2022
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NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

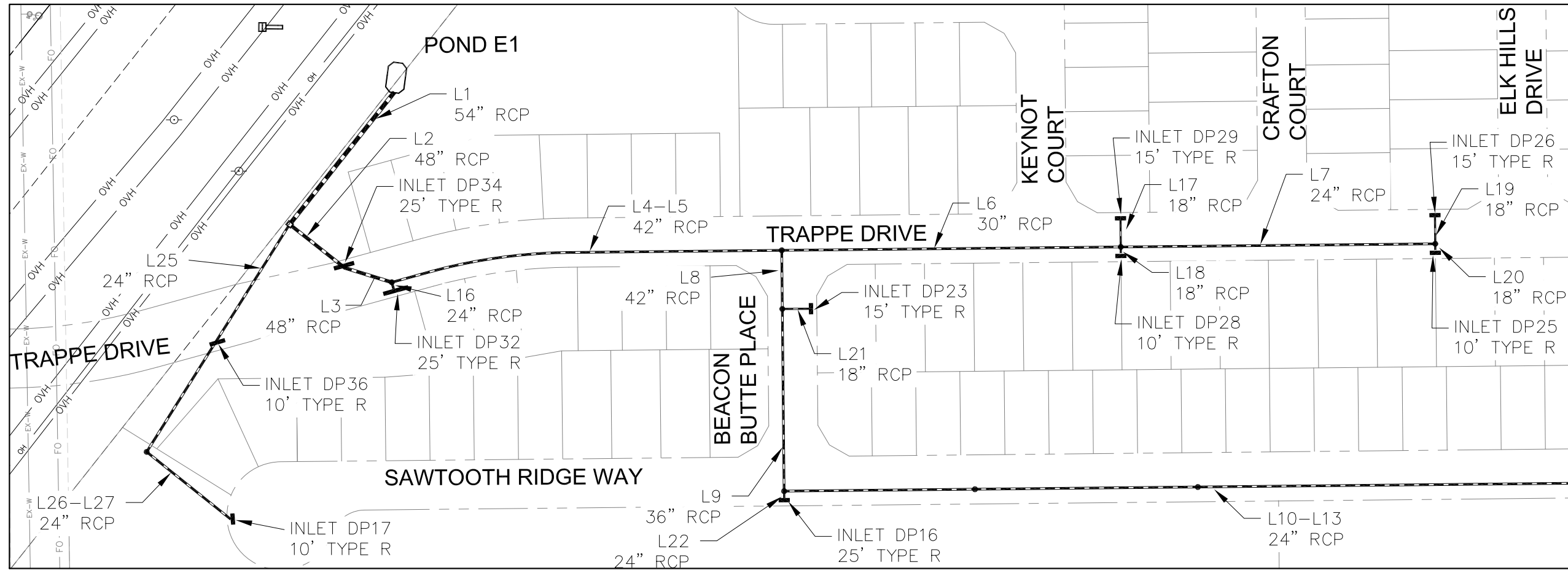
# Storm Sewer Summary Report

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	9.10	18 c	130.3	5789.60	5790.77	0.898	5792.36*	5793.34*	0.25	5793.59	1
3		9.10	18 c	175.0	5790.87	5795.51	2.651	5793.59	5796.66	n/a	5796.66 j	2
4	4	9.10	18 c	10.2	5795.51	5795.78	2.639	5796.86	5796.93	n/a	5796.93	3
5	5	32.00	24 c	7.5	5789.10	5789.17	0.933	5791.62*	5791.77*	1.61	5793.39	1

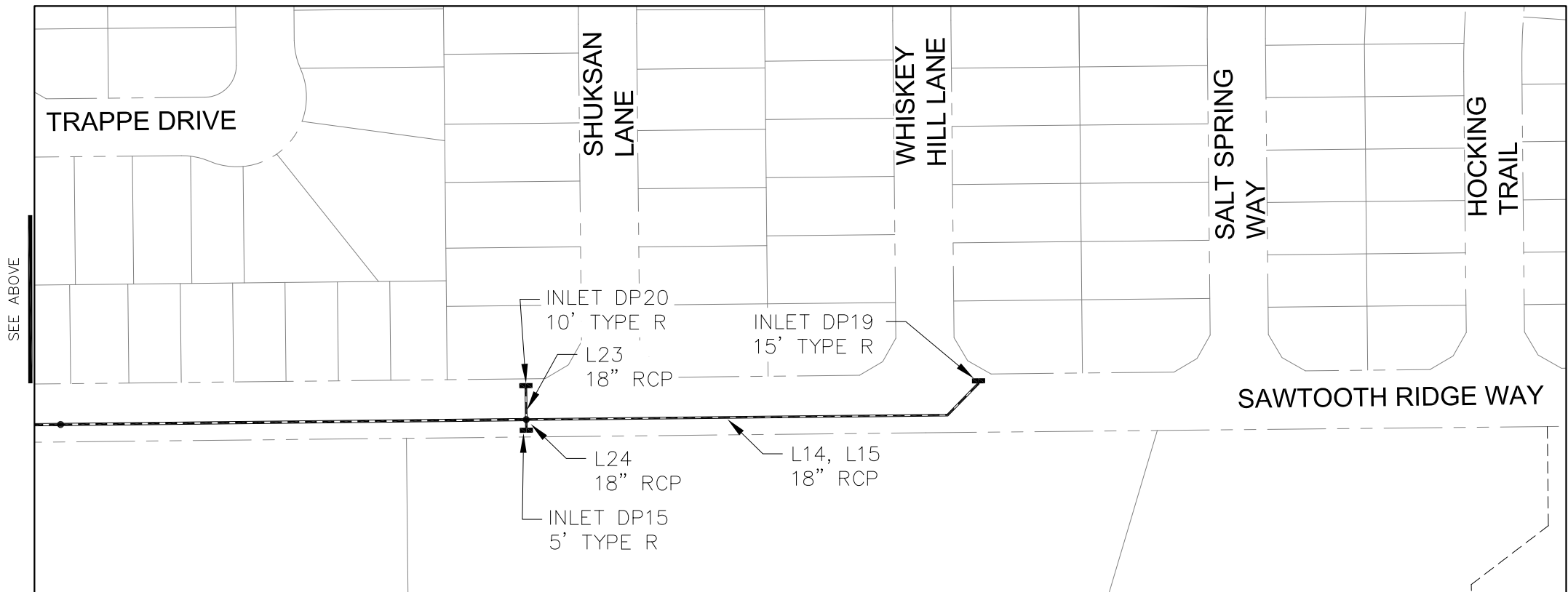
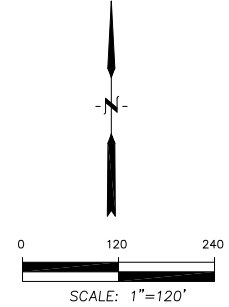
<b>hillside c4 basins -100yr</b>	Number of lines: 5	Run Date: 01-14-2022
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NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; \*Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# BASINS E STORM SCHEMATIC



SEE BELOW



SEE ABOVE

<p><b>CORE ENGINEERING GROUP</b> 15004 1ST AVE. S. BURNSVILLE, MN 55306 PH: 719.570.1100 CONTACT: RICHARD L. SCHINDLER, P.E. EMAIL: Rich@cegi.com</p>	
DATE	
DESCRIPTION	
NO.	
PROJECT:	HILLSIDE AT LORSON RANCH LORSON BLVD AND WALLEYE DR EL PASO COUNTY, COLORADO
PREPARED FOR:	LORSON, LLC 212 N. WAHSATCH AVE., SUITE 301 COLORADO SPRINGS, COLORADO 80903 CONTACT: JEFF MARK
DRAWN:	RLS
DESIGNED:	LAB
CHECKED:	LAB
<p><b>STORM SEWER SCHEMATIC</b> <b>BASINS E</b> <b>HILLSIDE AT LORSON RANCH</b></p>	
DATE	JAN, 2022
PROJECT NO.	100.065
SHEET NUMBER	1
TOTAL SHEETS:	1

P: 100.100.065\_schematic - 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.



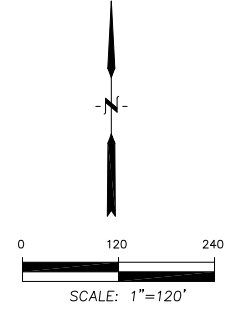
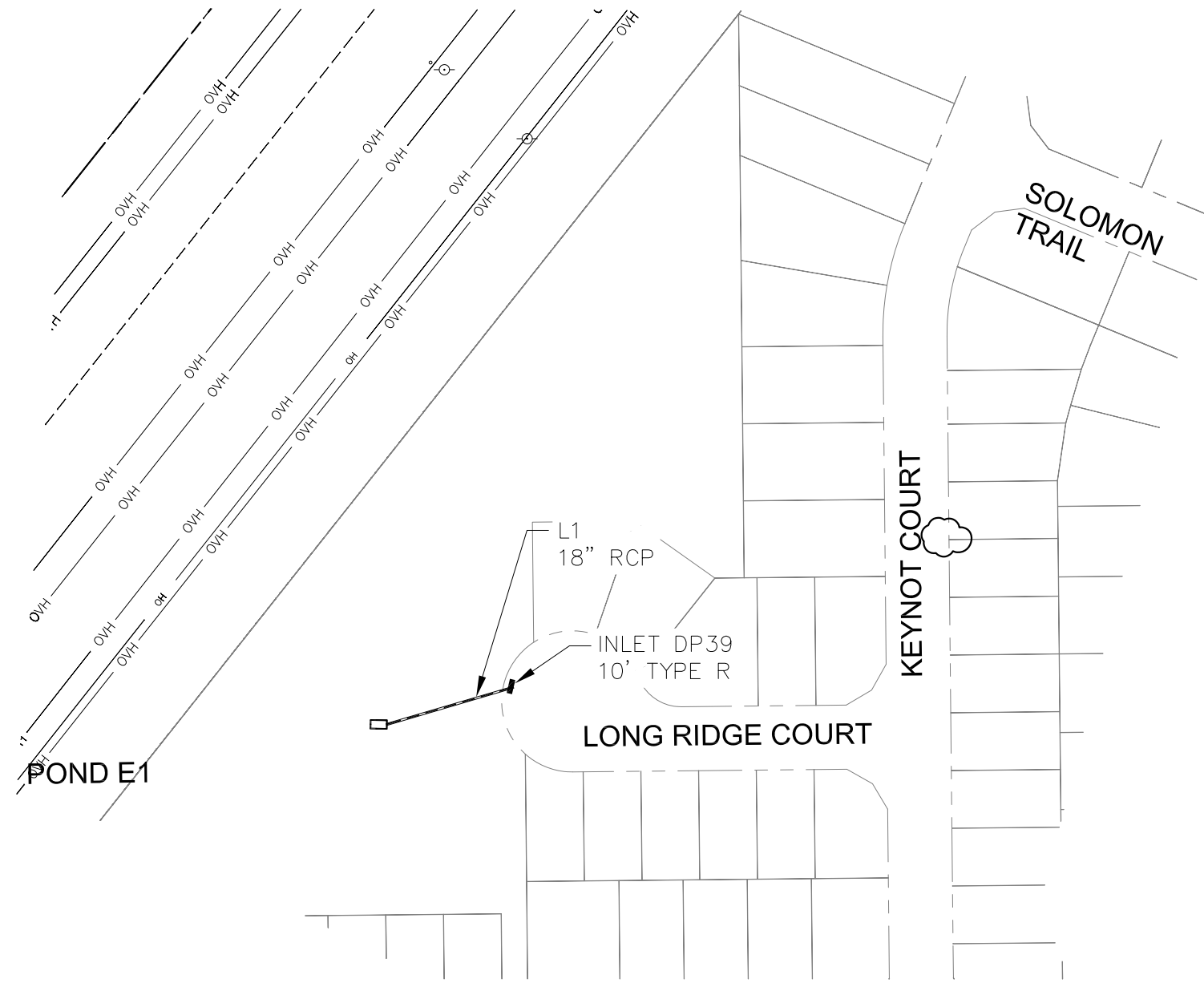
# Storm Sewer Summary Report

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	146.4	48 c	48.1	5737.50	5738.46	1.998	5741.02	5742.03	n/a	5742.03	2
4	4	120.2	42 c	150.3	5739.01	5741.51	1.663	5742.03	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	26.20	24 c	10.2	5740.51	5741.22	6.995	5743.33*	5743.46*	1.08	5744.54	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: 01-14-2022
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NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; \*Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# BASINS E14 STORM SCHEMATIC



P: 100.100.065\_ebrc009e-100.065-storm\_schematic.dwg Jan 14, 2022 - 12:44pm

 <b>CORE ENGINEERING GROUP</b> 15004 1ST AVE. S. BURNSVILLE, MN 55306 PH: 719.570.1100 CONTACT: RICHARD L. SCHINDLER, P.E. EMAIL: Rich@cegi.com													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">NO.</th> <th style="width: 80%;">DESCRIPTION</th> <th style="width: 10%;">DATE</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	NO.	DESCRIPTION	DATE										<p>PROJECT: HILLSIDE AT LORSON RANCH          LORSON BLVD, WALLEYE DR          EL PASO COUNTY, COLORADO</p> <p>PREPARED FOR: LORSON, LLC          212 N. WAHSATCH AVE., SUITE 301          COLORADO SPRINGS, COLORADO 80903          CONTRACT: JEFF MARK</p>
NO.	DESCRIPTION	DATE											
DRAWN: RLS DESIGNED: LAB CHECKED: LAB													
<b>STORM SEWER SCHEMATIC</b> <b>BASINS E14</b> <b>HILLSIDE AT LORSON RANCH</b>													
DATE JAN, 2022													
PROJECT NO. 100.065													
SHEET NUMBER <b>1</b>													
TOTAL SHEETS: 1													

# 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
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NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

# Storm Sewer Summary Report








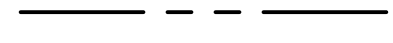



Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	10.30	18 c	102.6	5731.10	5747.51	15.995	5732.33	5748.74	n/a	5748.74 j	End

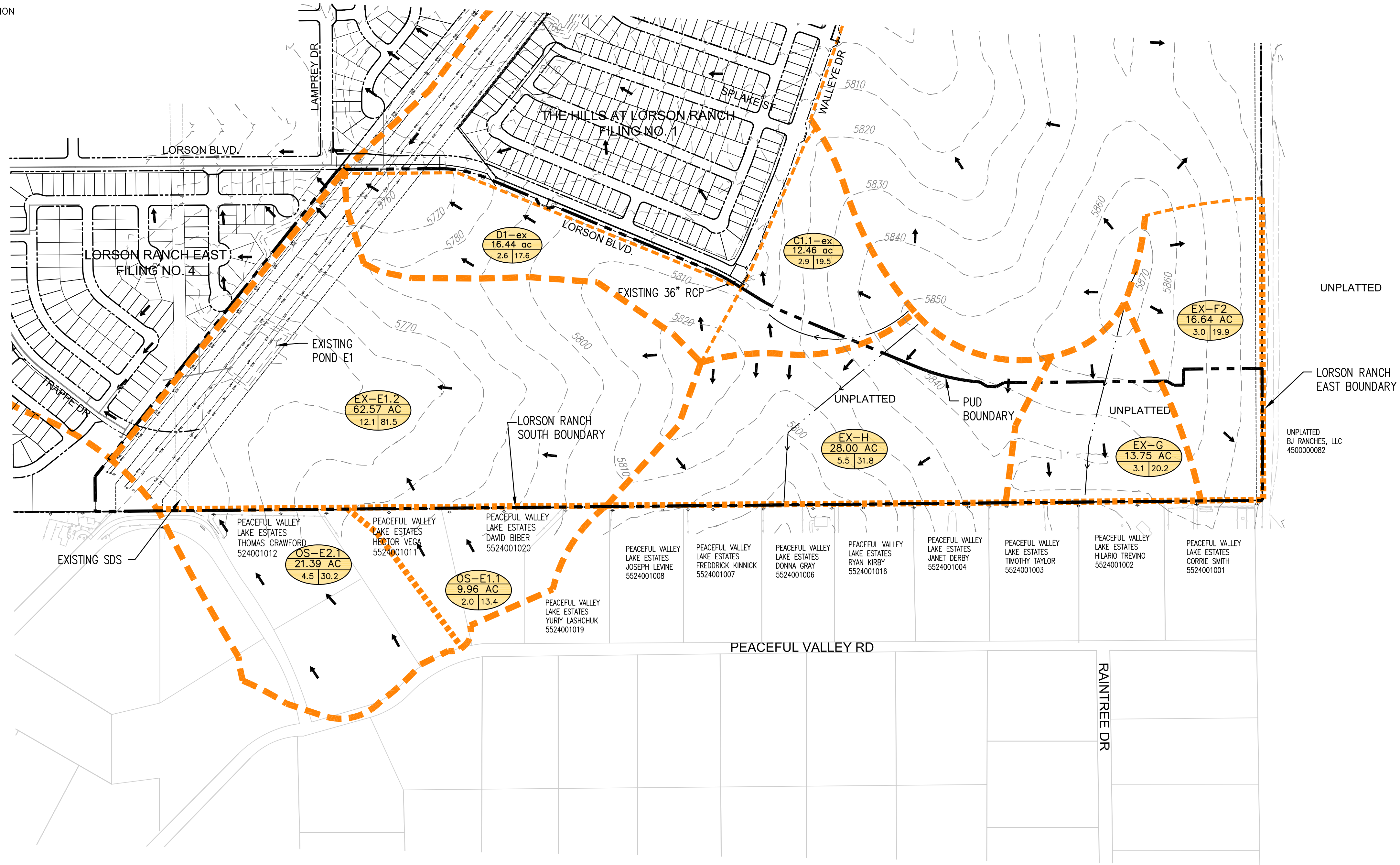
<b>hillside e14 basins -100yr</b>	Number of lines: 1	Run Date: 01-14-2022
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NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.

# 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

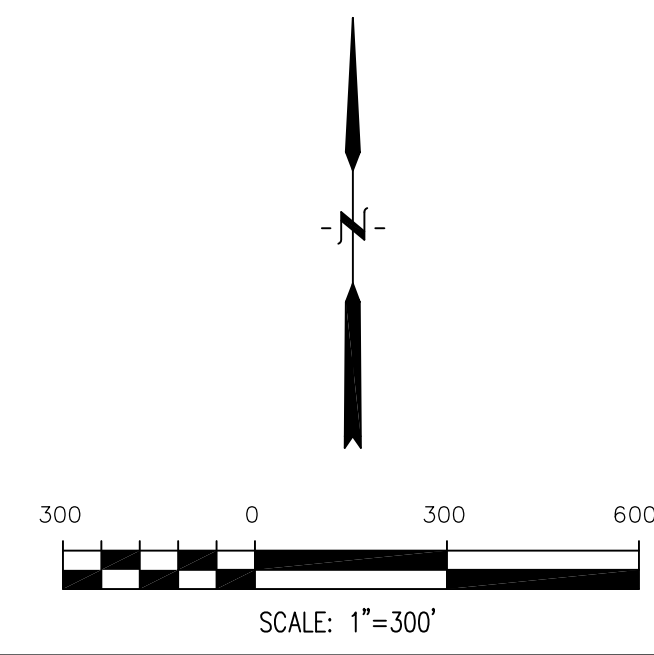


**CORE ENGINEERING GROUP**  
 15004 1ST AVENUE S.  
 PHOENIX, AZ 85006  
 CONTACT: RICHARD L. SCHINDLER, P.E.  
 EMAIL: Rich@cegi.com

DATE	
DESCRIPTION	
PROJECT	HILLSIDE AT LORSON RANCH LORSON BLVD / WALLEYE DRIVE EL PASO COUNTY, COLORADO
PREPARED FOR	LORSON LLC 212 NORTH WAHATCH AVE, SUITE 301 COLORADO SPRINGS, COLORADO 80903 (719) 635-3200 CONTACT: JEFF MARK
DRAWN	RLS
DESIGNED	RLS
CHECKED	RLS

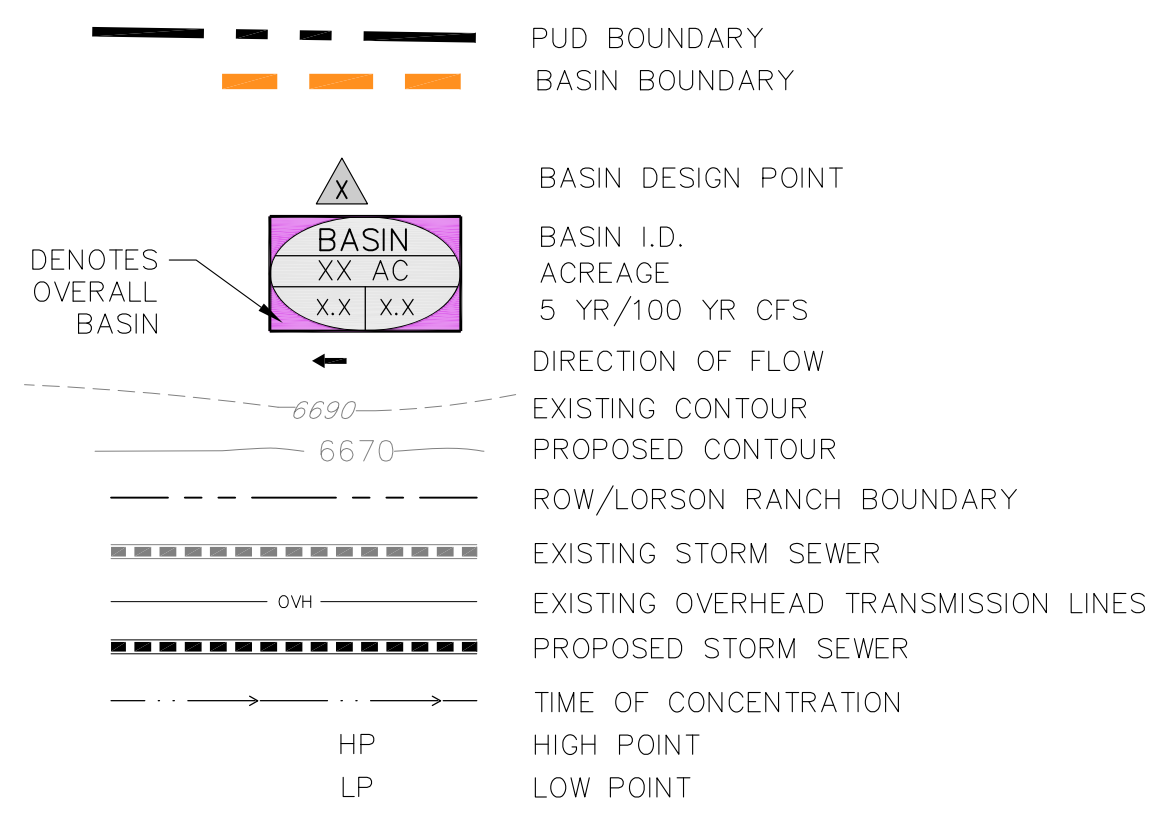
**EXISTING CONDITIONS  
 PUD / PRELIMINARY PLAN  
 HILLSIDE AT LORSON RANCH**

DATE:	JAN, 2022
PROJECT NO.	100.065
SHEET NUMBER	1
TOTAL SHEETS:	1





**LEGEND**



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	146.4	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

connected?  
Label existing pipes and which pond it flows to (Hills at Lorson D2?)  
Label existing inlets -- DP47c and d?  
Label D1.4  
Label to Pond C1

LORSON RANCH EAST FIL 4

POND E1

LORSON RANCH EAST FIL 4

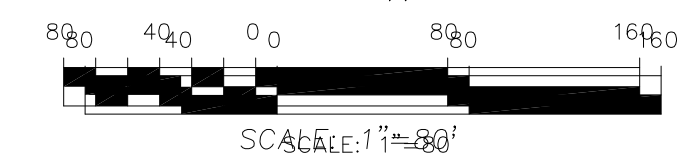
EXISTING SWALE

Add label for which pond this flows to (E2?)

Show maintenance access roads

SEE SHEET 2

SEE SHEET 4



**CORE ENGINEERING GROUP**  
15004 1ST AVE. S.  
BURNSVILLE, MN 55306  
PH: 763-570-1100  
FAX: 763-570-1100  
EMAIL: Rich@cegg.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO. \_\_\_\_\_  
DRAWN: RL6  
DESIGNED: L&B  
CHECKED: L&B

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

PROJECT:  
**HILLSIDE AT LORSON RANCH**  
LORSON BLVD - WALLEY DRIVE  
EL PASO COUNTY, COLORADO

**DEVELOPED CONDITIONS**  
**HILLSIDE AT LORSON RANCH**  
**X**

DATE: JAN, 2022  
PROJECT NO: 100.065  
SHEET NUMBER: 1  
TOTAL SHEETS: 4

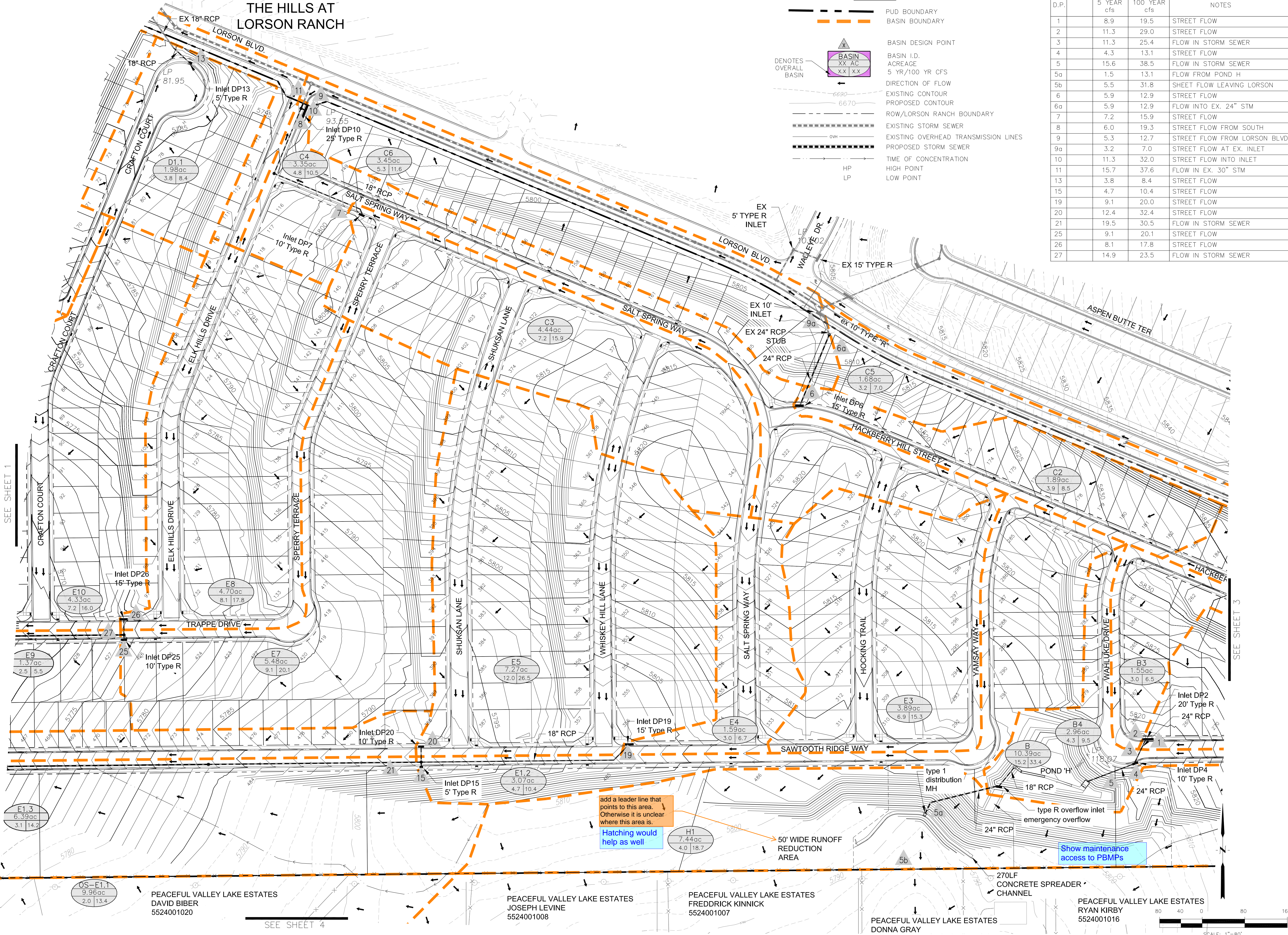


# THE HILLS AT LORSON RANCH

## LEGEND

- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D.  
ACREAGE  
5 YR/100 YR CFS
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- EXISTING OVERHEAD TRANSMISSION LINES
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HIGH POINT
- 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	6.0	19.3	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	11.3	32.0	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



add a leader line that points to this area. Otherwise it is unclear where this area is.

Hatching would help as well

50' WIDE RUNOFF REDUCTION AREA

Show maintenance access to PBMPs

SEE SHEET 1

SEE SHEET 3

SEE SHEET 4

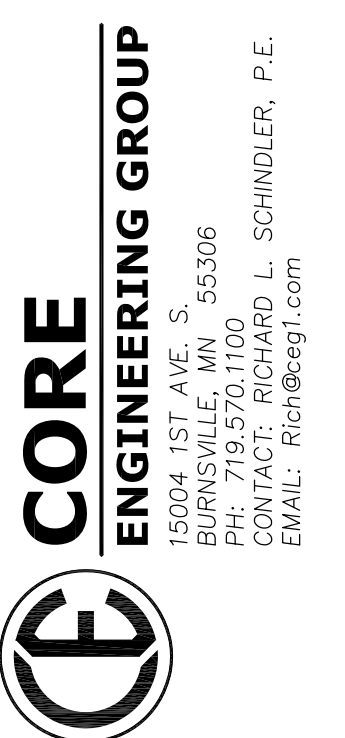
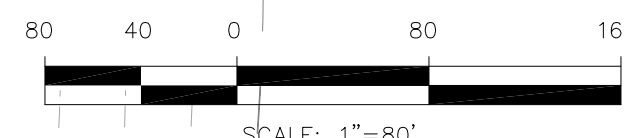
PEACEFUL VALLEY LAKE ESTATES  
DAVID BIBER  
5524001020

PEACEFUL VALLEY LAKE ESTATES  
JOSEPH LEVINE  
5524001008

PEACEFUL VALLEY LAKE ESTATES  
FREDRICK KINNICK  
5524001007

PEACEFUL VALLEY LAKE ESTATES  
DONNA GRAY

PEACEFUL VALLEY LAKE ESTATES  
RYAN KIRBY  
5524001016



DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
DRAWN: RL6  
DESIGNED: LB  
CHECKED: LB

PREPARED FOR:  
PROJECT:  
HILLSIDE AT LORSON RANCH  
LORSON BLVD - WALLEY DRIVE  
EL PASO COUNTY, COLORADO

DATE: \_\_\_\_\_  
PROJECT NO:  
100.065  
SHEET NUMBER:  
2

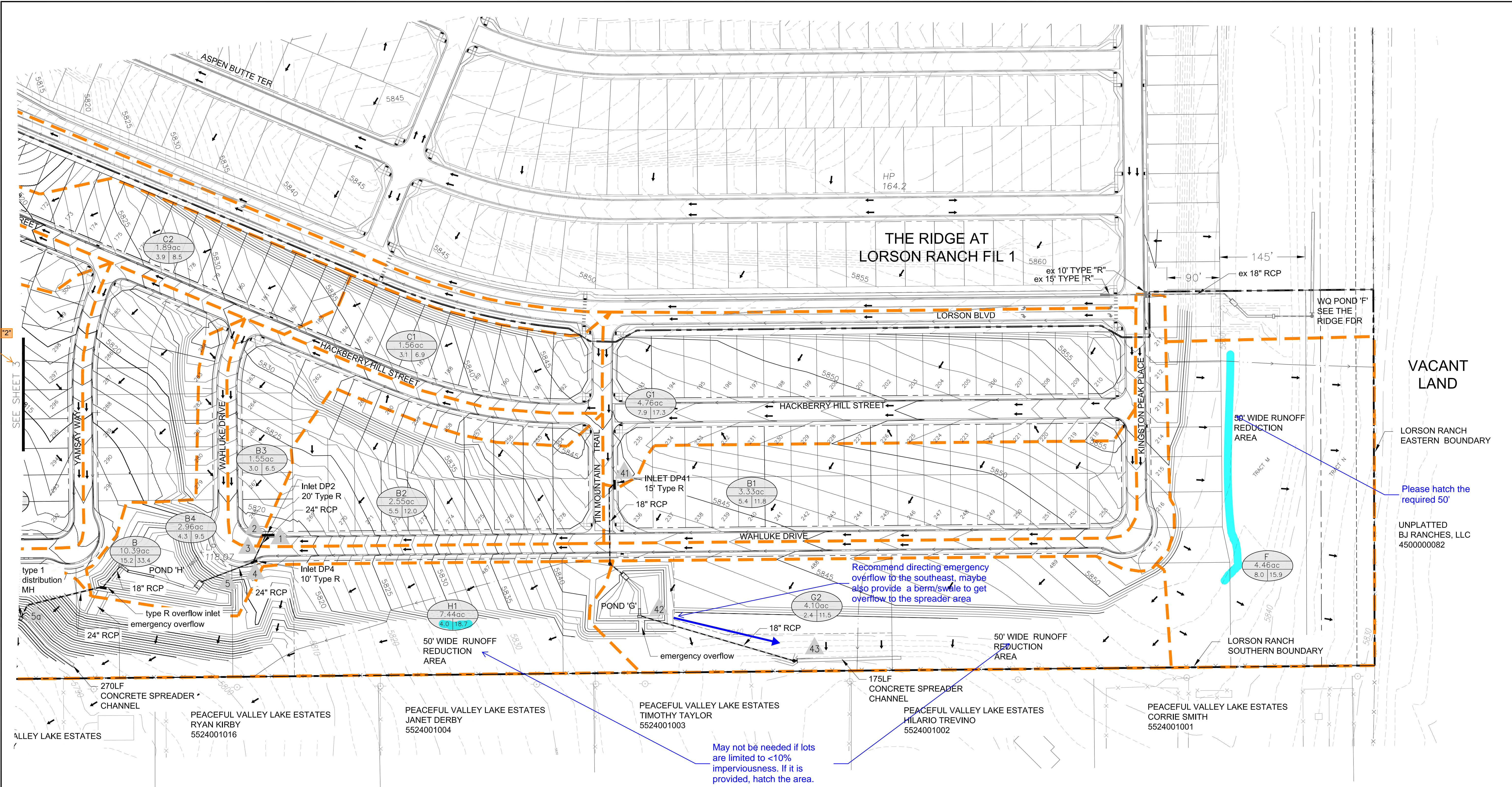
DEVELOPED CONDITIONS  
HILLSIDE AT LORSON RANCH  
X

DATE: JAN, 2022  
PROJECT NO: 100.065  
SHEET NUMBER: 2  
TOTAL SHEETS: 4

CORE ENGINEERING GROUP  
15004 1ST AVE. S.  
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PREPARED FOR:  
PROJECT:  
HILLSIDE AT LORSON RANCH  
LORSON BLVD - WALLEY DRIVE  
EL PASO COUNTY, COLORADO 80903  
CONTACT: JEFF MARK





revise to "2"

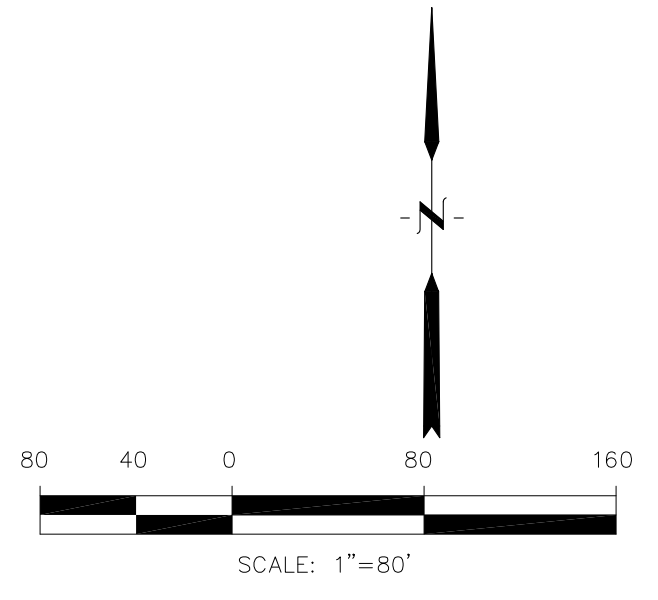
SEE SHEET 3

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

Show maintenance access to PBMPs

**LEGEND**

- PUD BOUNDARY
- - - BASIN BOUNDARY
- ▲ BASIN DESIGN POINT
- △ DENOTES OVERALL BASIN
- BASIN I.D. ACREAGE 5 YR/100 YR CFS
- 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



May not be needed if lots are limited to <10% imperviousness. If it is provided, hatch the area.

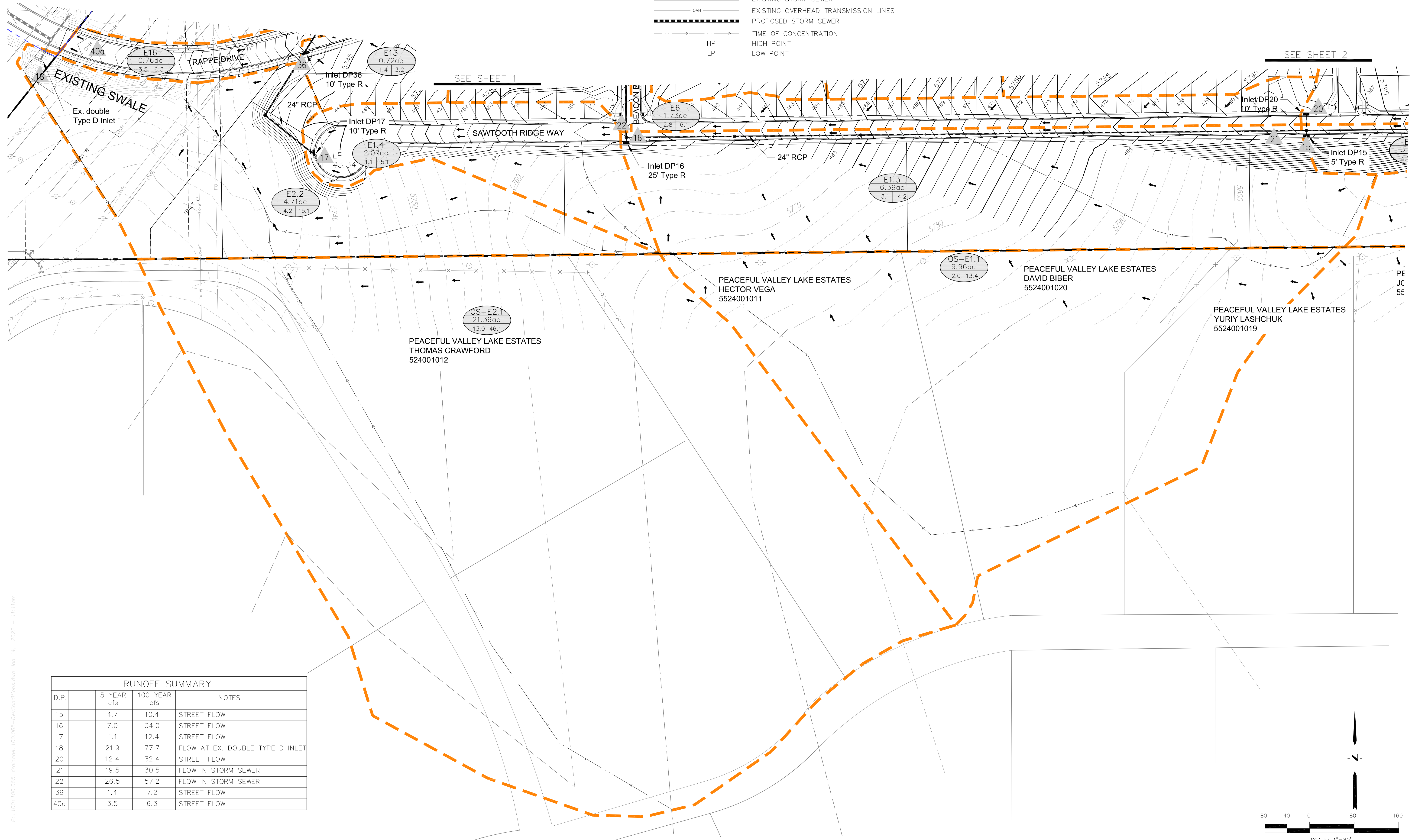
Recommend directing emergency overflow to the southeast, maybe also provide a berm/swale to get overflow to the spreader area

Please hatch the required 50'

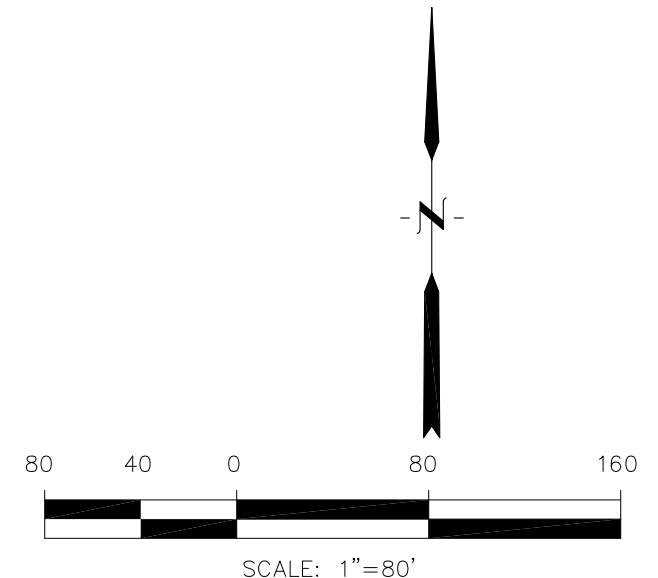


LEGEND

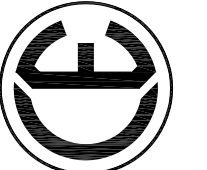
- PUD BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. ACREAGE
- 5 YR/100 YR CFS
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- TIME OF CONCENTRATION
- HIGH POINT
- LOW POINT



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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 PH: 763-570-1100  
 FAX: 763-570-1100  
 EMAIL: Rich@cegi.com



DATE: \_\_\_\_\_  
 DESCRIPTION: \_\_\_\_\_  
 NO. \_\_\_\_\_

PREPARED FOR:  
**LORSON, LLC**  
 212 N. WAHSAUCH AVE. SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 CONTACT: JEFF MARK

DRAWN: RL5  
 DESIGNED: LB  
 CHECKED: LB

DEVELOPED CONDITIONS  
**HILLSIDE AT LORSON RANCH**  
 X

DATE  
**JAN, 2022**

PROJECT NO.  
**100.065**

SHEET NUMBER  
**4**

TOTAL SHEETS: **4**

P:\100-100.065-Develop\100.065-Dev\Conditions.dwg Jan 14, 2022 - 11:11am