

# PRELIMINARY DRAINAGE PLAN PUD/SP 21-006

## THE RIDGE AT LORSON RANCH

**MARCH, 2021**  
**REV. JULY, 2021**

### Engineering Review

09/19/2021 2:44:38 PM

dsdrice

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EPC Planning & Community  
Development Department

PCD-ENGINEERING REVIEW COMMENTS  
IN BLUE BOXES WITH BLUE TEXT

See comment letter  
also.

### ***Prepared for:***

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### ***Prepared by:***

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Project No. 100.064



**CORE**  
**ENGINEERING GROUP**

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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

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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

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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. and 08041C0976 G, dated December 7, 2018. (See Appendix A, FEMA FIRM Exhibit)

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Richard L. Schindler, #33997

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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

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Date

County Engineer/ECM Administrator

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

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## 1.0 LOCATION and DESCRIPTION

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**The Ridge at Lorson Ranch** is located east of the East Tributary of Jimmy Camp Creek. The site is located on approximately 206.473 acres of vacant land. This project will develop this site into a single-family residential development. The land for the residential lots is currently owned by Love In Action

The site is located in the NE 1/4 of Sections 24 and the SE 1/4 of Section 13, Township 15 South and Range 65 West of the 6<sup>th</sup> Principal Meridian. The site is bounded on the north by unplatted land owned by Bull Hill, LLC, on the west by The Hills at Lorson Ranch, on the east by unplatted land, and the south by unplatted land in Lorson Ranch. For reference, a vicinity map is included in Appendix A of this report.

### Conformance with applicable Drainage Basin Planning Studies (DBPS)

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.

### 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 this site includes outlet structures in Detention/WQ Ponds C2.1 and C4 and WQ Pond F. Both detention ponds were graded, low flow channels, and forebays were constructed as part of The Hills at Lorson Ranch under PUDSP-20-003 and the WQ Pond F will be constructed with this project. There are also two bridges over the East Tributary that were built in 2018 to provide access to this development across the East Tributary. The bridges are located at Fontaine Boulevard and Lorson Boulevard.

The Ridge at Lorson Ranch is located within the ***“Jimmy Camp Creek Drainage Basin”***, which is a fee basin in El Paso County and a small portion (SE corner) within the “Upper Williams Creek Drainage Basin which does not have a DBPS.

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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.

### 3.0 EXISTING HYDROLOGICAL CONDITIONS

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

The Soil Conservation Service (SCS) classifies the soils within the site as Manzanola clay loam; Midway Clay Loam, Nelson-Tassel fine Sandy loam; Razor clay loam; and Wiley silt loam [3]. The sandy and silty loams are considered hydrologic soil group B soils with moderate to moderately rapid permeability. The Midway and Razor clay loams are considered hydrologic soil group C/D soils with slow 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). The clay loams are difficult to vegetate and comprise of a small portion of the study area. These soils can be mitigated easily by limiting their use as topsoil since they comprise of a small portion of the study area. 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
52-Manzanola Clay Loam	C	High	Slow	Medium	Moderate
54-Midway Clay Loam	D	High	Slow	Medium	Moderate
56-Nelson – Tassel Fine Sandy Loam	B	Moderate	Moderately Rapid	Slow	Moderate
75-Razor Clay Loam	C	High	Slow	Medium	Moderate
108-Wiley Silt Loam	B	Moderate	Moderate	Medium	Moderate

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

For the purpose of 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 08041C10976 G, effective December 7, 2018.

#### Basin OS-B1.1

This existing offsite basin consists of existing flow from undeveloped areas east of Lorson Ranch. Runoff flows overland to the northwest and drains offsite at Design Point 1x. The existing runoff is 5.2cfs and 29.0cfs for the 5-year and 100-year events.

#### Basin EX-B1

This existing basin consists of existing flow from undeveloped areas within Lorson Ranch near the north property line. Runoff flows overland to the north and drains offsite at Design Point 1x. The existing runoff is 5.6cfs and 31.2cfs for the 5-year and 100-year events.

#### Design Point 1x

Design Point 1x is the total existing runoff flowing offsite to the north. The developed runoff flowing north will need to be lower than the existing runoff at this design point. The existing runoff is 9.7cfs and 54.2cfs for the 5-year and 100-year events.

#### Basin C1.1-ex

This existing basin consists of existing flow from undeveloped areas east of the Lorson Boulevard/Walleye Drive intersection. Runoff flows overland to the west and drains into an existing storm sewer system in Lorson/Walleye. The existing runoff is 3.2cfs and 21cfs for the 5-year and 100-year events.

#### Basin C2.1-ex

This existing basin consists of existing flow from undeveloped areas east of the Fontaine Boulevard/Walleye Drive intersection. Runoff flows overland to the west and drains into an existing storm sewer system in Fontaine/Walleye. The existing runoff is 6.1cfs and 40.2cfs for the 5-year and 100-year events.

#### Basin C2.2-ex

This existing basin consists of existing flow from undeveloped areas on west side of the site. Runoff flows overland to the west and drains to an existing 42" storm sewer that discharges west into Existing Pond C2.1. The existing runoff is 12.2cfs and 81.8cfs for the 5-year and 100-year events.

#### Basin C3.1-ex

This existing basin consists of existing flow from undeveloped areas on the central portion of the PUD. Runoff flows overland to the west and drains into an existing storm sewer system at the intersection of Walleye Drive/Grayling Drive. The existing runoff is 2.6cfs and 15.0cfs for the 5-year and 100-year events.

#### Basin C4.1-ex

This existing basin consists of existing flow from offsite undeveloped areas east of Lorson Ranch. Runoff flows overland to the west into Basin C4.2-ex. The existing runoff is 1.2cfs and 7.8cfs for the 5-year and 100-year events.

#### Basin C4.2-ex

This existing basin consists of existing flow from undeveloped areas in the northern portion of the PUD. Runoff flows overland to the west to Existing Pond C4 excavated as part of The Hills at Lorson Ranch. The existing runoff is 15.0cfs and 85.1cfs for the 5-year and 100-year events.

#### Design Point 4x

Design Point 4x is the existing flow entering Existing Pond C4 from Basin C4.1-ex and C4.2-ex. The existing runoff is 15.3cfs and 87.7cfs for the 5-year and 100-year events from these two basins. This flow is then routed south into Existing Pond C3.

#### Basin EX-F1

This existing basin consists of existing flow from undeveloped areas in the east portions of the PUD. Runoff flows overland eastward and offsite to the adjacent landowner located in the Upper Williams Creek Drainage Basin. The existing runoff is 6.3cfs and 38.5cfs for the 5-year and 100-year events.

#### Basin EX-F2

This existing basin consists of existing flow from undeveloped areas in the east portions of the PUD. Runoff flows overland southeast and offsite to the adjacent landowner located in the Upper Williams Creek Drainage Basin. The existing runoff is 9.1cfs and 51.1cfs for the 5-year and 100-year events.

#### Design Point 2x

Design Point 2x is the total existing flow at the east property line from Basins EX-F1 and EX-F2. The existing runoff is 12.4cfs and 72.7cfs for the 5-year and 100-year events from these two basins. This flows east overland and offsite in the Upper Williams Creek Drainage Basin. Per Colorado Water regulations Lorson Ranch will need to maintain existing runoff amounts into the Upper Williams Creek Drainage Basin.

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### **4.0 DEVELOPED HYDROLOGICAL CONDITIONS**

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Hydrology for the **The Ridge 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/C/D 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.

All detention ponds for this project have been constructed per The Hills at Lorson Ranch (SF21-010 & EGP 20-005) and WQ Pond F will be constructed with this project. See Section 6.0 for Detention Pond Discussions. The list below shows the ponds and the tributary drainage basins:

1. C1 Basins drain to Pond C1
2. C3 & C4 Basins drain to Pond C2.1
3. C5 Basins drain to Pond C2.2
4. C8 Basins drain to Pond C4
5. F Basins drain to WQ Pond F

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

#### Basin C1.1

This basin consists of runoff from residential development and the east side of Nystrom Terrace and the north side of Aspen Butte Terrace. Runoff will be directed west to Design Point 1 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 5.6cfs and 12.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C1.2

This basin consists of runoff from residential development and the west side of Nystrom Terrace and the south side of Aspen Butte Terrace. Runoff will be directed west to Design Point 2 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 2.7cfs and 5.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C1.3

This basin consists of runoff from residential development and the north side of Lorson Blvd. Runoff will be directed south and west in Lorson Boulevard to Design Point 4 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 14.1cfs and 30.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C1.4

This basin consists of runoff from residential development, Nystrom Terrace, and Walleye Drive. Runoff will be directed west to Walleye Drive, then south to Design Point 1b in curb/gutter where it will be collected by an existing 15' Type R inlet. The developed flow from this basin is 4.2cfs and 9.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C1.5

This basin consists of runoff from future residential development and the south side of Lorson Blvd. Runoff will be directed north and west in Lorson Boulevard to Design Point 6 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 3.0cfs and 6.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C1.6

This basin consists of runoff from future residential development southeast of Walleye Dr./Lorson Blvd at Design Point 1a. Runoff will be directed north to Design Point 1a by future streets and a future storm sewer sized to handle a portion of the 100-year storm event from this basin. The remaining runoff will continue west in a future street to a future street intersection at Lorson Boulevard west of Brook Trout Trail. The future developed flow from this basin is 12.8cfs and 28.3cfs for the 5/100-year storm event. See the appendix for detailed calculations. This flow is only to be used to size a storm sewer stub from Design Point 6

#### Basin C3.1

This basin consists of runoff from residential development, Aspen Butte Terrace, Copper Butte Way, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 12 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 9.9cfs and 21.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.2

This basin consists of runoff from residential development, Mission Peak Place, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 13 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. 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 C3.3

This basin consists of runoff from residential development, Pearsoll Street, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 15 in curb/gutter of Split Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 8.5cfs and 18.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.4

This basin consists of runoff from residential development, Lost Peak Lane, and the east half of Split Mountain Drive. Runoff will be directed west and north to Design Point 17 in curb/gutter of Split

Mountain Drive where it will be collected by a Type R inlet. The developed flow from this basin is 7.2cfs and 15.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.5

This basin consists of runoff from residential development, Split Mountain Drive, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 19 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 10.3cfs and 22.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.6a

This basin consists of runoff from residential development and the north side of Lake Trout Dr. Runoff will be directed west to Design Point 20a in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 5.6cfs and 12.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.6b

This basin consists of runoff from residential development and Lookout Peak Lane. Runoff will be directed west and south to Design Point 21 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. 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 C3.7

This basin consists of runoff from residential development, Dragontail Terrace, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 23 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 8.7cfs and 19.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.8

This basin consists of runoff from residential development, Foraker Lane, Raven Ridge Terrace, and the north side of Lake Trout Dr. Runoff will be directed west and south to Design Point 25 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 10.0cfs and 22.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.9

This basin consists of runoff from residential development, Raven Ridge Terrace, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 27 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 8.1cfs and 17.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C3.10

This basin consists of runoff from residential development, Nystrom Terrace, and the south side of Lake Trout Dr. Runoff will be directed north and west to Design Point 29 in curb/gutter of Lake Trout Dr where it will be collected by a Type R inlet. The developed flow from this basin is 9.2cfs and 20.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C4.1

This basin consists of runoff from residential development, Pearsoll Street, Buckner Way, and the south side of Fontaine Boulevard. Runoff will be directed north and west to Fontaine Boulevard where it will flow west to Design Point 31. The developed flow from this basin is 6.4cfs and 14.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C4.2

This basin consists of runoff from residential development and the south side of Fontaine Boulevard. Runoff will be directed north and west to Fontaine Boulevard to Design Point 31. 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 C4.3

This basin consists of runoff from residential development, Lake Trout Dr, and Nystrom Terrace. Runoff will be directed north and west to Design Point 32 in curb/gutter of Nystrom Terrace where it will be collected by a Type R inlet. The developed flow from this basin is 5.7cfs and 12.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C4.4

This basin consists of runoff from residential development, Lake Trout Dr, and the west side of Walleye Drive. Runoff will be directed west and north to an existing 25' Type R inlet at Design Point 33 in curb/gutter of Walleye Drive. The developed flow from this basin is 6.2cfs and 13.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.1a

This basin consists of runoff from residential development and the south side of Sanderling Street. Runoff will be directed west and south to Design Point 39 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 4.2cfs and 9.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.1b

This basin consists of runoff from residential development and the north side of Gray Wolf Court. Runoff will be directed west to Design Point 36 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 11.4cfs and 25.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.1c

This basin consists of runoff from residential development and the south side of Gray Wolf Court. Runoff will be directed west to Design Point 37 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 7.4cfs and 16.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.1d

This basin consists of runoff from residential development and the north side of Snowfield Court. Runoff will be directed west and north to Design Point 41 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 9.3cfs and 20.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.1e

This basin consists of runoff from residential development and the south side of Snowfield Court. Runoff will be directed west to Design Point 43 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 10.0cfs and 21.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.2

This basin consists of runoff from residential development and the west side of Walleye Drive. Runoff will be directed south to Design Point 45 in curb/gutter where it will be collected by an existing 15' Type R inlet. The developed flow from this basin is 3.7cfs and 8.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C5.3

This basin consists of runoff from residential development and the north side of Fontaine Boulevard. Runoff will be directed west to Design Point 45 in curb/gutter where it will be collected by an existing 15'

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 C8.1a

This basin consists of runoff from residential development and the south side of Meridith Ridge Way. Runoff will be directed west to Design Point 47 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 7.5cfs and 16.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.1b

This basin consists of runoff from residential development and the north side of Meridith Ridge Way and Donnas Drive. Runoff will be directed west and south to Design Point 49 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 6.3cfs and 13.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.1c

This basin consists of runoff from residential development and the north side of Sanderling Street. Runoff will be directed west to Design Point 48 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 3.4cfs and 7.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.2

This basin consists of runoff from residential development and the east side of Walleye Drive. Runoff will be directed west and north to Design Point 51 in curb/gutter where it will be collected by an existing 25' Type R inlet in Walleye Drive. The developed flow from this basin is 4.5cfs and 10.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin OS-C4a

This basin consists of runoff from undeveloped offsite land east of Lorson Ranch. Runoff will be directed northwest to a swale where the flow is conveyed north to Design Point 63a. The existing flow from this basin is 0.8cfs and 5.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.3a

This basin consists of runoff from residential development and the east side of Danis Drive. Runoff will be directed north to Design Point 53 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 10.5cfs and 23.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.3b

This basin consists of runoff from residential development and the west side of Rikers Ridge Lane and the south side of Walley Drive. Runoff will be directed west to Design Point 54 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 6.0cfs and 13.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin OS-C4b

This basin consists of runoff from undeveloped offsite land east of Lorson Ranch. Runoff will be directed northwest to a swale where the flow is conveyed north to Design Point 63a. The existing flow from this basin is 0.9cfs and 5.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

**Downstream easement and conveyance is needed  
due to change from sheet flow to point discharge**

#### Basin C8.3c

These basins consist of runoff from residential development and the south side of Rikers Ridge Lane and Danis Drive. Runoff will be directed west to Design Point 54 in curb/gutter where it will be collected

by a Type R inlet. The developed flow from this basin is 4.5cfs and 9.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.3d

This basin consists of runoff from residential development and the north side of Jasons Ridge Way, and Donnas Drive. Runoff will be directed northwest to Design Point 56 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 8.9cfs and 19.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.4

This basin consists of runoff from residential development and the south side of Jasons Ridge Way and Donnas Drive. Runoff will be directed southwest to Design Point 57 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 11.0cfs and 24.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.5

This basin consists of runoff from residential development and the west side of Rikers Ridge Way and north side of Walleye Drive. Runoff will be directed southwest to Design Point 59 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 7.0cfs and 15.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.6

This basin consists of runoff from residential development, west side of Walleye Drive, and the north side of Grayling Drive. Runoff will be directed west to Design Point 62 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 4.0cfs and 6.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.7a

This basin consists of runoff from residential development and the north side of Logans Ridge Lane and the south side of Regan Ridge Drive. Runoff will be directed west to Design Point 63 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 8.1cfs and 18.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.7b

This basin consists of runoff from residential development and the south side of Logans Ridge Lane. Runoff will be directed west to Design Point 63 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 3.4cfs and 7.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.7c

This basin consists of runoff from residential development and Cody Ridge Way. Runoff will be directed west to Design Point 64 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 9.4cfs and 21.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.7d

This basin consists of runoff from residential development and the east side of Regan Ridge Drive. Runoff will be directed west to Design Point 66 in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 0.6cfs and 1.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.7e

This basin consists of runoff from residential development, the east side of Regan Ridge Drive, and Alpine Ridge Lane. Runoff will be directed southwest to Design Point 62 in curb/gutter where it will be



collected by a Type R inlet. The developed flow from this basin is 11.1cfs and 24.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin OS-B1

This basin consists of runoff from undeveloped offsite land east of Lorson Ranch. Runoff will be directed north to Design Point 63a in a swale. The existing flow from this basin is 5.2cfs and 29.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin C8.8a

This basin consists of runoff from residential development, the west/north side of Regan Ridge Drive. Runoff will be directed southwest to Design Point 69 in curb/gutter where it will be collected by an existing 25' Type R inlet. 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 C8.8

This basin consists of runoff from residential development. Runoff will be directed south directly to existing Pond C4. The developed flow from this basin is 5.9cfs and 21.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin F1.1

This basin consists of runoff from residential development. Runoff will be directed east into Basin F1.2 as sheet flow. The developed flow from this basin is 7.5cfs and 16.5cfs for the 5/100-year storm event. See the appendix for detailed calculations. Water quality for this basin flowing offsite will be addressed by the Runoff Reduction method for sheet flows crossing open space in Basin F1.2. See water quality section.

~ 12 Ac. diversion from EX-F1 and water rights need to be addressed. Reference DP-35 discussion below.

#### Basin F1.2

This basin consists of runoff from open space and will be directed east offsite generally as sheet flow which will not significantly be changed from existing conditions and grading. The flow from this basin is 6.1cfs and 44.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin F1.3

This basin consists of runoff from residential development, the east/north side of Kingston Peak Place. Runoff will be directed south to Design Point 35b in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 1.9cfs and 4.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

#### Basin F1.4

This basin consists of runoff from residential development, the west/south side of Kingston Peak Place. Runoff will be directed south to Design Point 35a in curb/gutter where it will be collected by a Type R inlet. The developed flow from this basin is 5.9cfs and 13.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

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

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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 *Storm Sewer* 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 1a

Design Point 1a is located south of Lorson Boulevard and Walleye Drive and flow is from future development from Basin C1.6. A 24" storm sewer will be stubbed out from Design Pt. 6 at Lorson Boulevard north towards this design point. The total future flow is 12.8cfs/28.3cfs in the 5/100-year storm events for this basin. In the 5-year storm event 12cfs will be routed north to Design Point 6 (in pipe) and 0.8cfs will be routed to west in the future street (surface flow in street). In the 100-year storm event 20cfs will be routed north to Design Point 6 (in pipe) and 8.3cfs will be routed west in the future street (surface flow in street).

#### Design Point 1

Design Point 1 is located at the NE corner of Nystrom Terrace and Aspen Butte Terrace at a knuckle and accepts flows from Basin C1.1 The developed conditions are as follows:

##### (5-year storm)

**Tributary Basins:** C1.1

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP1

**Total Street Flow:** 5.6cfs

**Flow Intercepted:** 5.6cfs

**Inlet Size:** 10' type R, sump

**Flow Bypassed:** 0

**Street Capacity:** Street slope = 1.0%, capacity = 9cfs, okay

##### (100-year storm)

**Tributary Basins:** C1.1

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP1

**Total Street Flow:** 12.2cfs

**Flow Intercepted:** 12.2cfs

**Inlet Size:** 10' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 37cfs (half street) is okay

### Design Point 2

Design Point 2 is located at the SW corner of Nystrom Terrace at a knuckle and accepts flows from Basin C1.2. The developed conditions are as follows:

#### (5-year storm)

**Tributary Basins:** C1.2  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP2  
**Total Street Flow:** 2.7cfs

**Flow Intercepted:** 2.7cfs  
**Inlet Size:** 10' type R, sump

**Flow Bypassed:** 0

**Street Capacity:** Street slope = 1.0%, capacity = 9cfs, okay

#### (100-year storm)

**Tributary Basins:** C1.2  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP2  
**Total Street Flow:** 5.9cfs

**Flow Intercepted:** 5.9cfs  
**Inlet Size:** 10' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 37cfs (half street) is okay

### Design Point 3

Design Point 3 is the storm sewer pipe flow from Nystrom Terrace to Lorson Boulevard from Design Pt's 1 and 2. The total pipe flow is 8.3cfs/18.1cfs in the 5/100-year storm events in the storm sewer.

### Design Point 4

Design Point 4 is located at the NE of Lorson Boulevard and Walleye Drive and accepts flows from Lorson Boulevard (Basin C1.3).

#### (5-year storm)

**Tributary Basins:** C1.3  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP4  
**Total Street Flow:** 8.9cfs

**Flow Intercepted:** 13.5cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 0.6cfs to ex. 15' inlet

**Street Capacity:** Street slope = 2.0%, capacity = 18cfs, okay

#### (100-year storm)

**Tributary Basins:** C1.3  
**Upstream flowby:** 1.9cfs

**Inlet/MH Number:** Inlet DP4  
**Total Street Flow:** 21.6cfs

**Flow Intercepted:** 18.0cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 3.6cfs to ex. 15' inlet

**Street Capacity:** Street slope = 2.0%, capacity = 50cfs (half street) is okay

The existing 15' inlet was designed to accept 10cfs of upstream flow in the 100-year storm. See final drainage report for CDR 20-007 at Design Point 1b and 1.

#### Design Point 5

Design Point 5 is the storm sewer pipe flow from Design Pt's 3 and 4. The total pipe flow is 17.2cfs/36.1cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 6

Design Point 6 is located at the SE of Lorson Boulevard and Walleye Drive and accepts flows from Lorson Boulevard (Basin C1.5).

##### (5-year storm)

**Tributary Basins:** C1.5  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP6  
**Total Street Flow:** 3.0cfs

**Flow Intercepted:** 3.0cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 0cfs in curb downstream

**Street Capacity:** Street slope = 2.0%, capacity = 18cfs, okay

##### (100-year storm)

**Tributary Basins:** C1.5  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP6  
**Total Street Flow:** 6.6cfs

**Flow Intercepted:** 5.7cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 0.9cfs in curb downstream

**Street Capacity:** Street slope = 2.0%, capacity = 50cfs (half street) is okay

#### Design Point 7

Design Point 7 is the existing 36" storm sewer pipe flow located in Lorson Boulevard. The total pipe flow is 36.8cfs/65.8cfs in the 5/100-year storm events in the storm sewer. Per the drainage report for CDR 20-007 the allowable flow in the existing 36" is 37.1cfs/65.3cfs.

#### Design Points 8-11 are not used

#### Design Point 12

Design Point 12 is located at the SE corner of Split Mountain Drive and Mission Peak Place and accepts flows from Basin C3.1.

##### (5-year storm)

**Tributary Basins:** C3.1

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP12

**Total Street Flow:** 9.9cfs

**Flow Intercepted:** 9.3cfs

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

**Flow Bypassed:** 0.6cfs in curb downstream

**Street Capacity:** Street slope = 2.6%, capacity = 14.4cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.1

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP12

**Total Street Flow:** 21.8cfs

**Flow Intercepted:** 14.8cfs

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

**Flow Bypassed:** 7.0cfs in curb downstream

**Street Capacity:** Street slope = 2.6%, capacity = 40.7cfs (half street) is okay

#### Design Point 13

Design Point 13 is located at the SE corner of Split Mountain Drive and Pearsoll Street and accepts flows from Basin C3.2.

##### (5-year storm)

**Tributary Basins:** C3.2

**Upstream flowby:** 0.6cfs from Des. Pt 12

**Inlet/MH Number:** Inlet DP13

**Total Street Flow:** 8.5cfs

**Flow Intercepted:** 8.3cfs

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

**Flow Bypassed:** 0.2cfs in curb downstream

**Street Capacity:** Street slope = 2.2%, capacity = 13.3cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.2

**Upstream flowby:** 7.0cfs from Des. Pt 12

**Inlet/MH Number:** Inlet DP13

**Total Street Flow:** 24.3cfs

**Flow Intercepted:** 15.6cfs

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

**Flow Bypassed:** 8.7cfs in curb downstream

**Street Capacity:** Street slope = 2.2%, capacity = 42.8cfs (half street) is okay

#### Design Point 14

Design Point 14 is the storm sewer pipe flow from Design Pt's 12 and 13. The total pipe flow is 17.6cfs/30.4cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 15

Design Point 15 is located at the SE corner of Split Mountain Drive and Lost Peak Lane and accepts flows from Basin C3.3.

##### (5-year storm)

**Tributary Basins:** C3.3  
**Upstream flowby:** 0.2cfs from Des. Pt 13

**Inlet/MH Number:** Inlet DP15  
**Total Street Flow:** 8.7cfs

**Flow Intercepted:** 8.4cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 0.3cfs in curb downstream

**Street Capacity:** Street slope = 1.9%, capacity = 12.2cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.3  
**Upstream flowby:** 8.7cfs from Des. Pt 13

**Inlet/MH Number:** Inlet DP15  
**Total Street Flow:** 27.3cfs

**Flow Intercepted:** 16.5cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 10.8cfs in curb downstream

**Street Capacity:** Street slope = 1.9%, capacity = 44.0cfs (half street) is okay

#### Design Point 16

Design Point 16 is the storm sewer pipe flow from Design Pt's 14 and 15. The total pipe flow is 26.0cfs/46.9cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 17

Design Point 17 is located at the SE corner of Split Mountain Drive and Lake Trout Dr and accepts flows from Basin C3.4.

##### (5-year storm)

**Tributary Basins:** C3.4  
**Upstream flowby:** 0.3cfs from Des. Pt 15

**Inlet/MH Number:** Inlet DP17  
**Total Street Flow:** 7.5cfs

**Flow Intercepted:** 7.5cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 0cfs in curb downstream

**Street Capacity:** Street slope = 3.4%, capacity = 16.5cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.4  
**Upstream flowby:** 10.8cfs from Des. Pt 15

**Inlet/MH Number:** Inlet DP17  
**Total Street Flow:** 26.7cfs

**Flow Intercepted:** 20.4cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 6.3cfs in curb downstream

**Street Capacity:** Street slope = 3.4%, capacity = 37.0cfs (half street) is okay

#### Design Point 18

Design Point 18 is the storm sewer pipe flow from Design Pt's 16 and 17. The total pipe flow is 33.5cfs/67.3cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 19

Design Point 19 is located at the SW corner of Split Mountain Drive and Lake Trout Dr and accepts flows from Basin C3.5.

##### (5-year storm)

**Tributary Basins:** C3.5

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP19

**Total Street Flow:** 10.3cfs

**Flow Intercepted:** 10.3cfs

**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 0cfs in curb downstream

**Street Capacity:** Street slope = 2.6%, capacity = 14.4cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.5

**Upstream flowby:** 6.3cfs from Des. Pt 17

**Inlet/MH Number:** Inlet DP19

**Total Street Flow:** 28.8cfs

**Flow Intercepted:** 21.2cfs

**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 7.6cfs in curb downstream

**Street Capacity:** Street slope = 2.6%, capacity = 40.7cfs (half street) is okay

#### Design Point 20

Design Point 20 is the storm sewer pipe flow from Design Pt's 18 and 19. The total pipe flow is 43.8cfs/88.5cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 20a

Design Point 20a is located at the NE corner of Lookout Peak Lane and Lake Trout Dr and accepts flows from Basin C3.6a.

##### (5-year storm)

**Tributary Basins:** C3.6a

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP20a

**Total Street Flow:** 5.6cfs

**Flow Intercepted:** 5.6cfs

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

**Flow Bypassed:** 0

**Street Capacity:** Street slope = 2.1%, capacity = 13.0cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.6a

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP20a

**Total Street Flow:** 12.3cfs

**Flow Intercepted:** 10.7cfs

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

**Flow Bypassed:** 1.6cfs in curb downstream

**Street Capacity:** Street slope = 2.1%, capacity = 42.0cfs (half street) is okay

#### Design Point 20b

Design Point 20b is the storm sewer pipe flow from Design Pt's 20a and 20. The total pipe flow is 49.4cfs/99.2cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 21

Design Point 21 is located at the NW corner of Lookout Peak Lane and Lake Trout Dr and accepts flows from Basin C3.6b.

##### (5-year storm)

**Tributary Basins:** C3.6b

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP21

**Total Street Flow:** 7.2cfs

**Flow Intercepted:** 7.2cfs

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

**Flow Bypassed:**

**Street Capacity:** Street slope = 2.1%, capacity = 13.0cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.6b

**Upstream flowby:** 1.6cfs from Des. Pt 20a

**Inlet/MH Number:** Inlet DP21

**Total Street Flow:** 17.5cfs

**Flow Intercepted:** 13.1cfs

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

**Flow Bypassed:** 4.4cfs in curb downstream

**Street Capacity:** Street slope = 2.1%, capacity = 42.0cfs (half street) is okay

#### Design Point 22 not used

#### Design Point 23

Design Point 23 is located at the SW corner of Dragontail Terrace and Lake Trout Dr and accepts flows from Basin C3.7.

##### (5-year storm)

**Tributary Basins:** C3.7

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP23

**Total Street Flow:** 8.7cfs

**Flow Intercepted:** 8.4cfs

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

**Flow Bypassed:** 0.3cfs in curb downstream

**Street Capacity:** Street slope = 2.0%, capacity = 13.0cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.7

**Upstream flowby:** 7.6cfs from Des. Pt 19

**Inlet/MH Number:** Inlet DP23

**Total Street Flow:** 26.7cfs

**Flow Intercepted:** 16.3cfs

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

**Flow Bypassed:** 10.4cfs in curb downstream

**Street Capacity:** Street slope = 2.0%, capacity = 42.0cfs (half street) is okay



#### Design Point 24

Design Point 24 is the storm sewer pipe flow from Design Pt's 20b and 23. The total pipe flow is 57.8cfs/115.5cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 24a

Design Point 24a is the storm sewer pipe flow from Design Pt's 21 and 24. The total pipe flow is 65cfs/118.6cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 25

Design Point 25 is located at the NW corner of Nystrom Terr and Lake Trout Dr and accepts flows from Basin C3.8.

##### (5-year storm)

**Tributary Basins:** C3.8

**Inlet/MH Number:** Inlet DP25

**Upstream flowby:**

**Total Street Flow:** 10.0cfs

**Flow Intercepted:** 7.2cfs

**Flow Bypassed:** 2.9cfs in curb downstream

**Inlet Size:** 10' type R, on-grade

**Street Capacity:** Street slope = 1.1%, capacity = 10.1cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.8

**Inlet/MH Number:** Inlet DP25

**Upstream flowby:** 4.4cfs from Des. Pt 21

**Total Street Flow:** 26.4cfs

**Flow Intercepted:** 11.3cfs

**Flow Bypassed:** 15.1cfs in curb downstream

**Inlet Size:** 10' type R, on-grade

**Street Capacity:** Street slope = 1.1%, capacity = 39.0cfs (half street) is okay

#### Design Point 26 – not used

#### Design Point 27

Design Point 27 is located at the SW corner of Raven Ridge Terrace and Lake Trout Dr and accepts flows from Basin C3.9.

##### (5-year storm)

**Tributary Basins:** C3.9

**Inlet/MH Number:** Inlet DP27

**Upstream flowby:** 0.3cfs from Des.Pt. 23

**Total Street Flow:** 8.4cfs

**Flow Intercepted:** 8.4cfs

**Flow Bypassed:** 0cfs in curb downstream

**Inlet Size:** 20' type R, on-grade

**Street Capacity:** Street slope = 1.7%, capacity = 11.9cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.9

**Inlet/MH Number:** Inlet DP27

**Upstream flowby:** 10.4cfs from Des. Pt 23

**Total Street Flow:** 28.3cfs

**Flow Intercepted:** 20.7cfs

**Flow Bypassed:** 7.6cfs in curb downstream

**Inlet Size:** 20' type R, on-grade

**Street Capacity:** Street slope = 1.7%, capacity = 45.0cfs (half street) is okay

#### Design Point 28

Design Point 28 is the storm sewer pipe flow from Design Pt's 27 and 24a. The total pipe flow is 73.4cfs/132.7cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 28a

Design Point 28a is the storm sewer pipe flow from Design Pt's 28 and 25. The total pipe flow is 80.6cfs/133.4cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 29

Design Point 29 is located at the SW corner of Nystrom Terrace and Lake Trout Dr and accepts flows from Basin C3.10.

##### (5-year storm)

**Tributary Basins:** C3.10

**Inlet/MH Number:** Inlet DP29

**Upstream flowby:** 0.3cfs from Des.Pt. 27

**Total Street Flow:** 9.2cfs

**Flow Intercepted:** 9.2cfs

**Flow Bypassed:** 0cfs in curb downstream

**Inlet Size:** 20' type R, on-grade

**Street Capacity:** Street slope = 1.0%, capacity = 9.2cfs, okay

##### (100-year storm)

**Tributary Basins:** C3.10

**Inlet/MH Number:** Inlet DP29

**Upstream flowby:** 7.6cfs from Des. Pt 27

**Total Street Flow:** 27.8cfs

**Flow Intercepted:** 20.5cfs

**Flow Bypassed:** 7.3cfs in curb downstream

**Inlet Size:** 20' type R, on-grade

**Street Capacity:** Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

#### Design Point 30

Design Point 30 is the storm sewer pipe flow from Design Pt's 28a and 29. The total pipe flow is 89.8cfs/153.9cfs in the 5/100-year storm events in the storm sewer.

### Design Point 31

Design Point 31 is located east of Walleye Drive on the south side of Fontaine Boulevard and accepts flows from Basin C4.1 and C4.2.

#### (5-year storm)

**Tributary Basins:** C4.1+C4.2  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP31  
**Total Street Flow:** 10.5cfs

**Flow Intercepted:** 9.7cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 0.8cfs in curb downstream

**Street Capacity:** Street slope = 4.8%, capacity = 15.7cfs, okay

#### (100-year storm)

**Tributary Basins:** C4.1+C4.2  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP31  
**Total Street Flow:** 23.2cfs

**Flow Intercepted:** 15.3cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 7.9cfs in curb downstream

**Street Capacity:** Street slope = 4.8%, capacity = 38.3cfs (half street) is okay

Design Point 32 is located on the north end of Nystrom Terr in a cul-de-sac and accepts flows from Basin C4.3

#### (5-year storm)

**Tributary Basins:** C4.3  
**Upstream flowby:** 2.8cfs from Des. Pt.25

**Inlet/MH Number:** Inlet DP32  
**Total Street Flow:** 10.3 cfs

**Flow Intercepted:** 10.3cfs  
**Inlet Size:** 20' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 9.2cfs, okay

#### (100-year storm)

**Tributary Basins:** C4.3  
**Upstream flowby:** 15.1cfs from Des.Pt. 25

**Inlet/MH Number:** Inlet DP32  
**Total Street Flow:** 27.5cfs

**Flow Intercepted:** 27.5cfs  
**Inlet Size:** 20' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

### Design Point 32a

Design Point 32a is the storm sewer pipe flow from Design Pt's 31 and 32. The total pipe flow is 18.2cfs/42.8cfs in the 5/100-year storm events in the storm sewer.

### Design Point 33

Design Point 33 is located on Walleye Drive south of Fontaine Boulevard and is an existing 25' type R inlet in a sump condition constructed as part of CDR 20-007.

#### (5-year storm)

**Tributary Basins:** C4.4

**Upstream flowby:** 0.8cfs from Des.Pt. 31

**Inlet/MH Number:** ex. 25' inlet DP33

**Total Street Flow:** 7.0cfs

**Flow Intercepted:** 7.0cfs

**Inlet Size:** ex 25' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 0.7%, capacity = 11.5cfs, okay

#### (100-year storm)

**Tributary Basins:** C4.4

**Upstream flowby:** 7.3cfs from Des.Pt. 29  
7.9cfs from Des. Pt. 31

**Inlet/MH Number:** ex. 25' inlet DP33

**Total Street Flow:** 28.7cfs

**Flow Intercepted:** 28.7cfs

**Inlet Size:** ex 25' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 0.7%, capacity = 34.6cfs (half street) is okay

### Design Point 34

Design Point 34 is the storm sewer pipe flow from Design Pt's 30, 32a, and 33. The total pipe flow is 115.0cfs/225.4cfs in the 5/100-year storm events in the existing 54" storm sewer constructed as part of CDR 20-007. The revised calculated flow in the existing 54" storm sewer is slightly more than the design flow in CDR 20-007 of 101.2cfs/218.6cfs in the 5/100-year storm events but the HGL's are not above the top of the 54" storm sewer.

### Design Point 35a

Design Point 35a is located at the NW corner of Kingston Peak Place and Lorson Boulevard and accepts flows from Basin F1.4.

#### (5-year storm)

**Tributary Basins:** F1.4

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP29

**Total Street Flow:** 5.9cfs

**Flow Intercepted:** 5.9cfs

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

**Flow Bypassed:** 0cfs in curb downstream

**Street Capacity:** Street slope = 0.9%, capacity = 9.2cfs, okay

#### (100-year storm)

**Tributary Basins:** F1.4

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP29

**Total Street Flow:** 13.2cfs

**Flow Intercepted:** 11.3cfs

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

**Flow Bypassed:** 1.9cfs in curb downstream

**Street Capacity:** Street slope = 0.9%, capacity = 37.3cfs (half street) is okay

#### Design Point 35b

Design Point 35b is located at the NE corner of Kingston Peak Place and Lorson Boulevard and accepts flows from Basin F1.3.

##### (5-year storm)

**Tributary Basins:** F1.3  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP29  
**Total Street Flow:** 1.9cfs

**Flow Intercepted:** 1.9cfs  
**Inlet Size:** 5' type R, sump

**Flow Bypassed:** 0cfs in curb downstream

**Street Capacity:** Street slope = 0.9%, capacity = 9.2cfs, okay

##### (100-year storm)

**Tributary Basins:** F1.3  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP29  
**Total Street Flow:** 4.6cfs

**Flow Intercepted:** 4.4cfs  
**Inlet Size:** 5' type R, sump

**Flow Bypassed:** 0.2cfs

**Street Capacity:** Street slope = 0.9%, capacity = 37.3cfs (half street) is okay

#### Design Point 35c

Design Point 35c is the storm sewer pipe flow from Design Pt's 35a and 35b. The total pipe flow is 7.8cfs/15.7cfs in the 5/100-year storm events in the storm sewer. Stormwater enters WQ Pond F where it will be treated and released. WQ Pond F will not detain the stormwater which will be allowed to flow through the pond

Downstream easement and conveyance is needed due to change from sheet flow to point discharge and increased flow

#### Design Point 35

Design Point 35 is located on the east side of this site and is the total flow from Basins F1.1, F1.2, and Design Point 35c. The total flow from these basins and the WQ pond (Des.Pt. 35c) is 12.0cfs/71.3cfs in the 5/100-year storm events. The existing flow calculated at Design Point 2x flowing east offsite is 12.4cfs/72.7cfs in the 5/100-year storm events. The developed flow will remain sheet flow into the Upper Williams Creek Drainage Basin as in existing conditions and will discharge the same runoff rates as in existing flows resulting in no negative impacts downstream.

#### Design Point 36

Design Point 36 is located on the north side of Gray Wolf Court and accepts flows from Basin C5.1b

##### (5-year storm)

**Tributary Basins:** C5.1b  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP36  
**Total Street Flow:** 11.4cfs

**Flow Intercepted:** 4.1cfs  
**Inlet Size:** 5' type R, on-grade

**Flow Bypassed:** 7.3cfs in curb downstream

**Street Capacity:** Street slope = 2.7%, capacity = 14.4cfs, okay

##### (100-year storm)

**Tributary Basins:** C5.1b  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP36  
**Total Street Flow:** 25.2cfs

**Flow Intercepted:** 5.7cfs  
**Inlet Size:** 5' type R, on-grade

**Flow Bypassed:** 19.5cfs in curb downstream

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

### Design Point 37

Design Point 37 is located on the south side of Gray Wolf Court and accepts flows from Basin C5.1c

#### (5-year storm)

**Tributary Basins:** C5.1c  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP37  
**Total Street Flow:** 7.4cfs

**Flow Intercepted:** 3.4cfs  
**Inlet Size:** 5' type R, on-grade

**Flow Bypassed:** 4.0cfs in curb downstream

**Street Capacity:** Street slope = 2.0%, capacity = 12.5cfs, okay

#### (100-year storm)

**Tributary Basins:** C5.1c  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP37  
**Total Street Flow:** 16.3cfs

**Flow Intercepted:** 4.8cfs  
**Inlet Size:** 5' type R, on-grade

**Flow Bypassed:** 11.5cfs in curb downstream

**Street Capacity:** Street slope = 2.0%, capacity = 44.0cfs (half street) is okay

### Design Point 38

Design Point 38 is the storm sewer pipe flow from Design Pt's 36 and 37. The total pipe flow is 7.5cfs/10.5cfs in the 5/100-year storm events in the storm sewer.

### Design Point 39

Design Point 39 is located at the southeast corner of Gray Wolf Court and Donnas Drive and accepts flows from Basin C5.1a.

#### (5-year storm)

**Tributary Basins:** C5.1a,b,c  
**Upstream flowby:** 20.2cfs – 4.1(inlet DP36) – 3.4(inlet DP37)

**Inlet/MH Number:** Inlet DP39  
**Total Street Flow:** 12.7cfs

**Flow Intercepted:** 12.7cfs  
**Inlet Size:** 25' type R, on-grade

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.9%, capacity = 14cfs, okay

#### (100-year storm)

**Tributary Basins:** C5.1a,b,c  
**Total flow in street:** 44.5cfs – 5.7(inlet DP36) – 4.8(inlet DP37)

**Inlet/MH Number:** Inlet DP39  
**Total Street Flow:** 34.0cfs

**Flow Intercepted:** 27.0cfs  
**Inlet Size:** 25' type R, on-grade

**Flow Bypassed:** 7.0cfs in curb downstream

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

#### Design Point 40

Design Point 40 is the storm sewer pipe flow from Design Pt's 38 and 39. The total pipe flow is 23.0cfs/37.0cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 41

Design Point 41 is located south of Gray Wolf Court on the east side of Donnas Drive and accepts flows from Basin C5.1d.

##### (5-year storm)

**Tributary Basins:** C5.1d

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP41

**Total Street Flow:** 9.3cfs

**Flow Intercepted:** 9.3cfs

**Inlet Size:** 20' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.4%, capacity = 10.5cfs, okay

##### (100-year storm)

**Tributary Basins:** C5.1d

**Upstream flowby:** 7.0cfs from Des.Pt.39

**Inlet/MH Number:** Inlet DP41

**Total Street Flow:** 27.7cfs

**Flow Intercepted:** 25.1cfs

**Inlet Size:** 20' type R, SUMP

**Flow Bypassed:** 2.6cfs to DP43

**Street Capacity:** Street slope = 1.4%, capacity = 44.1cfs (half street) is okay

#### Design Point 42

Design Point 42 is the storm sewer pipe flow from Design Pt's 40 and 41. The total pipe flow is 32.3cfs/62.1cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 43

Design Point 43 is located south of Gray Wolf Court on the west side of Donnas Drive and accepts flows from Basin C5.1e.

##### (5-year storm)

**Tributary Basins:** C5.1e

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP41

**Total Street Flow:** 10.0cfs

**Flow Intercepted:** 10.0cfs

**Inlet Size:** 20' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.4%, capacity = 10.5cfs, okay

##### (100-year storm)

**Tributary Basins:** C5.1e

**Upstream flowby:** 2.6cfs from Des.Pt.41

**Inlet/MH Number:** Inlet DP41

**Total Street Flow:** 24.5cfs

**Flow Intercepted:** 24.5cfs

**Inlet Size:** 20' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.4%, capacity = 44.1cfs (half street) is okay

Address the overflow  
conveyance design

Design Point 44

Design Point 44 is the storm sewer pipe flow from Design Pt's 42 and 43. The total pipe flow is 42.3cfs/87.1cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 16a) was designed to accept 42.3cfs/92.5cfs in the existing 36" RCP stub in Fontaine Boulevard.

Design Points 45 & 46

Design Points 45 & 46 are located at the NE corner of Walleye Drive and Fontaine Boulevard and is an existing 15' type R inlet in a sump condition constructed as part of CDR 20-007

(5-year storm)

**Tributary Basins:** C5.2 & C5.3  
**Upstream flowby:**

**Inlet/MH Number:** ex. 15' inlet  
**Total Street Flow:** 7.7cfs

**Flow Intercepted:** 7.7cfs  
**Inlet Size:** ex 15' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 13.7cfs, okay

(100-year storm)

**Tributary Basins:** C5.2 & C5.3  
**Upstream flowby:**

**Inlet/MH Number:** ex. 15' inlet  
**Total Street Flow:** 17.1cfs

**Flow Intercepted:** 17.1cfs  
**Inlet Size:** ex 15' type R, sump

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 41.4cfs (half street) is okay

The FDR for CDR 20-007 designed the existing inlet to accept 7.9cfs/17.7cfs in the 5/100 year storm events.

Design Point 47

Design Point 47 is located in the SE corner of Meridith Ridge Way and Donnas Drive and accepts flows from Basin C8.1a.

(5-year storm)

**Tributary Basins:** C8.1a  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP47  
**Total Street Flow:** 7.5cfs

**Flow Intercepted:** 6.1cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 1.4cfs

**Street Capacity:** Street slope = 1.0%, capacity = 9.0cfs, okay

(100-year storm)

**Tributary Basins:** C8.1a  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP47  
**Total Street Flow:** 16.4cfs

**Flow Intercepted:** 9.1cfs  
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 7.3cfs

**Street Capacity:** Street slope = 1.0%, capacity = 37.3cfs (half street) is okay



#### Design Point 48

Design Point 48 is located in the NE corner of Sanderling Street and Donnas Drive and accepts flows from Basin C8.1c.

##### (5-year storm)

**Tributary Basins:** C8.1c

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP48

**Total Street Flow:** 3.4cfs

**Flow Intercepted:** 3.4cfs

**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.5%, capacity = 11.0 cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.1c

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP48

**Total Street Flow:** 7.6cfs

**Flow Intercepted:** 6.2cfs

**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 1.4cfs

**Street Capacity:** Street slope = 1.5%, capacity = 44.5cfs (half street) is okay

#### Design Point 49

Design Point 49 is located in the NW corner of Sanderling Street and Donnas Drive and accepts flows from Basin C8.1b.

##### (5-year storm)

**Tributary Basins:** C8.1b

**Upstream flowby:** 1.4cfs from Des.Pt. 47

**Inlet/MH Number:** Inlet DP49

**Total Street Flow:** 7.7 cfs

**Flow Intercepted:** 7.7cfs

**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:**

**Street Capacity:** Street slope = 2.8%, capacity = 14.4cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.1b

**Upstream flowby:** 7.3cfs from Des.Pt.47  
1.4cfs from Des.Pt.48  
5.1cfs from Des.Pt.57

**Inlet/MH Number:** Inlet DP49

**Total Street Flow:** 27.7cfs

**Flow Intercepted:** 20.8cfs

**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 6.9cfs

**Street Capacity:** Street slope = 2.8%, capacity = 40.7cfs (half street) is okay

#### Design Point 50

Design Point 50 is the storm sewer pipe flow from Design Pt's 48 and 49. The total pipe flow is 11.1cfs/27.0cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 31a) was designed to accept 8.9cfs/20.9cfs in the existing 30" RCP stub from Walleye Drive at Sanderling Street. However, the existing pipe has capacity to handle the additional pipe flow based on the HGL. See Design Point 52.

#### Design Point 51

Design Point 51 is located at an existing 25' type R inlet in the SW corner of Grayling Drive and Walleye Drive and accepts flows from Basin C8.2.

##### (5-year storm)

**Tributary Basins:** C8.2

**Upstream flowby:**

**Inlet/MH Number:** existing 25'

**Total Street Flow:** 4.5 cfs

**Flow Intercepted:** 4.5cfs

**Inlet Size:** ex 25' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope (collector) = 1.0%, capacity = 13.7cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.2

**Upstream flowby:** 6.9cfs from Des.Pt.49

9.1cfs from Des.Pt.56

**Inlet/MH Number:** existing 25'

**Total Street Flow:** 26.0cfs

**Flow Intercepted:** 26.0cfs

**Inlet Size:** ex 25' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0% (collector) , capacity = 41.4cfs (half street) is okay

The FDR for CDR 20-007 (Des.Pt. 31) designed the existing inlet to accept 14.5cfs/30.0cfs in the 5/100 year storm events.

#### Design Point 52

Design Point 52 is the storm sewer pipe flow from Design Pt's 50 and 51 in an existing 36" storm sewer in Walleye Drive. The total pipe flow is 15.6cfs/53.0cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 31c) designed the storm sewer to accept 23.4cfs/50.9cfs in the existing 36" RCP storm sewer in Walleye Drive. The existing pipe has capacity to handle the slight increase in pipe flow in the 100yr storm event.

#### Design Point 53

Design Point 53 is located in the SE corner of Danis Drive and Walleye Drive and accepts flows from Basin C8.3a. Basin OS-C4a existing and future flows will be diverted north to Des. Pt. 63a.

##### (5-year storm)

**Tributary Basins:** C8.3a

**Inlet/MH Number:** Inlet DP53

**Upstream flowby:**

**Total Street Flow:** 10.6cfs

**Flow Intercepted:** 9.7cfs

**Flow Bypassed:** 0.9cfs

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

**Street Capacity:** Street slope = 1.4%, capacity = 10.5cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.3a

**Inlet/MH Number:** Inlet DP53

**Upstream flowby:**

**Total Street Flow:** 26.5cfs

**Flow Intercepted:** 16.2cfs

**Flow Bypassed:** 10.3cfs

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

**Street Capacity:** Street slope = 1.4%, capacity = 44.1cfs (half street) is okay

#### Design Point 54

Design Point 54 is located in the NE corner of Donnas Drive and Walleye Drive and accepts flows from Basin C8.3b& C8.3c.

##### (5-year storm)

**Tributary Basins:** C8.3b & C8.3c

**Inlet/MH Number:** Inlet DP54

**Upstream flowby:** 0.9cfs from Des.Pt.53

**Total Street Flow:** 11.8cfs

**Flow Intercepted:** 11.7cfs

**Flow Bypassed:** 0.1cfs

**Inlet Size:** 20' type R, on-grade

**Street Capacity:** Street slope = 1.5%, capacity = 11.8cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.3b & C8.3c

**Inlet/MH Number:** Inlet DP54

**Upstream flowby:** 10.3cfs from Des.Pt.53

**Total Street Flow:** 37.6cfs

**Flow Intercepted:** 24.0cfs

**Flow Bypassed:** 13.6cfs

**Inlet Size:** 20' type R, on-grade

**Street Capacity:** Street slope = 1.5%, capacity = 45.0cfs (half street) is okay

#### Design Point 55

Design Point 55 is the storm sewer pipe flow from Design Pt's 53 and 54. The total pipe flow is 21.4cfs/40.2cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 56

Design Point 56 is located on Walleye Drive south of Donnas Drive and accepts flows from Basin C8.3d

##### (5-year storm)

<b>Tributary Basins:</b>	C8.3d	<b>Inlet/MH Number:</b>	Inlet DP56
<b>Upstream flowby:</b>	0.1cfs from Des.Pt.54	<b>Total Street Flow:</b>	9.0cfs

**Flow Intercepted:** 9.0cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.2%, capacity = 10.0cfs, okay

##### (100-year storm)

<b>Tributary Basins:</b>	C8.3d	<b>Inlet/MH Number:</b>	Inlet DP56
<b>Upstream flowby:</b>	13.6cfs from Des.Pt.54	<b>Total Street Flow:</b>	32.8cfs

**Flow Intercepted:** 32.8cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 9.1cfs

**Street Capacity:** Street slope = 1.2%, capacity = 38.0cfs (half street) is okay

#### Design Point 57

Design Point 57 is located at the NE corner of Donnas Drive and Meridith Ridge Way and accepts flows from Basin C8.4

##### (5-year storm)

<b>Tributary Basins:</b>	C8.4	<b>Inlet/MH Number:</b>	Inlet DP57
<b>Upstream flowby:</b>		<b>Total Street Flow:</b>	11.0cfs

**Flow Intercepted:** 11.0cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:**

**Street Capacity:** Street slope = 1.0%, capacity = 9.0cfs, okay

##### (100-year storm)

<b>Tributary Basins:</b>	C8.4	<b>Inlet/MH Number:</b>	Inlet DP57
<b>Upstream flowby:</b>		<b>Total Street Flow:</b>	24.1cfs

**Flow Intercepted:** 19.0cfs  
**Inlet Size:** 20' type R, on-grade

**Flow Bypassed:** 5.1cfs to DP49

**Street Capacity:** Street slope = 1.0%, capacity = 37.3cfs (half street) is okay

#### Design Point 58

Design Point 58 is the storm sewer pipe flow from Design Pt's 57 and 47. The total pipe flow is 17.1cfs/28.1cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 59

Design Point 59 is located on the north side of Walleye Drive south of Broken Top Drive and accepts flows from Basin C8.5

##### (5-year storm)

**Tributary Basins:** C8.5

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP59

**Total Street Flow:** 7.0cfs

**Flow Intercepted:** 5.9cfs

**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 1.1cfs

**Street Capacity:** Street slope = 1.2%, capacity = 10.0cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.5

**Upstream flowby:**

**Inlet/MH Number:** Inlet DP59

**Total Street Flow:** 15.5cfs

**Flow Intercepted:** 8.9cfs

**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 6.6cfs

**Street Capacity:** Street slope = 1.2%, capacity = 38.0cfs (half street) is okay

#### Design Point 60

Design Point 60 is the storm sewer pipe flow from Design Pt's 55, 56 and 59. The total pipe flow is 32.7cfs/73.3cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 61

Design Point 61 is the storm sewer pipe flow from Design Pt's 52, 58 and 60 from the C8.1, C8.3, C8.4, and C8.5 basins. The total pipe flow is 44.9cfs/104.1cfs in the 5/100-year storm events in the storm sewer. The FDR for CDR20-007 (Design Point 32) designed the storm sewer to accept 45.1cfs/105.4cfs in the existing 42" RCP storm sewer in Walleye Drive.

### Design Point 62

Design Point 62 is located in the NE corner of Grayling Drive and Regan Ridge Drive and accepts flows from Basin C8.6 & C8.7e.

#### (5-year storm)

**Tributary Basins:** C8.6 & C8.7e  
**Upstream flowby:** 1.1 cfs from Des.Pt.59

**Inlet/MH Number:** Inlet DP62  
**Total Street Flow:** 14.3cfs

**Flow Intercepted:** 14.3cfs  
**Inlet Size:** 25' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope = 2.5%, capacity = 14.2cfs, okay

#### (100-year storm)

**Tributary Basins:** C8.6 & C8.7e  
**Upstream flowby:** 6.6cfs from Des.Pt.59  
2.7cfs from Des.Pt.66

**Inlet/MH Number:** Inlet DP62  
**Total Street Flow:** 37.4cfs

**Flow Intercepted:** 37.4cfs  
**Inlet Size:** 25' type R, SUMP

**Flow Bypassed:**

**Street Capacity:** Street slope = 2.5%, capacity = 41.4cfs (half street) is okay

### Design Point 63

Design Point 63 is located at the SE corner of Regan Ridge Drive and Logans Ridge Lane and accepts flows from Basin C8.7a&b

#### (5-year storm)

**Tributary Basins:** C8.7a&b  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP63  
**Total Street Flow:** 11.5cfs

**Flow Intercepted:** 10.2cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 1.3cfs

**Street Capacity:** Street slope = 1.6%, capacity = 11.5cfs, okay

#### (100-year storm)

**Tributary Basins:** C8.7a&b  
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP63  
**Total Street Flow:** 25.6cfs

**Flow Intercepted:** 15.9cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 9.7cfs

**Street Capacity:** Street slope = 1.6%, capacity = 45.0cfs (half street) is okay

### Design Point 63a

Design Point 63a is the existing flow from offsite Basins OS-B1, OS-C4a, and OS-C4b. The total existing flow is 6.9cfs/39.9cfs in the 5/100-year storm events in the storm sewer which is less than existing conditions at Design Point 1x (see existing conditions). The future flows from these basins will be from the future Meridian Road which has a natural low point at this location and then drains overland offsite to the northwest. A street and/or storm sewer system will be needed in the future to convey the future flows to the northwest.

proposed?

Address downstream easement and conveyance for point discharge and increased flows

#### Design Point 64

Design Point 64 is located at the SE corner of Regan Ridge Drive and Cody Ridge Way and accepts flows from Basin C8.7c

##### (5-year storm)

**Tributary Basins:** C8.7c  
**Upstream flowby:** 1.3cfs from Des.Pt.63

**Inlet/MH Number:** Inlet DP64  
**Total Street Flow:** 10.7cfs

**Flow Intercepted:** 9.8cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 0.9cfs

**Street Capacity:** Street slope = 4.0%, capacity = 17.9cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.7c  
**Upstream flowby:** 9.7cfs from Des.Pt.63

**Inlet/MH Number:** Inlet DP64  
**Total Street Flow:** 30.6cfs

**Flow Intercepted:** 17.5cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 13.1cfs

**Street Capacity:** Street slope = 4.0%, capacity = 35.7cfs (half street) is okay

#### Design Point 65

Design Point 65 is the storm sewer pipe flow from Design Pt's 63 and 64. The total pipe flow is 20.0cfs/33.4cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 66

Design Point 66 is located at the NE corner of Regan Ridge Drive and Broken Top Drive and accepts flows from Basin C8.7d

##### (5-year storm)

**Tributary Basins:** C8.7d  
**Upstream flowby:** 0.9cfs from Des.Pt.64

**Inlet/MH Number:** Inlet DP66  
**Total Street Flow:** 1.5cfs

**Flow Intercepted:** 1.5cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:**

**Street Capacity:** Street slope = 2.0%, capacity = 12.5cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.7d  
**Upstream flowby:** 13.1cfs from Des.Pt.64

**Inlet/MH Number:** Inlet DP66  
**Total Street Flow:** 14.5cfs

**Flow Intercepted:** 11.8cfs  
**Inlet Size:** 15' type R, on-grade

**Flow Bypassed:** 2.7cfs

**Street Capacity:** Street slope = 2.0%, capacity = 44.0cfs (half street) is okay

#### Design Point 67

Design Point 67 is the storm sewer pipe flow from Design Pt's 65 and 66. The total pipe flow is 21.5cfs/45.2cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 68

Design Point 68 is the storm sewer pipe flow from Basins C8.6-C8.7e and runby from Des.Pt. 59. The total pipe flow is 33.0cfs/76.5cfs in the 5/100-year storm events in the storm sewer.

#### Design Point 69

Design Point 69 is located at the NW corner of Regan Ridge Drive and Walleye Drive at an existing 25' Type R sump inlet and accepts flows from Basin OS-B1 & C8.8a

##### (5-year storm)

**Tributary Basins:** C8.8a

**Inlet/MH Number:** Inlet DP69

**Upstream flowby:**

**Total Street Flow:** 7.9cfs

**Flow Intercepted:** 7.9cfs

**Flow Bypassed:**

**Inlet Size:** Ex 25' type R, SUMP

**Street Capacity:** Street slope = 2.0%, capacity = 12.5cfs, okay

##### (100-year storm)

**Tributary Basins:** C8.8a

**Inlet/MH Number:** Inlet DP69

**Upstream flowby:**

**Total Street Flow:** 17.3cfs

**Flow Intercepted:** 17.3cfs

**Flow Bypassed:**

**Inlet Size:** Ex 25' type R, SUMP

**Street Capacity:** Street slope = 2.0%, capacity = 44.0cfs (half street) is okay

#### Design Point 70

Design Point 70 is the storm sewer pipe flow from the offsite basins, C8.7's, and C8.8a basins and runby from Des.Pt.59. The total pipe flow is 34.5cfs/86.3cfs in the 5/100-year storm events in the storm sewer from the xcel spreadsheet calculations. The FDR for CDR20-007 (Design Point 34a) designed the storm sewer to accept 38.2cfs/84.5cfs in the existing 42" RCP storm sewer in Walleye Drive. The storm sewer has capacity for these basins.

---

## **6.0 DETENTION AND WATER QUALITY PONDS**

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Detention and Storm Water Quality for The Ridge at Lorson Ranch is required per El Paso County criteria. We have implemented the Full Spectrum approach for detention for the Denver Urban Drainage Districts specifications. There are four permanent full spectrum ponds previously constructed in The Hills at Lorson Ranch for this development which will incorporate storm water quality features and comply with the Lorson Ranch East MDDP. In addition, one WQ pond will drain eastward as in existing condition into the Upper Williams Creek Drainage Basin required to match existing conditions. 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

All four of the detention ponds required for this project have been previously graded as part of The Hills at Lorson Ranch (PUDSP 20-003) and include Pond C1, C2.1, C2.2, and C4. The Hills at Lorson Ranch constructed Existing Pond C1 and C2.2 which are complete full spectrum ponds that do not need to be modified and include the full spectrum outlet structure, forebays, outfall storm sewer, and



Is the constructed Pond C5  
orifice plate final?

low flow channels. Existing Pond C2.1 and Pond C4 were graded and constructed with forebays, outfall storm sewers, and low flow channels but did not include the full spectrum outlet structure. The outlet structure for these two ponds will be discussed in this section including what type of structure is proposed. Per the Lorson East MDDP, these four ponds and downstream Pond C5 (at Fontaine/East tributary) are part of an overall storm water system to be constructed by Lorson Ranch. Existing Pond C5 was completed with Lorson Ranch East Filing No. 1 in 2018 and the entire stormwater system tributary to Pond C5 will be completed with this subdivision.

Design calculations for Pond C2.1 and Pond C4 spectrum outlet structures are included in this report. The existing ponds currently have a 15' wide gravel access road at a maximum 10% slope to the pond bottom, forebay, storm sewer outfall, and concrete low flow channels. The final design of the Pond C2.1 and Pond C4 will consist of a full spectrum outlet structure and overflow weirs. Soil borings, embankment, slope, and compaction requirements for detention ponds can be found in the geotechnical report for the The Hills at Lorson Ranch prepared by RMG.

#### WQ Pond Construction Requirements

In addition to the four detention ponds Lorson Ranch is required to discharge the same runoff rates eastward into the Upper Williams which will require one WQ Pond to be constructed for a small area draining eastward. The WQ pond will have a 15' wide gravel access road at a maximum 10% slope to the pond bottom, forebay, and a concrete low flow channel.

#### Detention Pond C1 (existing pond for information only, See CDR20-007)

This is an existing permanent full spectrum detention pond that includes water quality and discharges downstream to a storm sewer system in Fontaine Boulevard. Pond C1 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 and will include an emergency overflow spillway. See map in appendix for watershed areas.

- Watershed Area: 76 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B
- Zone 1 WQCV: 1.397ac-ft, WSEL: 5747.04
- Zone 2 EURV: 4.505ac-ft, WSEL: 5749.21, Top outlet structure set at 5749.50, 3'x6' outlet structure
- (5-yr): 5.006ac-ft, WSEL: 5749.54, 7.1cfs
- Zone 3 (100-yr): 10.736ac-ft, WSEL: 5752.80, 18.1cfs
- Pipe Outlet: 18" RCP at 0.5%
- Overflow Spillway: 28' wide bottom, elevation=5753.40, 4:1 side slopes, flow depth=1.44' 1.16' freeboard
- Micropool Elevation: 5743.40

Was this reduced  
with basin F1.4  
flows to Pond F?

#### Detention Pond C2.2 (existing pond for information only, see CDR 20-007)

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to an existing storm sewer in Fontaine Boulevard. Inflow to this pond is from direct tributary development and outflow from Pond C3. The inflow hydrograph has been modeled in the full spectrum spreadsheets by adding the direct tributary area CUHP hydrograph to the upstream pond outflow hydrograph of Pond C3. The outlet structure, overflow wall, pond forebay and low flow channel will be built as part of the CDR 20-007 project. Pond C2.2 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. See map in appendix for watershed areas.

- Watershed Area: 45.0 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B (95%), Group C/D (5%)
- Zone 1 WQCV: 0.829ac-ft, WSEL: 5747.25
- Zone 2 EURV: 2.658ac-ft, WSEL: 5749.17, Top outlet structure set at 5751.00, 8'x6' outlet structure
- (5-yr): 4.475ac-ft, WSEL: 5760.88, 2.7cfs
- Zone 3 (100-yr): 6.67ac-ft, WSEL: 5752.75, 42.9cfs
- Pipe Outlet: 30" RCP
- Overflow Spillway: 20' wide bottom, elevation=5754.00, 4:1 side slopes, flow depth=1.51' 1.49' freeboard
- Micropool Elevation: 5744.00

#### Detention Pond C2.1

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to Pond C2.3. The outlet Structure and overflow wall will be built as part of the final plat for this project. The pond forebay and low flow channel were built as part of the CDR 20-007 project. Pond C2.1 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 map in appendix for watershed areas.

- Watershed Area: 74.5 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B
- Zone 1 WQCV: 1.377ac-ft, WSEL: 5763.42
- Zone 2 EURV: 4.415ac-ft, WSEL: 5766.20, Top outlet structure set at 5766.20, 8'x6' outlet structure
- (5-yr): 4.694ac-ft, WSEL: 5766.44, 12.8cfs
- Zone 3 (100-yr): 7.829ac-ft, WSEL: 5768.80, 65.0cfs
- Pipe Outlet: 30" RCP at 0.5%
- Overflow Spillway: 25' wide bottom, elevation=5769.30, 4:1 side slopes, flow depth=1.69' 1.01' freeboard
- Micropool Elevation: 5760.00

#### Detention Pond C4

This is a permanent full spectrum detention pond that includes water quality and discharges downstream to Pond C3. Pond C4 has been graded. The outlet Structure and overflow wall will be built with the final plat of this project. The pond forebay and low flow channel were built as part of the CDR 20-007 project. Pond C4 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 map in appendix for watershed areas.

- Watershed Area: 81.00 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B (40%), Group C/D (60%)
- Zone 1 WQCV: 1.488ac-ft, WSEL: 5767.97

- Zone 2 EURV: 4.477ac-ft, WSEL: 5770.41, Top outlet structure set at 5770.50, 6'x6' outlet structure
- (5-yr): 3.934ac-ft, WSEL: 5770.84, 16.5cfs
- Zone 3 (100-yr): 10.152ac-ft, WSEL: 5774.34, 43.7cfs
- Pipe Outlet: 24" RCP at 0.5%
- Overflow Spillway: 30' wide bottom, elevation=5775.00, 4:1 side slopes, flow depth=1.87' 1.13' freeboard
- Micropool Elevation: 5765.00

4.9?

#### Water Quality for Basin F1.1 (4.23ac)

Developed runoff from this basin flows east offsite (shallow sheet flow) and does not include a water quality pond. Runoff from this basin is from a standard 50'x110' lot with the back 90 feet of the residential lots which flows overland east across a 145' wide open space tract prior to discharging to the east. The Runoff Reduction Method procedure from the Mile High Flood Control District spreadsheet (UD-BMP-V3.07) calculations have been applied to a standard 50' wide lot to address water quality provisions for development in this basin (see appendix). The UIA area is 4500sf (50'x90') and the RPA area is 7250sf (50'x145') per lot which can then be applied to the remaining lots within the basin. The large 145' wide open space tract provides a 100% reduction in the water quality requirements for this basin. Grading within this basin should not channelize flow from backyards and flow should be allowed to pass under any backyard fencing without obstructing or channelizing the overland flow.

#### Water Quality Pond F

This is a permanent water quality pond that discharges eastward overland into the Upper Williams Creek drainage basin. The pond forebay, low flow channel, and outlet structure will be built as part of this project. WQ Pond F is designed in the UDCF Full Spectrum spreadsheets for Water Quality. In order to maintain existing discharge rates to the east (see Design Pt. 35), this pond allow the 5-year and 100-year storms to discharge undetained through the pond overland to the east. The outlet structure is a standard extended detention basin structure with only the WQ plate. The pond print outs are in the appendix of this report. See map in appendix for watershed areas.

- Watershed Area: 4.90 acres
- Watershed Imperviousness: 55%
- Hydrologic Soils Group B (100%)
- Zone 1 WQCV: 0.09ac-ft, WSEL: 5845.23
- Zone 2 EURV: not used
- (5-yr): not used
- Zone 3 (100-yr): not used
- Micropool Elevation: 5843.17

Address downstream  
easement and  
conveyance for increased  
flow and point discharge

## **7.0 DRAINAGE AND BRIDGE FEES**

The Ridge at Lorson Ranch is located within the Jimmy Camp Creek drainage basin which is currently a fee basin in El Paso County. 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.

**Table 7.1: Public Drainage Facility Costs (non-reimbursable)**

Item	Quantity	Unit	Unit Cost	Item Total

Inlets/Manholes	65	EA	\$5000/EA	\$325,000
18" Storm	1820	LF	\$35	\$63,700
24" Storm	720	LF	\$40	\$28,800
30" Storm	1330	LF	\$45	\$59,850
36" Storm	1130	LF	\$55	\$62,150
42" Storm	245	LF	\$65	\$15,925
48" Storm	400	LF	\$85	\$34,000
			Subtotal	\$589,425
			Eng/Cont (10%)	\$58,942
			Total Est. Cost	\$648,367

**Table 7.2: Lorson Ranch Metro District Drainage Facility Costs (non-reimbursable)**

Item	Quantity	Unit	Unit Cost	Item Total
Full Spectrum Outlets	2	LS	\$20,000	\$40,000
WQ Pond	1	LS	\$20,000	\$20,000
			Subtotal	\$60,000
			Eng/Cont (15%)	\$9,000
			Total Est. Cost	\$69,000

## 8.0 FOUR STEP PROCESS

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

### Step 1: Employ Runoff Reduction Practices

The Ridge 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 on the east side
- Construct outlet structures for two 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. The Ridge at Lorson Ranch will construct two full spectrum stormwater extended detention basins and one WQ pond 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 four permanent ponds and one runoff reduction area, and one WQ Pond.

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## **10.0 REFERENCES**

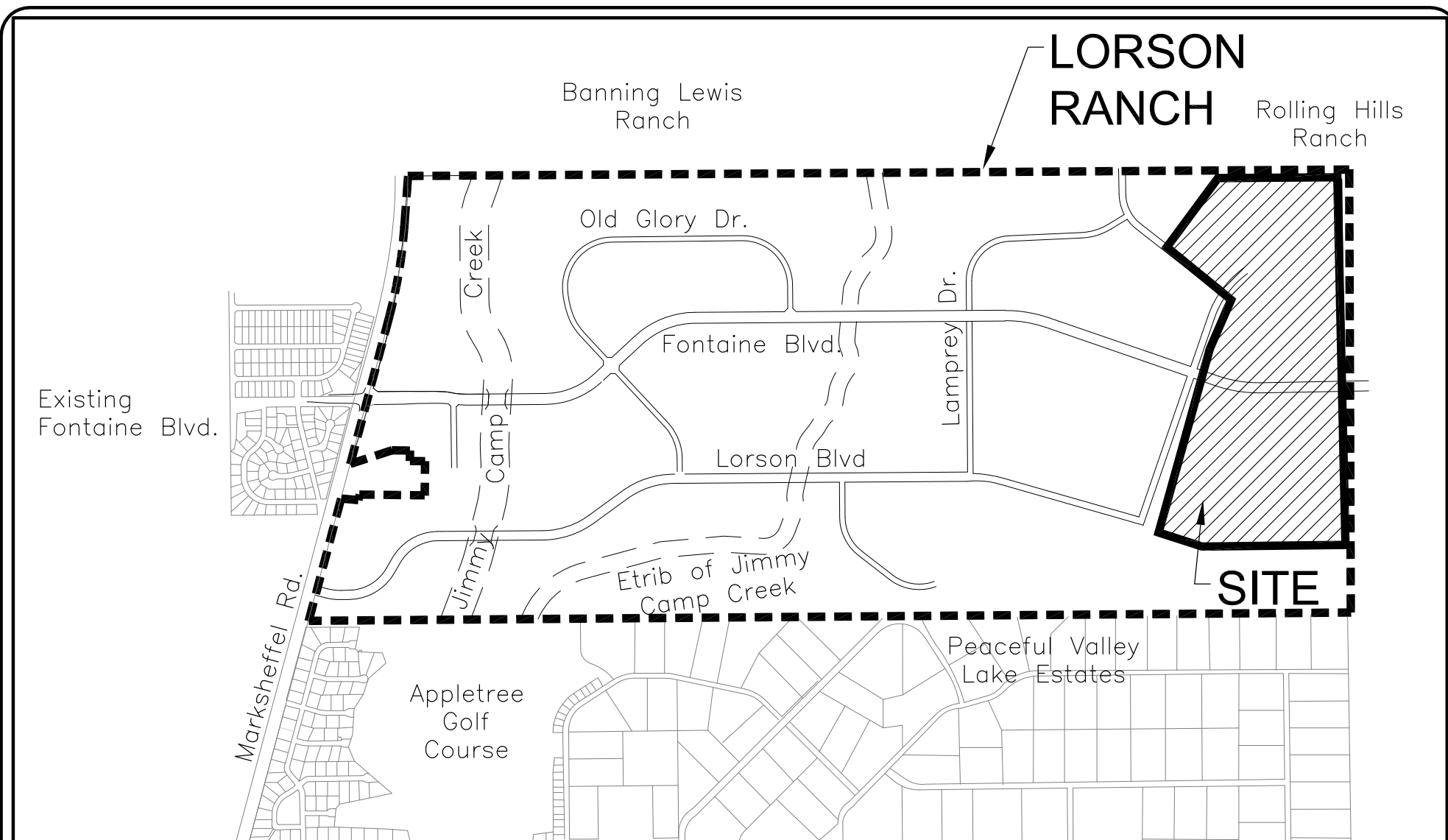
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1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs "Drainage Criteria Manual, Volume 2
5. El Paso County "Engineering Criteria Manual"
6. Lorson Ranch East MDDP, June 30, 2017 by Core Engineering.
7. 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.
8. Lorson Ranch East MDDP prepared by Core Engineering Group, dated November 27, 2017
9. Final Drainage Report for CDR 20-007 prepared by Core Engineering Group, dated October 22, 2020
10. Final Drainage Report for The Hills at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, Reference SF 21-010

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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

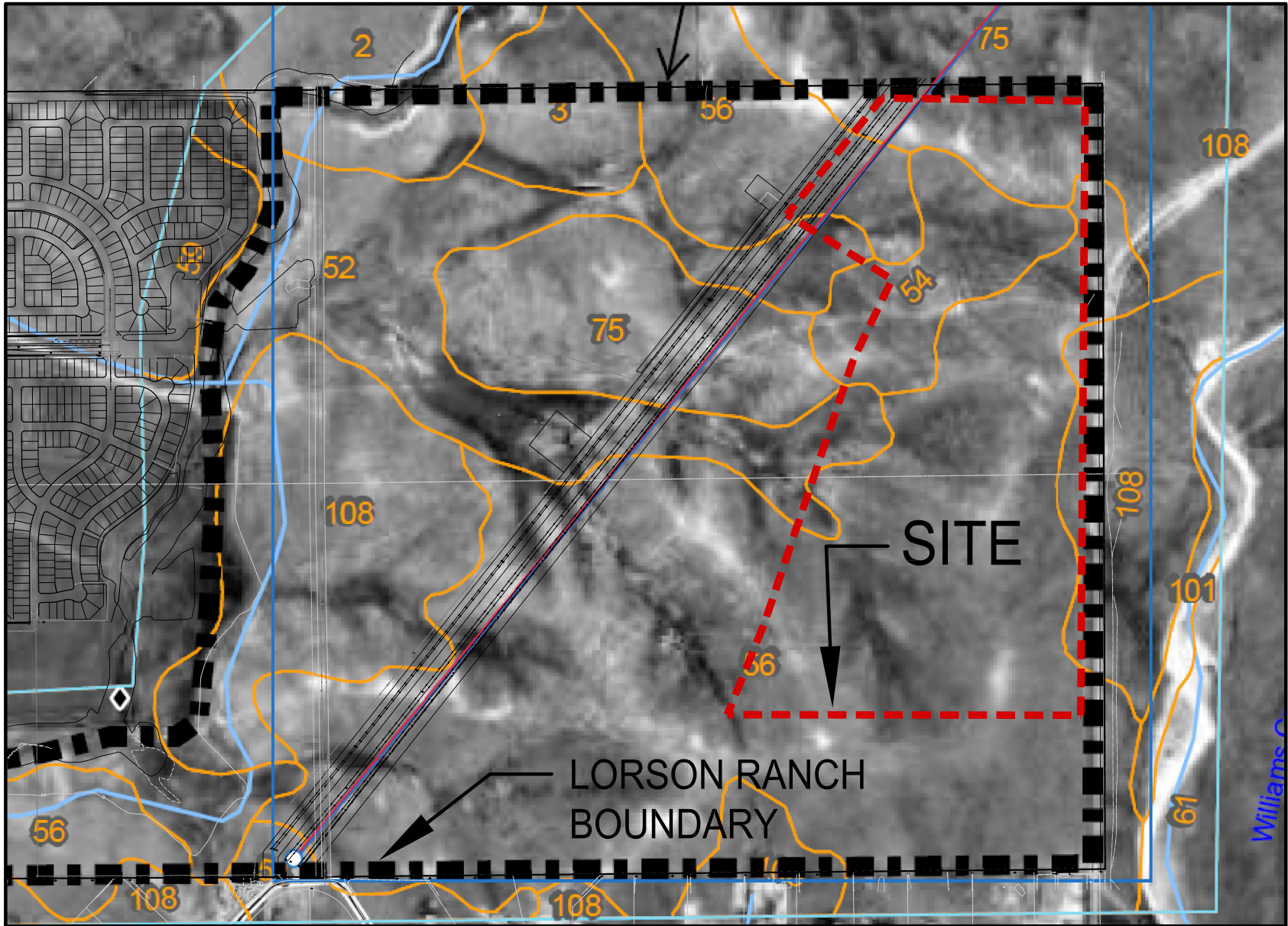
**THE RIDGE AT LORSON RANCH**  
**VICINITY MAP**

SCALE:  
NTS

DATE:  
APRIL, 2021

FIGURE NO.  
--





**CORE**  
**ENGINEERING GROUP**

15004 1ST AVENUE S.  
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**THE RIDGE AT LORSON RANCH  
SOILS MAP**

SCALE:  
NTS

DATE:  
APRIL, 2021

FIGURE NO.  
--



CITY OF COLORADO SPRINGS  
080060

LOMR 19-08-0605P  
eff. 5/4/2020

FLOODWAY

Zone AE Zone AE

EL PASO COUNTY  
080059

08041C0957 G  
eff. 12/7/2018

AREA OF MINIMAL FLOOD HAZARD

Zone X

08041C0976 G  
eff. 12/7/2018

Zone A

site

1000 FEET

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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: Feb. 17, 2021

 Checked By: Leonard Beasley

 Job No: 100.064

 Project: The Ridge 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	
EX-B1			14.42	0.15	28.1	2.16	2.58	5.6													
OS-B1.1			11.47	0.15	21.0	1.72	3.02	5.2													
<b>EX-B</b>	<b>1X</b>	25.89							29.7	3.88	2.50	9.7									
C1.1-ex			12.49	0.09	23.8	1.12	2.83	3.2													
C2.1-ex			26.58	0.10	33.6	2.66	2.31	6.1													
C2.2-ex			60.28	0.09	35.1	5.43	2.25	12.2													
C3.1-ex			8.36	0.12	28.6	1.00	2.55	2.6													
OS-C4.1			3.90	0.10	20.7	0.39	3.04	1.2													
C4.2-ex			47.93	0.13	31.6	6.23	2.41	15.0													
<b>C4-ex</b>	<b>4X</b>	51.83							34.1	6.62	2.29	15.2									
EX-F1			22.36	0.12	33.1	2.68	2.33	6.3													
EX-F2			17.49	0.15	15.4	2.62	3.48	9.1													
<b>EX-F</b>	<b>2X</b>	39.85							33.1	5.31	2.33	12.4									



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

Calculated By: Leonard Beasley  
 Date: Feb. 17, 2021  
 Checked By: Leonard Beasley

Job No: 100.064  
 Project: The Ridge 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 <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	
EX-B1			14.42	0.50	28.1	7.21	4.33	31.2													
OS-B1.1			11.47	0.50	21.0	5.74	5.06	29.0													
<b>EX-B</b>	<b>1X</b>	25.89							29.7	12.95	4.19	54.2									
C1.1-ex			12.49	0.36	23.8	4.50	4.75	21.4													
C2.1-ex			26.58	0.39	33.6	10.37	3.88	40.2													
C2.2-ex			60.28	0.36	35.1	21.70	3.77	81.8													
C3.1-ex			8.36	0.42	28.6	3.51	4.28	15.0													
C4.1-ex			3.90	0.39	20.7	1.52	5.10	7.8													
C4.2-ex			47.93	0.44	31.6	21.09	4.04	85.1													
<b>C4-ex</b>	<b>4X</b>	51.83							34.1	22.61	3.84	86.9									
EX-F1			22.36	0.44	33.1	9.84	3.91	38.5													
EX-F2			17.49	0.50	15.4	8.75	5.84	51.1													
<b>EX-F</b>	<b>2X</b>	39.85							33.1	18.58	3.91	72.7									

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

 Calculated By: Leonard Beasley

 Date: Feb. 18, 2021

 Checked By: Leonard Beasley

 Job No: 100.064

 Project: The Ridge 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 <sub>t</sub>	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C1.1	I-1		3.18	0.45	11.8	1.43	3.89	5.6													
C1.2	I-2		1.52	0.45	11.5	0.68	3.92	2.7													
C1.1-C1.2	3	4.70							11.8	2.12	3.89	8.2									
C1.3	I-4		6.71	0.45	21.8	3.02	2.96	8.9													
C1.1-C1.3	5	11.41							26.1	5.13	2.69	13.8									
C1.4			2.51	0.45	13.2	1.13	3.72	4.2													
C1.5	I-6		1.61	0.45	9.9	0.72	4.14	3.0													
C1.6			9.35	0.45	20.5	4.21	3.05	12.8													
C1.5-C1.6	7	10.96							20.5	6.06	3.05	18.5									
C3.1	I-12		6.20	0.45	14.7	2.79	3.55	9.9													
C3.2	I-13		5.01	0.45	15.3	2.25	3.49	7.9													
C3.1-C3.2	14	11.21							16.1	5.04	3.41	17.2									
C3.3	I-15		4.75	0.45	11.2	2.14	3.96	8.5													
C3.1-C3.3	16	15.96							18.1	7.18	3.24	23.3									
C3.4	I-17		3.77	0.45	9.4	1.70	4.23	7.2													
C3.1-C3.4	18	19.73							18.9	8.88	3.17	28.2									
C3.5	I-19		6.32	0.45	14.1	2.84	3.62	10.3													
C3.1-C3.5	20	26.05							19.9	11.72	3.10	36.3									
C3.6a	I-20a		3.15	0.45	11.2	1.42	3.96	5.6													
C3.1-C3.6a	20b	29.20							20.0	13.14	3.09	40.6									
C3.6b	I-21		4.80	0.45	16.8	2.16	3.35	7.2													
C3.7	I-23		4.58	0.45	9.4	2.06	4.22	8.7													
C3.1-C3.7	24	38.58							21.0	17.36	3.02	52.4									
C3.8	I-25		6.51	0.45	16.1	2.93	3.41	10.0													
C3.9	I-27		4.55	0.45	11.1	2.05	3.97	8.1													
C3.1-C3.9	28	49.64							22.3	22.34	2.93	65.4									
C3.10	I-29		6.01	0.45	16.4	2.70	3.39	9.2													
C3.1-C3.10	30	55.65							24.4	25.04	2.79	69.9									
C4.1			4.61	0.45	20.3	2.07	3.07	6.4													
C4.2			3.08	0.45	15.7	1.39	3.45	4.8													
C4.1-C4.2	31	7.69							20.6	3.46	3.04	10.5									
C4.3			3.07	0.46	10.7	1.41	4.02	5.7													

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

 Calculated By: Leonard Beasley

 Date: Feb. 18, 2021

 Checked By: Leonard Beasley

 Job No: 100.064

 Project: The Ridge 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 <sub>t</sub>	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C4.4			3.29	0.46	10.4	1.51	4.07	6.2													
C4.1-C4.4	<b>34</b>	14.05							22.6	6.39	2.91	18.6									
C4.5			0.63	0.90	5.0	0.57	5.17	2.9													
F1.1			4.23	0.45	11.3	1.90	3.94	7.5													
F1.2			19.06	0.08	11.0	1.52	3.98	6.1													
F1.3			1.15	0.46	13.6	0.53	3.67	1.9													
F1.4			3.75	0.45	15.3	1.69	3.49	5.9													
F1.1-F1.4	<b>35</b>	28.19							15.3	3.43	3.49	12.0									
C5.1a	I-39		2.33	0.47	12.5	1.10	3.79	4.2													
C5.1b	I-36		6.32	0.45	10.8	2.84	4.02	11.4													
C5.1c	I-37		3.78	0.45	8.6	1.70	4.35	7.4													
C5.1b-C5.1c	<b>38</b>	10.10							10.8	4.55	4.02	18.3									
C5.1a-C5.1c	<b>I-39 &amp; 40</b>	12.43							14.4	5.64	3.58	20.2									
C5.1d	I-41		5.67	0.45	14.0	2.58	3.62	9.3													
C5.1a-C5.1d	<b>42</b>	18.10							14.4	4.28	3.58	15.3									
C5.1e	I-43		6.44	0.46	16.5	2.96	3.38	10.0													
C5.1a-C5.1e	<b>44</b>	24.54							16.5	11.18	3.38	37.8									
C5.2			1.71	0.49	8.5	0.84	4.37	3.7													
C5.3			2.26	0.46	10.3	1.04	4.09	4.3													
C5.2-C5.3	<b>I-45 &amp; 46</b>	3.97							10.3	1.88	4.09	7.7									
C8.1a	I-47		4.12	0.45	10.7	1.85	4.03	7.5													
C8.1b	I-49		3.69	0.48	14.6	1.77	3.56	6.3													
C8.1c	I-48		1.88	0.46	11.3	0.86	3.94	3.4													
C8.1	<b>I-49</b>	9.69							14.6	4.49	3.56	16.0									
C8.2	I-51		2.12	0.49	8.9	1.04	4.31	4.5													
OS-C4a			2.29	0.09	11.8	0.21	3.88	0.8													
C8.3a	I-53		5.88	0.46	11.8	2.70	3.89	10.5													
OS-C4a-C8.3a	<b>I-54</b>	8.17							14.0	2.91	3.62	10.6									





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

Calculated By: Leonard Beasley  
 Date: Feb. 19, 2021  
 Checked By: Leonard Beasley

Job No: 100.064  
 Project: The Ridge 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	min	
C1.1	I-1		3.18	0.59	11.8	1.88	6.52	12.2													
C1.2	I-2		1.52	0.59	11.5	0.90	6.58	5.9													
C1.1-C1.2	<b>3</b>	4.70							11.8	2.77	6.52	18.1									
C1.3	I-4		6.71	0.59	21.8	3.96	4.97	19.7													
C1.1-C1.3	<b>5</b>	11.41							26.1	6.73	4.52	30.4									
C1.4			2.51	0.59	13.2	1.48	6.24	9.2													
C1.5	I-6		1.61	0.59	9.9	0.95	6.96	6.6													
C1.6			9.35	0.59	20.5	5.52	5.12	28.3													
C1.5-C1.6	<b>7</b>	10.96							20.5	7.95	5.12	40.7									
C3.1	I-12		6.20	0.59	14.7	3.66	5.96	21.8													
C3.2	I-13		5.01	0.59	15.3	2.96	5.86	17.3													
C3.1-C3.2	<b>14</b>	11.21							16.1	6.61	5.73	37.9									
C3.3	I-15		4.75	0.59	11.2	2.80	6.65	18.6													
C3.1-C3.3	<b>16</b>	15.96							18.1	9.42	5.44	51.3									
C3.4	I-17		3.77	0.59	9.4	2.22	7.10	15.8													
C3.1-C3.4	<b>18</b>	19.73							18.9	11.64	5.32	62.0									
C3.5	I-19		6.32	0.59	14.1	3.73	6.07	22.6													
C3.1-C3.5	<b>20</b>	26.05							19.9	15.37	5.20	80.0									
C3.6a	I-20a		3.15	0.59	11.2	1.86	6.64	12.3													
C3.1-C3.6a	<b>20b</b>	29.20							20.0	17.23	5.19	89.3									
C3.6b	I-21		4.80	0.59	16.8	2.83	5.63	15.9													
C3.7	I-23		4.58	0.59	9.4	2.70	7.08	19.1													
C3.1-C3.7	<b>24</b>	38.58							21.0	22.76	5.06	115.2									
C3.8	I-25		6.51	0.59	16.1	3.84	5.73	22.0													
C3.9	I-27		4.55	0.59	11.1	2.68	6.66	17.9													
C3.1-C3.9	<b>28</b>	49.64							22.3	29.29	4.92	144.0									
C3.10	I-29		6.01	0.59	16.4	3.55	5.69	20.2													
C3.1-C3.10	<b>30</b>	55.65							24.4	32.83	4.69	153.9									
C4.1			4.61	0.59	20.3	2.72	5.15	14.0													
C4.2			3.08	0.59	15.7	1.82	5.79	10.5													
C4.1-C4.2	<b>31</b>	7.69							20.6	4.54	5.11	23.2									
C4.3			3.07	0.60	10.7	1.84	6.76	12.4													
C4.4			3.29	0.60	10.4	1.97	6.84	13.5													
C4.1-C4.4	<b>34</b>	14.05							22.6	8.35	4.88	40.8									







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

Calculated By: Leonard Beasley

Date: Feb. 19, 2021

Checked By: Leonard Beasley

Job No: 100.064

Project: The Ridge 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	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
C8.3a	I-53		5.88	0.60	11.8	3.53	6.53	23.0													
OS-C4a-C8.3a	<b>I-54</b>	8.17							14.0	4.35	6.08	26.5									
OS-C4b			2.10	0.41	12.7	0.86	6.34	5.5													
C8.3b			3.46	0.63	14.2	2.18	6.06	13.2													
C8.3c (OS-C4b-C8.3c)	I-54	7.89	2.33	0.63	10.7	1.47	6.76	9.9	14.2	4.51	6.06	27.3									
OS-C4a-C8.3c	<b>I-54</b>	16.06							20.0	8.86	5.18	45.9									
C8.3d	I-56		5.26	0.62	15.1	3.26	5.89	19.2													
OS-C4a-C8.3d	<b>I-56</b>	21.32							20.6	11.30	5.12	57.8									
C8.4	I-57		6.70	0.60	14.5	4.02	5.99	24.1													
C8.1-C8.4	<b>I-51</b>	39.83							21.1	17.52	5.06	88.6									
C8.5	I-59		3.84	0.65	13.4	2.50	6.20	15.5													
C8.6			0.79	0.96	5.6	0.76	8.40	6.4													
C8.7a			4.52	0.65	13.7	2.94	6.14	18.0													
C8.7b	I-63		1.77	0.65	11.3	1.15	6.62	7.6													
C8.7a-C8.7b	<b>I-63</b>	6.29							13.9	4.09	6.10	24.9									
C8.7c	I-64		4.94	0.65	11.7	3.21	6.55	21.0													
C8.7a-C8.7c	<b>I-64</b>	11.23							14.4	7.30	6.01	43.8									
C8.7d			0.27	0.61	5.0	0.16	8.68	1.4													
C8.7a-C8.7d	<b>I-66</b>	11.50							15.0	7.46	5.91	44.1									
C8.7e			6.09	0.62	11.9	3.78	6.50	24.5													
C8.6+C8.7e	I-62								13.4	4.53	6.19	28.1									
C8.7a-C8.7e		17.59							15.4	11.24	5.84	65.7									
C8.6-C8.7e	<b>I-68</b>	18.38							15.5	12.00	5.83	69.9									
OS-B1			5.11	0.49	12.7	2.50	6.33	15.8													
C8.8a			5.65	0.64	23.4	3.62	4.80	17.3													
OS-B1-C8.8a	<b>I-69</b>	10.76							27.3	6.12	4.40	26.9									
68+69	<b>I-70</b>	29.14							27.3	18.12	4.40	79.7									
C8.8			7.80	0.48	15.6	3.74	5.81	21.8													
C8			73.39	0.60	27.5	44.16	4.39	193.7													



15004 1st Avenue South  
Burnsville, MN 55306

**PROJECT NAME:** The Ridge at Lorson Ranch  
**PROJECT NUMBER:** 100.064  
**ENGINEER:** LAB  
**DATE:** Feb. 17, 2021

**Preliminary Drainage Plan**  
**CURRENT CONDITIONS COEFFICIENT "C" CALCULATIONS**

[illegible]



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

Calculated By: Leonard Beasley  
 Date: Feb. 17, 2021  
 Checked By: Leonard Beasley

Job No: 100.064  
 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		Final tc
BASIN or DESIGN	C <sub>5</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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=Ti+Tt (min)
EX-B1	0.15	14.42	7.0	300.00	4.00%	0.27	18.80	575.00	4.00%	1.40	6.85				
			20.0					375.00	1.60%	2.53	2.47	28.12	1250.00	16.94	16.94
OS-B1.1	0.15	5.64	20.0	300.00	4.00%	0.27	18.80	550.00	4.40%	4.20	2.19	20.99	850.00	14.72	14.72
EX-B1	0.15	20.06	20.0	300.00	2.00%	0.21	23.63	650.00	0.80%	1.79	6.06	29.69	950.00	15.28	15.28
C1.1-ex	0.09	12.49	7.0	300.00	5.40%	0.28	18.16	434.00	5.50%	1.64	4.41				
			15.0					225.00	4.44%	3.16	1.19	23.75	959.00	15.33	23.75
C2.1-ex	0.10	26.56	7.0	300.00	5.33%	0.28	18.06	1347.00	5.72%	1.67	13.41				
			15.0					266.00	1.88%	2.06	2.16	33.62	1913.00	20.63	33.62
C2.2-ex	0.09	60.28	7.0	140.00	3.57%	0.16	14.22	1216.00	4.28%	1.45	13.99				
			15.0					1123.00	3.29%	2.72	6.88	35.10	2479.00	23.77	35.10
C3.1-ex	0.12	8.36	7.0	300.00	6.00%	0.29	17.01	1052.00	6.10%	1.73	10.14				
			15.0					152.00	1.32%	1.72	1.47	28.63	1504.00	18.36	28.63
OS-C4.1	0.10	4.39	7.0	300.00	4.50%	0.26	19.10	143.00	4.60%	1.50	1.59	20.68	443.00	12.46	20.68
C4.2-ex	0.13	47.93	7.0	300.00	5.25%	0.28	17.60	500.00	5.25%	1.60	5.20				
			15.0					1307.00	2.75%	2.49	8.76	31.55	2107.00	21.71	31.55





# CORE ENGINEERING GROUP

15004 1st Avenue South  
Burnsville, MN 55306

**PROJECT NAME:** The Ridge at Lorson Ranch

**PROJECT NUMBER:** 100.064

**ENGINEER:** LAB

**DATE:** Feb. 19, 2021

## Preliminary Drainage Plan

### PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

BASIN	Soil No.	Hydro Group	Area	Cover (%)	C5	Wtd. C5	C100	Wtd. C100	Impervious	Type of Cover
C1.1	56	B	3.18		0.45		0.59		65%	1/8 ac. Single Family
C1.2	56	B	1.52		0.45		0.59		65%	1/8 ac. Single Family
C1.3	56	B	13.47		0.45		0.59		65%	1/8 ac. Single Family
C1.4	56	B	5.19		0.45		0.59		65%	1/8 ac. Single Family
C1.5	56	B	0.70		0.45		0.59		65%	1/8 ac. Single Family
C1.6	56/108	B	9.35		0.45		0.59		65%	1/8 ac. Single Family
C3.1	56	B	6.20		0.45		0.59		65%	1/8 ac. Single Family
C3.2	56	B	5.01		0.45		0.59		65%	1/8 ac. Single Family
C3.3	56	B	4.75		0.45		0.59		65%	1/8 ac. Single Family
C3.4	56	B	3.77		0.45		0.59		65%	1/8 ac. Single Family
C3.5	56	B	6.32		0.45		0.59		65%	1/8 ac. Single Family
C3.6a	56	B	3.15		0.45		0.59		65%	1/8 ac. Single Family
C3.6b	56	B	4.80		0.45		0.59		65%	1/8 ac. Single Family
C3.7	56	B	4.58		0.45		0.59		65%	1/8 ac. Single Family
C3.8	56	B	6.51		0.45		0.59		65%	1/8 ac. Single Family
C3.9	56	B	4.55		0.45		0.59		65%	1/8 ac. Single Family
C3.10	56	B	6.01		0.45		0.59		65%	1/8 ac. Single Family
C4.1	56	B	4.61		0.45		0.59		65%	1/8 ac. Single Family
C4.2	56	B	3.08		0.45		0.59		65%	1/8 ac. Single Family
C4.3	56	B	2.46	80.13%	0.45	0.36	0.59	0.47	65%	1/8 ac. Single Family
	52	C	0.61	19.87%	0.49	0.10	0.65	0.13	65%	1/8 ac. Single Family
			3.07	100.00%		0.46		0.60		
C4.1	56	B	4.61		0.45		0.59		65%	1/8 ac. Single Family
C4.2	56	B	3.08		0.45		0.59		65%	1/8 ac. Single Family
C4.3	56	B	2.46	80.13%	0.45	0.36	0.59	0.47	65%	1/8 ac. Single Family
	52	C	0.61	19.87%	0.49	0.10	0.65	0.13	65%	1/8 ac. Single Family
			3.07	100.00%		0.46		0.60		



# CORE ENGINEERING GROUP

15004 1st Avenue South  
Burnsville, MN 55306

**PROJECT NAME:** The Ridge at Lorson Ranch

**PROJECT NUMBER:** 100.064

**ENGINEER:** LAB

**DATE:** Feb. 19, 2021

## Preliminary Drainage Plan

### PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

C4.4	56	B	2.56	77.81%	0.45	0.35	0.59	0.46	65%	1/8 ac. Single Family
	52	C	0.73	22.19%	0.49	0.11	0.65	0.14	65%	1/8 ac. Single Family
			3.29	100.00%		0.46		0.60		
C4.5	56	B	0.26	41.27%	0.90	0.37	0.96	0.40	100%	Roadway
	52	C	0.37	58.73%	0.90	0.53	0.96	0.56	100%	Roadway
			0.63	100.00%		0.90		0.96		
C5.1a	56	B	1.34	57.51%	0.45	0.26	0.59	0.34	65%	1/8 ac. Single Family
	54/52	D/C	0.99	42.49%	0.49	0.21	0.65	0.28	65%	1/8 ac. Single Family
			2.33	100.00%		0.47		0.62		
C5.1b	56	B	5.96	94.30%	0.45	0.42	0.59	0.56	65%	1/8 ac. Single Family
	52	C	0.36	5.70%	0.49	0.03	0.65	0.04	65%	1/8 ac. Single Family
			6.32	100.00%		0.45		0.59		
C5.1c	56	B	3.54	93.65%	0.45	0.42	0.59	0.55	65%	1/8 ac. Single Family
	52	C	0.24	6.35%	0.49	0.03	0.65	0.04	65%	1/8 ac. Single Family
			3.78	100.00%		0.45		0.59		
C5.1d	56	B	4.98	87.83%	0.45	0.40	0.59	0.52	65%	1/8 ac. Single Family
	52	C	0.69	12.17%	0.49	0.06	0.65	0.08	65%	1/8 ac. Single Family
			5.67	100.00%		0.45		0.60		
C5.1e	56	B	5.44	84.47%	0.45	0.38	0.59	0.50	65%	1/8 ac. Single Family
	52	C	1.00	15.53%	0.49	0.08	0.65	0.10	65%	1/8 ac. Single Family
			6.44	100.00%		0.46		0.60		
C5.2	52	C	1.71		0.49		0.65		65%	1/8 ac. Single Family
C5.3	56	B	1.50	66.37%	0.45	0.30	0.59	0.39	65%	1/8 ac. Single Family
	52	C	0.76	33.63%	0.49	0.16	0.65	0.22	65%	1/8 ac. Single Family
			2.26	100.00%		0.46		0.61		



# CORE ENGINEERING GROUP

15004 1st Avenue South  
Burnsville, MN 55306

PROJECT NAME: The Ridge at Lorson Ranch

PROJECT NUMBER: 100.064

ENGINEER: LAB

DATE: Feb. 19, 2021

## Preliminary Drainage Plan

### PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

C8.1a	56	B	3.81	92.48%	0.45	0.42	0.59	0.55	65%	1/8 ac. Single Family
	54	D	0.31	7.52%	0.49	0.04	0.65	0.05	65%	1/8 ac. Single Family
			4.12	100.00%		0.45		0.59		
C8.1b	56	B	1.36	36.86%	0.45	0.17	0.59	0.22	65%	1/8 ac. Single Family
	54	D	2.33	63.14%	0.49	0.31	0.65	0.41	65%	1/8 ac. Single Family
			3.69	100.00%		0.48		0.63		
C8.1c	56	B	1.31	69.68%	0.45	0.31	0.59	0.41	65%	1/8 ac. Single Family
	54	D	0.57	30.32%	0.49	0.15	0.65	0.20	65%	1/8 ac. Single Family
			1.88	100.00%		0.46		0.61		
C8.2	52	C	2.12		0.49		0.65		65%	1/8 ac. Single Family
OS-C4a	56	B	2.29		0.09		0.36		10%	Undeveloped
C8.3a	56	B	4.88	82.99%	0.45	0.37	0.59	0.49	65%	1/8 ac. Single Family
	54	C/D	1.00	17.01%	0.49	0.08	0.65	0.11	65%	1/8 ac. Single Family
			5.88	100.00%		0.46		0.60		
OS-C4b	56	B	1.36	64.76%	0.09	0.06	0.36	0.23	10%	Undeveloped
	75	D	0.74	35.24%	0.16	0.06	0.51	0.18	10%	Undeveloped
			2.10	100.00%		0.11		0.41		
C8.3b	56	B	1.09	31.50%	0.45	0.14	0.59	0.19	65%	1/8 ac. Single Family
	54	D	2.37	68.50%	0.49	0.34	0.65	0.45	65%	1/8 ac. Single Family
			3.46	100.00%		0.48		0.63		
C8.3c	56	B	0.87	37.34%	0.45	0.17	0.59	0.22	65%	1/8 ac. Single Family
	54	D	1.46	62.66%	0.49	0.31	0.65	0.41	65%	1/8 ac. Single Family
			2.33	100.00%		0.48		0.63		
DP-54	56	B	6.84	58.61%	0.45	0.26	0.59	0.35	65%	1/8 ac. Single Family





# CORE ENGINEERING GROUP

15004 1st Avenue South  
Burnsville, MN 55306

**PROJECT NAME:** The Ridge at Lorson Ranch

**PROJECT NUMBER:** 100.064

**ENGINEER:** LAB

**DATE:** Feb. 19, 2021

## Preliminary Drainage Plan

### PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

	54	D	4.83	41.39%	0.49	0.20	0.65	0.27	65%	1/8 ac. Single Family
			11.67	100.00%		0.47		0.61		
C8.3d	56	B	0.81	15.40%	0.45	0.07	0.59	0.09	65%	1/8 ac. Single Family
	54	D	4.45	84.60%	0.49	0.41	0.65	0.55	65%	1/8 ac. Single Family
			5.26	100.00%		0.48		0.64		
C8.4	56	B	5.25	78.36%	0.45	0.35	0.59	0.46	65%	1/8 ac. Single Family
	54	D	1.45	21.64%	0.49	0.11	0.65	0.14	65%	1/8 ac. Single Family
			6.70	100.00%		0.46		0.60		
C8.5	54/75	D	3.84		0.49		0.65		100%	1/8 ac. Single Family
C8.6	54	D	0.79		0.90		0.96		100%	Street
C8.7a	75	D	6.29		0.49		0.65		100%	1/8 ac. Single Family
C8.7b	54/75	D	4.94		0.49		0.65		100%	1/8 ac. Single Family
C8.7c	75	D	4.94		0.49		0.65		100%	1/8 ac. Single Family
C8.7d	56	B	0.17	62.96%	0.45	0.28	0.59	0.37	65%	1/8 ac. Single Family
	54	D	0.10	37.04%	0.49	0.18	0.65	0.24	65%	1/8 ac. Single Family
			0.27	100.00%		0.46		0.61		
C8.7e	56	B	2.56	42.04%	0.45	0.19	0.59	0.25	65%	1/8 ac. Single Family
	52/54	C/D	3.53	57.96%	0.49	0.28	0.65	0.38	65%	1/8 ac. Single Family
			6.09	100.00%		0.47		0.62		
OS-B1	56	B	0.75	14.68%	0.09	0.01	0.36	0.05	10%	Undeveloped
	75	D	4.36	85.32%	0.16	0.14	0.51	0.44	10%	Undeveloped
			5.11	100.00%		0.15		0.49		
C8.8a	56	B	0.70	12.39%	0.45	0.06	0.59	0.07	65%	1/8 ac. Single Family
	52/54/75	C/D	4.95	87.61%	0.49	0.43	0.65	0.57	65%	1/8 ac. Single Family
			5.65	100.00%		0.49		0.64		
C8.8	56	B	3.85	49.36%	0.16	0.08	0.41	0.20	13%	Pond / Open Space
	52	C	3.08	39.49%	0.23	0.09	0.54	0.21	13%	Pond / Open Space



# CORE ENGINEERING GROUP

15004 1st Avenue South  
Burnsville, MN 55306

**PROJECT NAME:** The Ridge at Lorson Ranch

**PROJECT NUMBER:** 100.064

**ENGINEER:** LAB

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## Preliminary Drainage Plan

### PROPOSED CONDITIONS COEFFICIENT "C" CALCULATIONS

	56	B	0.63	8.08%	0.45	0.04	0.59	0.05	65%	1/8 ac. Single Family
	52	C	0.24	3.08%	0.49	0.02	0.65	0.02	65%	1/8 ac. Single Family
			7.80	100.00%		0.22		0.48		
C8.4	56	B	4.89	72.99%	0.45	0.33	0.59	0.43	65%	1/8 ac. Single Family
	54	C	1.81	27.01%	0.49	0.13	0.65	0.18	65%	1/8 ac. Single Family
			6.70	100.00%		0.46		0.61		
C8.5	75	D	3.49		0.49		0.65		100%	1/8 ac. Single Family
C8.6	54	D	0.79		0.90		0.96		100%	Street
C8.7	56	B	3.68	15.59%	0.45	0.07	0.59	0.09	65%	1/8 ac. Single Family
	52/54/75	C/D	19.93	84.41%	0.49	0.41	0.65	0.55	65%	1/8 ac. Single Family
			23.61	100.00%		0.48		0.64		
C8.8	56	B	3.85	49.36%	0.16	0.08	0.41	0.20	13%	Pond / Open Space
	52	C	3.08	39.49%	0.23	0.09	0.54	0.21	13%	Pond / Open Space
	56	B	0.63	8.08%	0.45	0.04	0.59	0.05	65%	1/8 ac. Single Family
	52	C	0.24	3.08%	0.49	0.02	0.65	0.02	65%	1/8 ac. Single Family
			7.80	100.00%		0.22		0.48		
	52/75	C/D	0.93	10.65%	0.49	0.05	0.65	0.07	65%	1/8 ac. Single Family
			8.73	110.65%		0.27		0.55		

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

 Calculated By: Leonard Beasley

 Date: Feb. 19, 2021

 Checked By: Leonard Beasley

 Job No: 100.064

 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		Final tc
BASIN or DESIGN	C <sub>5</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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
C1.1	0.45	3.18	7.0	100.00	3.00%	0.20	8.20	90.00	2.60%	1.13	1.33				
			20.0					350.00	1.71%	2.62	2.23	11.76	540.00	13.00	11.76
C1.2	0.45	1.52	20.0	67.00	2.00%	0.15	7.67	417.00	0.83%	1.82	3.81	11.49	484.00	12.69	11.49
DP-3	0.45	4.70	7.0	100.00	3.00%	0.20	8.20	90.00	2.60%	1.13	1.33				
			20.0					350.00	1.71%	2.62	2.23	11.76	540.00	13.00	11.76
C1.3	0.45	6.71	7.0	80.00	2.00%	0.16	8.38	87.00	1.40%	0.83	1.75				
			20.0					1400.00	1.39%	2.36	9.90				
			20.0					552.00	5.25%	4.58	2.01	22.04	2119.00	21.77	21.77
DP-5	0.45	16.31	7.0	100.00	2.00%	0.18	9.37	87.00	1.40%	0.83	1.75				
			20.0					2158.00	1.39%	2.36	15.25				
			20.0					552.00	5.25%	4.58	2.01	28.38	2897.00	26.09	26.09
C1.4	0.45	2.51	20.0	51.00	2.00%	0.13	6.69	685.00	2.10%	2.90	3.94				
			20.0					302.00	1.00%	2.00	2.52	13.15	1038.00	15.77	13.15
C1.5	0.45	1.61	20.0	23.00	2.00%	0.09	4.50	1220.00	3.52%	3.75	5.42	9.91	1243.00	16.91	9.91
C1.6	0.45	9.35	20.0	81.00	2.90%	0.18	7.46	2102.00	1.80%	2.68	13.06	20.52	2183.00	22.13	20.52
C3.1	0.45	6.20	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65	14.73	1105.00	16.14	14.73
C3.2	0.45	5.01	7.0	100.00	2.00%	0.18	9.37	120.00	2.20%	1.04	1.93				
			20.0					940.00	3.80%	3.90	4.02	15.32	1160.00	16.44	15.32
DP-14	0.45	11.21	7.0	100.00	2.00%	0.18	9.37	2.00	2.10%	1.01	0.03				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70	16.13	1342.00	17.46	16.13
C3.3	0.45	4.75	7.0	55.00	7.82%	0.21	4.43	165.00	2.79%	1.17	2.35				
			20.0					631.00	4.90%	4.43	2.38				
			20.0					286.00	1.40%	2.37	2.01	11.17	1137.00	16.32	11.17
DP-16	0.45	15.96	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				

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

 Calculated By: Leonard Beasley

 Date: Feb. 19, 2021

 Checked By: Leonard Beasley

 Job No: 100.064

 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62	18.05	1607.00	18.93	18.05
C3.4	0.45	3.77	7.0	45.00	9.33%	0.20	3.78	130.00	2.31%	1.06	2.04				
			20.0					601.00	4.74%	4.35	2.30				
			20.0					225.00	2.22%	2.98	1.26	9.37	1001.00	15.56	9.37
DP-18	0.45	19.73	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89	18.94	1773.00	19.85	18.94
C3.5	0.45	6.32	7.0	82.00	6.22%	0.23	5.83	100.00	2.80%	1.17	1.42				
			20.0					535.00	1.16%	2.15	4.14				
			20.0					559.00	5.01%	4.48	2.08				
			20.0					114.00	2.63%	3.24	0.59	14.06	1390.00	17.72	14.06
DP-20	0.45	26.05	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92	19.86	1935.00	20.75	19.86
C3.6a	0.45	3.15	20.0	63.00	2.00%	0.14	7.44	915.00	4.07%	4.03	3.78	11.22	978.00	15.43	11.22
C3.6b	0.45	4.80	7.0	100.00	2.00%	0.18	9.37	65.00	2.00%	0.99	1.09				
			20.0					301.00	0.90%	1.90	2.64				
			20.0					515.00	5.24%	4.58	1.87				
			20.0					318.00	2.20%	2.97	1.79	16.77	1299.00	17.22	16.77
C3.7	0.45	4.58	20.0	30.00	2.33%	0.10	4.88	364.00	1.73%	2.63	2.31				
			20.0					386.00	5.96%	4.88	1.32				
			20.0					154.00	1.95%	2.79	0.92	9.42	934.00	15.19	9.42
DP-24	0.45	38.58	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				



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

Calculated By: Leonard Beasley

Job No: 100.064

Date: Feb. 19, 2021

Project: The Ridge at Lorson Ranch

Checked By: Leonard Beasley

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92				
			20.0					236.00	2.97%	3.45	1.14	21.00	2171.00	22.06	21.00
C3.8	0.45	6.51	20.0	39.00	2.00%	0.11	5.85	569.00	1.28%	2.26	4.19				
			20.0					600.00	4.83%	4.40	2.28				
			20.0					539.00	1.39%	2.36	3.81	16.13	1747.00	19.71	16.13
C3.9	0.45	4.55	20.0	54.00	2.78%	0.15	6.18	1063.00	3.20%	3.58	4.95	11.13	1117.00	16.21	11.13
DP-28	0.45	45.09	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92				
			20.0					236.00	2.97%	3.45	1.14				
			20.0					246.00	2.64%	3.25	1.26	22.26	2417.00	23.43	22.26
C3.10	0.45	6.01	7.0	66.00	3.79%	0.18	6.16	118.00	2.37%	1.08	1.82				
			20.0					1076.00	2.39%	3.09	5.80				
			20.0					343.00	3.79%	3.89	1.47				
			20.0					146.00	1.23%	2.22	1.10	16.35	1749.00	19.72	16.35
DP-30	0.45	51.10	7.0	100.00	2.00%	0.18	9.37	20.00	2.10%	1.01	0.33				
			20.0					395.00	3.92%	3.96	1.66				
			20.0					440.00	1.82%	2.70	2.72				
			20.0					150.00	3.67%	3.83	0.65				
			20.0					255.00	1.57%	2.51	1.70				
			20.0					247.00	1.62%	2.55	1.62				
			20.0					166.00	2.41%	3.10	0.89				
			20.0					162.00	2.16%	2.94	0.92				
			20.0					236.00	2.97%	3.45	1.14				

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

 Calculated By: Leonard Beasley

 Date: Feb. 19, 2021

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 Job No: 100.064

 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		Final tc
BASIN or DESIGN	C5	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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
			20.0					246.00	2.64%	3.25	1.26				
			20.0					245.00	0.94%	1.94	2.11	24.37	2662.00	24.79	24.37
C4.1	0.45	4.61	7.0	45.00	10.00%	0.20	3.69	128.00	2.58%	1.12	1.90				
			20.0					1680.00	1.45%	1.36	20.59	26.18	1853.00	20.29	20.29
C4.2	0.45	3.08	20.0	43.00	2.80%	0.13	5.50	124.00	2.72%	3.30	0.63				
			20.0					865.00	4.44%	1.36	10.60	16.73	1032.00	15.73	15.73
DP-31	0.45	7.69	7.0	45.00	10.00%	0.20	3.69	128.00	2.58%	1.12	1.90				
			20.0					1680.00	1.45%	2.41	11.63				
			20.0					865.00	4.44%	4.21	3.42	20.64	2718.00	25.10	20.64
C4.3	0.46	3.07	7.0	100.00	2.00%	0.18	9.23	85.00	2.00%	0.99	1.43				
			20.0					5.07	1.12%	1.36	0.06	10.72	190.07	11.06	10.72
C4.4	0.46	3.29	20.0	34.00	3.82%	0.13	4.34	900.00	3.08%	3.51	4.27				
			20.0					144.00	1.32%	1.36	1.76	10.38	1078.00	15.99	10.38
DP-33	0.45	14.05	7.0	45.00	10.00%	0.20	3.66	128.00	2.58%	1.12	1.90				
			20.0					1680.00	1.45%	2.41	11.63				
			20.0					1170.00	4.27%	4.13	4.72				
			20.0					84.00	1.07%	2.07	0.68	22.58	3107.00	27.26	22.58
C4.5	0.90	0.63	20.0	56.00	3.93%	0.54	1.73	384.00	2.86%	3.38	1.89	3.62	440.00	12.44	3.62
F1.1	0.45	4.23	15.0	88.00	20.00%	0.36	4.10	150.00	2.50%	2.37	1.05	5.16	238.00	11.32	11.32
F1.2	0.08	19.06	7.0	37.00	19.19%	0.15	4.23	150.00	2.50%	1.11	2.26	6.49	187.00	11.04	11.04
F1.3	0.46	1.15	7.0	10.00	2.00%	0.06	2.92	30.00	2.00%	0.99	0.51				
			20.0					830.00	1.00%	1.36	10.17	13.59	870.00	14.83	13.59
F1.4	0.46	3.75	7.0	50.00	2.00%	0.13	6.53	100.00	2.00%	0.99	1.68				
			20.0					580.00	1.00%	1.36	7.11	15.32	730.00	14.06	15.32
C5.1a & I-39	0.47	2.33	7.0	87.00	12.76%	0.32	4.59	141.00	2.13%	1.02	2.30				
			20.0					1159.00	5.13%	4.53	4.26				
			20.0					296.00	3.14%	3.54	1.39	12.54	1683.00	19.35	12.54
C5.1b & I-36	0.45	6.32	7.0	45.00	24.44%	0.27	2.75	255.00	3.53%	1.32	3.23				
			20.0					1212.00	5.07%	4.50	4.49				
			20.0					62.00	3.23%	3.59	0.29	10.75	1574.00	18.74	10.75
C5.1c & I-37	0.45	3.78	7.0	44.00	20.45%	0.25	2.88	47.00	2.55%	1.12	0.70				
			20.0					1335.00	4.85%	4.40	5.05	8.63	1426.00	17.92	8.63



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

Calculated By: Leonard Beasley  
 Date: Feb. 19, 2021  
 Checked By: Leonard Beasley

Job No: 100.064  
 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
C5.1d & I-41	0.45	5.67	7.0	83.00	15.30%	0.32	4.32	228.00	2.68%	1.15	3.32				
			20.0					1356.00	4.23%	4.11	5.49				
			20.0					115.00	1.13%	2.13	0.90	14.03	1782.00	19.90	14.03
DP-42	0.46	12.43	7.0	87.00	12.76%	0.31	4.66	141.00	2.13%	1.02	2.30				
			20.0					1159.00	5.13%	4.53	4.26				
			20.0					375.00	2.61%	3.23	1.93				
			20.0					123.00	0.65%	1.61	1.27	14.43	1885.00	20.47	14.43
C5.1e & DP-44	0.46	6.44	7.0	100.00	7.00%	0.27	6.13	191.00	6.00%	1.71	1.86				
			20.0					742.00	1.62%	2.55	4.86				
			20.0					786.00	4.58%	4.28	3.06				
			20.0					104.00	2.40%	3.10	0.56	16.47	1923.00	20.68	16.47
C5.2	0.49	1.71	20.0	38.00	2.63%	0.13	4.95	677.00	2.48%	3.15	3.58	8.53	715.00	13.97	8.53
C5.3	0.46	2.26	20.0	42.00	2.00%	0.12	5.98	1115.00	4.68%	4.33	4.30	10.28	1157.00	16.43	10.28
C8.1a	0.45	4.12	7.0	60.00	7.67%	0.21	4.65	163.00	2.45%	1.10	2.48				
			20.0					966.00	5.12%	4.53	3.56	10.69	1189.00	16.61	10.69
C8.1b	0.48	3.69	20.0	73.00	2.00%	0.16	7.64	929.00	5.30%	4.60	3.36				
			20.0					465.00	1.08%	2.08	3.73	14.73	1467.00	18.15	14.73
C8.1c	0.46	1.88	20.0	63.00	2.00%	0.14	7.30	1119.00	5.36%	4.63	4.03	11.32	1182.00	16.57	11.32
C8.1	0.45	9.68	7.0	57.00	8.07%	0.21	4.43	163.00	2.45%	1.10	2.48				
			20.0					1018.00	4.93%	4.44	3.82				
			20.0					363.00	1.29%	2.27	2.66	13.39	1601.00	18.89	13.39
C8.2	0.49	2.12	20.0	50.00	4.20%	0.17	4.87	385.00	0.64%	1.60	4.01	8.88	435.00	12.42	8.88
OS-C4a	0.09	2.29	7.0	100.00	4.30%	0.15	11.30	227.00	4.40%	1.47	2.58	13.88	327.00	11.82	11.82
C8.3a	0.46	5.88	7.0	61.00	18.85%	0.30	3.43	123.00	2.60%	1.13	1.82				
			20.0					1390.00	3.17%	3.56	6.51	11.75	1574.00	18.74	11.75
DP-53	0.38	8.17	7.0	100.00	4.30%	0.21	8.06	377.00	5.60%	1.66	3.79				
			20.0					548.00	4.50%	4.24	2.15	14.00	1025.00	15.69	14.00
OS-C4b	0.11	2.10	7.0	100.00	4.00%	0.15	11.35	378.00	5.00%	1.57	4.02	15.37	478.00	12.66	12.66
C8.3b	0.48	3.46	7.0	100.00	4.50%	0.24	6.84	28.00	16.00%	2.80	0.17				
			7.0					108.00	2.00%	0.99	1.82				
			20.0					672.00	2.40%	3.10	3.61	12.44	908.00	15.04	12.44
C8.3c	0.48	2.33	7.0	60.00	11.17%	0.26	3.92	148.00	2.36%	1.08	2.29				
			20.0					900.00	3.50%	3.74	4.01				
			20.0					93.00	2.69%	3.28	0.47	10.69	1201.00	16.67	10.69

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

 Calculated By: Leonard Beasley

 Date: Feb. 19, 2021

 Checked By: Leonard Beasley

 Job No: 100.064

 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
<b>DP-54</b>	0.36	16.06	7.0	100.00	4.00%	0.20	8.48	616.00	4.91%	1.55	6.62				
			20.0					1085.00	3.24%	3.60	5.02	20.13	1801.00	20.01	20.01
C8.3d	0.48	5.26	20.0	76.00	2.00%	0.16	7.79	700.00	5.19%	4.56	2.56				
			20.0					664.00	1.36%	2.33	4.74	15.10	1440.00	18.00	15.10
<b>DP-56</b>	0.44	21.32	7.0	100.00	4.00%	0.22	7.57	616.00	4.91%	1.55	6.62				
			20.0					1310.00	2.92%	3.42	6.39	20.57	2026.00	21.26	20.57
C8.4	0.46	6.70	7.0	42.00	1.19%	0.10	7.16	157.00	4.14%	1.42	1.84				
			20.0					89.00	3.37%	3.67	0.40				
			20.0					697.00	5.16%	4.54	2.56				
			20.0					374.00	1.48%	2.43	2.56	14.52	1359.00	17.55	14.52
<b>DP-51</b>	0.46	39.82	7.0	100.00	4.00%	0.23	7.34	616.00	4.91%	1.55	6.62				
			20.0					1310.00	2.92%	3.42	6.39				
			20.0					391.00	1.20%	9.15	0.71	21.06	2417.00	23.43	21.06
C8.5	0.49	3.84	7.0	45.00	2.20%	0.13	5.72	160.00	1.88%	0.96	2.78				
			20.0					683.00	4.25%	4.12	2.76				
			20.0					320.00	1.60%	2.53	2.11	13.36	1208.00	16.71	13.36
C8.6	0.90	0.79	20.0	25.00	2.00%	0.29	1.44	342.00	1.67%	2.58	2.21				
			20.0					400.00	2.98%	3.45	1.93	5.58	767.00	14.26	5.58
C8.7a	0.49	4.52	7.0	75.00	6.67%	0.24	5.11	108.00	2.50%	1.11	1.63				
			20.0					857.00	1.05%	2.05	6.97	13.71	1040.00	15.78	13.71
C8.7b	0.49	1.77	20.0	33.00	2.00%	0.11	5.05	1040.00	1.92%	2.77	6.25	11.31	1073.00	15.96	11.31
<b>DP-63</b>	0.49	6.29	7.0	75.00	6.67%	0.24	5.11	108.00	2.50%	1.11	1.63				
			20.0					885.00	1.05%	2.05	7.20	13.94	1068.00	15.93	13.94
C8.7c	0.49	4.94	20.0	60.00	2.10%	0.15	6.70	817.00	3.11%	3.53	3.86				
			20.0					172.00	1.74%	2.64	1.09	11.65	1049.00	15.83	11.65
<b>DP-64</b>	0.49	11.23	7.0	75.00	6.67%	0.24	5.11	108.00	2.50%	1.11	1.63				
			20.0					885.00	1.05%	2.05	7.20				
			RCP					270.00	1.00%	10.63	0.42	14.36	1338.00	17.43	14.36
C8.7d	0.46	0.27	7.0	20.00	16.50%	0.16	2.05	166.00	3.31%	1.27	2.17	4.23	186.00	11.03	4.23
C8.7e	0.47	6.09	7.0	40.00	20.00%	0.25	2.68	290.00	2.83%	1.18	4.10				
			20.0					293.00	1.06%	2.06	2.37				
			20.0					577.00	3.14%	3.54	2.71	11.87	1200.00	16.67	11.87
<b>DP-62</b> C3.7a-e	0.48	17.59	7.0	75.00	6.67%	0.24	5.20	108.00	2.50%	1.11	1.63				
			20.0					885.00	1.05%	2.05	7.20				
			RCP					270.00	1.00%	10.63	0.42				
			RCP					777.00	3.40%	13.28	0.98	15.42	2115.00	21.75	15.42





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

Calculated By: Leonard Beasley  
 Date: Feb. 19, 2021  
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Job No: 100.064  
 Project: The Ridge at Lorson Ranch

Sub-Basin Data				Initial Overland Time (ti)				Travel Time (tt)					tc Check (urbanized Basins)		Final tc
BASIN or DESIGN	C5	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	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended tc=ti+tt (min)
DP-62 C3.5-C3.7	0.50	22.22	7.0	45.00	2.20%	0.13	5.62	160.00	1.88%	0.96	2.78				
			20.0					683.00	4.25%	4.12	2.76				
			20.0					320.00	1.60%	2.53	2.11				
			20.0					342.00	1.67%	2.58	2.21				
			20.0					400.00	2.98%	3.45	1.93	17.41	1950.00	20.83	17.41
OS-B1	0.15	5.11	7.0	100.00	4.40%	0.16	10.55	388.00	4.30%	1.45	4.46	15.01	488.00	12.71	12.71
C8.8a	0.49	5.65	7.0	100.00	4.60%	0.25	6.68	133.00	4.36%	1.46	1.52				
			20.0					1457.00	1.41%	2.37	10.23				
			20.0					427.00	3.75%	3.87	1.84				
			20.0					650.00	3.06%	3.50	3.10	23.35	2767.00	25.37	23.35
DP-68	0.33	10.76	7.0	100.00	4.50%	0.20	8.49	488.00	2.42%	1.09	7.47				
			20.0					1457.00	1.41%	2.37	10.23				
			20.0					427.00	3.75%	3.87	1.84				
			20.0					650.00	0.60%	1.55	6.99	35.01	3122.00	27.34	27.34
C8.8	0.22	7.80	7.0	100.00	2.00%	0.13	12.69	611.00	5.48%	1.64	6.21				
			7.0					53.00	33.00%	4.02	0.22				
			7.0					245.00	0.60%	0.54	7.53	26.65	1009.00	15.61	15.61
C8	0.43	73.39	7.0	20.00	18.50%	0.16	2.07	99.00	2.42%	1.09	1.52				
			20.0					2654.00	2.15%	2.93	15.08				
			RCP					566.00	5.30%	21.72	0.43				
			7.0					272.00	0.60%	0.54	8.36	27.46	3611.00	30.06	27.46

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## APPENDIX C – HYDRAULIC CALCULATIONS

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# Channel Report

## EAST SWALE 3%

### Trapezoidal

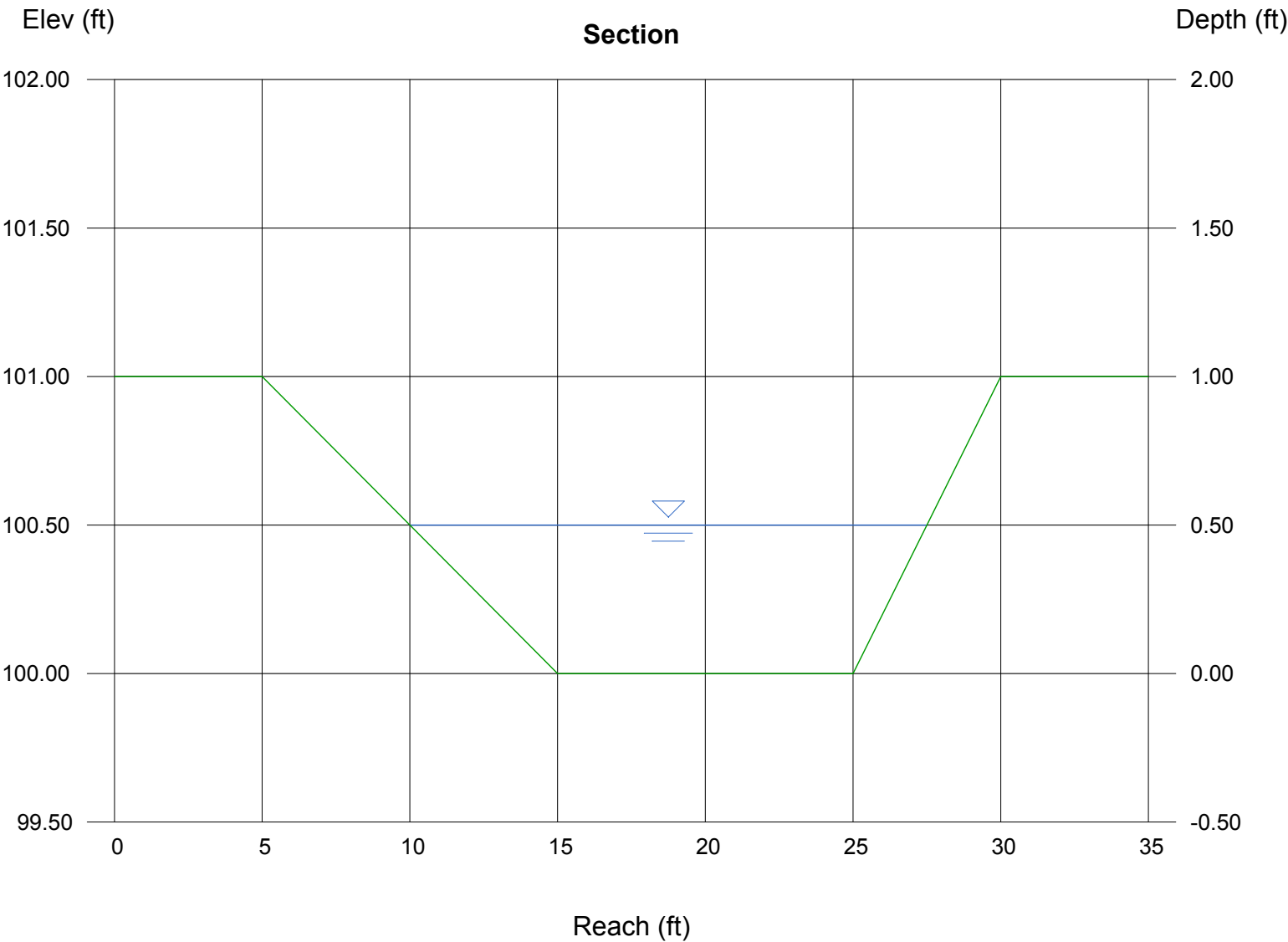
Botom Width (ft) = 10.00  
Side Slope (z:1) = 10.00  
Total Depth (ft) = 1.00  
Invert Elev (ft) = 100.00  
Slope (%) = 3.00  
N-Value = 0.020

### Highlighted

Depth (ft) = 0.50  
Q (cfs) = 47.31  
Area (sqft) = 6.88  
Velocity (ft/s) = 6.88  
Wetted Perim (ft) = 17.57  
Crit Depth, Yc (ft) = 0.59  
Top Width (ft) = 17.50  
EGL (ft) = 1.24

### Calculations

Compute by: Q vs Depth  
No. Increments = 10



# Channel Report

## EAST SWALE BY CUT/FILL 0.5%

### Triangular

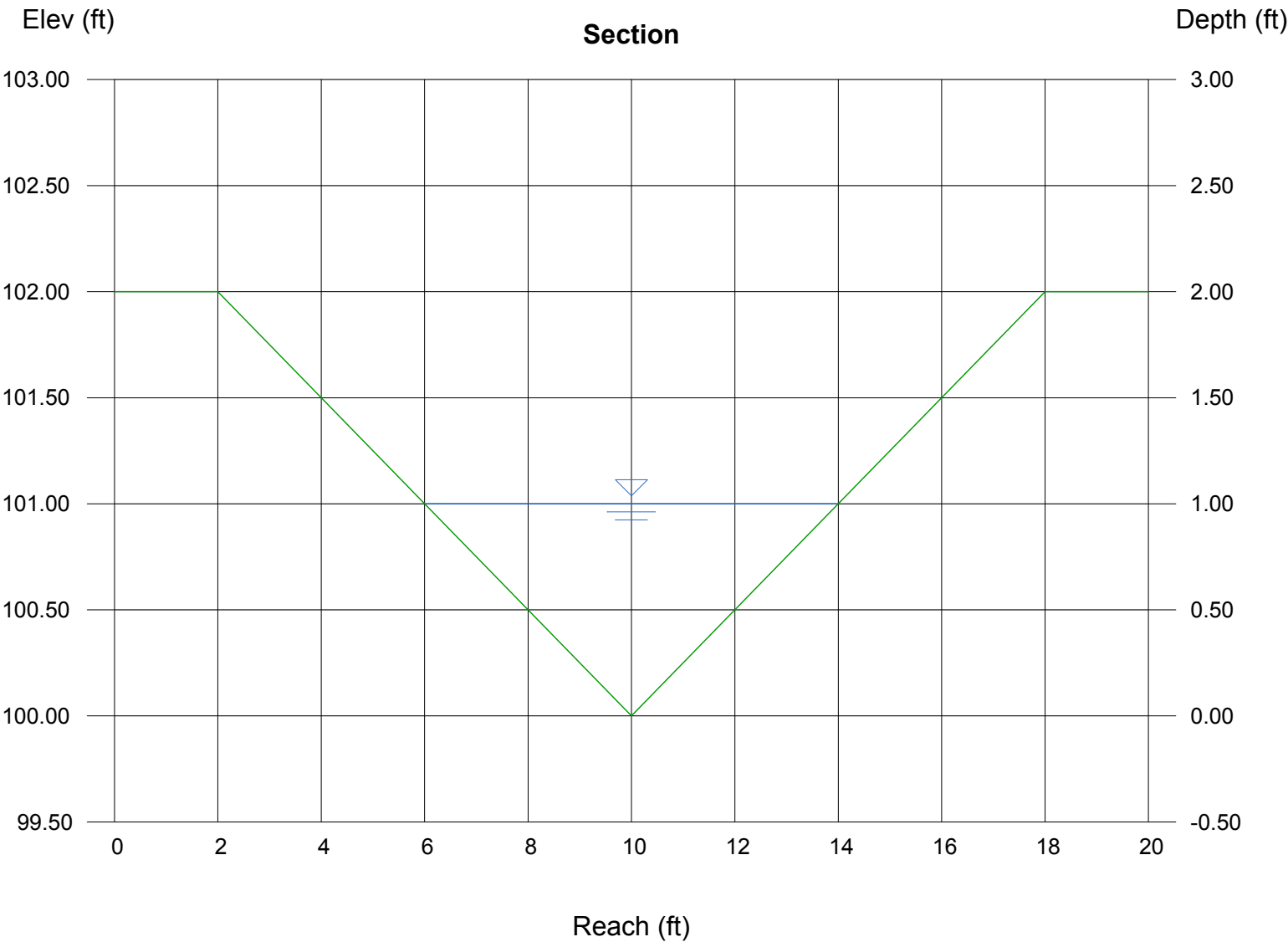
Side Slope (z:1) = 4.00  
Total Depth (ft) = 2.00  
  
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.020

### Calculations

Compute by: Q vs Depth  
No. Increments = 10

### Highlighted

Depth (ft) = 1.00  
Q (cfs) = 12.97  
Area (sqft) = 4.00  
Velocity (ft/s) = 3.24  
Wetted Perim (ft) = 8.25  
Crit Depth, Yc (ft) = 0.73  
Top Width (ft) = 8.00  
EGL (ft) = 1.16

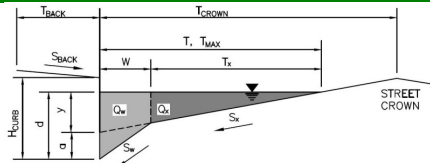


**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-1**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 17.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_w = 0.083$  ft/ft  
 $S_o = 0.000$  ft/ft  
 $n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

**Maximum Capacity for 1/2 Street based On Allowable Spread**

Water Depth without Gutter Depression (Eq. ST-2)  
 Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")  
 Gutter Depression ( $d_c - (W * S_x * 12)$ )  
 Water Depth at Gutter Flowline  
 Allowable Spread for Discharge outside the Gutter Section  $W$  ( $T - W$ )  
 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)  
 Discharge outside the Gutter Section  $W$ , carried in Section  $T_x$   
 Discharge within the Gutter Section  $W$  ( $Q_T - Q_X$ )  
 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)

	Minor Storm	Major Storm	
$y =$	4.08	4.08	inches
$d_c =$	2.0	2.0	inches
$a =$	1.51	1.51	inches
$d =$	5.59	5.59	inches
$T_x =$	15.0	15.0	ft
$E_o =$	0.350	0.350	
$Q_X =$	0.0	0.0	cfs
$Q_W =$	0.0	0.0	cfs
$Q_{BACK} =$	0.0	0.0	cfs
$Q_T =$	SUMP	SUMP	cfs
$V =$	0.0	0.0	fps
$V * d =$	0.0	0.0	

**Maximum Flow Based On Allowable Spread**

Flow Velocity within the Gutter Section  
 $V * d$  Product: Flow Velocity times Gutter Flowline Depth

**Maximum Capacity for 1/2 Street based on Allowable Depth**

Theoretical Water Spread  
 Theoretical Spread for Discharge outside the Gutter Section  $W$  ( $T - W$ )  
 Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)  
 Theoretical Discharge outside the Gutter Section  $W$ , carried in Section  $T_{XTH}$   
 Actual Discharge outside the Gutter Section  $W$ , (limited by distance  $T_{CROWN}$ )  
 Discharge within the Gutter Section  $W$  ( $Q_d - Q_X$ )  
 Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)  
 Total Discharge for Major & Minor Storm (Pre-Safety Factor)  
 Average Flow Velocity Within the Gutter Section  
 $V * d$  Product: Flow Velocity Times Gutter Flowline Depth  
 Slope-Based Depth Safety Reduction Factor for Major & Minor ( $d \geq 6"$ ) Storm  
**Max Flow Based on Allowable Depth (Safety Factor Applied)**  
 Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)  
 Resultant Flow Depth at Street Crown (Safety Factor Applied)

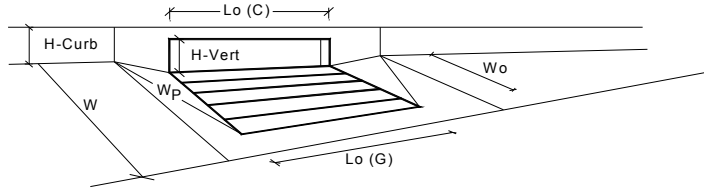
	Minor Storm	Major Storm	
$T_{TH} =$	17.0	26.7	ft
$T_{XTH} =$	15.0	24.7	ft
$E_o =$	0.349	0.219	
$Q_{XTH} =$	0.0	0.0	cfs
$Q_X =$	0.0	0.0	cfs
$Q_W =$	0.0	0.0	cfs
$Q_{BACK} =$	0.0	0.0	cfs
$Q =$	0.0	0.0	cfs
$V =$	0.0	0.0	fps
$V * d =$	0.0	0.0	
$R =$	SUMP	SUMP	
$Q_d =$	SUMP	SUMP	cfs
$d =$			inches
$d_{CROWN} =$			inches

**MINOR STORM Allowable Capacity is based on Depth Criterion**  
**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	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	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} = 3.00$	$3.00$	inches	
Number of Unit Inlets (Grate or Curb Opening)		$N_o = 1$	$1$		
Water Depth at Flowline (outside of local depression)		Ponding Depth = $5.2$	$7.0$	inches	
<b>Grate Information</b>		MINOR		MAJOR <input checked="" type="checkbox"/> Override Depths	
Length of a Unit Grate		$L_o (G) = N/A$	$N/A$	feet	
Width of a Unit Grate		$W_o = N/A$	$N/A$	feet	
Area Opening Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} = N/A$	$N/A$		
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_r (G) = N/A$	$N/A$		
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) = N/A$	$N/A$		
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) = N/A$	$N/A$		
<b>Curb Opening Information</b>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) = 10.00$	$10.00$	feet	
Height of Vertical Curb Opening in Inches		$H_{vert} = 6.00$	$6.00$	inches	
Height of Curb Orifice Throat in Inches		$H_{throat} = 6.00$	$6.00$	inches	
Angle of Throat (see USDCM Figure ST-5)		$\Theta = 63.40$	$63.40$	degrees	
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p = 2.00$	$2.00$	feet	
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C) = 0.10$	$0.10$		
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) = 3.60$	$3.60$		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) = 0.67$	$0.67$		
<b>Low Head Performance Reduction (Calculated)</b>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} = N/A$	$N/A$	ft	
Depth for Curb Opening Weir Equation		$d_{Curb} = 0.27$	$0.42$	ft	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} = 0.49$	$0.66$		
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} = 0.88$	$0.99$		
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} = N/A$	$N/A$		
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>		MINOR		MAJOR	
		$Q_a = 5.6$	$12.2$	cfs	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED} = 5.6$	$12.2$	cfs	

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-2**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_X = 0.020$  ft/ft $S_W = 0.083$  ft/ft $S_O = 0.000$  ft/ft $n_{STREET} = 0.017$ 

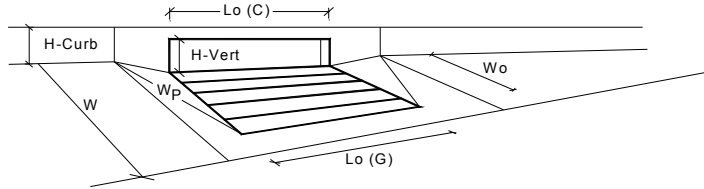
	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐☐

	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	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		a <sub>local</sub> =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.6	6.3	inches
<b>Grate Information</b>		MINOR		MAJOR	
Length of a Unit Grate		L <sub>g</sub> (G) =	N/A	N/A	feet
Width of a Unit Grate		W <sub>o</sub> =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A <sub>ratio</sub> =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C <sub>r</sub> (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C <sub>w</sub> (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C <sub>o</sub> (G) =	N/A	N/A	
<b>Curb Opening Information</b>		MINOR		MAJOR	
Length of a Unit Curb Opening		L <sub>o</sub> (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H <sub>vert</sub> =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H <sub>throat</sub> =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W <sub>p</sub> =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C <sub>r</sub> (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C <sub>w</sub> (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C <sub>o</sub> (C) =	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>		MINOR		MAJOR	
Depth for Grate Midwidth		d <sub>Grate</sub> =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d <sub>Curb</sub> =	0.21	0.36	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF <sub>Combination</sub> =	0.58	0.80	
Curb Opening Performance Reduction Factor for Long Inlets		RF <sub>Curb</sub> =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF <sub>Grate</sub> =	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>		MINOR		MAJOR	
		Q <sub>a</sub> =	2.7	5.9	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		Q <sub>PEAK REQUIRED</sub> =	2.7	5.9	cfs

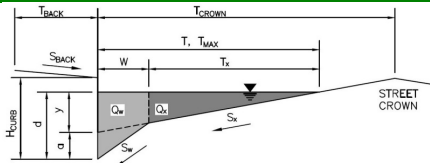


**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-4**

**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

 $S_o = 0.026$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	22.0	22.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	6.0	8.4	inches

Allow Flow Depth at Street Crown (leave blank for no)

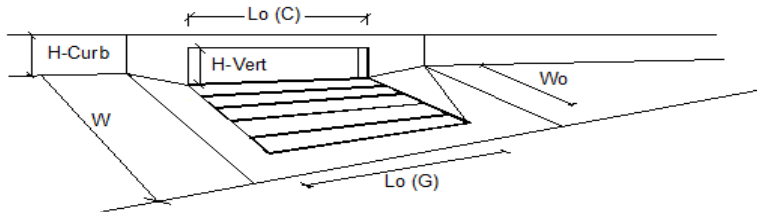
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	17.5	44.5	cfs

**MAJOR STORM Allowable Capacity is based on Depth Criterion****Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



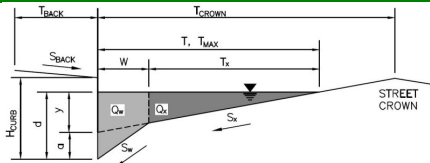
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{T-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{T-C}$ =	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Design Discharge for Half of Street (from Sheet Inlet Management)		MINOR		MAJOR	
Water Spread Width		$Q_o$ =	8.9	21.6	cfs
Water Depth at Flowline (outside of local depression)		$T$ =	13.3	19.0	ft
Water Depth at Street Crown (or at $T_{MAX}$ )		$d$ =	4.7	6.1	inches
Ratio of Gutter Flow to Design Flow		$d_{CROWN}$ =	0.0	0.0	inches
Discharge outside the Gutter Section W, carried in Section $T_x$		$E_o$ =	0.448	0.312	
Discharge within the Gutter Section W		$Q_s$ =	4.9	14.9	cfs
Discharge Behind the Curb Face		$Q_w$ =	4.0	6.7	cfs
Flow Area within the Gutter Section W		$Q_{BACK}$ =	0.0	0.0	cfs
Velocity within the Gutter Section W		$A_w$ =	0.62	0.85	sq ft
Water Depth for Design Condition		$V_w$ =	6.5	8.0	fps
		$d_{LOCAL}$ =	7.7	9.1	inches
<b>Grate Analysis (Calculated)</b>		MINOR		MAJOR	
Total Length of Inlet Grate Opening		$L$ =	N/A	N/A	ft
Ratio of Grate Flow to Design Flow		$E_o-GRATE$ =	N/A	N/A	
<b>Under No-Clogging Condition</b>		MINOR		MAJOR	
Minimum Velocity Where Grate Splash-Over Begins		$V_o$ =	N/A	N/A	fps
Interception Rate of Frontal Flow		$R_f$ =	N/A	N/A	
Interception Rate of Side Flow		$R_s$ =	N/A	N/A	
Interception Capacity		$Q_i$ =	N/A	N/A	cfs
<b>Under Clogging Condition</b>		MINOR		MAJOR	
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A	
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A	
Effective (unclogged) Length of Multiple-unit Grate Inlet		$L_e$ =	N/A	N/A	ft
Minimum Velocity Where Grate Splash-Over Begins		$V_o$ =	N/A	N/A	fps
Interception Rate of Frontal Flow		$R_f$ =	N/A	N/A	
Interception Rate of Side Flow		$R_s$ =	N/A	N/A	
Actual Interception Capacity		$Q_a$ =	N/A	N/A	cfs
Carry-Over Flow = $Q_o - Q_a$ (to be applied to curb opening or next d/s inlet)		$Q_b$ =	N/A	N/A	cfs
<b>Curb or Slotted Inlet Opening Analysis (Calculated)</b>		MINOR		MAJOR	
Equivalent Slope $S_e$ (based on grate carry-over)		$S_e$ =	0.104	0.079	ft/ft
Required Length $L_T$ to Have 100% Interception		$L_T$ =	17.27	30.89	ft
<b>Under No-Clogging Condition</b>		MINOR		MAJOR	
Effective Length of Curb Opening or Slotted Inlet (minimum of $L$ , $L_T$ )		$L$ =	17.27	20.00	ft
Interception Capacity		$Q_i$ =	8.9	18.3	cfs
<b>Under Clogging Condition</b>		MINOR		MAJOR	
Clogging Coefficient		CurbCoef =	1.33	1.33	
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.03	0.03	
Effective (Unclogged) Length		$L_e$ =	17.34	17.34	ft
Actual Interception Capacity		$Q_a$ =	8.9	18.0	cfs
Carry-Over Flow = $Q_o - Q_a$		$Q_b$ =	0.0	3.6	cfs
<b>Summary</b>		MINOR		MAJOR	
Total Inlet Interception Capacity		$Q$ =	8.9	18.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	0.0	3.6	cfs
Capture Percentage = $Q_i/Q_o$ =		$C\%$ =	100	83	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-6**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$T_{BACK} = 10.0$  ft

$S_{BACK} = 0.020$  ft/ft

$n_{BACK} = 0.015$

$H_{CURB} = 6.00$  inches

$T_{CROWN} = 22.0$  ft

$W = 2.00$  ft

$S_x = 0.020$  ft/ft

$S_w = 0.083$  ft/ft

$S_o = 0.025$  ft/ft

$n_{STREET} = 0.017$

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	18.5	22.0	ft
$d_{MAX} =$	6.0	8.4	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

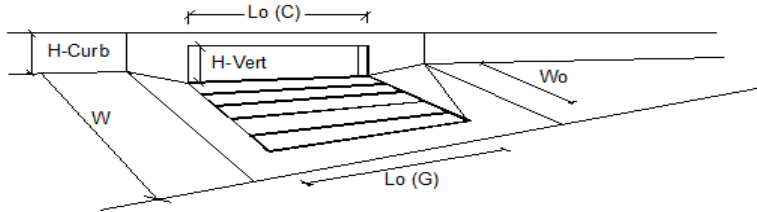
	Minor Storm	Major Storm	
$Q_{allow} =$	17.7	44.8	cfs

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

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	3.0	5.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	0.9	cfs
Capture Percentage = $Q_i/Q_o$ =	100	86	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-12**

**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

 $S_O = 0.026$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

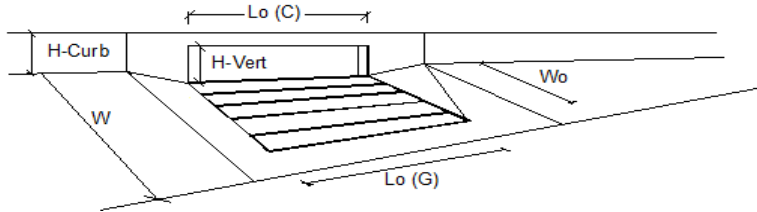
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	16.3	34.6	cfs

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{T-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{T-C}$ =	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Total Inlet Interception Capacity		Q =	9.3	14.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	0.6	7.0	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	94	68	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-13**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$T_{BACK} = 8.0$  ft

$S_{BACK} = 0.020$  ft/ft

$n_{BACK} = 0.015$

$H_{CURB} = 6.00$  inches

$T_{CROWN} = 17.0$  ft

$W = 2.00$  ft

$S_x = 0.020$  ft/ft

$S_w = 0.083$  ft/ft

$S_o = 0.022$  ft/ft

$n_{STREET} = 0.017$

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	15.2	36.0	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	8.3	15.6	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.2	8.7	cfs
Capture Percentage = $Q_i/Q_o$ =	97	64	%



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

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

Project: The Ridge at Lorson Ranch, #100.064  
 Inlet ID: Inlet DP-15

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 17.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_w = 0.083$  ft/ft  
 $S_o = 0.019$  ft/ft  
 $n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Spread Criterion**  
**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	14.1	37.8	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	8.4	16.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.3	10.8	cfs
Capture Percentage = $Q_i/Q_o$ =	97	60	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-17**

**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

 $S_o = 0.034$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

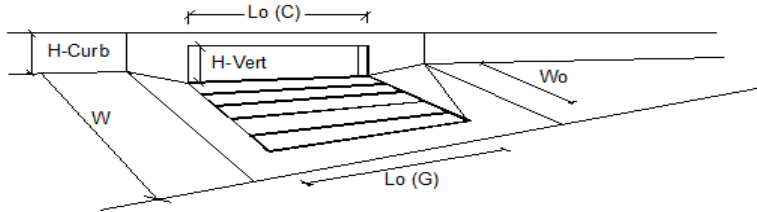
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	16.0	31.6	cfs

**MAJOR STORM Allowable Capacity is based on Depth Criterion****Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL} =$	3.0	3.0 inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o =$	1	1
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o =$	20.00	20.00 ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o =$	N/A	N/A ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{r-G} =$	N/A	N/A
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{r-C} =$	0.10	0.10
Street Hydraulics: OK - $Q < \text{Allowable Street Capacity}$				
Total Inlet Interception Capacity		$Q =$	7.5	20.4 cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b =$	0.0	6.3 cfs
Capture Percentage = $Q_i/Q_o =$		$C\% =$	100	77 %

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-19**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 17.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_w = 0.083$  ft/ft  
 $S_o = 0.026$  ft/ft  
 $n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

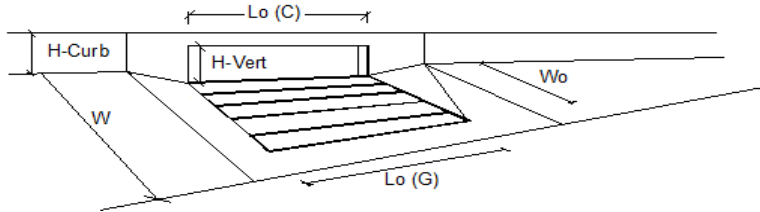
**MINOR STORM Allowable Capacity is based on Spread Criterion**  
**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	16.4	34.5	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
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)	20.00	20.00	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	10.3	21.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	7.6	cfs
Capture Percentage = $Q_i/Q_o$ =	100	74	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-20a**

**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

 $S_o = 0.030$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

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

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	16.7	32.9	cfs

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

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
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	5.6	10.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	1.6	cfs
Capture Percentage = $Q_i/Q_o$ =	100	87	%



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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-21**

**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

 $S_o = 0.021$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	14.8	36.6	cfs

**MAJOR STORM Allowable Capacity is based on Depth Criterion****Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
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	13.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	4.4	cfs
Capture Percentage = $Q_i/Q_o$ =	100	75	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-23**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 17.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_w = 0.083$  ft/ft  
 $S_o = 0.020$  ft/ft  
 $n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Spread Criterion**  
**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	14.5	37.1	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

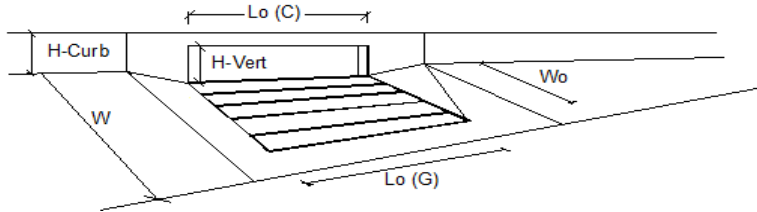


Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	15.00	15.00	ft
Width 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	8.4	16.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.3	10.4	cfs
Capture Percentage = $Q_i/Q_o$ =	97	61	%



## 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	7.2	11.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	2.9	15.1	cfs
Capture Percentage = $Q_i/Q_o$ =	71	43	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-27**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

 $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_x = 0.020$  ft/ft $S_w = 0.083$  ft/ft $S_o = 0.011$  ft/ft $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

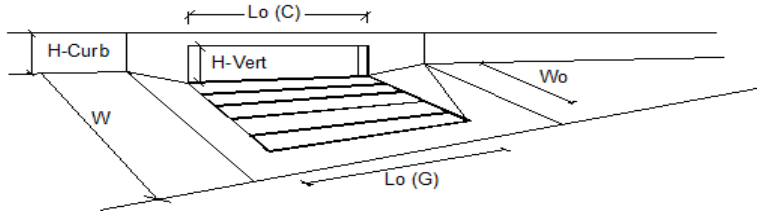
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	10.7	33.0	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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)	20.00	20.00	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	8.4	20.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	7.6	cfs
Capture Percentage = $Q_i/Q_o$ =	100	73	%



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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-29**

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	10.2	31.8	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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)	20.00	20.00	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	9.2	20.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	7.3	cfs
Capture Percentage = $Q_i/Q_o$ =	100	74	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-31**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

 $T_{BACK} = 24.0$  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

 $T_{CROWN} = 26.0$  ft

Gutter Width

 $W = 2.00$  ft

Street Transverse Slope

 $S_x = 0.020$  ft/ft

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

 $S_w = 0.083$  ft/ft

Street Longitudinal Slope - Enter 0 for sump condition

 $S_o = 0.048$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	26.0	26.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	6.0	11.8	inches

Allow Flow Depth at Street Crown (leave blank for no)

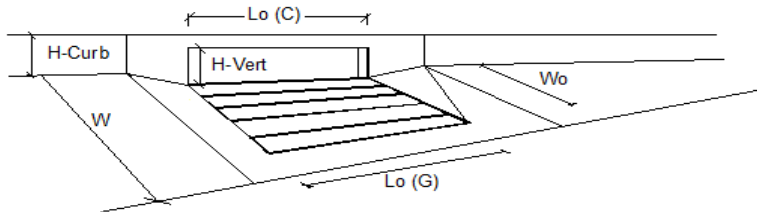
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	14.5	115.2	cfs

**MAJOR STORM Allowable Capacity is based on Depth Criterion****Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet		Type =		CDOT Type R Curb Opening
Local Depression (additional to continuous gutter depression 'a')		a <sub>LOCAL</sub> =	3.0	3.0 inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L <sub>o</sub> =	15.00	15.00 ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W <sub>o</sub> =	N/A	N/A ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C <sub>T-G</sub> =	N/A	N/A
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C <sub>T-C</sub> =	0.10	0.10
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>				
Design Discharge for Half of Street (from Sheet Inlet Management)		Q <sub>o</sub> =	10.5	23.2 cfs
Water Spread Width		T =	12.4	17.2 ft
Water Depth at Flowline (outside of local depression)		d =	4.5	5.6 inches
Water Depth at Street Crown (or at T <sub>MAX</sub> )		d <sub>CROWN</sub> =	0.0	0.0 inches
Ratio of Gutter Flow to Design Flow		E <sub>o</sub> =	0.477	0.346
Discharge outside the Gutter Section W, carried in Section T <sub>x</sub>		Q <sub>s</sub> =	5.5	15.2 cfs
Discharge within the Gutter Section W		Q <sub>w</sub> =	5.0	8.0 cfs
Discharge Behind the Curb Face		Q <sub>BACK</sub> =	0.0	0.0 cfs
Flow Area within the Gutter Section W		A <sub>w</sub> =	0.58	0.77 sq ft
Velocity within the Gutter Section W		V <sub>w</sub> =	8.6	10.4 fps
Water Depth for Design Condition		d <sub>LOCAL</sub> =	7.5	8.6 inches
<b>Grate Analysis (Calculated)</b>				
Total Length of Inlet Grate Opening		L =	N/A	N/A ft
Ratio of Grate Flow to Design Flow		E <sub>o-GRATE</sub> =	N/A	N/A
<b>Under No-Clogging Condition</b>				
Minimum Velocity Where Grate Splash-Over Begins		V <sub>o</sub> =	N/A	N/A fps
Interception Rate of Frontal Flow		R <sub>f</sub> =	N/A	N/A
Interception Rate of Side Flow		R <sub>s</sub> =	N/A	N/A
Interception Capacity		Q <sub>i</sub> =	N/A	N/A cfs
<b>Under Clogging Condition</b>				
Clogging Coefficient for Multiple-unit Grate Inlet		GrateCoef =	N/A	N/A
Clogging Factor for Multiple-unit Grate Inlet		GrateClog =	N/A	N/A
Effective (unclogged) Length of Multiple-unit Grate Inlet		L <sub>e</sub> =	N/A	N/A ft
Minimum Velocity Where Grate Splash-Over Begins		V <sub>o</sub> =	N/A	N/A fps
Interception Rate of Frontal Flow		R <sub>f</sub> =	N/A	N/A
Interception Rate of Side Flow		R <sub>s</sub> =	N/A	N/A
Actual Interception Capacity		Q <sub>a</sub> =	N/A	N/A cfs
Carry-Over Flow = Q <sub>o</sub> - Q <sub>a</sub> (to be applied to curb opening or next d/s inlet)		Q <sub>b</sub> =	N/A	N/A cfs
<b>Curb or Slotted Inlet Opening Analysis (Calculated)</b>				
Equivalent Slope S <sub>e</sub> (based on grate carry-over)		S <sub>e</sub> =	0.110	0.085 ft/ft
Required Length L <sub>T</sub> to Have 100% Interception		L <sub>T</sub> =	19.05	32.09 ft
<b>Under No-Clogging Condition</b>				
Effective Length of Curb Opening or Slotted Inlet (minimum of L, L <sub>T</sub> )		L =	15.00	15.00 ft
Interception Capacity		Q <sub>i</sub> =	9.9	15.7 cfs
<b>Under Clogging Condition</b>				
Clogging Coefficient		CurbCoef =	1.31	1.31
Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet		CurbClog =	0.04	0.04
Effective (Unclogged) Length		L <sub>e</sub> =	13.03	13.03 ft
Actual Interception Capacity		Q <sub>a</sub> =	9.7	15.3 cfs
Carry-Over Flow = Q <sub>b(Grate)</sub> - Q <sub>a</sub>		Q <sub>b</sub> =	0.8	7.9 cfs
<b>Summary</b>				
Total Inlet Interception Capacity		Q =	9.7	15.3 cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		Q <sub>b</sub> =	0.8	7.9 cfs
Capture Percentage = Q <sub>a</sub> /Q <sub>o</sub> =		C% =	92	66 %

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-32**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_X = 0.020$  ft/ft $S_W = 0.083$  ft/ft $S_O = 0.000$  ft/ft $n_{STREET} = 0.017$ 

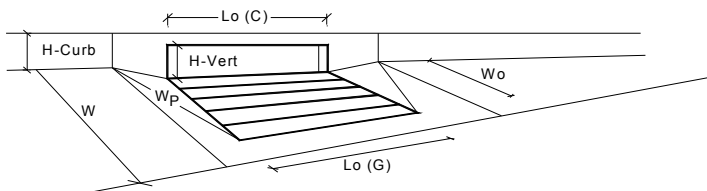
	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐☐

	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)

Type of Inlet  
Local Depression (additional to continuous gutter depression 'a' from above)  
Number of Unit Inlets (Grate or Curb Opening)  
Water Depth at Flowline (outside of local depression)

## Grate Information

Length of a Unit Grate  
Width of a Unit Grate  
Area Opening Ratio for a Grate (typical values 0.15-0.90)  
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)  
Grate Weir Coefficient (typical value 2.15 - 3.60)  
Grate Orifice Coefficient (typical value 0.60 - 0.80)

## Curb Opening Information

Length of a Unit Curb Opening  
Height of Vertical Curb Opening in Inches  
Height of Curb Orifice Throat in Inches  
Angle of Throat (see USDCM Figure ST-5)  
Side Width for Depression Pan (typically the gutter width of 2 feet)  
Clogging Factor for a Single Curb Opening (typical value 0.10)  
Curb Opening Weir Coefficient (typical value 2.3-3.7)  
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

## Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth  
Depth for Curb Opening Weir Equation  
Combination Inlet Performance Reduction Factor for Long Inlets  
Curb Opening Performance Reduction Factor for Long Inlets  
Grated Inlet Performance Reduction Factor for Long Inlets

## Total Inlet Interception Capacity (assumes clogged condition)

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

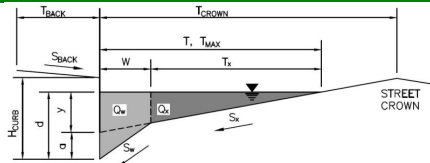
	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
$a_{local}$ =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.6	8.4	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
$W_o$ =	N/A	N/A	feet
$A_{ratio}$ =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	20.00	20.00	feet
$H_{vert}$ =	6.00	6.00	inches
$H_{throat}$ =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
$W_p$ =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
$d_{Grate}$ =	N/A	N/A	ft
$d_{Curb}$ =	0.30	0.53	ft
$RF_{Combination}$ =	0.53	0.79	
$RF_{Curb}$ =	0.76	0.91	
$RF_{Grate}$ =	N/A	N/A	
	MINOR	MAJOR	
$Q_a$ =	10.3	29.2	cfs
$Q_{PEAK REQUIRED}$ =	8.6	27.5	cfs

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-33 (Exist. 25' Type "R")**

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

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

☐☐

Check boxes are not applicable in SUMP conditions

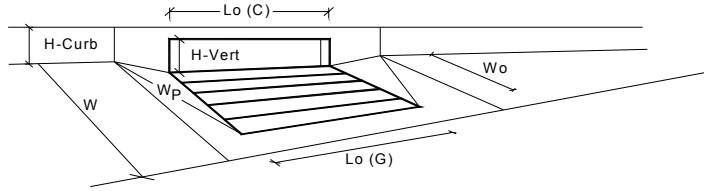
**MINOR STORM Allowable Capacity is based on Depth Criterion**

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

**MAJOR STORM Allowable Capacity is based on Depth Criterion**

# 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	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} = 3.00$	$3.00$	inches	
Number of Unit Inlets (Grate or Curb Opening)		$N_o = 1$	$1$		
Water Depth at Flowline (outside of local depression)		Ponding Depth = $4.6$	$7.7$	inches	
<b>Grate Information</b>		MINOR		MAJOR <input checked="" type="checkbox"/> Override Depths	
Length of a Unit Grate		$L_o (G) = N/A$	$N/A$	feet	
Width of a Unit Grate		$W_o = N/A$	$N/A$	feet	
Area Opening Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} = N/A$	$N/A$		
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_r (G) = N/A$	$N/A$		
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) = N/A$	$N/A$		
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) = N/A$	$N/A$		
<b>Curb Opening Information</b>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) = 25.00$	$25.00$	feet	
Height of Vertical Curb Opening in Inches		$H_{vert} = 6.00$	$6.00$	inches	
Height of Curb Orifice Throat in Inches		$H_{throat} = 6.00$	$6.00$	inches	
Angle of Throat (see USDCM Figure ST-5)		Theta = $63.40$	$63.40$	degrees	
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p = 2.00$	$2.00$	feet	
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C) = 0.10$	$0.10$		
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) = 3.60$	$3.60$		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) = 0.67$	$0.67$		
<b>Low Head Performance Reduction (Calculated)</b>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} = N/A$	$N/A$	ft	
Depth for Curb Opening Weir Equation		$d_{Curb} = 0.22$	$0.47$	ft	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} = 0.43$	$0.72$		
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} = 0.69$	$0.88$		
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} = N/A$	$N/A$		
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>		MINOR		MAJOR	
		$Q_a = 7.0$	$28.7$	cfs	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED} = 7.0$	$28.7$	cfs	



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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-35a**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

 $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_x = 0.020$  ft/ft $S_w = 0.083$  ft/ft $S_o = 0.090$  ft/ft $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

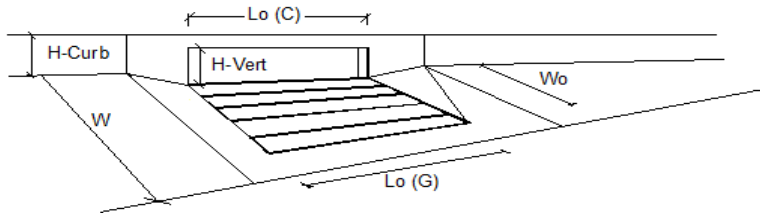
☐ ☐ check = yes
**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	12.0	23.5	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
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	11.3	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	1.9	cfs
Capture Percentage = $Q_i/Q_o$ =	100	86	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-35b**

**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

 $S_o = 0.006$  ft/ft

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

 $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

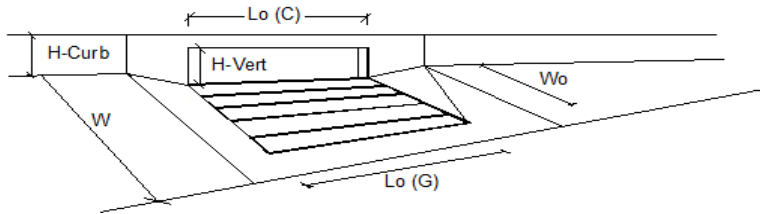
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	7.9	24.2	cfs

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{T-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{T-C}$ =	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Total Inlet Interception Capacity		Q =	1.9	4.4	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	0.0	0.2	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	100	96	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-36**

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

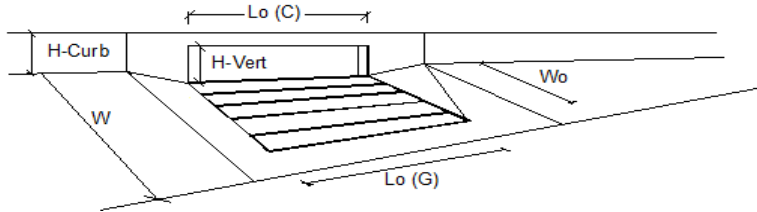
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	16.8	34.0	cfs

**MAJOR STORM Allowable Capacity is based on Depth Criterion****Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{T-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{T-C}$ =	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Total Inlet Interception Capacity		Q =	4.1	5.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	7.3	19.5	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	36	22	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-37**

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	14.5	37.2	cfs

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{T-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{T-C}$ =	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Total Inlet Interception Capacity		Q =	3.4	4.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	4.0	11.5	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	46	29	%

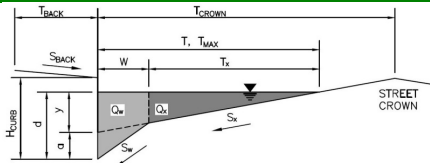


**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-39**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

 $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_x = 0.020$  ft/ft $S_w = 0.083$  ft/ft $S_o = 0.019$  ft/ft $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

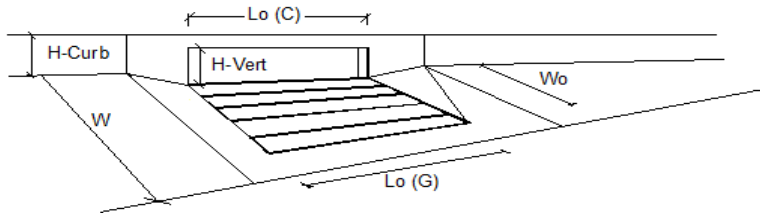
	Minor Storm	Major Storm	
$Q_{allow} =$	14.1	38.0	cfs

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

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



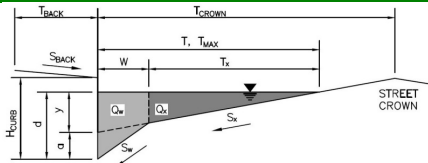
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	25.00	25.00	ft
Width 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	12.7	27.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	7.0	cfs
Capture Percentage = $Q_i/Q_o$ =	100	79	%

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

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

Project: The Ridge at Lorson Ranch, #100.064

Inlet ID: Inlet DP-41

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_X = 0.020$  ft/ft $S_W = 0.083$  ft/ft $S_O = 0.000$  ft/ft $n_{STREET} = 0.017$ 

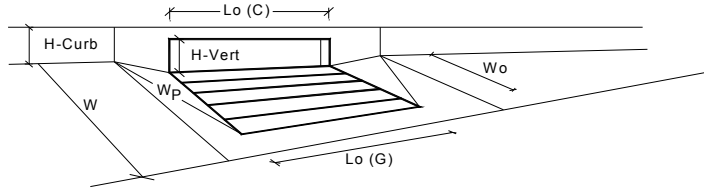
	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐☐

	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	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local} = 3.00$	$3.00$	inches	
Number of Unit Inlets (Grate or Curb Opening)		$N_o = 1$	$1$		
Water Depth at Flowline (outside of local depression)		Ponding Depth = $5.6$	$7.9$	inches	
<b>Grate Information</b>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G) = N/A$	$N/A$	<input checked="" type="checkbox"/> Override Depths	
Width of a Unit Grate		$W_o = N/A$	$N/A$	feet	
Area Opening Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio} = N/A$	$N/A$		
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_r (G) = N/A$	$N/A$		
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G) = N/A$	$N/A$		
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G) = N/A$	$N/A$		
<b>Curb Opening Information</b>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C) = 20.00$	$20.00$	feet	
Height of Vertical Curb Opening in Inches		$H_{vert} = 6.00$	$6.00$	inches	
Height of Curb Orifice Throat in Inches		$H_{throat} = 6.00$	$6.00$	inches	
Angle of Throat (see USDCM Figure ST-5)		$\Theta = 63.40$	$63.40$	degrees	
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p = 2.00$	$2.00$	feet	
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C) = 0.10$	$0.10$		
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C) = 3.60$	$3.60$		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C) = 0.67$	$0.67$		
<b>Low Head Performance Reduction (Calculated)</b>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate} = N/A$	$N/A$	ft	
Depth for Curb Opening Weir Equation		$d_{Curb} = 0.30$	$0.49$	ft	
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination} = 0.53$	$0.74$		
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb} = 0.76$	$0.89$		
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate} = N/A$	$N/A$		
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>		MINOR		MAJOR	
		$Q_a = 10.3$	$25.1$	cfs	
<b>WARNING: Inlet Capacity less than Q Peak for Major Storm</b>		$Q_{PEAK REQUIRED} = 9.3$	$27.7$	cfs	

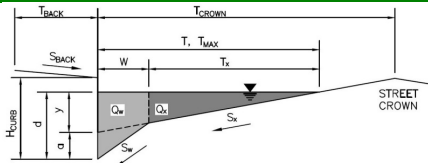
(Overtops to Inlet 43)

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

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

Project: The Ridge at Lorson Ranch, #100.064

Inlet ID: Inlet DP-43

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

 $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 35.0$  ft $W = 2.00$  ft $S_X = 0.020$  ft/ft $S_W = 0.083$  ft/ft $S_O = 0.000$  ft/ft $n_{STREET} = 0.017$ 

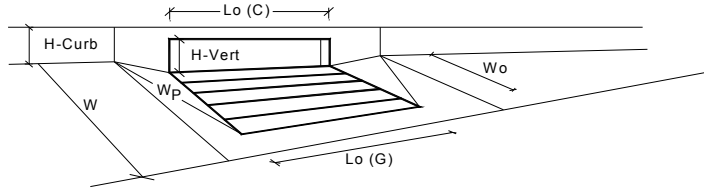
	Minor Storm	Major Storm	
$T_{MAX} =$	35.0	35.0	ft
$d_{MAX} =$	6.0	7.9	inches

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

	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	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from above)		$a_{local}$	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth	5.6	7.9	inches
<b>Grate Information</b>		MINOR		MAJOR	
Length of a Unit Grate		$L_o (G)$	N/A	N/A	feet
Width of a Unit Grate		$W_o$	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		$A_{ratio}$	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		$C_r (G)$	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		$C_w (G)$	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		$C_o (G)$	N/A	N/A	
<b>Curb Opening Information</b>		MINOR		MAJOR	
Length of a Unit Curb Opening		$L_o (C)$	20.00	20.00	feet
Height of Vertical Curb Opening in Inches		$H_{vert}$	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		$H_{throat}$	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		$W_p$	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		$C_r (C)$	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		$C_w (C)$	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		$C_o (C)$	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>		MINOR		MAJOR	
Depth for Grate Midwidth		$d_{Grate}$	N/A	N/A	ft
Depth for Curb Opening Weir Equation		$d_{Curb}$	0.30	0.49	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$	0.53	0.74	
Curb Opening Performance Reduction Factor for Long Inlets		$RF_{Curb}$	0.76	0.89	
Grated Inlet Performance Reduction Factor for Long Inlets		$RF_{Grate}$	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>		MINOR		MAJOR	
		$Q_a$	10.3	25.0	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK REQUIRED}$	10.0	24.5	cfs

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

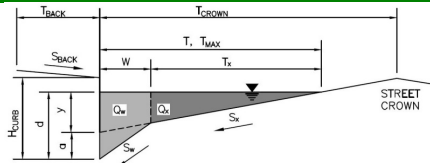
(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:

The Ridge at Lorson Ranch, #100.064

Inlet ID:

Inlet DP-47

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

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

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	10.2	31.5	cfs

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

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	6.1	9.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	1.4	7.3	cfs
Capture Percentage = $Q_i/Q_o$ =	81	56	%



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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-48**

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	12.6	38.8	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



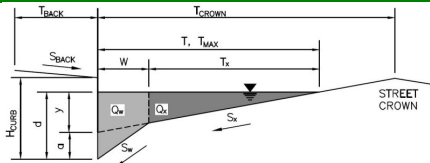
Design Information (Input)	MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	10.00	10.00	ft
Width 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	3.4	6.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	1.4	cfs
Capture Percentage = $Q_i/Q_o$ =	100	81	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-49**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

$T_{BACK} = 8.0$  ft

$S_{BACK} = 0.020$  ft/ft

$n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$H_{CURB} = 6.00$  inches

$T_{CROWN} = 17.0$  ft

$W = 2.00$  ft

$S_X = 0.020$  ft/ft

$S_W = 0.083$  ft/ft

$S_O = 0.028$  ft/ft

$n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Depth Criterion**

**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	17.0	33.6	cfs

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

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



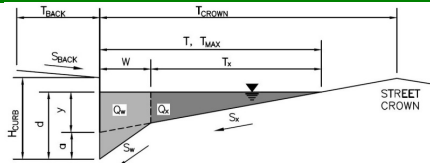
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{r-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{r-C}$ =	0.10	0.10	
<b>Street Hydraulics: OK - Q &lt; Allowable Street Capacity</b>					
Total Inlet Interception Capacity		Q =	7.7	20.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	0.0	6.9	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	100	75	%

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

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

Project: The Ridge at Lorson Ranch, #100.064

Inlet ID: Inlet DP-51

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_X = 0.020$  ft/ft $S_W = 0.083$  ft/ft $S_O = 0.000$  ft/ft $n_{STREET} = 0.017$ 

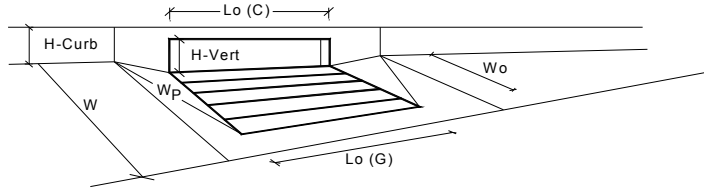
	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐☐

	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	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a <sub>local</sub> =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.0	7.1	inches
<b>Grate Information</b>			MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
Length of a Unit Grate		L <sub>o</sub> (G) =	N/A	N/A	feet
Width of a Unit Grate		W <sub>o</sub> =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A <sub>ratio</sub> =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C <sub>r</sub> (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C <sub>w</sub> (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C <sub>o</sub> (G) =	N/A	N/A	
<b>Curb Opening Information</b>			MINOR	MAJOR	
Length of a Unit Curb Opening		L <sub>o</sub> (C) =	25.00	25.00	feet
Height of Vertical Curb Opening in Inches		H <sub>vert</sub> =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H <sub>throat</sub> =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W <sub>p</sub> =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C <sub>r</sub> (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C <sub>w</sub> (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C <sub>o</sub> (C) =	0.67	0.67	
<b>Low Head Performance Reduction (Calculated)</b>			MINOR	MAJOR	
Depth for Grate Midwidth		d <sub>Grate</sub> =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d <sub>Curb</sub> =	0.17	0.43	ft
Combination Inlet Performance Reduction Factor for Long Inlets		RF <sub>Combination</sub> =	0.38	0.67	
Curb Opening Performance Reduction Factor for Long Inlets		RF <sub>Curb</sub> =	0.64	0.85	
Grated Inlet Performance Reduction Factor for Long Inlets		RF <sub>Grate</sub> =	N/A	N/A	
<b>Total Inlet Interception Capacity (assumes clogged condition)</b>			MINOR	MAJOR	
		Q <sub>a</sub> =	4.5	24.0	cfs
<b>WARNING: Inlet Capacity less than Q Peak for Major Storm</b>		Q <sub>PEAK REQUIRED</sub> =	4.5	26.0	cfs

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-53**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

 $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_x = 0.020$  ft/ft $S_w = 0.083$  ft/ft $S_o = 0.014$  ft/ft $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	12.3	37.8	cfs

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

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	9.7	16.2	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.9	10.3	cfs
Capture Percentage = $Q_i/Q_o$ =	91	61	%



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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-54**

**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 &amp; Major Storm

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft

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

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

Allow Flow Depth at Street Crown (leave blank for no)

☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	12.5	38.6	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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)	20.00	20.00	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	11.7	24.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.1	13.6	cfs
Capture Percentage = $Q_i/Q_o$ =	99	64	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-56**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$T_{BACK} = 8.0$  ft

$S_{BACK} = 0.020$  ft/ft

$n_{BACK} = 0.015$

$H_{CURB} = 6.00$  inches

$T_{CROWN} = 17.0$  ft

$W = 2.00$  ft

$S_x = 0.020$  ft/ft

$S_w = 0.083$  ft/ft

$S_o = 1.210$  ft/ft

$n_{STREET} = 0.017$

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	5.5	10.9	cfs

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



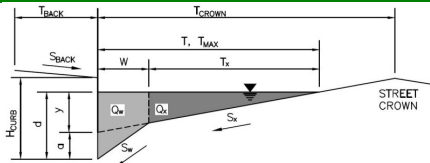
Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_F-G$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_F-C$ =	0.10	0.10	
<b>Street Hydraulics: WARNING: Q &gt; ALLOWABLE Q FOR MINOR &amp; MAJOR STORM</b>					
Total Inlet Interception Capacity		Q =	9.0	23.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	0.0	9.1	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	100	72	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-57**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

 $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_x = 0.020$  ft/ft $S_w = 0.083$  ft/ft $S_o = 0.010$  ft/ft $n_{STREET} = 0.017$ 

Max. Allowable Spread for Minor &amp; Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

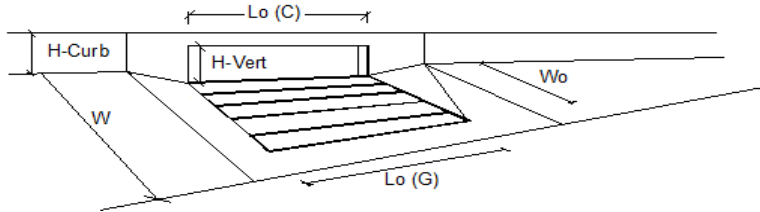
☐ ☒ check = yes
**MINOR STORM Allowable Capacity is based on Spread Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	10.2	31.5	cfs

**WARNING: MINOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'****Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'**

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR		MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')		$a_{LOCAL}$ =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		$N_o$ =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		$L_o$ =	20.00	20.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		$W_o$ =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		$C_{T-G}$ =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		$C_{T-C}$ =	0.10	0.10	
<b>Street Hydraulics: WARNING: Q &gt; ALLOWABLE Q FOR MINOR STORM'</b>					
Total Inlet Interception Capacity		Q =	11.0	19.0	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)		$Q_b$ =	0.0	5.1	cfs
Capture Percentage = $Q_i/Q_o$ =		C% =	100	79	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-62**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_X = 0.020$  ft/ft $S_W = 0.083$  ft/ft $S_O = 0.000$  ft/ft $n_{STREET} = 0.017$ 

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

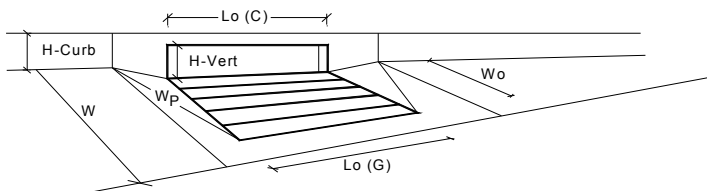
	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

	Minor Storm	Major Storm	
$d_{MAX} =$	5.6	7.9	inches

	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)

Type of Inlet: **CDOT Type R Curb Opening**  
 Local Depression (additional to continuous gutter depression 'a' from above)  
 Number of Unit Inlets (Grate or Curb Opening)  
 Water Depth at Flowline (outside of local depression)

## Grate Information

Length of a Unit Grate  
 Width of a Unit Grate  
 Area Opening Ratio for a Grate (typical values 0.15-0.90)  
 Clogging Factor for a Single Grate (typical value 0.50 - 0.70)  
 Grate Weir Coefficient (typical value 2.15 - 3.60)  
 Grate Orifice Coefficient (typical value 0.60 - 0.80)

## Curb Opening Information

Length of a Unit Curb Opening  
 Height of Vertical Curb Opening in Inches  
 Height of Curb Orifice Throat in Inches  
 Angle of Throat (see USDCM Figure ST-5)  
 Side Width for Depression Pan (typically the gutter width of 2 feet)  
 Clogging Factor for a Single Curb Opening (typical value 0.10)  
 Curb Opening Weir Coefficient (typical value 2.3-3.7)  
 Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

## Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth  
 Depth for Curb Opening Weir Equation  
 Combination Inlet Performance Reduction Factor for Long Inlets  
 Curb Opening Performance Reduction Factor for Long Inlets  
 Grated Inlet Performance Reduction Factor for Long Inlets

## Total Inlet Interception Capacity (assumes clogged condition)

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

	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
$a_{local}$ =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.6	8.0	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o$ (G) =	N/A	N/A	feet
$W_o$ =	N/A	N/A	feet
$A_{ratio}$ =	N/A	N/A	
$C_r$ (G) =	N/A	N/A	
$C_w$ (G) =	N/A	N/A	
$C_o$ (G) =	N/A	N/A	
	MINOR	MAJOR	
$L_o$ (C) =	30.00	30.00	feet
$H_{vert}$ =	6.00	6.00	inches
$H_{throat}$ =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
$W_p$ =	2.00	2.00	feet
$C_r$ (C) =	0.10	0.10	
$C_w$ (C) =	3.60	3.60	
$C_o$ (C) =	0.67	0.67	
	MINOR	MAJOR	
$d_{Grate}$ =	N/A	N/A	ft
$d_{Curb}$ =	0.30	0.50	ft
$RF_{Combination}$ =	0.53	0.75	
$RF_{Curb}$ =	0.76	0.89	
$RF_{Grate}$ =	N/A	N/A	
	MINOR	MAJOR	
$Q_a$ =	14.9	37.4	cfs
$Q_{PEAK REQUIRED}$ =	14.3	37.4	cfs

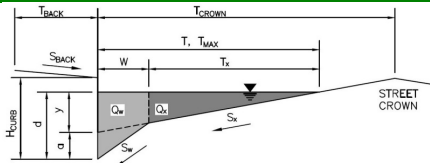


**ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)**

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-63**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 17.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_w = 0.083$  ft/ft  
 $S_o = 0.016$  ft/ft  
 $n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Spread Criterion**  
**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	13.1	39.4	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	10.2	15.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	1.3	9.7	cfs
Capture Percentage = $Q_i/Q_o$ =	89	62	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-64**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

$T_{BACK} = 8.0$  ft

$S_{BACK} = 0.020$  ft/ft

$n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

$H_{CURB} = 6.00$  inches

$T_{CROWN} = 17.0$  ft

$W = 2.00$  ft

$S_x = 0.020$  ft/ft

$S_w = 0.083$  ft/ft

$S_o = 0.040$  ft/ft

$n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm

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

Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

**MINOR STORM Allowable Capacity is based on Depth Criterion**

**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	15.3	30.2	cfs

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

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

# INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	Type = CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a <sub>LOCAL</sub> = 3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No = 1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L <sub>o</sub> = 15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W <sub>o</sub> = N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C <sub>T-G</sub> = N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C <sub>T-C</sub> = 0.10	0.10	
<b>Street Hydraulics: WARNING: Q &gt; ALLOWABLE Q FOR MAJOR STORM</b>			
Total Inlet Interception Capacity	Q = 9.8	17.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q <sub>b</sub> = 0.9	13.1	cfs
Capture Percentage = Q <sub>i</sub> /Q <sub>c</sub> =	C% = 92	57	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-66**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 8.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.015$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 17.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_w = 0.083$  ft/ft  
 $S_o = 0.020$  ft/ft  
 $n_{STREET} = 0.017$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Allow Flow Depth at Street Crown (leave blank for no)

	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	check = yes

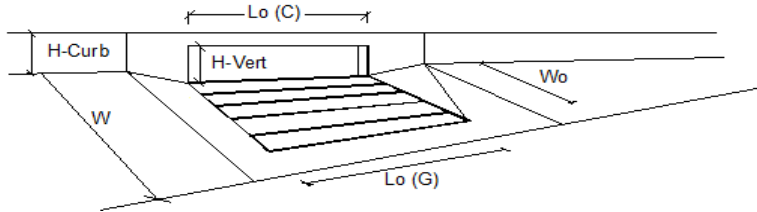
**MINOR STORM Allowable Capacity is based on Spread Criterion**  
**MAJOR STORM Allowable Capacity is based on Depth Criterion**

	Minor Storm	Major Storm	
$Q_{allow} =$	14.5	37.2	cfs

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

## INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)	MINOR	MAJOR	
Type of Inlet	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	1.5	11.8	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	0.0	2.7	cfs
Capture Percentage = $Q_i/Q_o$ =	100	81	%

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

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

Project: **The Ridge at Lorson Ranch, #100.064**

Inlet ID: **Inlet DP-69**

**Gutter Geometry (Enter data in the blue cells)**

Maximum Allowable Width for Spread Behind Curb

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

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

Height of Curb at Gutter Flow Line

Distance from Curb Face to Street Crown

Gutter Width

Street Transverse Slope

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

Street Longitudinal Slope - Enter 0 for sump condition

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

Max. Allowable Spread for Minor &amp; Major Storm

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

Check boxes are not applicable in SUMP conditions

**MINOR STORM Allowable Capacity is based on Depth Criterion****MAJOR STORM Allowable Capacity is based on Depth Criterion** $T_{BACK} = 8.0$  ft $S_{BACK} = 0.020$  ft/ft $n_{BACK} = 0.015$  $H_{CURB} = 6.00$  inches $T_{CROWN} = 17.0$  ft $W = 2.00$  ft $S_x = 0.020$  ft/ft $S_w = 0.083$  ft/ft $S_o = 0.000$  ft/ft $n_{STREET} = 0.017$ 

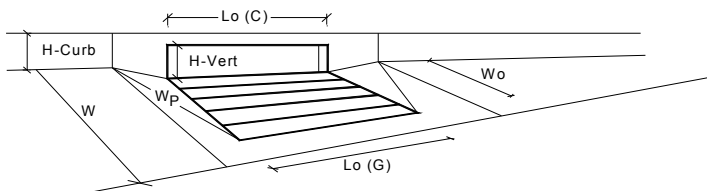
	Minor Storm	Major Storm	
$T_{MAX} =$	17.0	17.0	ft
$d_{MAX} =$	5.6	7.9	inches

☐☐

	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)

Type of Inlet  
Local Depression (additional to continuous gutter depression 'a' from above)  
Number of Unit Inlets (Grate or Curb Opening)  
Water Depth at Flowline (outside of local depression)

## Grate Information

Length of a Unit Grate  
Width of a Unit Grate  
Area Opening Ratio for a Grate (typical values 0.15-0.90)  
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)  
Grate Weir Coefficient (typical value 2.15 - 3.60)  
Grate Orifice Coefficient (typical value 0.60 - 0.80)

## Curb Opening Information

Length of a Unit Curb Opening  
Height of Vertical Curb Opening in Inches  
Height of Curb Orifice Throat in Inches  
Angle of Throat (see USDCM Figure ST-5)  
Side Width for Depression Pan (typically the gutter width of 2 feet)  
Clogging Factor for a Single Curb Opening (typical value 0.10)  
Curb Opening Weir Coefficient (typical value 2.3-3.7)  
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)

## Low Head Performance Reduction (Calculated)

Depth for Grate Midwidth  
Depth for Curb Opening Weir Equation  
Combination Inlet Performance Reduction Factor for Long Inlets  
Curb Opening Performance Reduction Factor for Long Inlets  
Grated Inlet Performance Reduction Factor for Long Inlets

## Total Inlet Interception Capacity (assumes clogged condition)

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

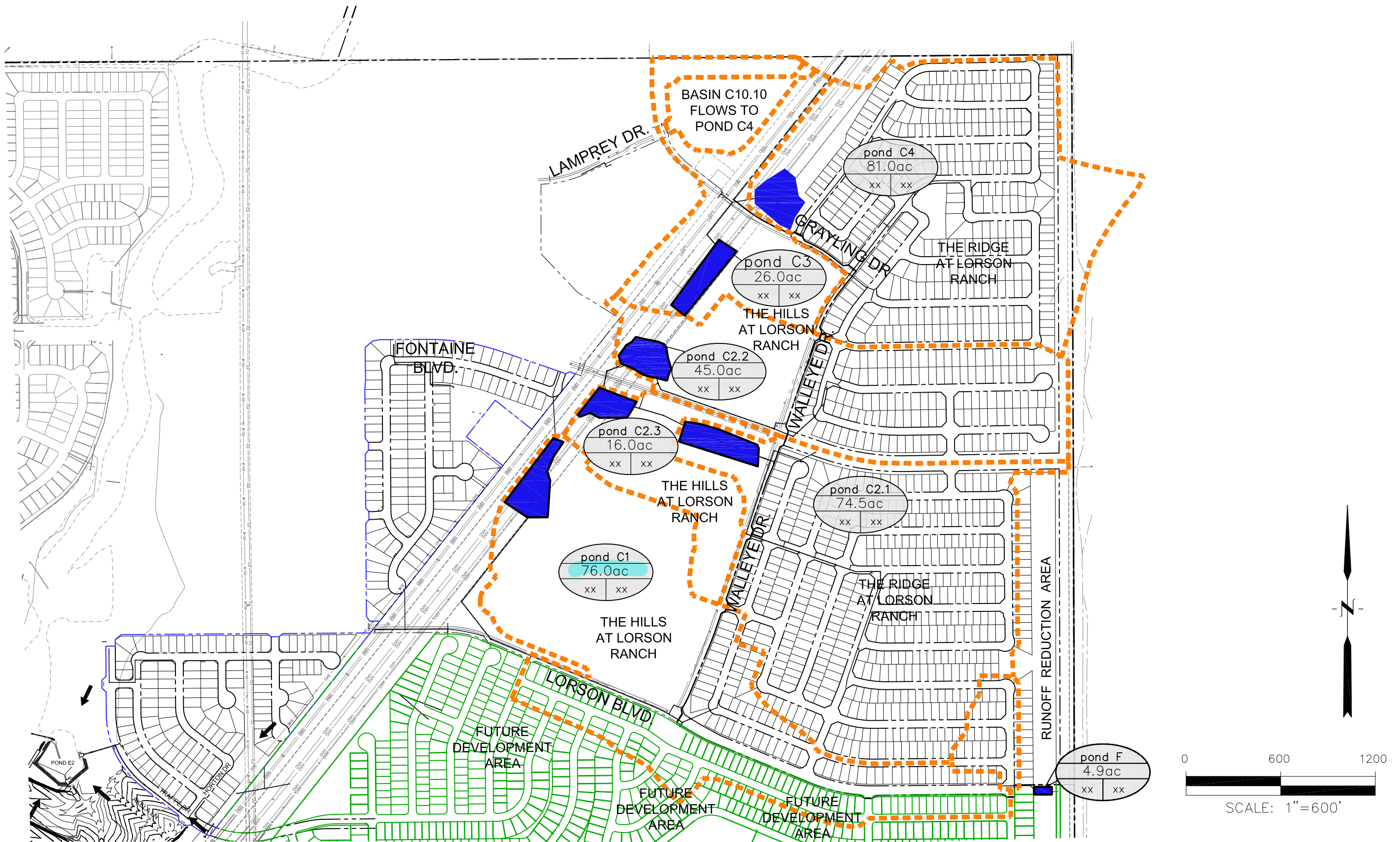
	MINOR	MAJOR	
Type =	CDOT Type R Curb Opening		
$a_{local}$ =	3.00	3.00	inches
No =	1	1	
Ponding Depth =	5.5	7.8	inches
	MINOR	MAJOR	<input checked="" type="checkbox"/> Override Depths
$L_o (G)$ =	N/A	N/A	feet
$W_o$ =	N/A	N/A	feet
$A_{ratio}$ =	N/A	N/A	
$C_r (G)$ =	N/A	N/A	
$C_w (G)$ =	N/A	N/A	
$C_o (G)$ =	N/A	N/A	
	MINOR	MAJOR	
$L_o (C)$ =	25.00	25.00	feet
$H_{vert}$ =	6.00	6.00	inches
$H_{throat}$ =	6.00	6.00	inches
Theta =	63.40	63.40	degrees
$W_p$ =	2.00	2.00	feet
$C_r (C)$ =	0.10	0.10	
$C_w (C)$ =	3.60	3.60	
$C_o (C)$ =	0.67	0.67	
	MINOR	MAJOR	
$d_{Grate}$ =	N/A	N/A	ft
$d_{Curb}$ =	0.29	0.48	ft
$RF_{Combination}$ =	0.52	0.74	
$RF_{Curb}$ =	0.75	0.88	
$RF_{Grate}$ =	N/A	N/A	
	MINOR	MAJOR	
$Q_a$ =	12.0	29.8	cfs
$Q_{PEAK REQUIRED}$ =	7.9	17.3	cfs



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## APPENDIX D – POND AND ROUTING CALCULATIONS

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**CORE  
ENGINEERING GROUP**

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**THE RIDGE AT LORSON RANCH  
WATER QUALITY & POND TRIBUTARY AREAS**

SCALE:  
NTS

DATE:  
JULY, 2021

FIGURE NO.  
1

# Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 1

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: March 18, 2021  
 Project: The Ridge at Lorson Ranch  
 Location: Basin F1

## SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth 0.60 inches  
 Depth of Average Runoff Producing Storm,  $d_0$  = 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> )	4,500												
RPA (ft <sup>2</sup> )	7,250												
SPA (ft <sup>2</sup> )	--												
HSG A (%)	0%												
HSG B (%)	100%												
HSG C/D (%)	0%												
Average Slope of RPA (ft/ft)	0.060												
UIA:RPA Interface Width (ft)	145.00												

## CALCULATED RUNOFF RESULTS

Area ID	res. Lot												
UIA:RPA Area (ft <sup>2</sup> )	11,750												
L / W Ratio	0.56												
UIA / Area	0.3830												
Runoff (in)	0.00												
Runoff (ft <sup>3</sup> )	0												
Runoff Reduction (ft <sup>3</sup> )	188												

## CALCULATED WQCV RESULTS

Area ID	res. Lot												
WQCV (ft <sup>3</sup> )	188												
WQCV Reduction (ft <sup>3</sup> )	188												
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)

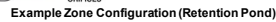
Downstream Design Point ID	1												
DCIA (ft <sup>2</sup> )	0												
UIA (ft <sup>2</sup> )	4,500												
RPA (ft <sup>2</sup> )	7,250												
SPA (ft <sup>2</sup> )	0												
Total Area (ft <sup>2</sup> )	11,750												
Total Impervious Area (ft <sup>2</sup> )	4,500												
WQCV (ft <sup>3</sup> )	188												
WQCV Reduction (ft <sup>3</sup> )	188												
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> )	11,750
Total Impervious Area (ft <sup>2</sup> )	4,500
WQCV (ft <sup>3</sup> )	188
WQCV Reduction (ft <sup>3</sup> )	188
WQCV Reduction (%)	100%
Untreated WQCV (ft <sup>3</sup> )	0

## MHFD-Detention, Version 4.02 (February 2020)

**Basin ID: Pond C1**



Depth Increment =	0.20	ft
-------------------	------	----

### Watershed Information

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

### Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

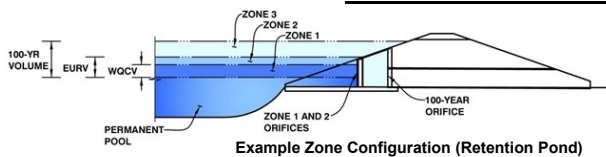
Initial Surcharge Area ( $A_{SV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{FLOOR}$ )	=	user	ft
Length of Basin Floor ( $L_{FLOOR}$ )	=	user	ft
Width of Basin Floor ( $W_{FLOOR}$ )	=	user	ft
Area of Basin Floor ( $A_{FLOOR}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{FLOOR}$ )	=	user	ft <sup>3</sup>
Depth of Main Basin ( $H_{MAIN}$ )	=	user	ft
Length of Main Basin ( $L_{MAIN}$ )	=	user	ft
Width of Main Basin ( $W_{MAIN}$ )	=	user	ft
Area of Main Basin ( $A_{MAIN}$ )	=	user	ft <sup>2</sup>
Volume of Main Basin ( $V_{MAIN}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{TOTAL}$ )	=	user	acre-feet

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C1**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.64	1.396	Orifice Plate
Zone 2 (EURV)	5.81	3.107	Rectangular Orifice
Zone 3 (100+1/2WQCV)	8.11	3.820	Weir&Pipe (Restrict)
Total (all zones)		8.323	

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

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

Calculated Parameters for Underdrain

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

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

Calculated Parameters for Plate

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

WQ Orifice Area per Row =  ft<sup>2</sup>  
Elliptical Half-Width =  feet  
Elliptical Slot Centroid =  feet  
Elliptical Slot Area =  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	1.21	2.43					
Orifice Area (sq. inches)	3.74	3.74	3.74					

	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)

Calculated Parameters for Vertical Orif

	Zone 2 Rectangular	Not Selected		Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.64	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.82	N/A
Depth at top of Zone using Vertical Orifice =	5.81	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches		
Vertical Orifice Width =	19.74		inches		

Vertical Orifice Area =  ft<sup>2</sup>  
Vertical Orifice Centroid =  feet

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, H <sub>o</sub> =	6.10	N/A	ft (relative to basin bottom at Stage = 0 ft)	6.10	N/A
Overflow Weir Front Edge Length =	5.66	N/A	feet	3.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	9.41	N/A
Horiz. Length of Weir Sides =	3.00	N/A	feet	11.89	N/A
Overflow Grate Open Area % =	70%	N/A	% , grate open area/total area	5.94	N/A
Debris Clogging % =	50%	N/A	%		

Height of Grate Upper Edge, H<sub>u</sub> =  ft  
Overflow Weir Slope Length =  feet  
Grate Open Area / 100-yr Orifice Area =  ft<sup>2</sup>  
Overflow Grate Open Area w/o Debris =  ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  ft<sup>2</sup>

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	1.26	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	0.57	N/A
Restrictor Plate Height Above Pipe Invert =	12.10		inches	1.92	N/A

Outlet Orifice Area =  ft<sup>2</sup>  
Outlet Orifice Centroid =  feet  
Half-Central Angle of Restrictor Plate on Pipe =  degrees

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.44
Spillway Crest Length =	28.00	feet	Stage at Top of Freeboard =	12.60
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.30
Freeboard above Max Water Surface =	1.16	feet	Basin Volume at Top of Freeboard =	17.50

pond bottom = 0 = 5743.40

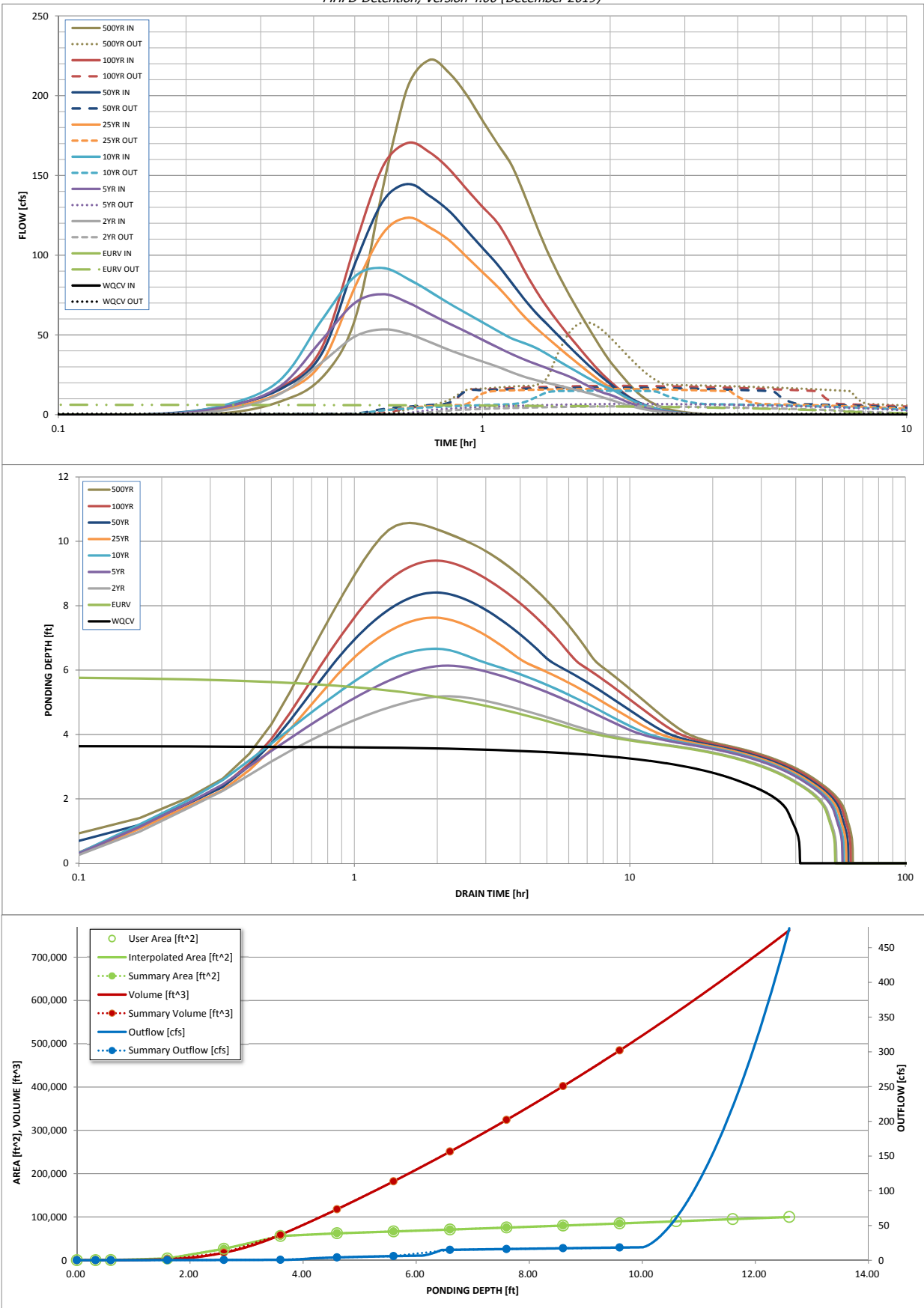
## Routed Hydrograph Results

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) =	1.396	4.503	4.251	5.966	7.456	9.398	11.003	13.015
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.251	5.966	7.456	9.398	11.003	13.015
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.7	16.2	25.0	45.9	57.7	74.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A						
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.08	0.21	0.33	0.60	0.76	0.98
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	53.5	75.6	91.9	123.5	144.7	170.4
Peak Inflow Q (cfs) =	0.6	6.3	5.3	7.1	15.0	16.2	17.0	18.1
Peak Outflow Q (cfs) =	N/A	N/A	N/A	0.4	0.6	0.4	0.3	0.2
Ratio Peak Outflow to Predevelopment Q =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Structure Controlling Flow =	N/A	N/A	N/A	0.0	0.6	0.6	0.6	0.6
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	38	48	49	50	49	48	47	46
Time to Drain 97% of Inflow Volume (hours) =	40	52	53	55	55	55	55	56
Time to Drain 99% of Inflow Volume (hours) =	3.64	5.81	5.19	6.14	6.66	7.63	8.41	9.40
Maximum Ponding Depth (ft) =	1.29	1.55	1.49	1.58	1.64	1.74	1.82	1.93
Area at Maximum Ponding Depth (acres) =	1.397	4.505	3.548	5.006	5.858	7.493	8.862	10.736
Maximum Volume Stored (acre-ft) =								

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Depotion, Version 4.00 (December 2019)



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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

### Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.04	1.17
	0:15:00	0.00	0.00	3.21	5.25	6.50	4.37	5.65	5.35	8.30
	0:20:00	0.00	0.00	13.15	17.89	21.81	13.53	16.01	16.83	22.90
	0:25:00	0.00	0.00	32.51	46.49	58.89	32.12	37.80	41.36	59.51
	0:30:00	0.00	0.00	49.01	70.15	86.70	79.84	94.50	105.98	143.35
	0:35:00	0.00	0.00	53.50	75.56	91.94	113.93	134.11	156.12	205.77
	0:40:00	0.00	0.00	50.76	70.34	85.18	123.53	144.65	170.44	222.50
	0:45:00	0.00	0.00	45.62	63.33	77.42	117.46	137.22	164.57	214.42
	0:50:00	0.00	0.00	40.68	57.25	69.85	109.47	127.83	154.14	200.67
	0:55:00	0.00	0.00	36.68	51.94	63.56	99.08	115.78	141.50	184.45
	1:00:00	0.00	0.00	33.32	46.99	57.93	89.35	104.59	130.33	170.05
	1:05:00	0.00	0.00	30.16	42.30	52.71	80.48	94.37	120.48	157.26
	1:10:00	0.00	0.00	26.80	38.16	48.05	71.14	83.50	106.47	139.23
	1:15:00	0.00	0.00	23.93	34.81	45.03	62.00	72.87	91.26	120.06
	1:20:00	0.00	0.00	21.79	31.93	42.03	54.66	64.30	78.39	103.47
	1:25:00	0.00	0.00	20.06	29.26	38.18	48.56	57.10	67.84	89.53
	1:30:00	0.00	0.00	18.49	26.81	34.21	42.90	50.35	58.80	77.50
	1:35:00	0.00	0.00	16.99	24.50	30.55	37.64	44.04	50.99	67.10
	1:40:00	0.00	0.00	15.50	21.77	27.14	32.80	38.24	43.80	57.54
	1:45:00	0.00	0.00	14.01	18.85	23.90	28.26	32.83	37.08	48.66
	1:50:00	0.00	0.00	12.61	16.16	20.96	24.03	27.80	30.90	40.50
	1:55:00	0.00	0.00	10.93	13.95	18.31	20.21	23.27	25.43	33.31
	2:00:00	0.00	0.00	9.49	12.47	16.37	17.03	19.54	20.89	27.55
	2:05:00	0.00	0.00	7.95	10.63	13.90	13.96	16.01	16.79	22.24
	2:10:00	0.00	0.00	6.45	8.62	11.29	10.99	12.60	13.04	17.30
	2:15:00	0.00	0.00	5.19	6.89	9.06	8.59	9.84	9.97	13.24
	2:20:00	0.00	0.00	4.19	5.52	7.27	6.74	7.71	7.64	10.15
	2:25:00	0.00	0.00	3.35	4.42	5.78	5.30	6.05	5.81	7.73
	2:30:00	0.00	0.00	2.67	3.51	4.56	4.15	4.71	4.40	5.85
	2:35:00	0.00	0.00	2.11	2.75	3.53	3.21	3.63	3.33	4.41
	2:40:00	0.00	0.00	1.67	2.12	2.71	2.47	2.78	2.57	3.39
	2:45:00	0.00	0.00	1.31	1.63	2.07	1.90	2.13	1.99	2.62
	2:50:00	0.00	0.00	1.02	1.26	1.62	1.49	1.67	1.58	2.08
	2:55:00	0.00	0.00	0.77	0.95	1.24	1.14	1.28	1.22	1.61
	3:00:00	0.00	0.00	0.56	0.69	0.91	0.86	0.96	0.91	1.20
	3:05:00	0.00	0.00	0.38	0.48	0.64	0.61	0.68	0.65	0.85
	3:10:00	0.00	0.00	0.24	0.32	0.41	0.40	0.45	0.43	0.56
	3:15:00	0.00	0.00	0.13	0.19	0.24	0.24	0.27	0.25	0.33
	3:20:00	0.00	0.00	0.06	0.09	0.11	0.12	0.13	0.12	0.16
	3:25:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.05
	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	

*MHFD-Detention, Version 4.02 (February 2020)*

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

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

[illegible]



# Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

**Designer:** Richard Schindler  
**Company:** Core Engineering Group  
**Date:** April 30, 2020  
**Project:** The Hills at Lorson Ranch  
**Location:** Pond C1

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$
- B) Tributary Area's Imperviousness Ratio ( $i = I_a / 100$ )
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept  
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time  
( $V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$ )
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume  
( $V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$ )
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)
- 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
- J) Excess Urban Runoff Volume (EURV) Design Volume  
 For HSG A:  $EURV_A = 1.68 * i^{1.28}$   
 For HSG B:  $EURV_B = 1.36 * i^{1.08}$   
 For HSG C/D:  $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume  
(Only if a different EURV Design Volume is desired)

$I_a = 55.0$  %

$i = 0.550$

Area = 76.000 ac

$d_b =$  in

Choose One

- ☒ Water Quality Capture Volume (WQCV)  
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 1.396$  ac-ft

$V_{DESIGN\ OTHER} =$  ac-ft

$V_{DESIGN\ USER} =$  ac-ft

HSG A = %

HSG B = %

HSG C/D = %

$EURV_{DESIGN} =$  ac-ft

$EURV_{DESIGN\ USER} =$  ac-ft

## 2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

## 3. Basin Side Slopes

- A) Basin Maximum Side Slopes  
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

## 4. Inlet

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

## 5. Forebay

- A) Minimum Forebay Volume  
( $V_{MIN} = 3\%$  of the WQCV)
- B) Actual Forebay Volume
- C) Forebay Depth  
( $D_F = 30$  inch maximum)
- D) Forebay Discharge  
 i) Undetained 100-year Peak Discharge  
 ii) Forebay Discharge Design Flow  
( $Q_F = 0.02 * Q_{100}$ )
- E) Forebay Discharge Design
- F) Discharge Pipe Size (minimum 8-inches)
- G) Rectangular Notch Width

$V_{MIN} = 0.042$  ac-ft

$V_F = 0.045$  ac-ft

$D_F = 24.0$  in

$Q_{100} = 170.00$  cfs

$Q_F = 3.40$  cfs

Choose One

- ☐ Berm With Pipe  
☒ Wall with Rect. Notch  
☐ Wall with V-Notch Weir

Calculated  $D_P =$  in

Calculated  $W_N = 9.1$  in

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: April 30, 2020  
 Project: The Hills at Lorson Ranch  
 Location: Pond C1

## 6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

☒ Concrete

☐ Soft Bottom

S = 0.0050 ft / ft

## 7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing  
(Use UD-Detention)

E) Total Outlet Area

D<sub>M</sub> = 2.5 ft

A<sub>M</sub> = 50 sq ft

Choose One

☒ Orifice Plate

☐ Other (Describe):

D<sub>orifice</sub> = 1.93 inches

A<sub>orifice</sub> = 6.45 square inches

## 8. Initial Surge Volume

A) Depth of Initial Surge Volume  
(Minimum recommended depth is 4 inches)

B) Minimum Initial Surge Volume  
(Minimum volume of 0.3% of the WQCV)

C) Initial Surge Provided Above Micropool

D<sub>IS</sub> = 4 in

V<sub>IS</sub> = 182 cu ft

V<sub>s</sub> = 16.7 cu ft

## 9. Trash Rack

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

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.)

Other (Y/N): y

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV)  
(Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H<sub>TR</sub>)

G) Width of Water Quality Screen Opening (W<sub>opening</sub>)  
(Minimum of 12 inches is recommended)

A<sub>t</sub> = 207 square inches

Other (Please describe below)

wellscreen stainless

User Ratio = 0.6

A<sub>total</sub> = 345 sq. in. Based on type 'Other' screen ratio

H = 3.64 feet

H<sub>TR</sub> = 71.68 inches

W<sub>opening</sub> = 12.0 inches VALUE LESS THAN RECOMMENDED MIN. WIDTH.  
WIDTH HAS BEEN SET TO 12 INCHES.

# Weir Report

## Pond C1 forebay overflow

### Rectangular Weir

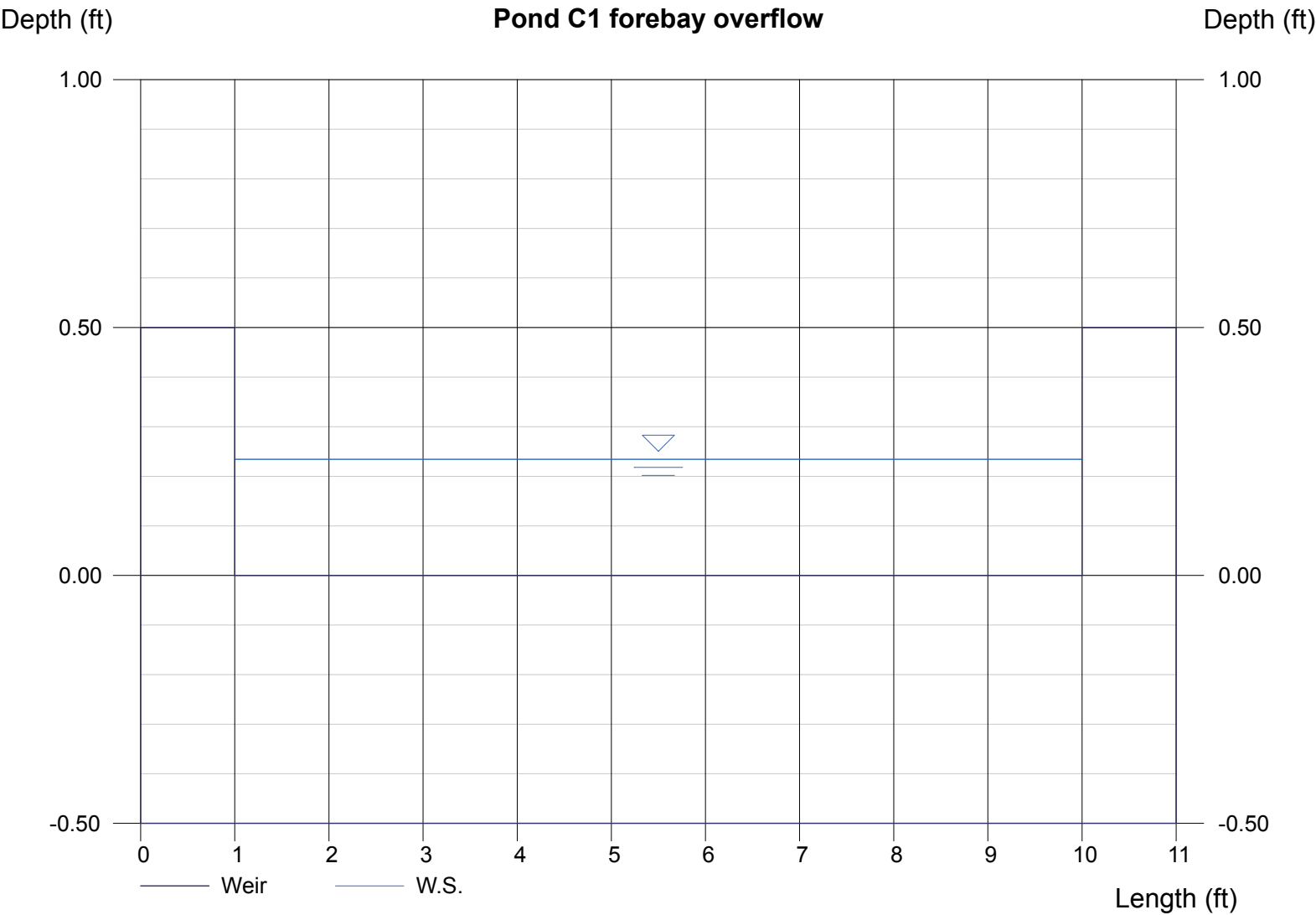
Crest = Sharp  
Bottom Length (ft) = 9.00  
Total Depth (ft) = 0.50

### Calculations

Weir Coeff. Cw = 3.33  
Compute by: Known Q  
Known Q (cfs) = 3.40

### Highlighted

Depth (ft) = 0.23  
Q (cfs) = 3.400  
Area (sqft) = 2.11  
Velocity (ft/s) = 1.61  
Top Width (ft) = 9.00



# Channel Report

Hydraflow Express by Intelisolve

Friday, May 1 2020, 6:2 AM

## pond C1 low flow channel (2 x forebay release = 6.8cfs)

### Rectangular

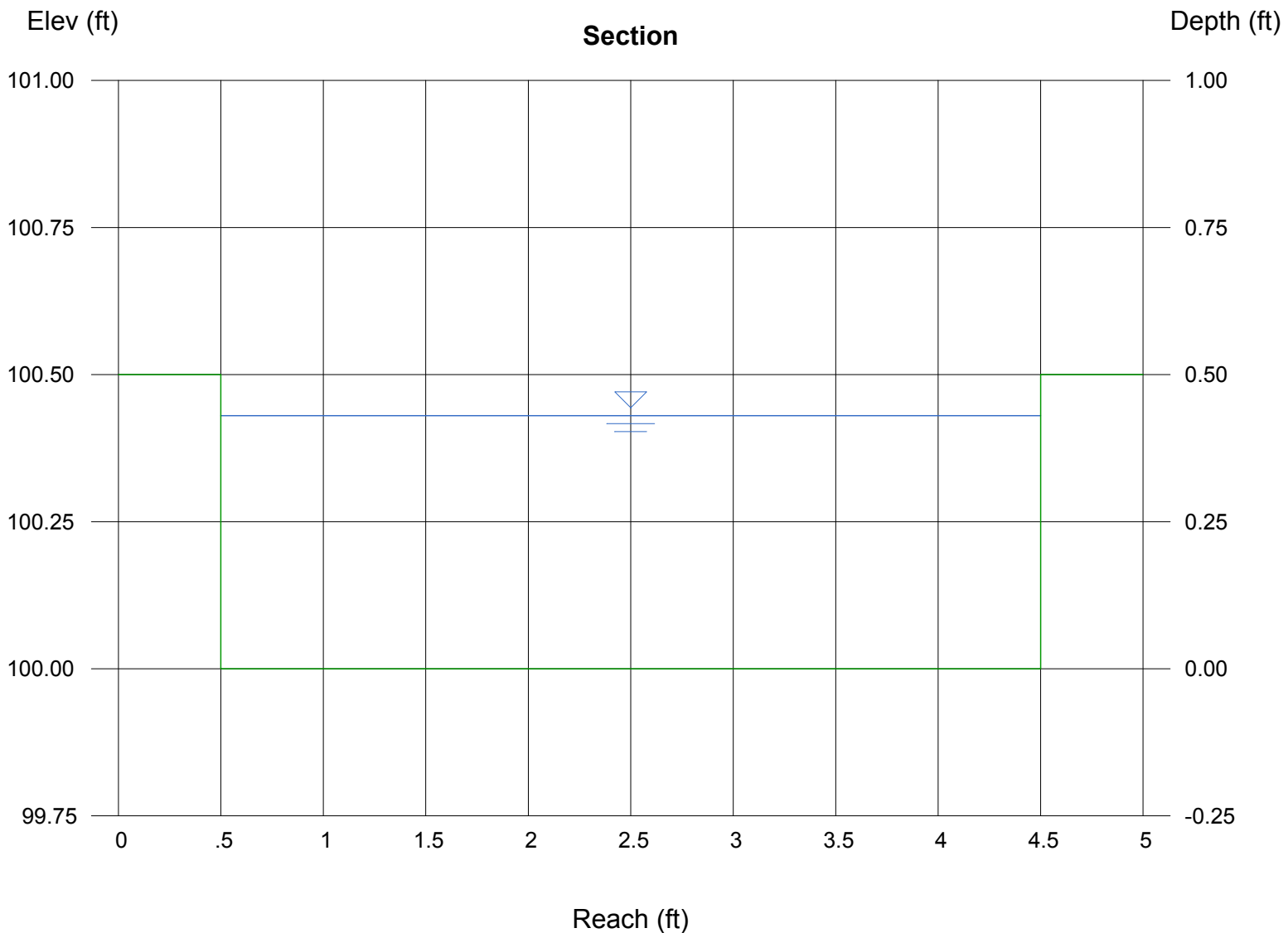
Bottom Width (ft) = 4.00  
Total Depth (ft) = 0.50  
  
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

Compute by: Known Q  
Known Q (cfs) = 6.80

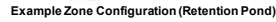
### Highlighted

Depth (ft) = 0.43  
Q (cfs) = 6.800  
Area (sqft) = 1.72  
Velocity (ft/s) = 3.95  
Wetted Perim (ft) = 4.86  
Crit Depth, Yc (ft) = 0.45  
Top Width (ft) = 4.00  
EGL (ft) = 0.67



## MHFD-Detention, Version 4.02 (February 2020)

**Basin ID: Pond C2.1**



Depth Increment =	0.20	ft
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Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)
<b>Top of Micropool</b>	--	0.0	--	--	--	42	0.001		
<b>5760.33</b>	--	0.33	--	--	--	50	0.001	15	0.000
<b>5761</b>	--	1.00	--	--	--	1,264	0.029	455	0.010
<b>5762</b>	--	2.00	--	--	--	20,478	0.470	11,326	0.260
<b>5763</b>	--	3.00	--	--	--	41,417	0.951	42,274	0.970
<b>5764</b>	--	4.00	--	--	--	44,796	1.028	85,380	1.960
<b>5765</b>	--	5.00	--	--	--	48,239	1.107	131,898	3.028
<b>5766</b>	--	6.00	--	--	--	51,758	1.188	181,896	4.176
<b>5767</b>	--	7.00	--	--	--	55,348	1.271	235,449	5.405
<b>5768</b>	--	8.00	--	--	--	59,010	1.355	292,628	6.718
<b>5769</b>	--	9.00	--	--	--	62,743	1.440	353,505	8.115
<b>5770</b>	--	10.00	--	--	--	66,548	1.528	418,150	9.599
<b>5771</b>	--	11.00	--	--	--	70,423	1.617	486,636	11.172
<b>5772</b>	--	12.00	--	--	--	74,434	1.709	559,064	12.834

Selected BMP Type =	<b>EDB</b>	
Watershed Area =	74.50	acres
Watershed Length =	2,500	ft
Watershed Length to Centroid =	2,000	ft
Watershed Slope =	0.038	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Group C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = User Input		

### Optional User Overrides

Water Quality Capture Volume (WQCV)	1,368	acre-feet
Excess Urban Runoff Volume (EURV)	4,414	acre-feet
2-yr Runoff Volume ( $P1 = 1.19$ in.)	4,152	acre-feet
5-yr Runoff Volume ( $P1 = 1.5$ in.)	5,828	acre-feet
10-yr Runoff Volume ( $P1 = 1.75$ in.)	7,285	acre-feet
25-yr Runoff Volume ( $P1 = 2$ in.)	9,182	acre-feet
50-yr Runoff Volume ( $P1 = 2.25$ in.)	10,750	acre-feet
100-yr Runoff Volume ( $P1 = 2.52$ in.)	12,716	acre-feet
500-yr Runoff Volume ( $P1 = 3.14$ in.)	16,746	acre-feet
Approximate 2-yr Detention Volume	3,363	acre-feet
Approximate 5-yr Detention Volume	4,574	acre-feet
Approximate 10-yr Detention Volume	5,970	acre-feet
Approximate 25-yr Detention Volume	6,490	acre-feet
Approximate 50-yr Detention Volume	6,774	acre-feet
Approximate 100-yr Detention Volume	7,475	acre-feet

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Zone 1 Volume (WQCV) =	1.358	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.045	acre-feet
Zone 3 (100yr + 1 / 2 / WQCV - Zones 1 & 2) =	3.745	acre-feet
Total Detention Basin Volume =	8.159	acre-feet
Initial Surcharge Volume (ISV) =	user	ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth ( $H_{\text{total}}$ ) =	user	ft
Depth of Trickle Channel ( $H_{\text{TC}}$ ) =	user	ft
Slope of Trickle Channel ( $S_{\text{TC}}$ ) =	user	ft/ft
Slopes of Main Basin Sides ( $S_{\text{main}}$ ) =	user	H:V
Basin Length-to-Width Ratio ( $R_{\text{BW}}$ ) =	user	

Initial Surcharge Area ( $A_{SV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{FLOOR}$ )	=	user	ft
Length of Basin Floor ( $L_{FLOOR}$ )	=	user	ft
Width of Basin Floor ( $W_{FLOOR}$ )	=	user	ft
Area of Basin Floor ( $A_{FLOOR}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{FLOOR}$ )	=	user	ft <sup>3</sup>
Depth of Main Basin ( $H_{MAIN}$ )	=	user	ft
Length of Main Basin ( $L_{MAIN}$ )	=	user	ft
Width of Main Basin ( $W_{MAIN}$ )	=	user	ft
Area of Main Basin ( $A_{MAIN}$ )	=	user	ft <sup>2</sup>
Volume of Main Basin ( $V_{MAIN}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{TOTAL}$ )	=	user	acre-feet

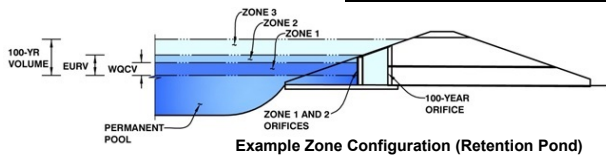
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# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.02 (February 2020)

Project: The Hills at Lorson Ranch

Basin ID: Pond C2.1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.42	1.368	Orifice Plate
Zone 2 (EURV)	6.20	3.045	Rectangular Orifice
Zone 3 (100+1/2WQCV)	9.04	3.745	Weir&Pipe (Restrict)
Total (all zones)		8.159	

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 = 3.42 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing = 13.70 inches  
Orifice Plate: Orifice Area per Row = 4.06 sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row = 2.819E-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	1.14	2.28					
Orifice Area (sq. inches)	4.06	4.06	4.06					

	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)

Invert of Vertical Orifice = 3.42 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Vertical Orifice = 6.20 ft (relative to basin bottom at Stage = 0 ft)  
Vertical Orifice Height = 6.00 inches  
Vertical Orifice Width = 14.59 inches

Calculated Parameters for Vertical Orif

Zone 2 Rectangular Not Selected  
Vertical Orifice Area = 0.61 ft<sup>2</sup>  
Vertical Orifice Centroid = 0.25 feet

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

Overflow Weir Front Edge Height, H<sub>o</sub> = 6.20 ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length = 8.00 feet  
Overflow Weir Grate Slope = 0.00 H:V  
Horiz. Length of Weir Sides = 6.00 feet  
Overflow Grate Open Area % = 70%  
Debris Clogging % = 50%

Calculated Parameters for Overflow We

Height of Grate Upper Edge, H<sub>u</sub> = 6.20 ft  
Overflow Weir Slope Length = 6.00 feet  
Grate Open Area / 100-yr Orifice Area = 6.84  
Overflow Grate Open Area w/o Debris = 33.60  
Overflow Grate Open Area w/ Debris = 16.80

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

Depth to Invert of Outlet Pipe = 0.00 ft (distance below basin bottom at Stage = 0 ft)  
Outlet Pipe Diameter = 30.00 inches  
Restrictor Plate Height Above Pipe Invert = 30.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = 4.91 ft<sup>2</sup>  
Outlet Orifice Centroid = 1.25 feet  
Half-Central Angle of Restrictor Plate on Pipe = 3.14

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 9.30 ft (relative to basin bottom at Stage = 0 ft)  
Spillway Crest Length = 25.00 feet  
Spillway End Slopes = 4.00 H:V  
Freeboard above Max Water Surface = 1.01 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth = 1.69 feet  
Stage at Top of Freeboard = 12.00 feet  
Basin Area at Top of Freeboard = 1.71 acres  
Basin Volume at Top of Freeboard = 12.83 acre-ft

top micropool = 5761= stage 0

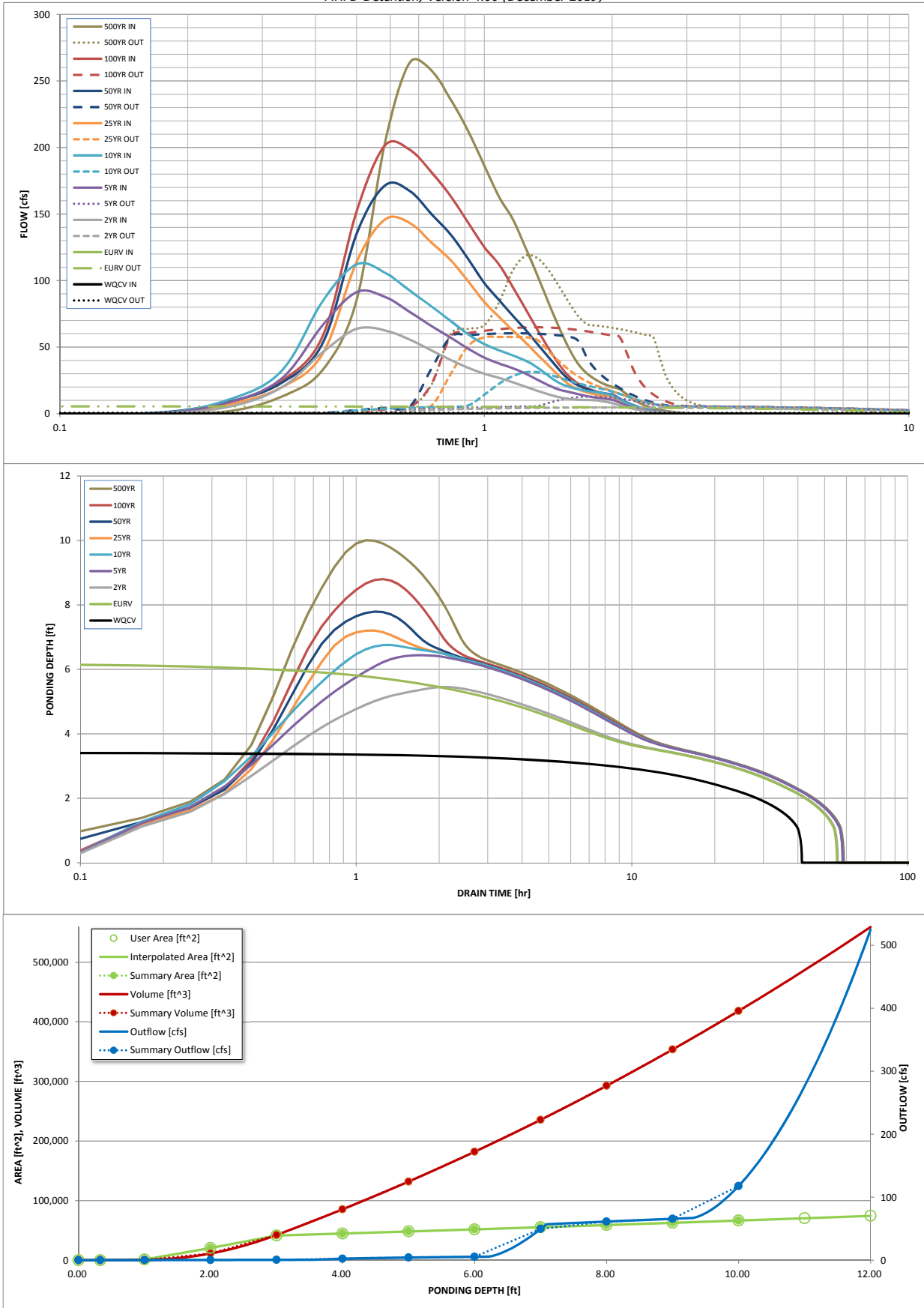
## Routed Hydrograph Results

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) =	1.368	4.414	4.152	5.828	7.285	9.182	10.750	12.716
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.152	5.828	7.285	9.182	10.750	12.716
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	7.5	21.2	32.2	57.6	72.4	92.1
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A						
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	0.43	0.77	0.97	1.24
Peak Inflow Q (cfs) =	N/A	N/A	63.8	91.4	112.2	146.0	171.6	201.7
Peak Outflow Q (cfs) =	0.6	5.6	4.8	12.8	31.2	57.7	60.5	65.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.6	1.0	1.0	0.8	0.7
Structure Controlling Flow =	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.8	1.5	1.6	1.7
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	48	48	49	47	45	43	41
Time to Drain 99% of Inflow Volume (hours) =	40	52	53	54	53	52	52	51
Maximum Ponding Depth (ft) =	3.42	6.20	5.45	6.44	6.76	7.20	7.79	8.80
Area at Maximum Ponding Depth (acres) =	0.98	1.20	1.14	1.22	1.25	1.29	1.34	1.42
Maximum Volume Stored (acre-ft) =	1.377	4.415	3.534	4.694	5.090	5.661	6.435	7.829

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



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

Outflow Hydrograph Workbook Filename: .\xxxxxxxx.xlsm

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

[illegible]



## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.02 (February 2020)*

### Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]

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

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

# Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

**Designer:** Richard Schindler  
**Company:** Core Engineering Group  
**Date:** May 2, 2020  
**Project:** The Hills at Lorson Ranch  
**Location:** Pond C2.1

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$
- B) Tributary Area's Imperviousness Ratio ( $i = I_a / 100$ )
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept  
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time  
( $V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$ )
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume  
( $V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$ )
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)
- 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
- J) Excess Urban Runoff Volume (EURV) Design Volume  
 For HSG A:  $EURV_A = 1.68 * i^{1.28}$   
 For HSG B:  $EURV_B = 1.36 * i^{1.08}$   
 For HSG C/D:  $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume  
(Only if a different EURV Design Volume is desired)

$I_a = 55.0$  %

$i = 0.550$

Area = 74.500 ac

$d_b =$  in

Choose One

- ☒ Water Quality Capture Volume (WQCV)  
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 1.368$  ac-ft

$V_{DESIGN\ OTHER} =$  ac-ft

$V_{DESIGN\ USER} =$  ac-ft

HSG A = %

HSG B = %

HSG C/D = %

$EURV_{DESIGN} =$  ac-ft

$EURV_{DESIGN\ USER} =$  ac-ft

## 2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

## 3. Basin Side Slopes

- A) Basin Maximum Side Slopes  
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

## 4. Inlet

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

## 5. Forebay

- A) Minimum Forebay Volume  
( $V_{MIN} = 3\%$  of the WQCV)
- B) Actual Forebay Volume
- C) Forebay Depth  
( $D_F = 30$  inch maximum)
- D) Forebay Discharge
- i) Undetained 100-year Peak Discharge
- ii) Forebay Discharge Design Flow  
( $Q_F = 0.02 * Q_{100}$ )
- E) Forebay Discharge Design
- F) Discharge Pipe Size (minimum 8-inches)
- G) Rectangular Notch Width

$V_{MIN} = 0.041$  ac-ft

$V_F = 0.045$  ac-ft

$D_F = 24.0$  in

$Q_{100} = 202.00$  cfs

$Q_F = 4.04$  cfs

Choose One

- ☐ Berm With Pipe  
☒ Wall with Rect. Notch  
☐ Wall with V-Notch Weir

Calculated  $D_P =$  in

Calculated  $W_N = 9.9$  in

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: May 2, 2020  
 Project: The Hills at Lorson Ranch  
 Location: Pond C2.1

## 6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

☒ Concrete

☐ Soft Bottom

S = 0.0050 ft / ft

## 7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing  
(Use UD-Detention)

E) Total Outlet Area

D<sub>M</sub> = 2.5 ft

A<sub>M</sub> = 50 sq ft

Choose One

☒ Orifice Plate

☐ Other (Describe):

D<sub>orifice</sub> = 2.01 inches

A<sub>orifice</sub> = 12.60 square inches

## 8. Initial Surge Volume

A) Depth of Initial Surge Volume  
(Minimum recommended depth is 4 inches)

B) Minimum Initial Surge Volume  
(Minimum volume of 0.3% of the WQCV)

C) Initial Surge Provided Above Micropool

D<sub>IS</sub> = 4 in

V<sub>IS</sub> = 179 cu ft

V<sub>s</sub> = 16.7 cu ft

## 9. Trash Rack

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

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.)

Other (Y/N): y

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV)  
(Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H<sub>TR</sub>)

G) Width of Water Quality Screen Opening (W<sub>opening</sub>)  
(Minimum of 12 inches is recommended)

A<sub>t</sub> = 401 square inches

Other (Please describe below)

wellscreen stainless

User Ratio = 0.6

A<sub>total</sub> = 668 sq. in. Based on type 'Other' screen ratio

H = 3.42 feet

H<sub>TR</sub> = 69.04 inches

W<sub>opening</sub> = 12.0 inches VALUE LESS THAN RECOMMENDED MIN. WIDTH.  
WIDTH HAS BEEN SET TO 12 INCHES.

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 3

**Designer:** Richard Schindler  
**Company:** Core Engineering Group  
**Date:** May 2, 2020  
**Project:** The Hills at Lorson Ranch  
**Location:** Pond C2.1

## 10. Overflow Embankment

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

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

Ze =  ft / ft

## 11. Vegetation

Choose One

- ☐ Irrigated  
☐ Not Irrigated

## 12. Access

A) Describe Sediment Removal Procedures

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Notes:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Channel Report

## pond C2.1 low flow channel (2 x forebay release = 8.08cfs)

### Rectangular

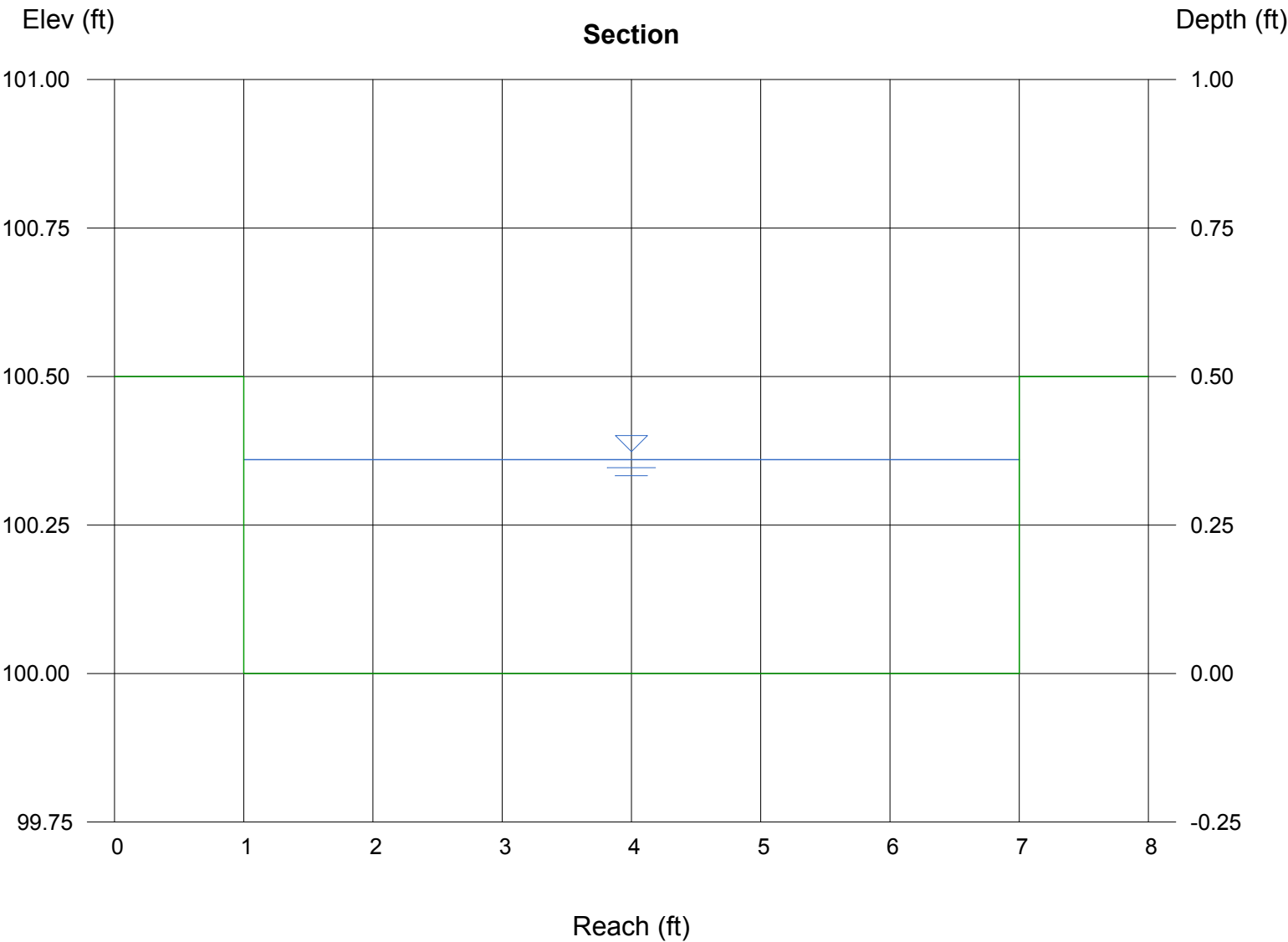
Botom Width (ft) = 6.00  
Total Depth (ft) = 0.50  
  
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

Compute by: Known Q  
Known Q (cfs) = 8.08

### Highlighted

Depth (ft) = 0.36  
Q (cfs) = 8.080  
Area (sqft) = 2.16  
Velocity (ft/s) = 3.74  
Wetted Perim (ft) = 6.72  
Crit Depth, Yc (ft) = 0.39  
Top Width (ft) = 6.00  
EGL (ft) = 0.58



# Weir Report

## Pond C2.1 forebay overflow

### Rectangular Weir

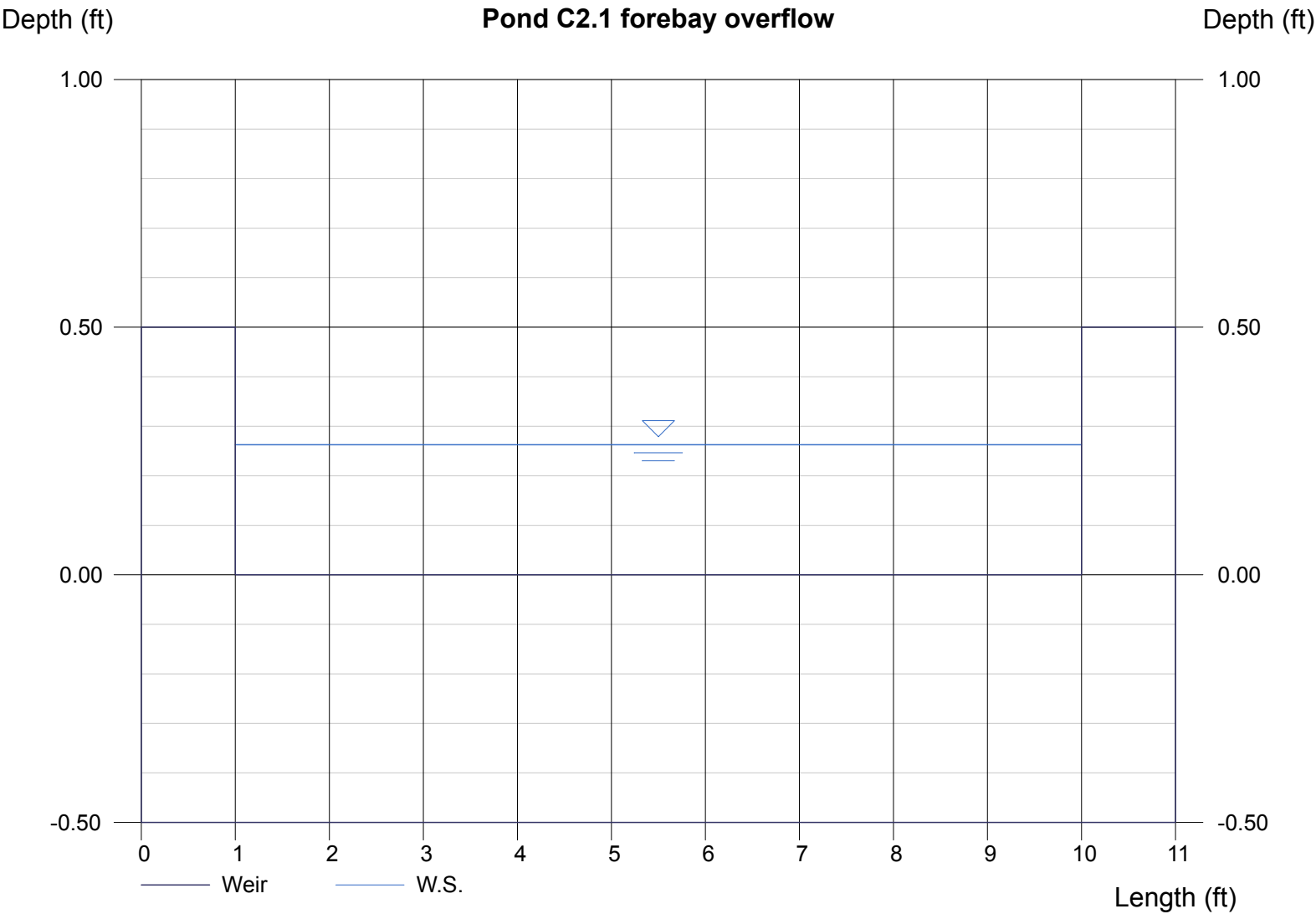
Crest = Sharp  
Bottom Length (ft) = 9.00  
Total Depth (ft) = 0.50

### Calculations

Weir Coeff. Cw = 3.33  
Compute by: Known Q  
Known Q (cfs) = 4.04

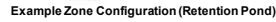
### Highlighted

Depth (ft) = 0.26  
Q (cfs) = 4.040  
Area (sqft) = 2.36  
Velocity (ft/s) = 1.71  
Top Width (ft) = 9.00



## MHFD-Detention, Version 4.02 (February 2020)

**Basin ID: Pond C2.2**



Depth Increment =	0.20	ft
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5/2/2020, 9:11 AM

Pond C2.2 Developed Inflow Hydrograph---- Pond C3 outflow + C5 Basin + C7 Basin

			2yr				Syr				10yr				25yr				50yr				100yr				500yr	
Time [hr]	Time [min]	Pond C3 Outflow2 - [cfs]	CUHP 2 Year [cfs]	Combined Hydrograph	Pond C3 Outflow2 - [cfs]	CUHP 5 Year [cfs]	Combined Hydrograph	Pond C3 Outflow2 - [cfs]	CUHP 10 Year [cfs]	Combined Hydrograph	Pond C3 Outflow2 - [cfs]	CUHP 25 Year [cfs]	Combined Hydrograph	Pond C3 Outflow2 - [cfs]	CUHP 50 Year [cfs]	Combined Hydrograph	Pond C3 Outflow2 - [cfs]	CUHP 100 Year [cfs]	Combined Hydrograph	Pond C3 Outflow2 - [cfs]	CUHP 500 Year [cfs]	Combined Hydrograph						
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.02	0.00	0.02	0.03	0.00	0.03						
0.08	5.00	0.03	0.00	0.03	0.03	0.00	0.03	0.03	0.00	0.03	0.03	0.00	0.03	0.04	0.00	0.04	0.03	0.00	0.03	0.04	0.00	0.04						
0.17	10.00	0.06	0.00	0.06	0.07	0.00	0.07	0.08	0.00	0.08	0.07	0.00	0.07	0.08	0.42	0.50	0.07	0.04	0.11	0.09	1.36	1.45						
0.25	15.00	0.10	3.74	3.84	0.11	6.11	6.22	0.11	7.57	7.68	0.10	5.09	5.19	0.10	6.38	6.48	0.10	6.20	6.30	0.12	9.01	9.13						
0.33	20.00	0.14	13.60	13.74	0.16	18.00	18.16	0.17	21.92	22.09	0.14	13.38	13.52	0.15	15.61	15.76	0.16	16.68	16.84	0.17	22.29	22.46						
0.42	25.00	0.17	31.11	31.28	0.20	45.07	45.27	0.52	57.54	58.06	0.19	30.50	30.69	0.24	35.87	36.11	0.39	39.63	40.02	1.63	57.77	59.40						
0.50	30.00	0.24	40.82	41.06	1.21	58.25	59.46	1.95	71.19	73.14	1.68	76.90	78.58	2.14	91.05	93.19	2.56	102.55	105.11	3.27	136.67	139.94						
0.58	35.00	0.87	38.60	39.47	2.10	53.89	55.99	2.57	65.04	67.61	2.72	92.11	94.83	3.16	108.06	111.22	3.60	127.72	131.32	4.27	166.67	170.94						
0.67	40.00	1.66	33.84	35.50	2.52	46.24	48.76	2.99	55.88	58.87	3.44	88.47	91.91	3.89	103.22	107.11	4.32	122.26	126.58	4.98	158.77	163.75						
0.75	45.00	2.01	28.43	30.44	2.81	39.40	42.21	3.35	48.41	51.76	3.99	77.76	81.75	4.43	90.67	95.10	4.86	110.23	115.09	5.54	143.17	148.71						
0.83	50.00	2.25	23.82	26.07	3.03	33.85	36.88	3.70	41.10	44.80	4.43	69.49	73.92	4.85	81.04	85.89	5.29	98.35	103.64	20.24	127.67	147.91						
0.92	55.00	2.44	20.11	22.55	3.21	28.41	31.62	4.03	34.74	38.77	4.78	58.63	63.41	5.19	68.45	73.64	5.65	85.07	90.72	30.72	110.43	141.15						
1.00	60.00	2.59	17.63	20.22	3.38	24.74	28.12	4.33	30.90	35.23	5.08	48.90	53.98	5.49	57.23	62.72	15.15	73.51	88.66	31.92	95.81	127.73						
1.08	65.00	2.70	15.89	18.59	3.55	22.20	25.75	4.58	28.16	32.74	5.33	42.78	48.11	6.30	50.23	56.53	29.72	66.37	96.09	34.49	86.66	121.15						
1.17	70.00	2.79	13.63	16.42	3.70	19.91	23.61	4.81	25.58	30.39	5.55	36.41	41.96	14.94	42.84	57.78	30.21	55.34	85.55	53.73	72.60	126.33						
1.25	75.00	2.87	11.46	14.33	3.84	17.10	20.94	5.01	23.01	28.02	6.25	30.66	36.91	24.32	36.16	60.48	30.53	44.97	75.50	68.71	59.42	128.13						
1.33	80.00	2.93	9.51	12.44	3.97	14.14	18.11	5.18	19.48	24.66	12.33	24.76	37.09	29.87	29.17	59.04	30.79	34.93	65.72	73.88	46.13	120.01						
1.42	85.00	2.99	7.93	10.92	4.09	11.69	15.78	5.32	15.58	20.90	19.28	19.60	38.88	30.07	23.03	53.10	31.01	26.23	57.24	72.67	34.55	107.22						
1.50	90.00	3.05	6.97	10.02	4.20	10.29	14.49	5.44	13.16	18.60	25.17	14.82	39.99	30.25	17.32	47.57	31.20	19.11	50.31	68.71	25.36	94.07						
1.58	95.00	3.10	6.50	9.60	4.30	9.58	13.88	5.55	11.74	17.29	29.61	11.96	41.57	30.41	13.95	44.36	31.37	14.90	46.27	64.29	19.87	84.16						
1.67	100.00	3.15	6.27	9.42	4.40	8.56	12.96	5.64	10.76	16.40	29.92	10.21	40.13	30.56	11.85	42.41	31.53	12.39	43.92	60.59	16.55	77.14						
1.75	105.00	3.20	6.14	9.34	4.48	7.72	12.20	6.07	10.05	16.12	30.03	9.08	39.11	30.69	10.48	41.17	31.67	10.63	42.30	57.81	14.20	72.01						
1.83	110.00	3.24	6.04	9.28	4.55	7.11	11.66	8.15	9.57	17.72	30.13	8.29	38.42	30.82	9.52	40.34	31.81	9.43	41.24	55.69	12.60	68.29						
1.92	115.00	3.28	5.34	8.62	4.62	6.67	11.29	10.36	8.98	19.34	30.22	7.79	38.01	30.93	8.90	39.83	31.94	8.58	40.52	54.06	11.45	65.51						
2.00	120.00	3.32	4.68	8.00	4.67	6.16	10.83	12.00	8.10	20.10	30.31	7.44	37.75	31.04	8.45	39.49	32.05	7.98	40.03	52.58	10.64	63.22						
2.08	125.00	3.35	3.59	6.94	4.71	4.72	9.43	12.85	6.16	19.01	30.35	5.71	36.06	31.13	6.47	37.60	32.15	6.02	38.17	51.05	8.02	59.07						
2.17	130.00	3.37	2.65	6.02	4.75	3.44	8.19	13.03	4.45	17.48	30.34	4.14	34.48	31.20	4.68	35.88	32.24	4.36	36.60	49.59	5.80	55.39						
2.25	135.00	3.39	1.95	5.34	4.77	2.52	7.29	12.75	3.22	15.97	30.26	3.01	33.27	31.26	3.40	34.66	32.32	3.19	35.51	48.23	4.22	52.45						
2.33	140.00	3.41	1.42	4.83	4.79	1.83	6.62	12.18	2.34	14.52	30.12	2.20	32.32	31.31	2.48	33.79	32.38	2.35	34.73	46.99	3.11	50.10						
2.42	145.00	3.43	1.02	4.45	4.80	1.28	6.08	11.47	1.67	13.14	29.95	1.56	31.51	31.35	1.75	33.10	32.44	1.68	34.12	45.87	2.22	48.09						
2.50	150.00	3.44	0.71	4.15	4.81	0.88	5.69	10.72	1.17	11.89	28.62	1.10	29.72	31.39	1.23	32.62	32.49	1.18	33.67	44.86	1.56	46.42						
2.58	155.00	3.46	0.49	3.95	4.81	0.61	5.42	10.00	0.82	10.82	23.64	0.79	24.43	31.37	0.88	32.25	32.54	0.84	33.38	43.95	1.11	45.06						
2.67	160.00	3.47	0.31	3.78	4.82	0.41	5.23	9.36	0.53	9.89																		

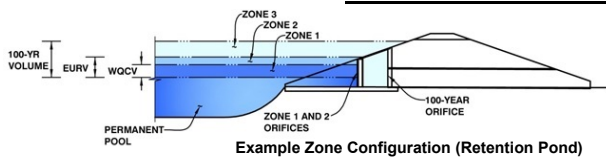


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C2.2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.25	0.827	Orifice Plate
Zone 2 (EURV)	5.17	1.824	Rectangular Orifice
Zone 3 (100+1/2WQCV)	7.28	2.269	Weir&Pipe (Restrict)
Total (all zones)		4.920	

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

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

Calculated Parameters for Underdrain

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

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

Calculated Parameters for Plate

Invert of Lowest Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  inches  
Orifice Plate: Orifice Area per Row =  sq. inches (diameter = 1-11/16 inches)

WQ Orifice Area per Row =  ft<sup>2</sup>  
Elliptical Half-Width =  feet  
Elliptical Slot Centroid =  feet  
Elliptical Slot Area =  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	1.08	2.17					
Orifice Area (sq. inches)	2.21	2.21	2.21					

	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)

Calculated Parameters for Vertical Orif

	Zone 2 Rectangular	Not Selected		Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	3.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.25	N/A
Depth at top of Zone using Vertical Orifice =	5.17	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches		
Vertical Orifice Width =	6.00		inches		

Vertical Orifice Area =  ft<sup>2</sup>  
Vertical Orifice Centroid =  feet

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, H <sub>o</sub> =	7.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	7.00	N/A
Overflow Weir Front Edge Length =	8.00	N/A	feet	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	10.58	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	33.60	N/A
Overflow Grate Open Area % =	70%	N/A	%	16.80	N/A
Debris Clogging % =	50%	N/A	%		

Height of Grate Upper Edge, H<sub>u</sub> =  ft  
Overflow Weir Slope Length =  feet  
Grate Open Area / 100-yr Orifice Area =   
Overflow Grate Open Area w/o Debris =   
Overflow Grate Open Area w/ Debris =

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	3.18	N/A
Outlet Pipe Diameter =	30.00	N/A	inches	0.87	N/A
Restrictor Plate Height Above Pipe Invert =	18.50		inches	1.81	N/A

Outlet Orifice Area =  ft<sup>2</sup>  
Outlet Orifice Centroid =  feet  
Half-Central Angle of Restrictor Plate on Pipe =  degrees

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.51	feet
Spillway Crest Length =	20.00	feet	Stage at Top of Freeboard =	13.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.33	acres
Freeboard above Max Water Surface =	1.49	feet	Basin Volume at Top of Freeboard =	8.28	acre-ft

micropool = 0 = 5744.00

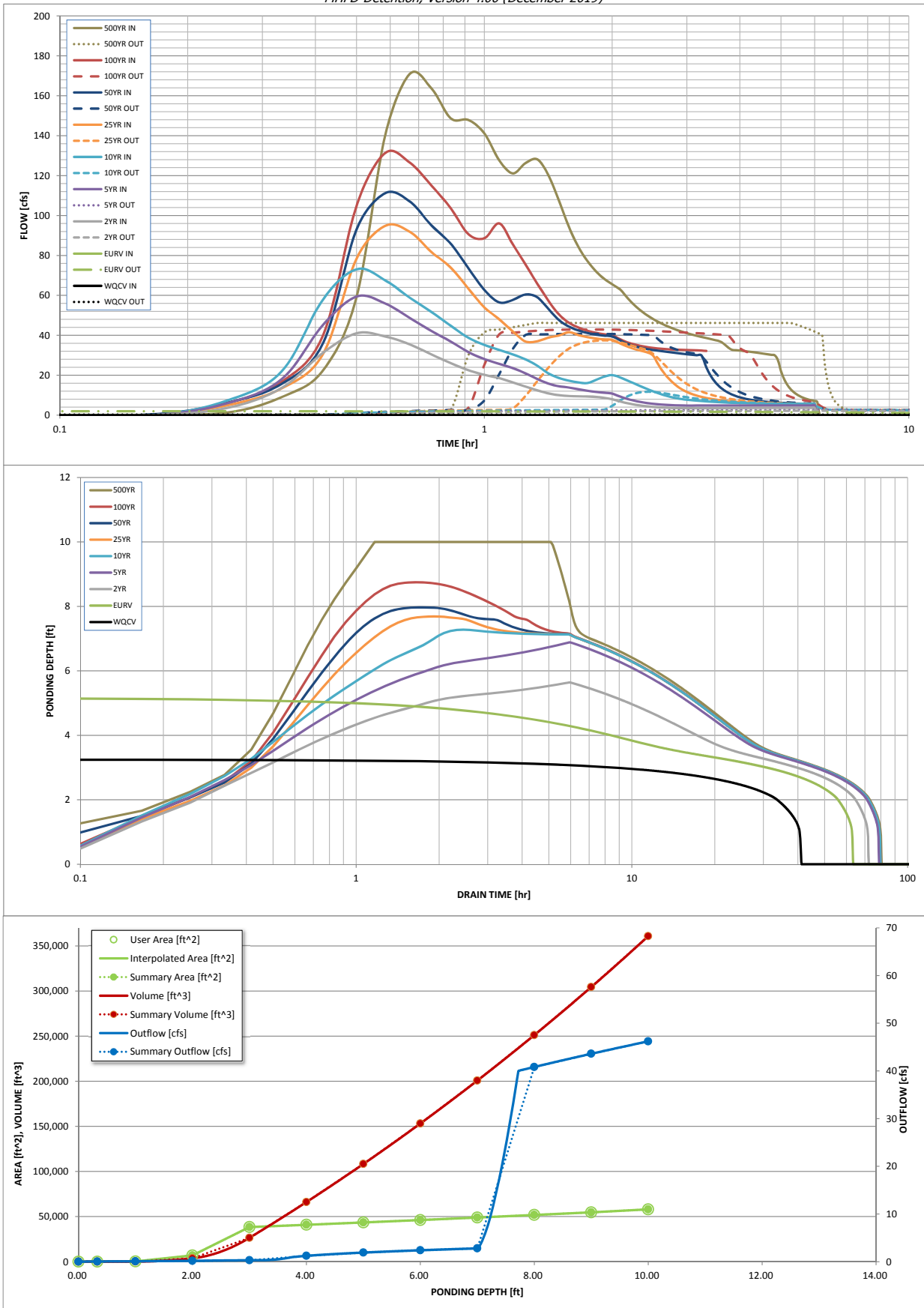
## Routed Hydrograph Results

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	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.827	2.651	2.510	3.521	4.403	5.541	6.487	7.671
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.034	5.603	7.467	11.034	14.029	17.717
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	5.0	13.5	20.5	36.5	45.7	58.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.30	0.46	0.81	1.02	1.29
Peak Inflow Q (cfs) =	N/A	N/A	41.1	59.5	73.1	94.8	111.2	131.3
Peak Outflow Q (cfs) =	0.3	2.0	2.2	2.7	11.7	37.5	40.7	42.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.6	1.0	0.9	0.7
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.3	1.0	1.1	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	56	62	66	64	59	55	50
Time to Drain 99% of Inflow Volume (hours) =	40	61	68	73	73	71	69	67
Maximum Ponding Depth (ft) =	3.25	5.17	5.64	6.88	7.28	7.69	7.97	8.75
Area at Maximum Ponding Depth (acres) =	0.90	1.01	1.04	1.12	1.14	1.17	1.19	1.24
Maximum Volume Stored (acre-ft) =	0.829	2.658	3.139	4.475	4.916	5.390	5.720	6.666

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Depotion, Version 4.00 (December 2019)



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

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

## Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	USER	USER	USER	USER	USER	USER	USER
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.02	0.03
	0:05:00	0.00	0.00	0.03	0.03	0.03	0.03	0.04	0.03	0.04
	0:10:00	0.00	0.00	0.06	0.07	0.08	0.07	0.50	0.11	1.45
	0:15:00	0.00	0.00	3.84	6.22	7.68	5.19	6.48	6.30	9.13
	0:20:00	0.00	0.00	13.74	18.16	22.09	13.52	15.76	16.84	22.46
	0:25:00	0.00	0.00	31.28	45.27	58.06	30.69	36.11	40.02	59.40
	0:30:00	0.00	0.00	41.06	59.46	73.14	78.58	93.19	105.11	139.94
	0:35:00	0.00	0.00	39.47	55.99	67.61	94.83	111.22	131.32	170.94
	0:40:00	0.00	0.00	35.50	48.76	58.87	91.91	107.11	126.58	163.75
	0:45:00	0.00	0.00	30.44	42.21	51.76	81.75	95.10	115.09	148.71
	0:50:00	0.00	0.00	26.07	36.88	44.80	73.92	85.89	103.64	147.91
	0:55:00	0.00	0.00	22.55	31.62	38.77	63.41	73.64	90.72	141.15
	1:00:00	0.00	0.00	20.22	28.12	35.23	53.98	62.72	88.66	127.73
	1:05:00	0.00	0.00	18.59	25.75	32.74	48.11	56.53	96.09	121.15
	1:10:00	0.00	0.00	16.42	23.61	30.39	41.96	57.78	85.55	126.33
	1:15:00	0.00	0.00	14.33	20.94	28.02	36.91	60.48	75.50	128.13
	1:20:00	0.00	0.00	12.44	18.11	24.66	37.09	59.04	65.72	120.01
	1:25:00	0.00	0.00	10.92	15.78	20.90	38.88	53.10	57.24	107.22
	1:30:00	0.00	0.00	10.02	14.49	18.60	39.99	47.57	50.31	94.07
	1:35:00	0.00	0.00	9.60	13.88	17.29	41.57	44.36	46.27	84.16
	1:40:00	0.00	0.00	9.42	12.96	16.40	40.13	42.41	43.92	77.14
	1:45:00	0.00	0.00	9.34	12.20	16.12	39.11	41.17	42.30	72.01
	1:50:00	0.00	0.00	9.28	11.66	17.72	38.42	40.34	41.24	68.29
	1:55:00	0.00	0.00	8.62	11.29	19.34	38.01	39.83	40.52	65.51
	2:00:00	0.00	0.00	8.00	10.83	20.10	37.75	39.49	40.03	63.22
	2:05:00	0.00	0.00	6.94	9.43	19.01	36.06	37.60	38.17	59.07
	2:10:00	0.00	0.00	6.02	8.19	17.48	34.48	35.88	36.60	55.39
	2:15:00	0.00	0.00	5.34	7.29	15.97	33.27	34.66	35.51	52.45
	2:20:00	0.00	0.00	4.83	6.62	14.52	32.32	33.79	34.73	50.10
	2:25:00	0.00	0.00	4.45	6.08	13.14	31.51	33.10	34.12	48.09
	2:30:00	0.00	0.00	4.15	5.69	11.89	29.72	32.62	33.67	46.42
	2:35:00	0.00	0.00	3.95	5.42	10.82	24.43	32.25	33.38	45.06
	2:40:00	0.00	0.00	3.78	5.23	9.89	20.37	31.86	33.14	43.85
	2:45:00	0.00	0.00	3.65	5.06	9.14	17.25	31.48	32.95	42.78
	2:50:00	0.00	0.00	3.58	4.95	8.54	14.83	31.14	32.81	41.86
	2:55:00	0.00	0.00	3.54	4.87	8.08	12.98	30.82	32.72	41.05
	3:00:00	0.00	0.00	3.52	4.84	7.72	11.61	30.54	32.67	40.37
	3:05:00	0.00	0.00	3.53	4.84	7.47	10.59	30.31	32.62	39.78
	3:10:00	0.00	0.00	3.54	4.85	7.25	9.79	30.07	32.51	39.21
	3:15:00	0.00	0.00	3.55	4.85	7.06	9.15	29.82	32.37	38.66
	3:20:00	0.00	0.00	3.56	4.86	6.90	8.63	23.98	32.19	38.13
	3:25:00	0.00	0.00	3.57	4.86	6.76	8.21	19.59	31.99	37.60
	3:30:00	0.00	0.00	3.58	4.86	6.63	7.86	16.49	31.78	37.04
	3:35:00	0.00	0.00	3.59	4.87	6.52	7.57	14.25	31.55	35.80
	3:40:00	0.00	0.00	3.59	4.87	6.42	7.32	12.58	31.31	33.93
	3:45:00	0.00	0.00	3.60	4.87	6.32	7.11	11.31	31.07	32.74
	3:50:00	0.00	0.00	3.61	4.88	6.24	6.92	10.33	30.82	32.57
	3:55:00	0.00	0.00	3.61	4.88	6.17	6.76	9.56	30.57	32.38
	4:00:00	0.00	0.00	3.62	4.88	6.10	6.62	8.94	30.32	32.17
	4:05:00	0.00	0.00	3.63	4.88	6.04	6.50	8.44	30.07	31.94
	4:10:00	0.00	0.00	3.63	4.88	5.98	6.39	8.03	29.77	31.71
	4:15:00	0.00	0.00	3.64	4.88	5.93	6.29	7.69	23.75	31.47
	4:20:00	0.00	0.00	3.64	4.89	5.88	6.21	7.41	19.39	31.22
	4:25:00	0.00	0.00	3.65	4.89	5.84	6.13	7.17	16.31	30.98
	4:30:00	0.00	0.00	3.65	4.89	5.80	6.05	6.96	14.07	30.73
	4:35:00	0.00	0.00	3.65	4.89	5.76	5.99	6.78	12.41	30.48
	4:40:00	0.00	0.00	3.66	4.89	5.74	5.93	6.63	11.14	30.22
	4:45:00	0.00	0.00	3.66	4.89	5.71	5.88	6.49	10.17	29.97
	4:50:00	0.00	0.00	3.66	4.89	5.70	5.83	6.37	9.40	27.51
	4:55:00	0.00	0.00	3.67	4.89	5.69	5.79	6.27	8.78	21.96
	5:00:00	0.00	0.00	3.67	4.89	5.69	5.75	6.17	8.29	18.12
	5:05:00	0.00	0.00	3.67	4.89	5.69	5.73	6.09	7.88	15.38
	5:10:00	0.00	0.00	3.67	4.89	5.68	5.70	6.01	7.54	13.38
	5:15:00	0.00	0.00	3.67	4.89	5.68	5.69	5.94	7.26	11.87
	5:20:00	0.00	0.00	3.67	4.89	5.68	5.69	5.88	7.02	10.72
	5:25:00	0.00	0.00	3.67	4.88	5.67	5.69	5.83	6.81	9.83
	5:30:00	0.00	0.00	3.67	4.88	5.67	5.68	5.78	6.64	9.12
	5:35:00	0.00	0.00	3.67	4.88	5.66	5.68	5.75	6.48	8.55
	5:40:00	0.00	0.00	3.67	4.88	5.66	5.68	5.72	6.35	8.09
	5:45:00	0.00	0.00	3.67	4.88	5.65	5.67	5.70	6.23	7.71
	5:50:00	0.00	0.00	3.67	4.87	5.65	5.67	5.69	6.13	7.39
	5:55:00	0.00	0.00	3.67	4.87	5.64	5.66	5.69	6.04	7.13
	6:00:00	0.00	0.00	3.65	4.86	5.63	5.65	5.68	5.81	6.62

## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.02 (February 2020)*

### Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]

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

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

# Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: May 2, 2020  
 Project: The Hills at Lorson Ranch  
 Location: Pond C2.2

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$
- B) Tributary Area's Imperviousness Ratio ( $i = I_a / 100$ )
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept  
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time  
( $V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$ )
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume  
( $V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$ )
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)
- 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
- J) Excess Urban Runoff Volume (EURV) Design Volume  
 For HSG A:  $EURV_A = 1.68 * i^{1.28}$   
 For HSG B:  $EURV_B = 1.36 * i^{1.08}$   
 For HSG C/D:  $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume  
(Only if a different EURV Design Volume is desired)

$I_a =$  55.0 %

$i =$  0.550

Area = 45.000 ac

$d_b =$       in

Choose One

- ☒ Water Quality Capture Volume (WQCV)  
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} =$  0.827 ac-ft

$V_{DESIGN\ OTHER} =$       ac-ft

$V_{DESIGN\ USER} =$       ac-ft

HSG A =      %

HSG B =      %

HSG C/D =      %

$EURV_{DESIGN} =$       ac-ft

$EURV_{DESIGN\ USER} =$       ac-ft

## 2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

## 3. Basin Side Slopes

- A) Basin Maximum Side Slopes  
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

## 4. Inlet

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

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## 5. Forebay

- A) Minimum Forebay Volume  
( $V_{MIN} =$  3% of the WQCV)

$V_{MIN} =$  0.025 ac-ft

- B) Actual Forebay Volume

$V_F =$  0.028 ac-ft

- C) Forebay Depth

( $D_F =$  30 inch maximum)

$D_F =$  24.0 in

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

$Q_{100} =$  131.00 cfs

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

$Q_F =$  2.62 cfs

- E) Forebay Discharge Design

Choose One

- ☐ Berm With Pipe  
☒ Wall with Rect. Notch  
☐ Wall with V-Notch Weir

- F) Discharge Pipe Size (minimum 8-inches)

Calculated  $D_P =$       in

- G) Rectangular Notch Width

Calculated  $W_N =$  8.1 in

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: May 2, 2020  
 Project: The Hills at Lorson Ranch  
 Location: Pond C2.2

## 6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

☒ Concrete

☐ Soft Bottom

S = 0.0050 ft / ft

## 7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing  
(Use UD-Detention)

E) Total Outlet Area

D<sub>M</sub> = 2.5 ft

A<sub>M</sub> = 50 sq ft

Choose One

☒ Orifice Plate

☐ Other (Describe):

D<sub>orifice</sub> = 1.48 inches

A<sub>orifice</sub> = 6.63 square inches

## 8. Initial Surge Volume

A) Depth of Initial Surge Volume  
(Minimum recommended depth is 4 inches)

B) Minimum Initial Surge Volume  
(Minimum volume of 0.3% of the WQCV)

C) Initial Surge Provided Above Micropool

D<sub>IS</sub> = 4 in

V<sub>IS</sub> = 108 cu ft

V<sub>s</sub> = 16.7 cu ft

## 9. Trash Rack

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

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.)

Other (Y/N): y

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV)  
(Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H<sub>TR</sub>)

G) Width of Water Quality Screen Opening (W<sub>opening</sub>)  
(Minimum of 12 inches is recommended)

A<sub>t</sub> = 222 square inches

Other (Please describe below)

wellscreen stainless

User Ratio = 0.6

A<sub>total</sub> = 370 sq. in. Based on type 'Other' screen ratio

H = 3.25 feet

H<sub>TR</sub> = 67 inches

W<sub>opening</sub> = 12.0 inches VALUE LESS THAN RECOMMENDED MIN. WIDTH.  
WIDTH HAS BEEN SET TO 12 INCHES.

# Channel Report

Hydraflow Express by Intelisolve

Saturday, May 2 2020, 9:18 AM

## pond C2.2 low flow channel (2 x forebay release = 5.24cfs)

### Rectangular

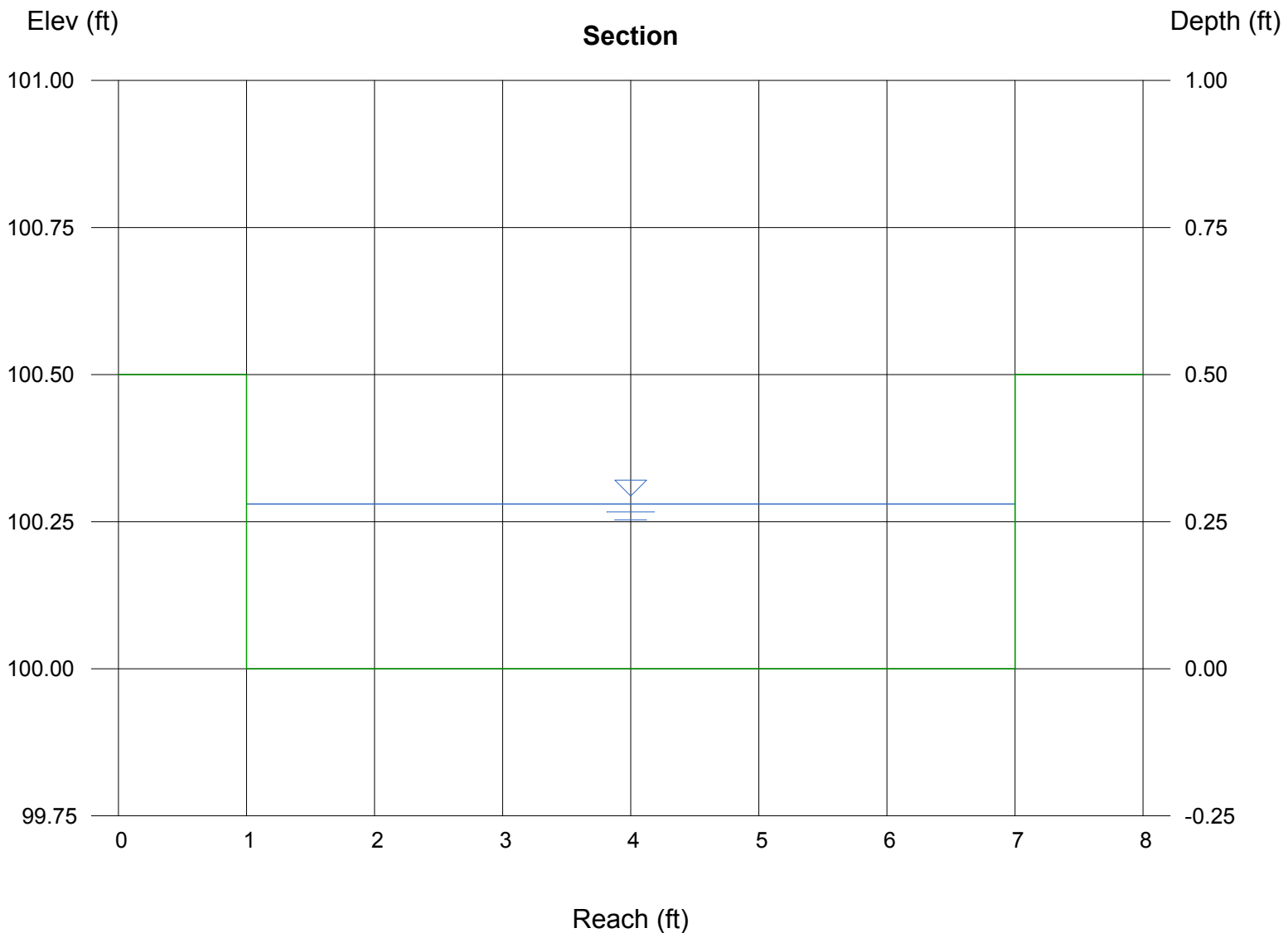
Bottom Width (ft) = 6.00  
Total Depth (ft) = 0.50  
  
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

Compute by: Known Q  
Known Q (cfs) = 5.24

### Highlighted

Depth (ft) = 0.28  
Q (cfs) = 5.240  
Area (sqft) = 1.68  
Velocity (ft/s) = 3.12  
Wetted Perim (ft) = 6.56  
Crit Depth, Yc (ft) = 0.29  
Top Width (ft) = 6.00  
EGL (ft) = 0.43



# Weir Report

## Pond C2.2 forebay overflow

### Rectangular Weir

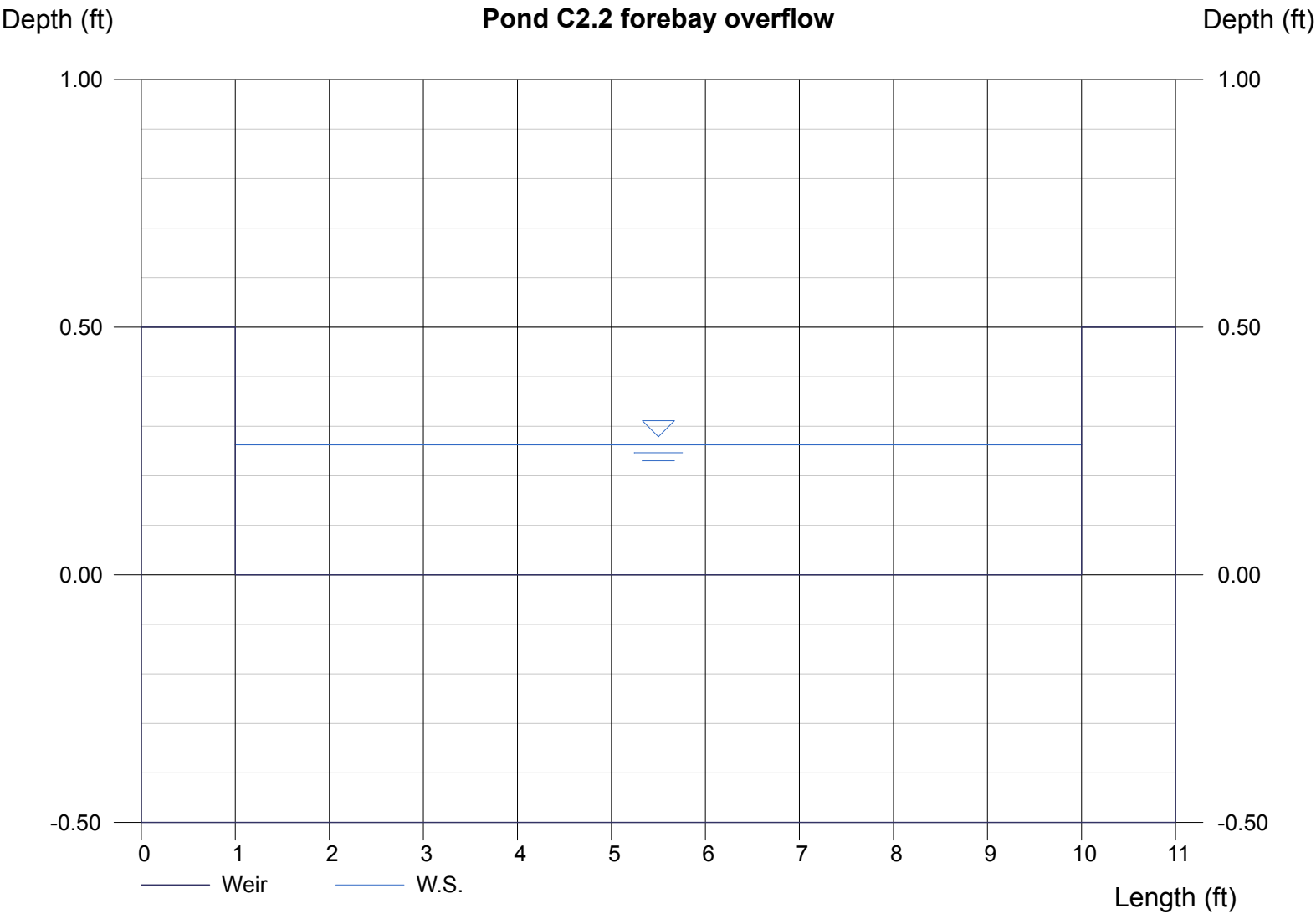
Crest = Sharp  
Bottom Length (ft) = 9.00  
Total Depth (ft) = 0.50

### Calculations

Weir Coeff. Cw = 3.33  
Compute by: Known Q  
Known Q (cfs) = 4.04

### Highlighted

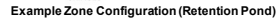
Depth (ft) = 0.26  
Q (cfs) = 4.040  
Area (sqft) = 2.36  
Velocity (ft/s) = 1.71  
Top Width (ft) = 9.00





## MHFD-Detention, Version 4.02 (February 2020)

**Basin ID: Pond C4**



Depth Increment =	0.20	ft
-------------------	------	----

### Watershed Information

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

### Optional User Overrides

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

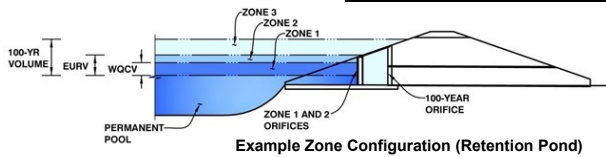
Initial Surcharge Area ( $A_{SV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{LFLOOR}$ )	=	user	ft
Length of Basin Floor ( $L_{FFLOOR}$ )	=	user	ft
Width of Basin Floor ( $W_{FFLOOR}$ )	=	user	ft
Area of Basin Floor ( $A_{FFLOOR}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{FFLOOR}$ )	=	user	ft <sup>3</sup>
Depth of Main Basin ( $H_{MAIN}$ )	=	user	ft
Length of Main Basin ( $L_{MAIN}$ )	=	user	ft
Width of Main Basin ( $W_{MAIN}$ )	=	user	ft
Area of Main Basin ( $A_{MAIN}$ )	=	user	ft <sup>2</sup>
Volume of Main Basin ( $V_{MAIN}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{TOTAL}$ )	=	user	acre-feet

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C4**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.97	1.488	Orifice Plate
Zone 2 (EURV)	5.41	2.980	Rectangular Orifice
Zone 3 (100+1/2WQCV)	8.40	4.225	Weir&Pipe (Restrict)
Total (all zones)		8.692	

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

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

Calculated Parameters for Underdrain

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

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

Calculated Parameters for Plate

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

WQ Orifice Area per Row =  ft<sup>2</sup>  
Elliptical Half-Width =  feet  
Elliptical Slot Centroid =  feet  
Elliptical Slot Area =  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	0.99	1.98					
Orifice Area (sq. inches)	4.68	4.68	4.68					

	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)

Calculated Parameters for Vertical Orif

	Zone 2 Rectangular	Not Selected		Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	2.97	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.68	N/A
Depth at top of Zone using Vertical Orifice =	5.41	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.25	N/A
Vertical Orifice Height =	6.00	N/A	inches		
Vertical Orifice Width =	16.39		inches		

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

Calculated Parameters for Overflow We

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, H <sub>o</sub> =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	5.50	N/A
Overflow Weir Front Edge Length =	6.00	N/A	feet	6.00	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	8.02	N/A
Horiz. Length of Weir Sides =	6.00	N/A	feet	25.20	N/A
Overflow Grate Open Area % =	70%	N/A	%	12.60	N/A
Debris Clogging % =	50%	N/A	%		

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	3.14	N/A
Outlet Pipe Diameter =	24.00	N/A	inches	1.00	N/A
Restrictor Plate Height Above Pipe Invert =	24.00		inches	3.14	N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	10.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.87	feet
Spillway Crest Length =	30.00	feet	Stage at Top of Freeboard =	13.00	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.72	acres
Freeboard above Max Water Surface =	1.13	feet	Basin Volume at Top of Freeboard =	12.89	acre-ft

micropool = 0 = 5765

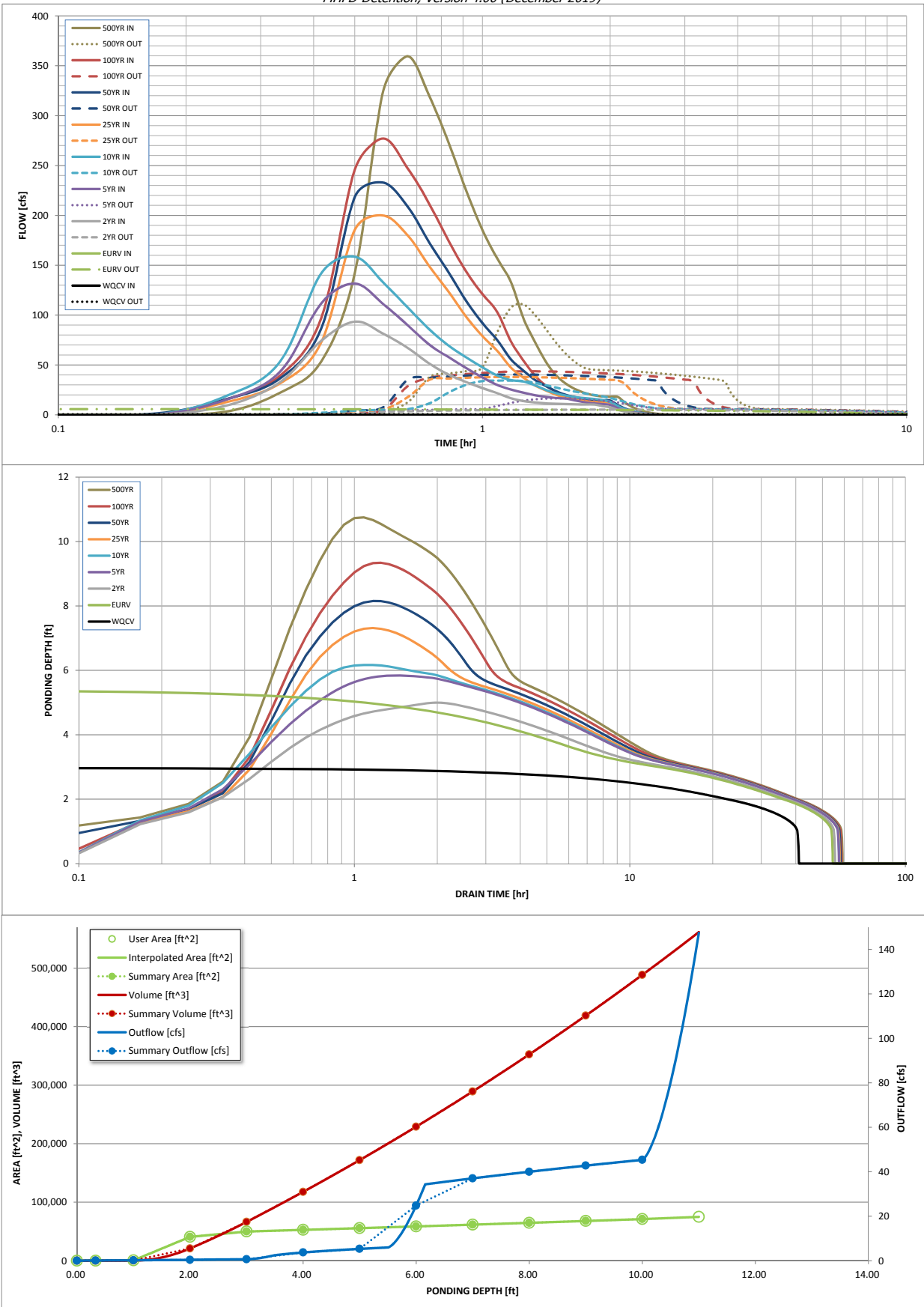
## Routed Hydrograph Results

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) =	1.488	4.468	4.607	6.475	8.109	10.045	11.748	13.830
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.607	6.475	8.109	10.045	11.748	13.830
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	17.5	39.6	56.8	90.6	111.9	138.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.22	0.49	0.70	1.12	1.38	1.71
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	93.5	131.6	158.6	200.0	232.9	277.2
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	5.3	16.5	34.4	38.0	40.5	43.7
Peak Inflow Q (cfs) =	0.6	5.8	N/A	0.4	0.6	0.4	0.4	0.3
Peak Outflow Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ratio Peak Outflow to Predevelopment Q =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Structure Controlling Flow =	N/A	N/A	N/A	0.4	1.1	1.2	1.3	1.4
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	39	48	49	49	47	45	44	42
Time to Drain 97% of Inflow Volume (hours) =	40	52	53	54	53	53	53	52
Maximum Ponding Depth (ft) =	2.97	5.41	5.00	5.84	6.17	7.31	8.15	9.34
Area at Maximum Ponding Depth (acres) =	1.14	1.31	1.28	1.34	1.36	1.44	1.50	1.59
Maximum Volume Stored (acre-ft) =	1.488	4.477	3.934	5.031	5.476	7.083	8.317	10.152

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



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

Outflow Hydrograph Workbook Filename: .|Outflow Hydrographs-pond C4.xlsx

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

[illegible]

## DETENTION BASIN OUTLET STRUCTURE DESIGN

*MHFD-Detention, Version 4.02 (February 2020)*

### Summary Stage-Area-Volume-Discharge Relationships

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

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

[illegible]

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

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

# Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

**Designer:** Richard Schindler  
**Company:** Core Engineering Group  
**Date:** May 4, 2020  
**Project:** The Hills at Lorson Ranch  
**Location:** Pond C4

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$
- B) Tributary Area's Imperviousness Ratio ( $i = I_a / 100$ )
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept  
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time  
( $V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$ )
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume  
( $V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$ )
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)
- 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
- J) Excess Urban Runoff Volume (EURV) Design Volume  
 For HSG A:  $EURV_A = 1.68 * i^{1.28}$   
 For HSG B:  $EURV_B = 1.36 * i^{1.08}$   
 For HSG C/D:  $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume  
(Only if a different EURV Design Volume is desired)

$I_a = 55.0$  %

$i = 0.550$

Area = 81.000 ac

$d_b =$  in

Choose One

- ☒ Water Quality Capture Volume (WQCV)  
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} = 1.488$  ac-ft

$V_{DESIGN\ OTHER} =$  ac-ft

$V_{DESIGN\ USER} =$  ac-ft

HSG A = %

HSG B = %

HSG C/D = %

$EURV_{DESIGN} =$  ac-ft

$EURV_{DESIGN\ USER} =$  ac-ft

## 2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

## 3. Basin Side Slopes

- A) Basin Maximum Side Slopes  
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

## 4. Inlet

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

## 5. Forebay

- A) Minimum Forebay Volume  
( $V_{MIN} = 3\%$  of the WQCV)

$V_{MIN} = 0.045$  ac-ft

- B) Actual Forebay Volume

$V_F = 0.050$  ac-ft

- C) Forebay Depth  
( $D_F = 30$  inch maximum)

$D_F = 24.0$  in

- D) Forebay Discharge

- i) Undetained 100-year Peak Discharge

$Q_{100} = 277.00$  cfs

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

$Q_F = 5.54$  cfs

- E) Forebay Discharge Design

Choose One

- ☐ Berm With Pipe  
☒ Wall with Rect. Notch  
☐ Wall with V-Notch Weir

- F) Discharge Pipe Size (minimum 8-inches)

Calculated  $D_P =$  in

- G) Rectangular Notch Width

Calculated  $W_N = 11.9$  in

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: May 4, 2020  
 Project: The Hills at Lorson Ranch  
 Location: Pond C4

## 6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

☒ Concrete

☐ Soft Bottom

S = 0.0050 ft / ft

## 7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing  
(Use UD-Detention)

E) Total Outlet Area

D<sub>M</sub> = 2.5 ft

A<sub>M</sub> = 50 sq ft

Choose One

☒ Orifice Plate

☐ Other (Describe):

D<sub>orifice</sub> = 2.16 inches

A<sub>orifice</sub> = 14.04 square inches

## 8. Initial Surge Volume

A) Depth of Initial Surge Volume  
(Minimum recommended depth is 4 inches)

B) Minimum Initial Surge Volume  
(Minimum volume of 0.3% of the WQCV)

C) Initial Surge Provided Above Micropool

D<sub>IS</sub> = 4 in

V<sub>IS</sub> = 194 cu ft

V<sub>s</sub> = 16.7 cu ft

## 9. Trash Rack

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

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.)

Other (Y/N): y

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV)  
(Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H<sub>TR</sub>)

G) Width of Water Quality Screen Opening (W<sub>opening</sub>)  
(Minimum of 12 inches is recommended)

A<sub>t</sub> = 440 square inches

Other (Please describe below)

wellscreen stainless

User Ratio = 0.6

A<sub>total</sub> = 734 sq. in. Based on type 'Other' screen ratio

H = 2.97 feet

H<sub>TR</sub> = 63.64 inches

W<sub>opening</sub> = 12.0 inches VALUE LESS THAN RECOMMENDED MIN. WIDTH.  
WIDTH HAS BEEN SET TO 12 INCHES.

# Channel Report

## pond C4 low flow channel (2 x forebay release = 11.08cfs)

### Rectangular

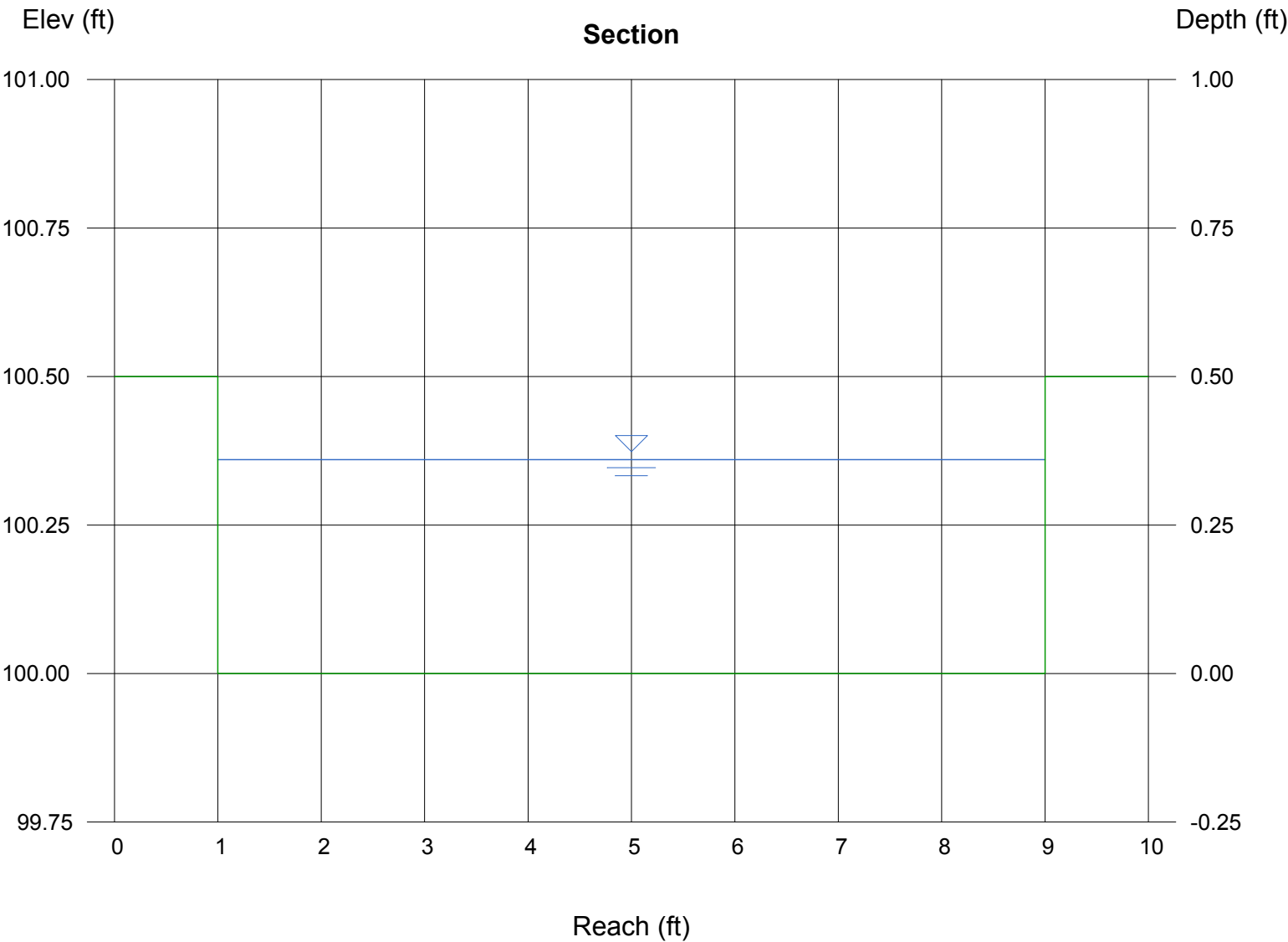
Botom Width (ft) = 8.00  
Total Depth (ft) = 0.50  
  
Invert Elev (ft) = 100.00  
Slope (%) = 0.50  
N-Value = 0.013

### Calculations

Compute by: Known Q  
Known Q (cfs) = 11.08

### Highlighted

Depth (ft) = 0.36  
Q (cfs) = 11.08  
Area (sqft) = 2.88  
Velocity (ft/s) = 3.85  
Wetted Perim (ft) = 8.72  
Crit Depth, Yc (ft) = 0.40  
Top Width (ft) = 8.00  
EGL (ft) = 0.59





# Weir Report

## Pond C4 forebay overflow

### Rectangular Weir

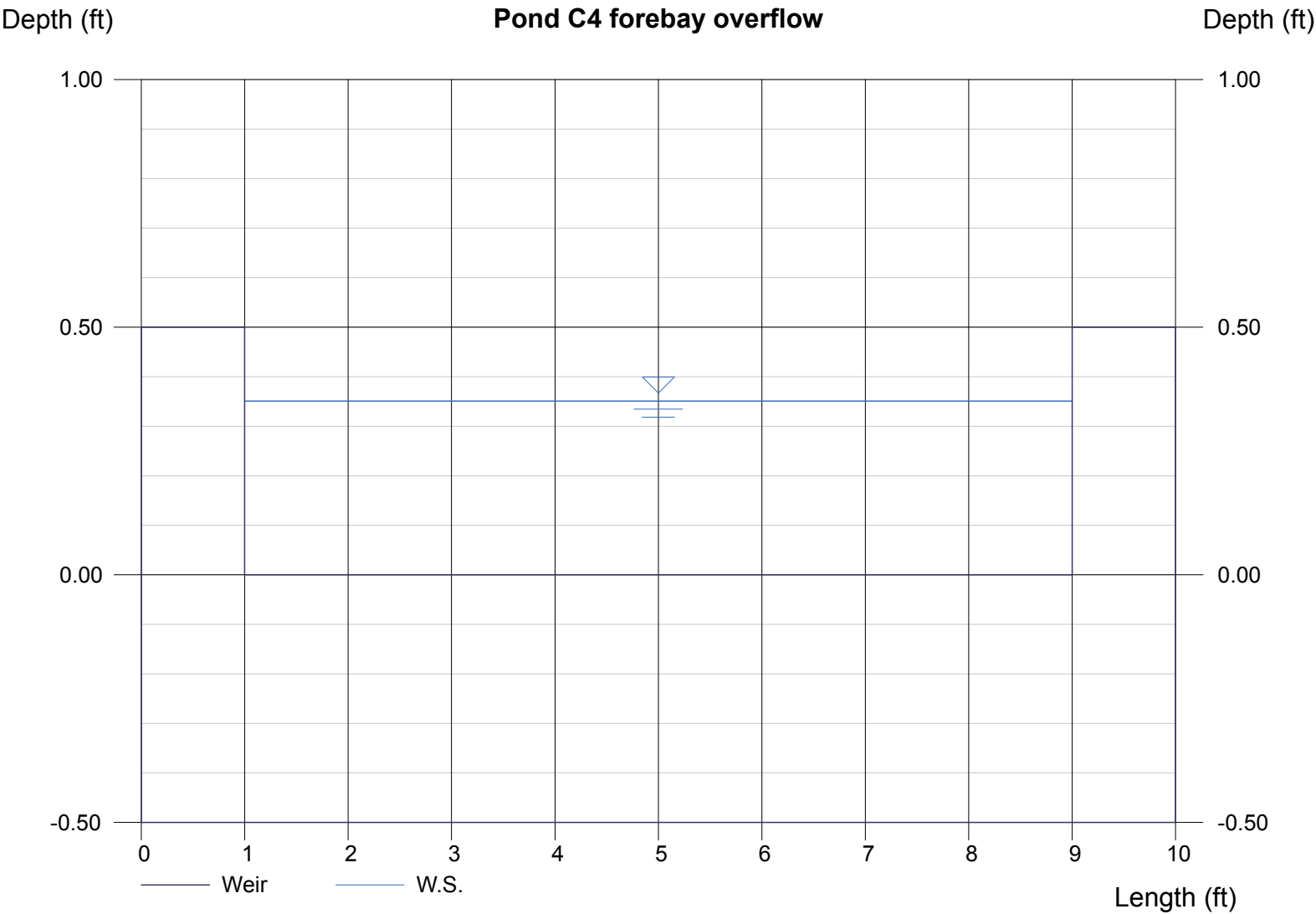
Crest = Sharp  
Bottom Length (ft) = 8.00  
Total Depth (ft) = 0.50

### Calculations

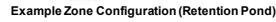
Weir Coeff. Cw = 3.33  
Compute by: Known Q  
Known Q (cfs) = 5.54

### Highlighted

Depth (ft) = 0.35  
Q (cfs) = 5.540  
Area (sqft) = 2.81  
Velocity (ft/s) = 1.97  
Top Width (ft) = 8.00



## MHFD-Detention, Version 4.02 (February 2020)

Basin ID: Pond F

Depth Increment =	0.20	ft
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### Optional User Overrides

### Watershed Information

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

	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Initial Surcharge Area ( $A_{SIV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{FLOOR}$ )	=	user	ft
Length of Basin Floor ( $L_{FLOOR}$ )	=	user	ft
Width of Basin Floor ( $W_{FLOOR}$ )	=	user	ft
Area of Basin Floor ( $A_{FLOOR}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{FLOOR}$ )	=	user	ft <sup>3</sup>
Depth of Main Basin ( $H_{MAIN}$ )	=	user	ft
Length of Main Basin ( $L_{MAIN}$ )	=	user	ft
Width of Main Basin ( $W_{MAIN}$ )	=	user	ft
Area of Main Basin ( $A_{MAIN}$ )	=	user	ft <sup>2</sup>
Volume of Main Basin ( $V_{MAIN}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{TOTAL}$ )	=	user	acre-feet

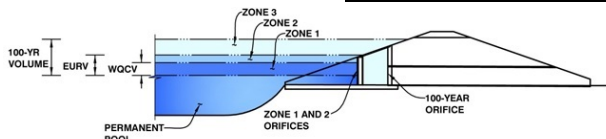
Calculated Total Basin Volume ( $V_{total}$ ) =	<b>user</b>	acre-feet
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# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Ridge at Lorson Ranch**

Basin ID: **Pond F**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.06	0.090	Orifice Plate
Zone 2			
Zone 3			
Total (all zones)		0.090	

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

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

Calculated Parameters for Underdrain

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

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

Invert of Lowest Orifice =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  2.06 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  9.00 inches  
Orifice Plate: Orifice Area per Row =  0.50 sq. inches (diameter = 13/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =  3.472E-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)	0.50	0.50	0.50					

	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)

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

Calculated Parameters for Vertical Orif

Vertical Orifice Area =  Not Selected  Not Selected  
Vertical Orifice Centroid =  Not Selected  Not Selected

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

Overflow Weir Front Edge Height, H<sub>o</sub> =  Not Selected  Not Selected ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length =  feet  
Overflow Weir Gate Slope =  H:V  
Horiz. Length of Weir Sides =  feet  
Overflow Gate Open Area % =  %  
Debris Clogging % =  %

Calculated Parameters for Overflow We

Height of Gate Upper Edge, H<sub>u</sub> =  Not Selected  Not Selected  
Overflow Weir Slope Length =   
Gate Open Area / 100-yr Orifice Area =   
Overflow Gate Open Area w/o Debris =   
Overflow Gate Open Area w/ Debris =

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

Depth to Invert of Outlet Pipe =  Not Selected  Not Selected ft (distance below basin bottom at Stage = 0 ft)  
Circular Orifice Diameter =  inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area =  Not Selected  Not Selected  
Outlet Orifice Centroid =   
Half-Central Angle of Restrictor Plate on Pipe =  N/A  N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

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

top micropool = 5843.17= 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	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft)	0.090	0.290	0.270	0.379	0.474	0.597	0.699	0.827
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.270	0.379	0.474	0.597	0.699	0.827
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.3	1.0	1.5	2.8	3.5	4.5
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.07	0.20	0.31	0.57	0.72	0.92
Peak Inflow Q (cfs)	N/A	N/A	3.2	4.5	5.5	7.4	8.6	10.2
Peak Outflow Q (cfs)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.1	0.0	0.0	0.0	0.0
Structure Controlling Flow	Plate	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	67	65	81	95	113	>120	>120
Time to Drain 99% of Inflow Volume (hours)	40	73	71	88	103	>120	>120	>120
Maximum Ponding Depth (ft)	2.06	2.84	2.84	2.84	2.84	2.84	2.84	2.84
Area at Maximum Ponding Depth (acres)	0.09	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Maximum Volume Stored (acre-ft)	0.090	0.179	0.179	0.179	0.179	0.179	0.179	0.179

This should go from Plate --> Overflow Gate ---> Spillway. Revise.

should be less than 72hrs.

should be less than 120hrs.

# Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: July 17, 2021  
 Project: The ridge at Lorson Ranch  
 Location: Pond F

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$
- B) Tributary Area's Imperviousness Ratio ( $i = I_a / 100$ )
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept  
(Select EURV when also designing for flood control)
- F) Design Volume (WQCV) Based on 40-hour Drain Time  
( $V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area)$ )
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume  
( $V_{WQCV\ OTHER} = (d_b * (V_{DESIGN} / 0.43))$ )
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)
- 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
- J) Excess Urban Runoff Volume (EURV) Design Volume  
 For HSG A:  $EURV_A = 1.68 * i^{1.28}$   
 For HSG B:  $EURV_B = 1.36 * i^{1.08}$   
 For HSG C/D:  $EURV_{C/D} = 1.20 * i^{1.08}$
- K) User Input of Excess Urban Runoff Volume (EURV) Design Volume  
(Only if a different EURV Design Volume is desired)

$I_a =$  55.0 %

$i =$  0.550

Area = 4.900 ac

$d_b =$       in

Choose One

- ☒ Water Quality Capture Volume (WQCV)  
☐ Excess Urban Runoff Volume (EURV)

$V_{DESIGN} =$       ac-ft

$V_{DESIGN\ OTHER} =$       ac-ft

$V_{DESIGN\ USER} =$  0.120 ac-ft

HSG A =      %

HSG B =      %

HSG C/D =      %

$EURV_{DESIGN} =$       ac-ft

$EURV_{DESIGN\ USER} =$       ac-ft

## 2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 2.0 : 1

## 3. Basin Side Slopes

- A) Basin Maximum Side Slopes  
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

## 4. Inlet

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

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## 5. Forebay

- A) Minimum Forebay Volume  
( $V_{MIN} =$  2% of the WQCV)

$V_{MIN} =$  0.002 ac-ft

- B) Actual Forebay Volume

$V_F =$  0.004 ac-ft

- C) Forebay Depth  
( $D_F =$  18 inch maximum)

$D_F =$  18.0 in

- D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} =$  17.60 cfs

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

$Q_F =$  0.35 cfs

- E) Forebay Discharge Design

Choose One

- ☐ Berm With Pipe  
☒ Wall with Rect. Notch  
☐ Wall with V-Notch Weir

Flow too small for berm w/ pipe

- F) Discharge Pipe Size (minimum 8-inches)

Calculated  $D_P =$       in

- G) Rectangular Notch Width

Calculated  $W_N =$  4.3 in

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 3

Designer: Richard Schindler  
 Company: Core Engineering Group  
 Date: July 17, 2021  
 Project: The ridge at Lorson Ranch  
 Location: Pond F

## 6. Trickle Channel

A) Type of Trickle Channel

F) Slope of Trickle Channel

Choose One

☒ Concrete

☐ Soft Bottom

S = 0.0050 ft / ft

## 7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)

C) Outlet Type

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing  
(Use UD-Detention)

E) Total Outlet Area

D<sub>M</sub> = 2.5 ft

A<sub>M</sub> = 50 sq ft

Choose One

☒ Orifice Plate

☐ Other (Describe):

D<sub>orifice</sub> = 2.01 inches

A<sub>orifice</sub> = 12.60 square inches

## 8. Initial Surge Volume

A) Depth of Initial Surge Volume  
(Minimum recommended depth is 4 inches)

B) Minimum Initial Surge Volume  
(Minimum volume of 0.3% of the WQCV)

C) Initial Surge Provided Above Micropool

D<sub>IS</sub> = 4 in

V<sub>IS</sub> =          cu ft

V<sub>s</sub> = 16.7 cu ft

## 9. Trash Rack

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

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.)

Other (Y/N): y

C) Ratio of Total Open Area to Total Area (only for type 'Other')

D) Total Water Quality Screen Area (based on screen type)

E) Depth of Design Volume (EURV or WQCV)  
(Based on design concept chosen under 1E)

F) Height of Water Quality Screen (H<sub>TR</sub>)

G) Width of Water Quality Screen Opening (W<sub>opening</sub>)  
(Minimum of 12 inches is recommended)

A<sub>t</sub> = 401 square inches

Other (Please describe below)

wellscreen stainless

User Ratio = 0.6

A<sub>total</sub> = 668 sq. in. **Based on type 'Other' screen ratio**

H = 2.14 feet

H<sub>TR</sub> = 53.68 inches

W<sub>opening</sub> = 12.4 inches

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 3

**Designer:** Richard Schindler  
**Company:** Core Engineering Group  
**Date:** July 17, 2021  
**Project:** The ridge at Lorson Ranch  
**Location:** Pond F

## 10. Overflow Embankment

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

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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

Ze =  ft / ft

## 11. Vegetation

Choose One

- ☐ Irrigated  
☐ Not Irrigated

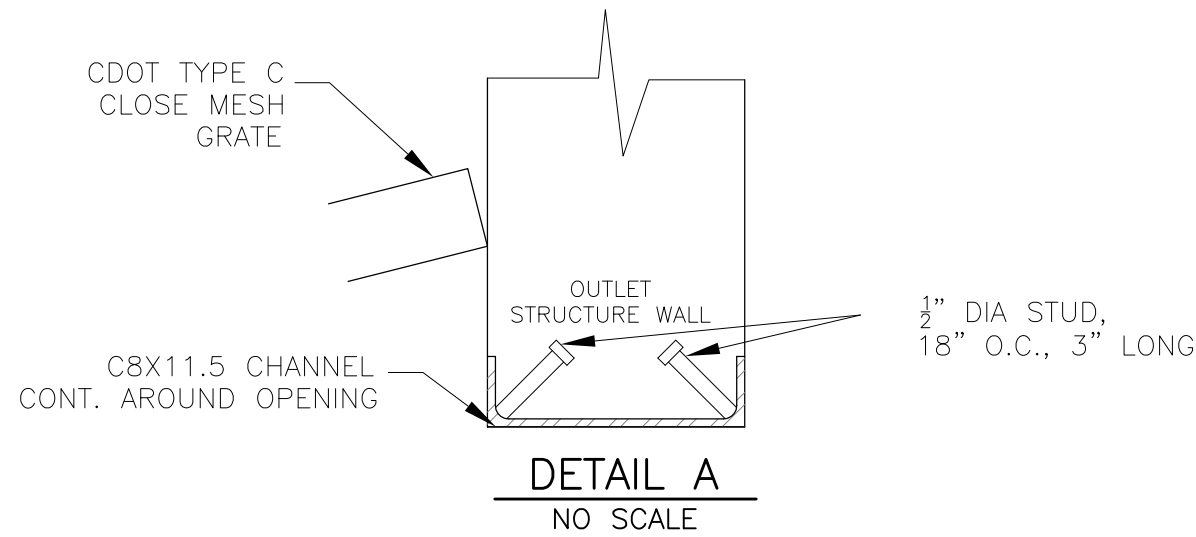
## 12. Access

A) Describe Sediment Removal Procedures

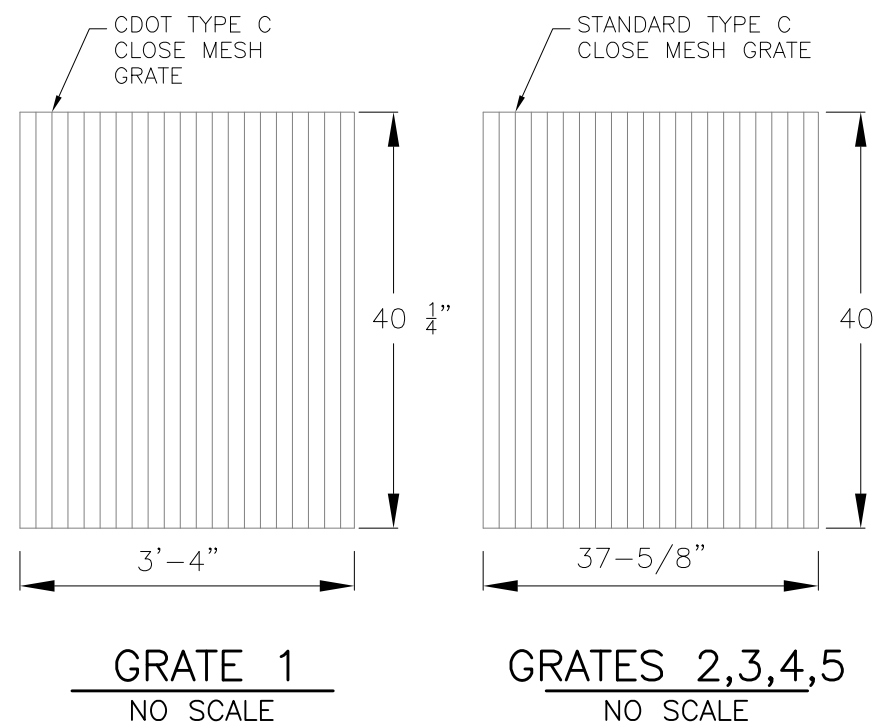
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Notes:

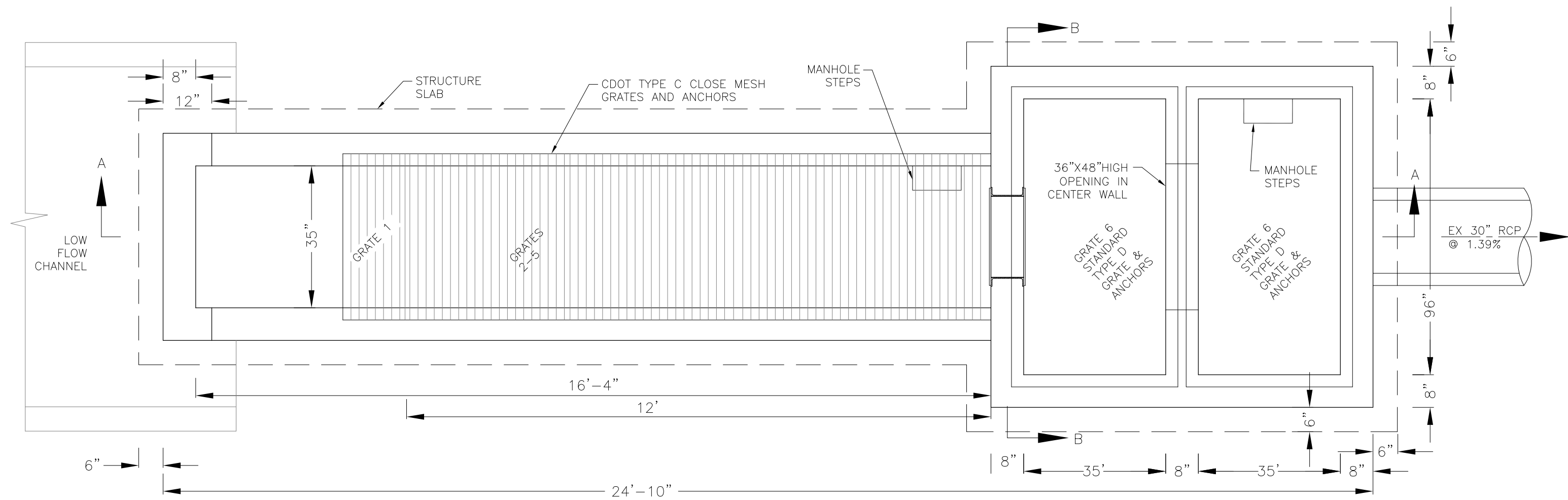
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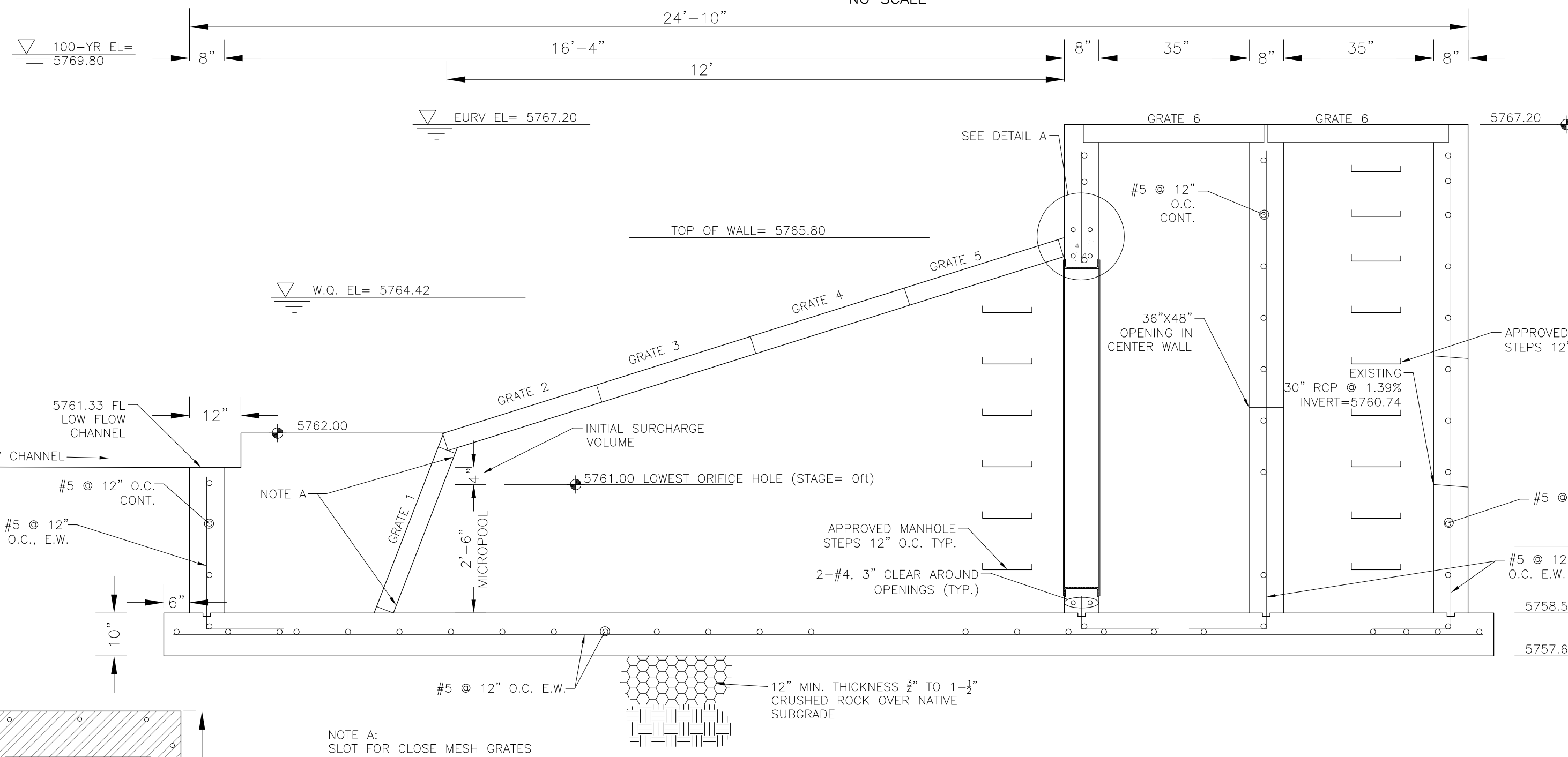
NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION



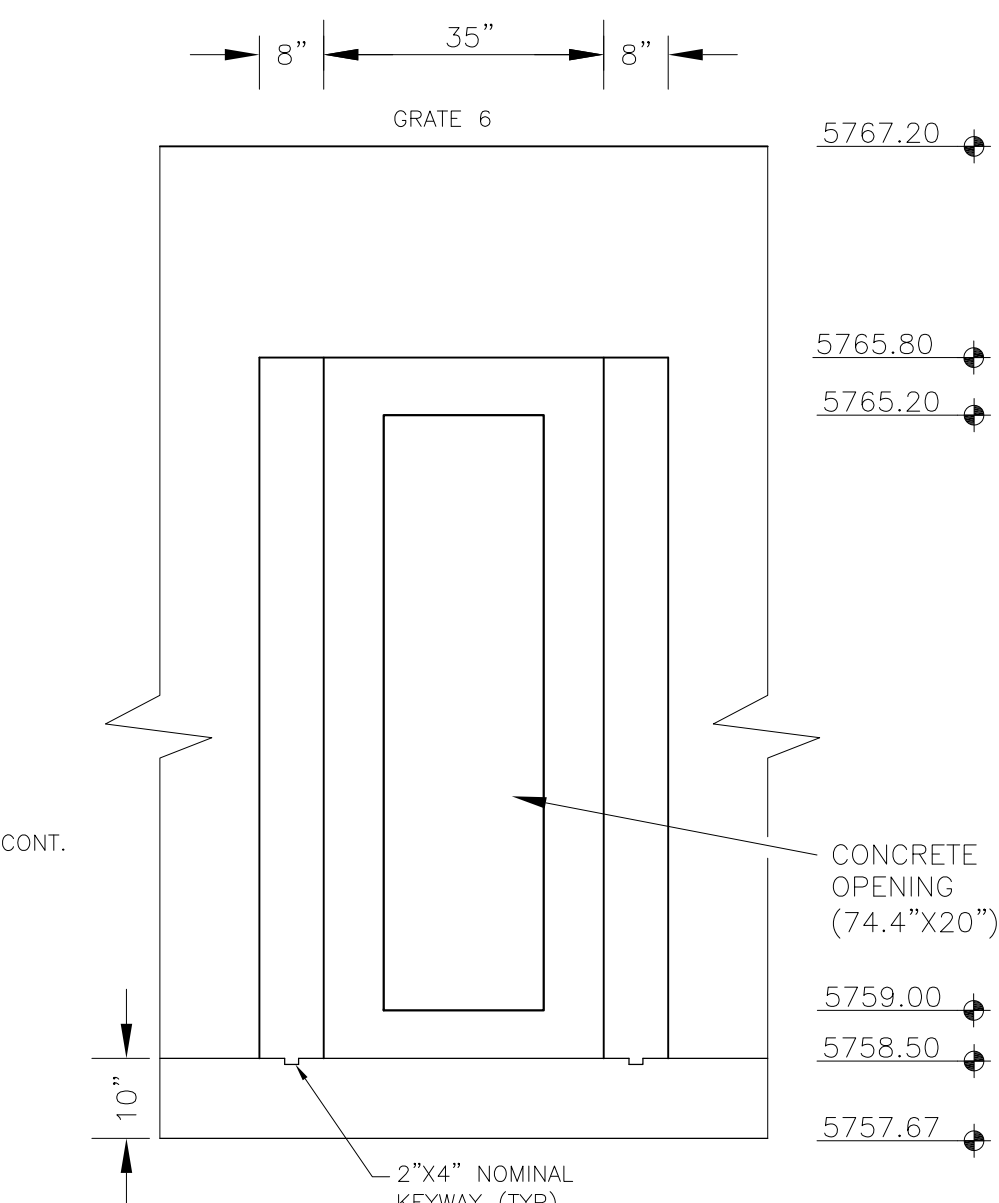
GRATES 2,3,4,5  
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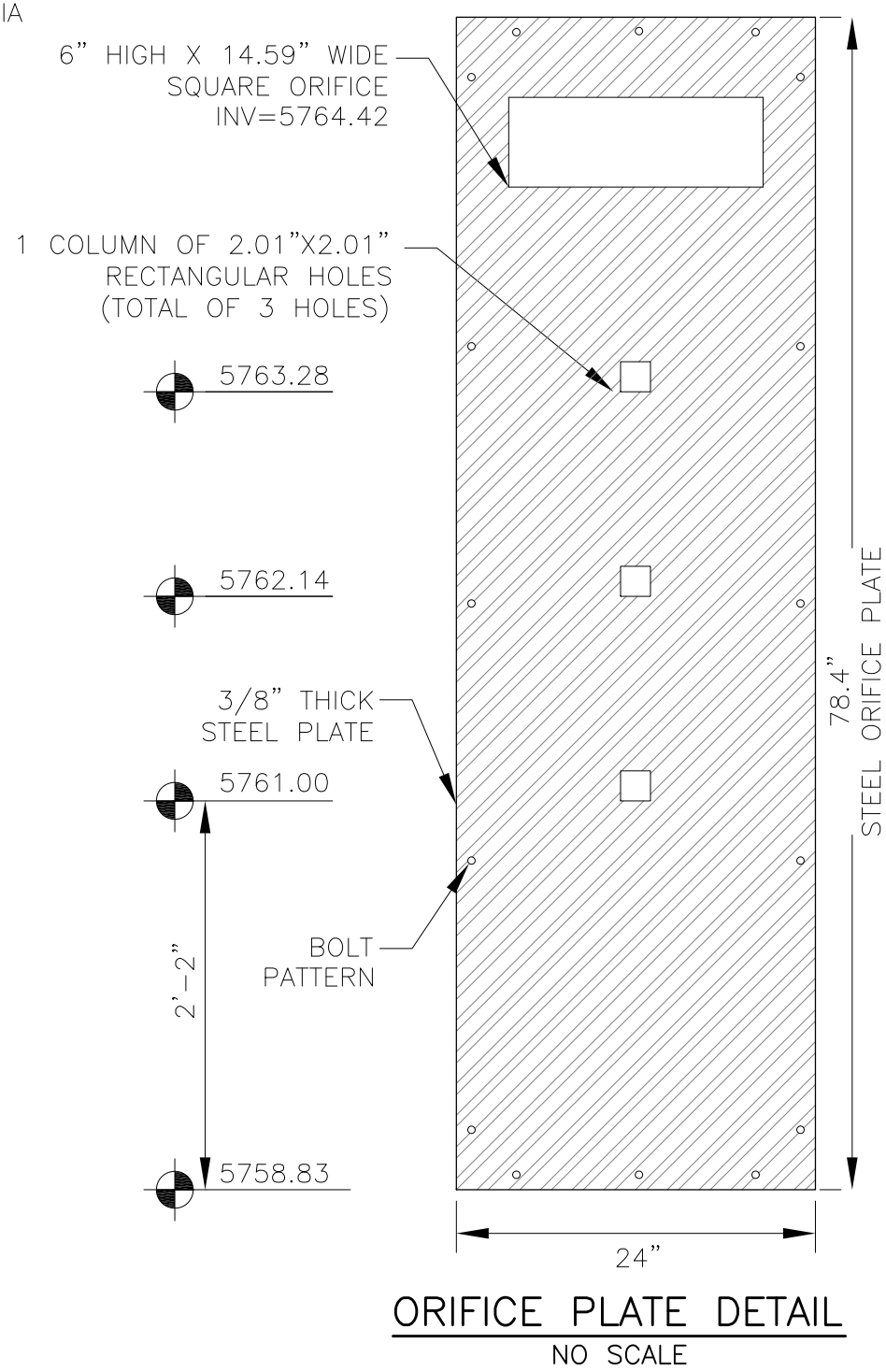
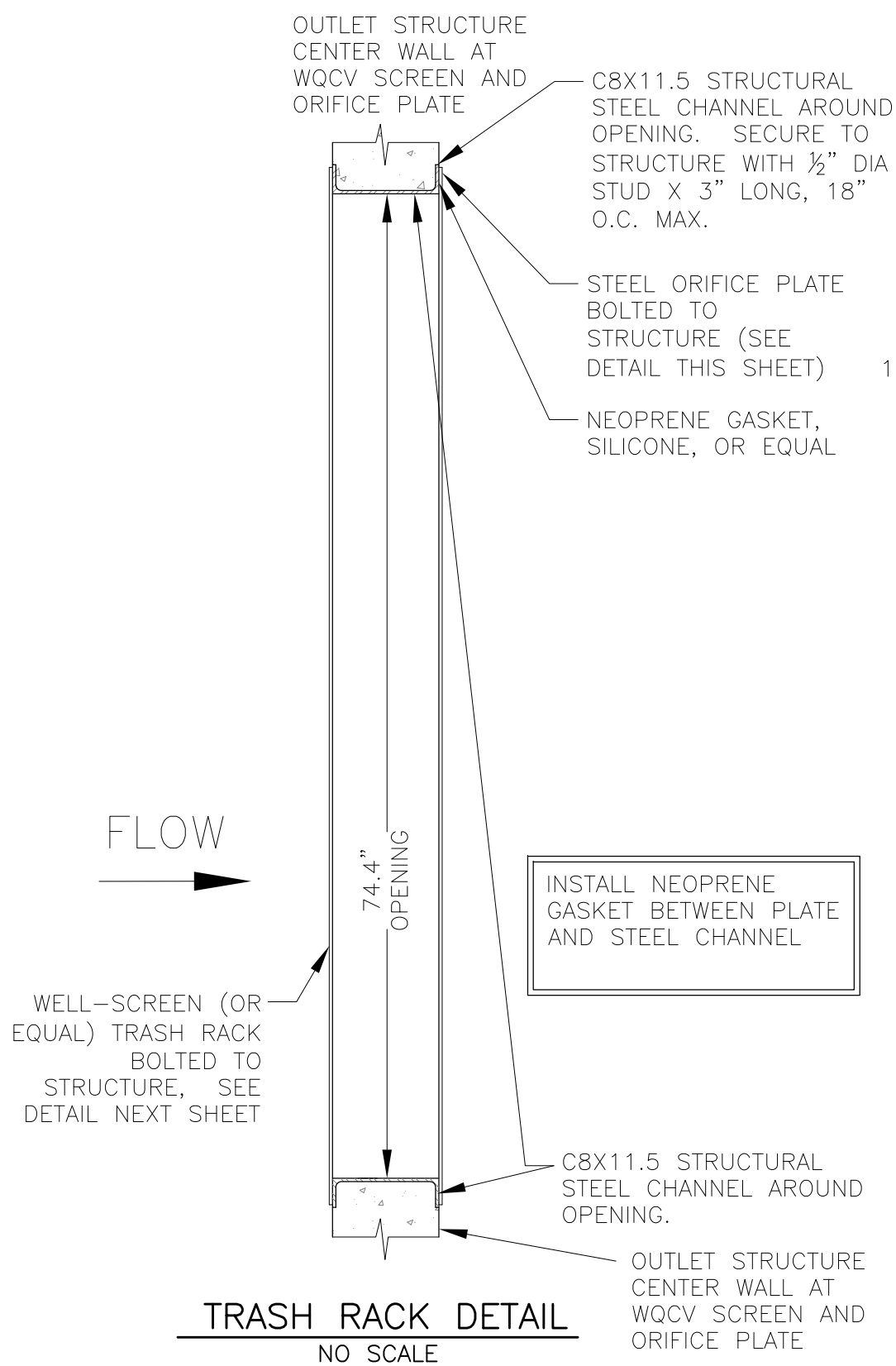
OUTLET STRUCTURE DETAIL - PLAN VIEW  
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OUTLET STRUCTURE DETAIL - SECTION A-A  
NO SCALE



OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE

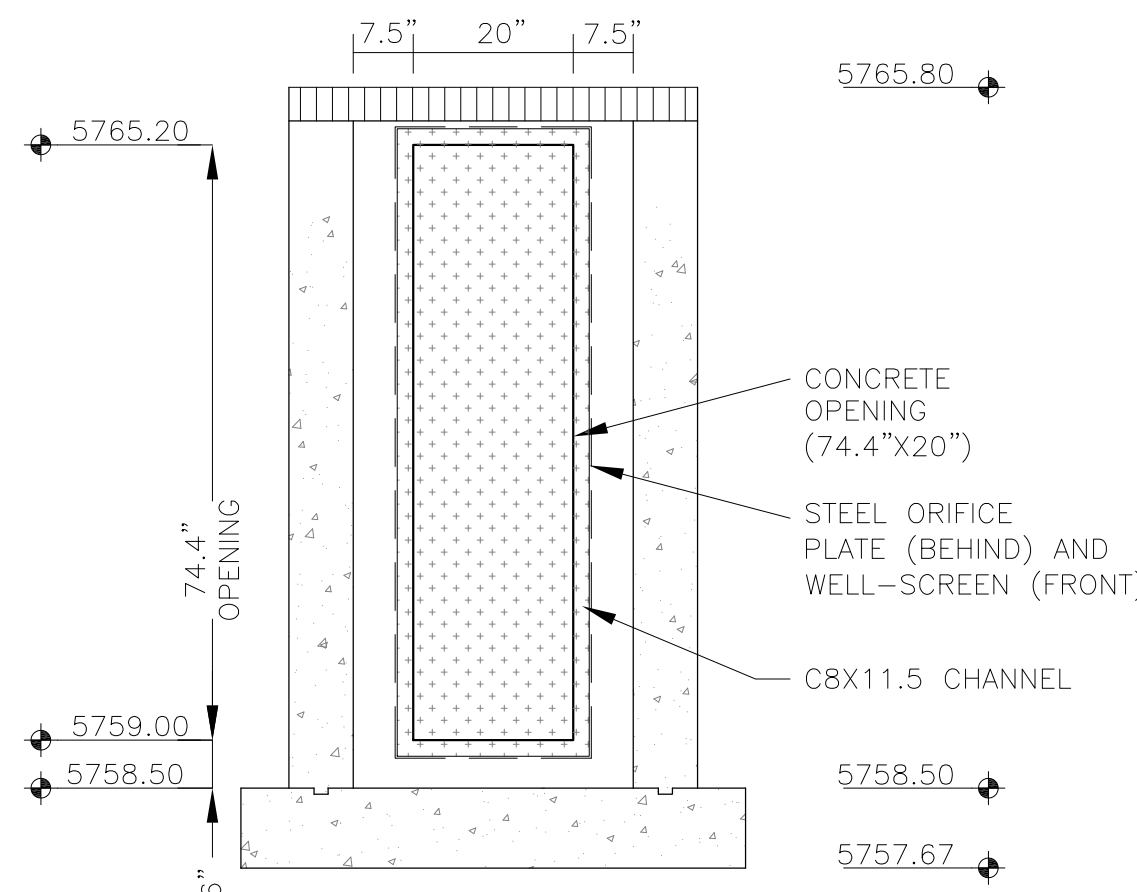


#### OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

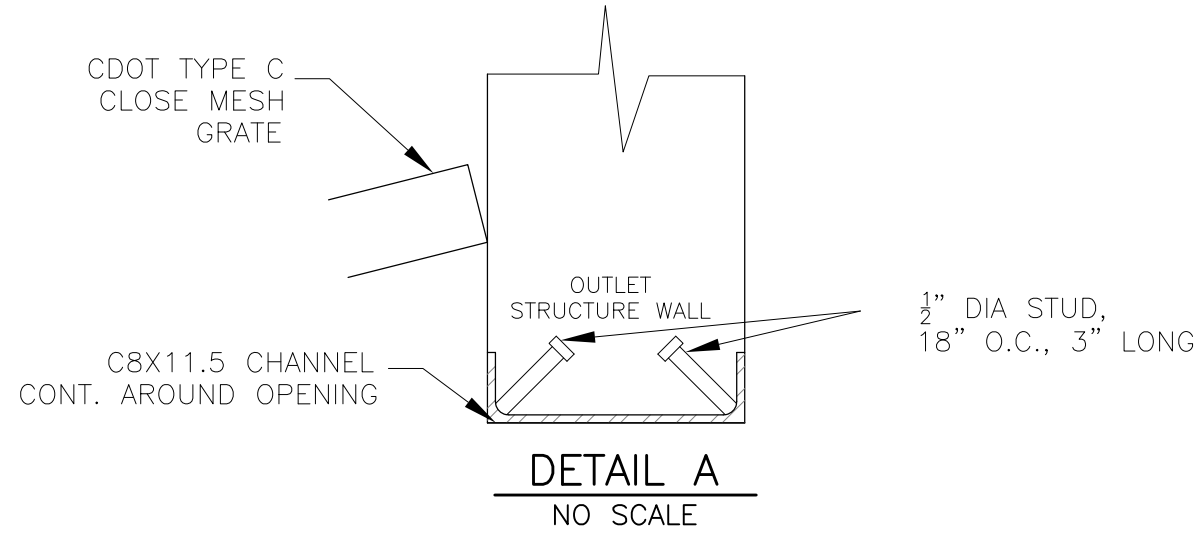
1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
2. GRADE 60 REINFORCING STEEL REQUIRED. SEE TABLE FOR THE MINIMUM LAP SPLICE LENGTH FOR REINFORCING BARS. ALL REINFORCING STEEL SHALL HAVE A TWO-INCH MINIMUM CLEARANCE FROM EDGE OF CONCRETE, UNLESS OTHERWISE NOTED.
3. CONCRETE FOR THE OUTLET STRUCTURE AND FOREBAY SHALL BE CDOT CLASS D CONCRETE.
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A 3/8" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO POND DETAILS FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCTION OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

#### WQCV WELL-SCREEN NOTES:

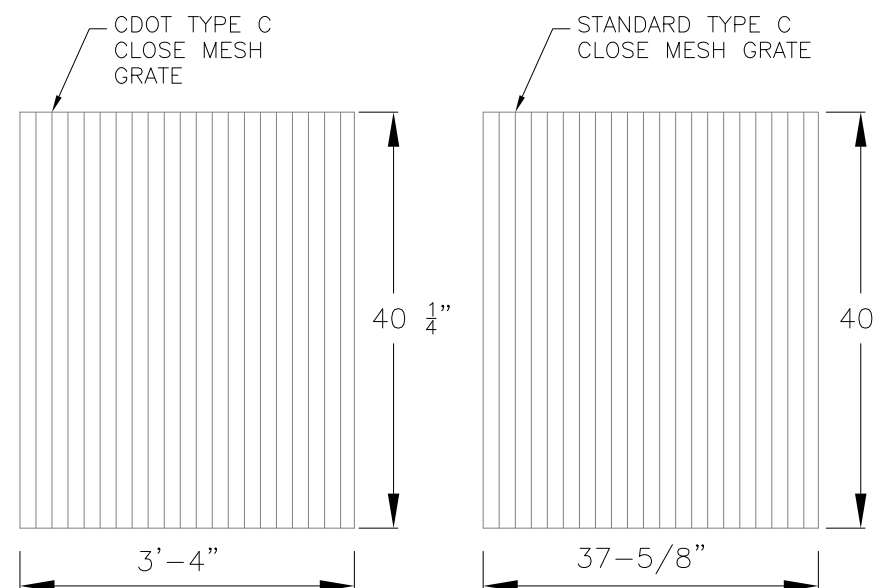
1. Well-Screen shall be stainless steel and attached by stainless steel bolts along edge of the mounting frame.
2. WQCV Well Screen
  - Type of Screen: Stainless steel #93 Vee Wire (Johnson Vee Wire (tm) Stainless Steel Screen or equivalent with 60% open area)
  - Screen slot opening dimension: 0.139" (Screen #93 Vee Wire Slot Opening)
  - Type and Size of Support Rod: TE 0.074"x0.50"
  - Spacing of Support Rod (O.C.): 1.0 Inch
  - Total Screen Thickness: 0.655"
  - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE

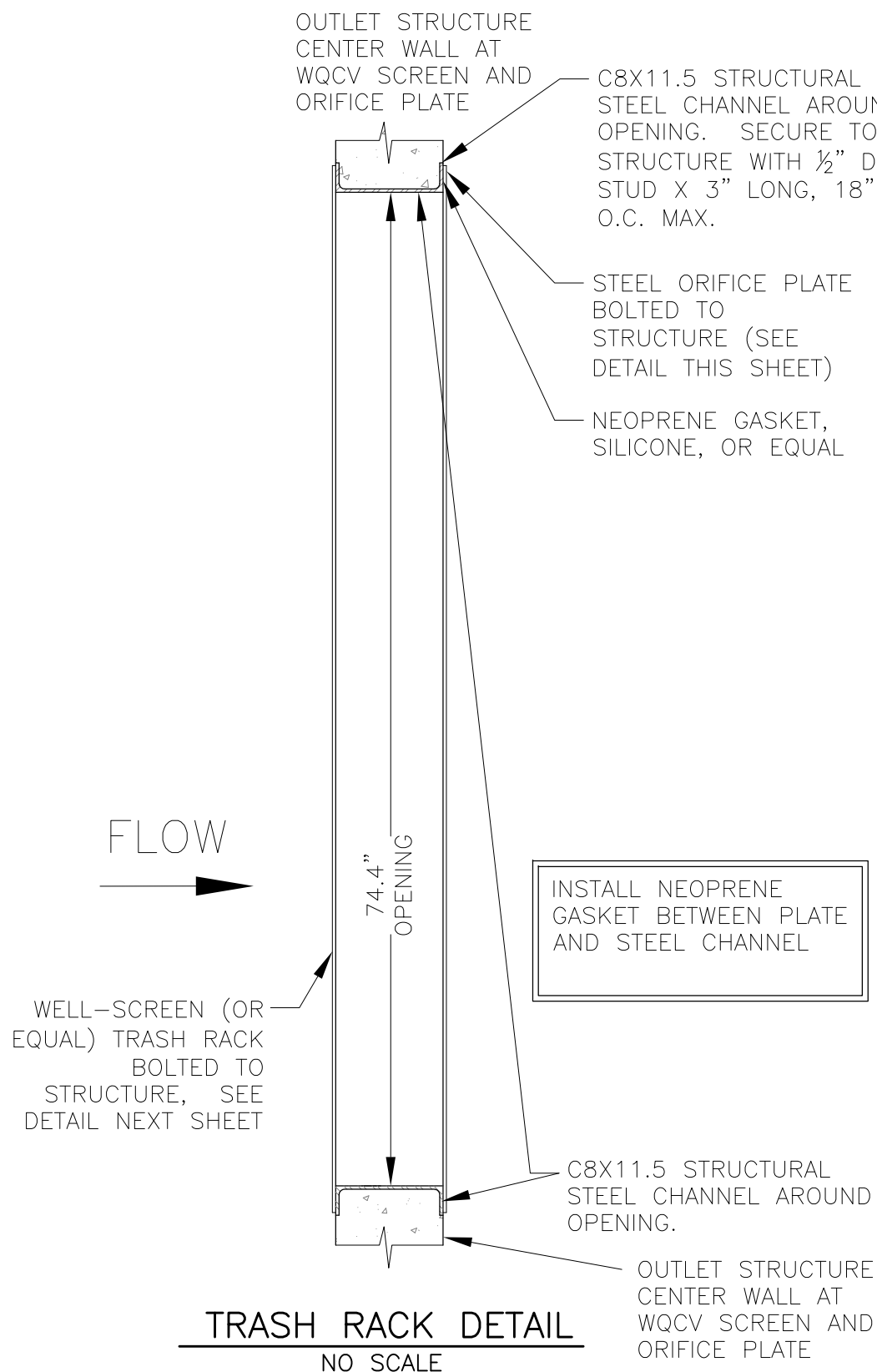


NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION

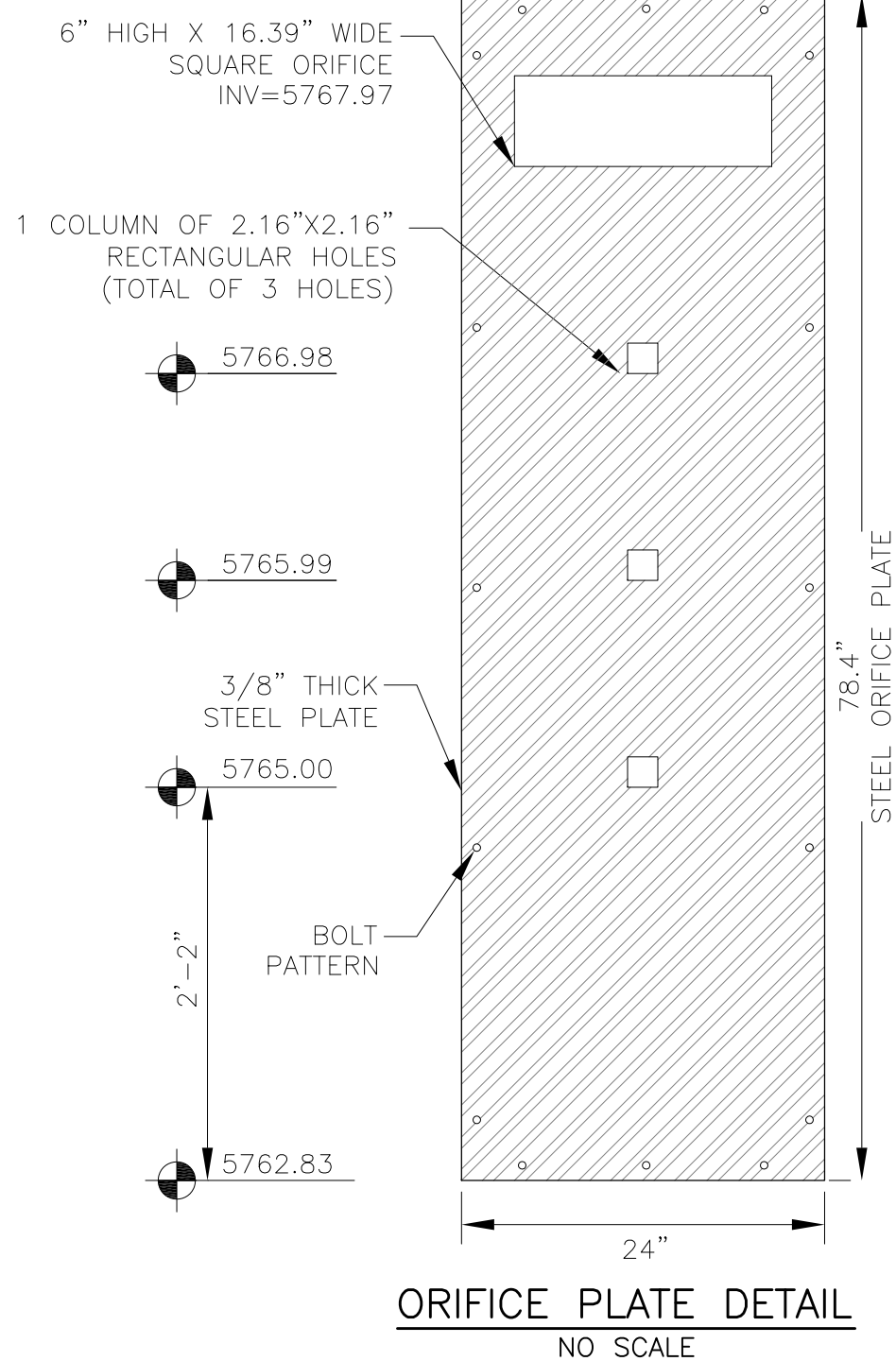


GRATE 1  
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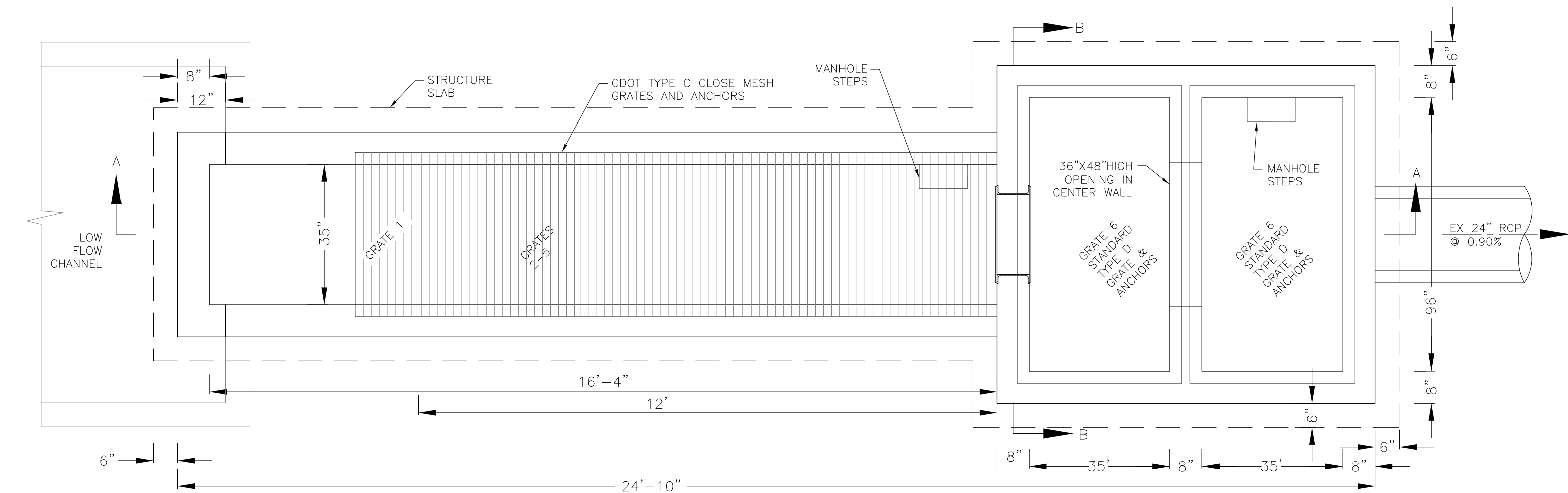
GRATES 2,3,4,5  
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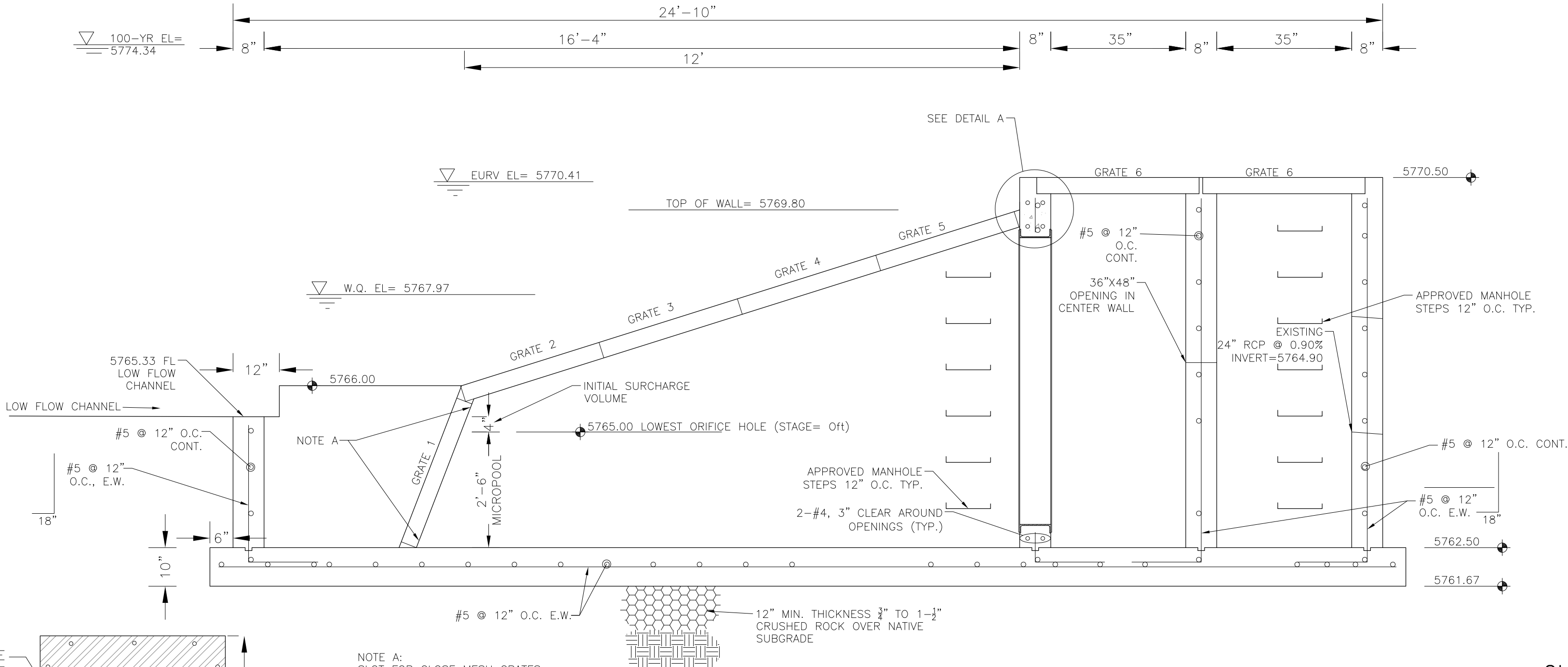
TRASH RACK DETAIL  
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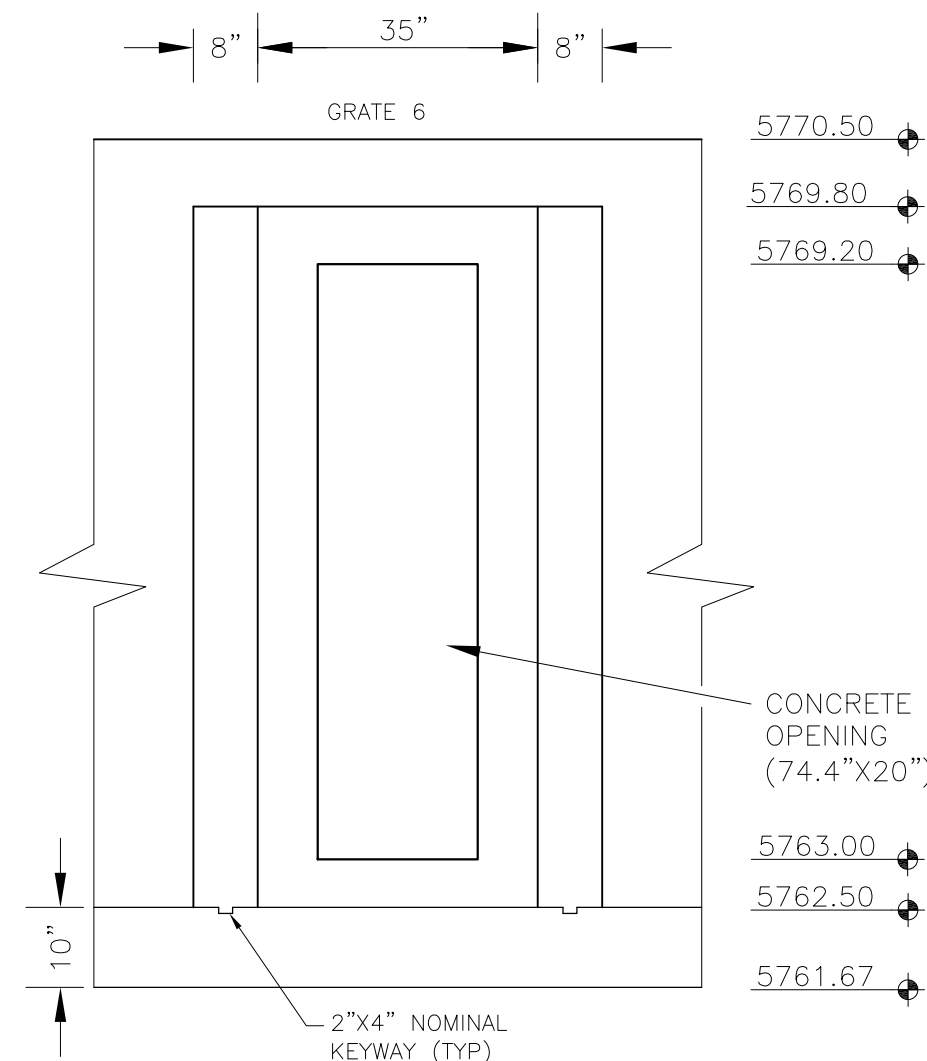
ORIFICE PLATE DETAIL  
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OUTLET STRUCTURE DETAIL - PLAN VIEW  
NO SCALE



OUTLET STRUCTURE DETAIL - SECTION A-A  
NO SCALE



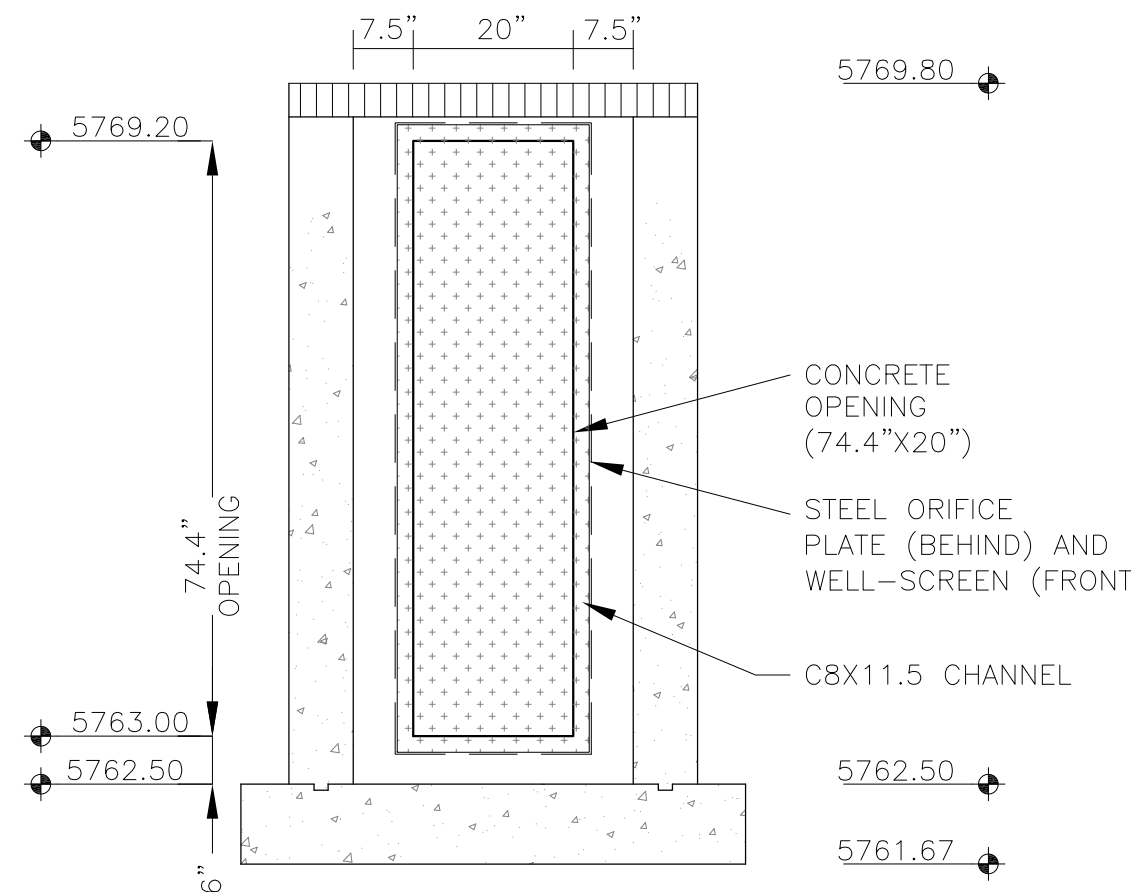
OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE

### 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.
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  - Total Screen Thickness: 0.655"
  - Carbon Steel Holding Frame Type: 3/4" x 1.0" angle



OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE

**CORE**  
**ENGINEERING GROUP**  
15004 1ST AVENUE S.  
DENVER, CO 80202  
PHONE: 303.757.1100  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: Rich@ceg1.com

DATE: \_\_\_\_\_  
DESCRIPTION: \_\_\_\_\_  
NO: \_\_\_\_\_  
PROJECT: THE RIDGE AT LORSON RANCH  
PREPARED FOR: LORSON, LLC  
212 N. WAHSATCH AVE. SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

DRAWN: RLS  
DESIGNED: RLS  
CHECKED: RLS

POND C4  
FULL SPECTRUM  
OUTLET STRUCTURE DETAILS

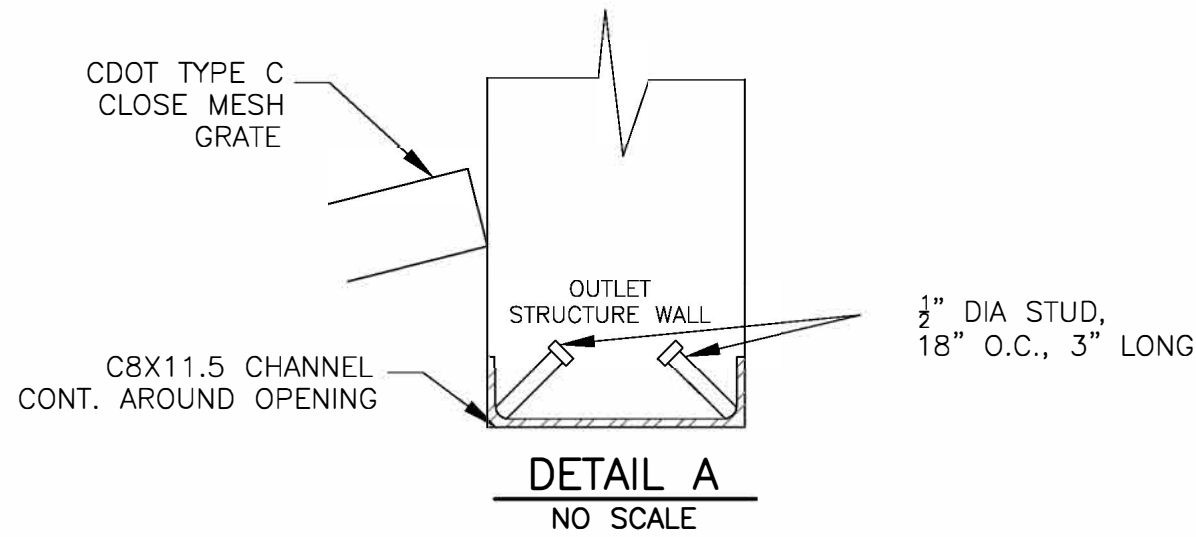
DATE:  
JULY, 2021

PROJECT NO.  
100.064

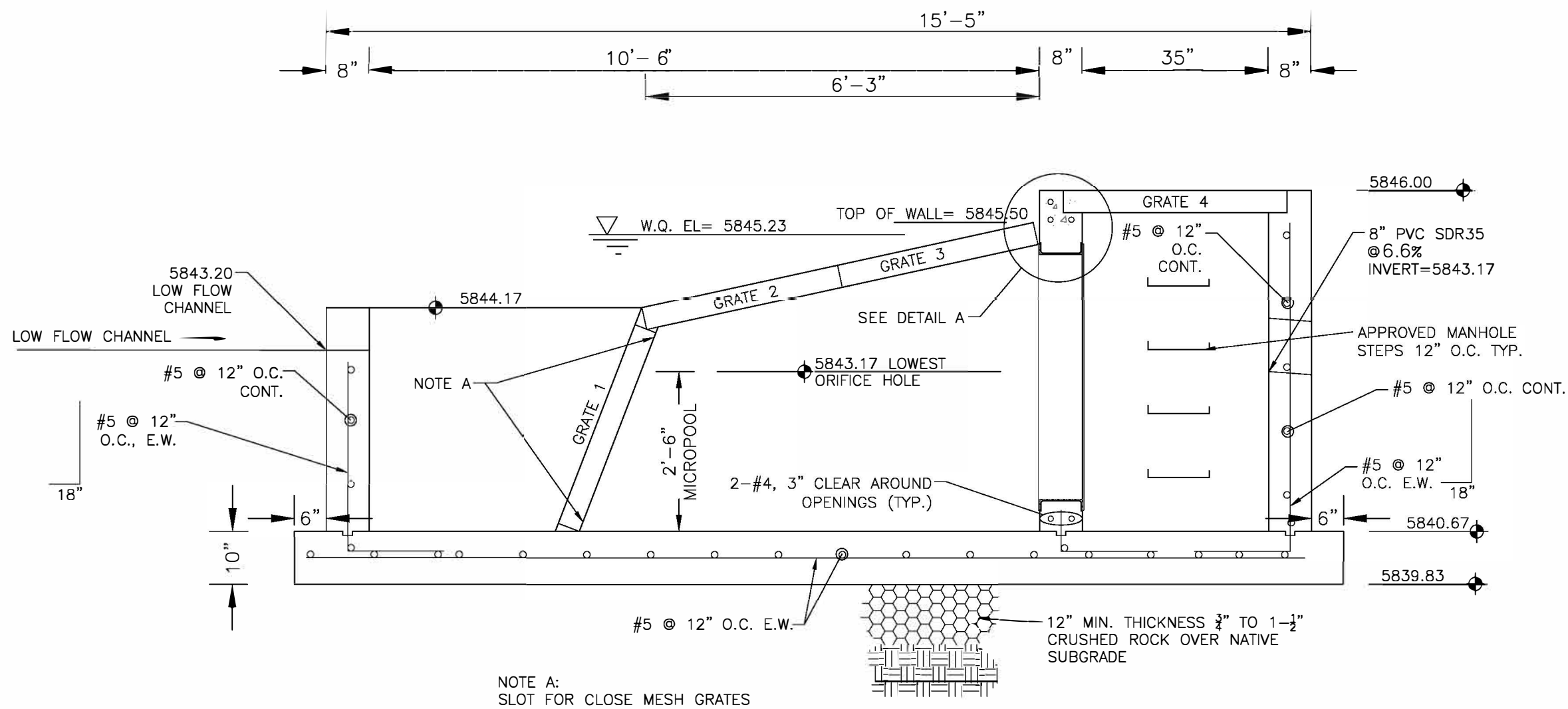
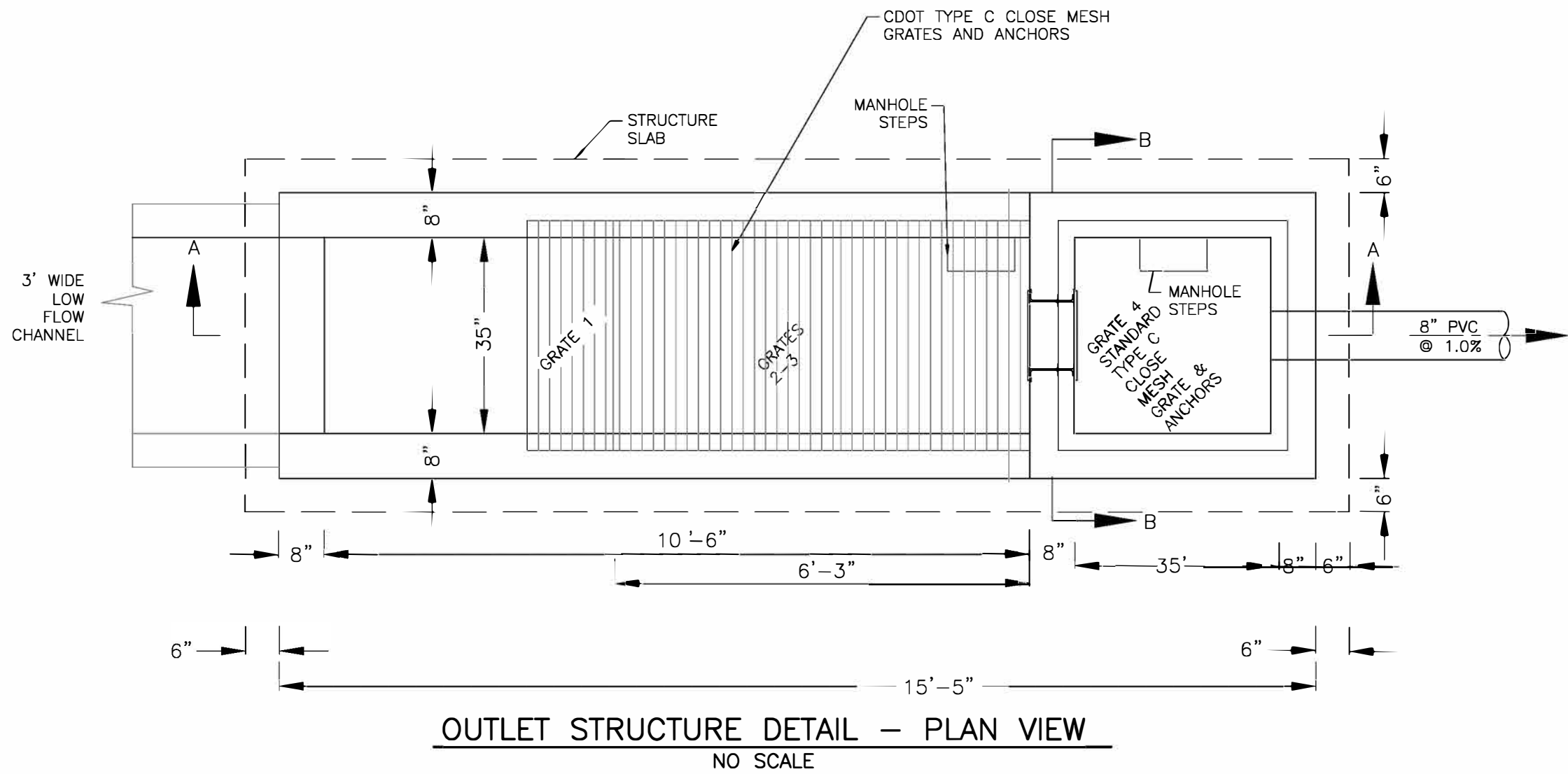
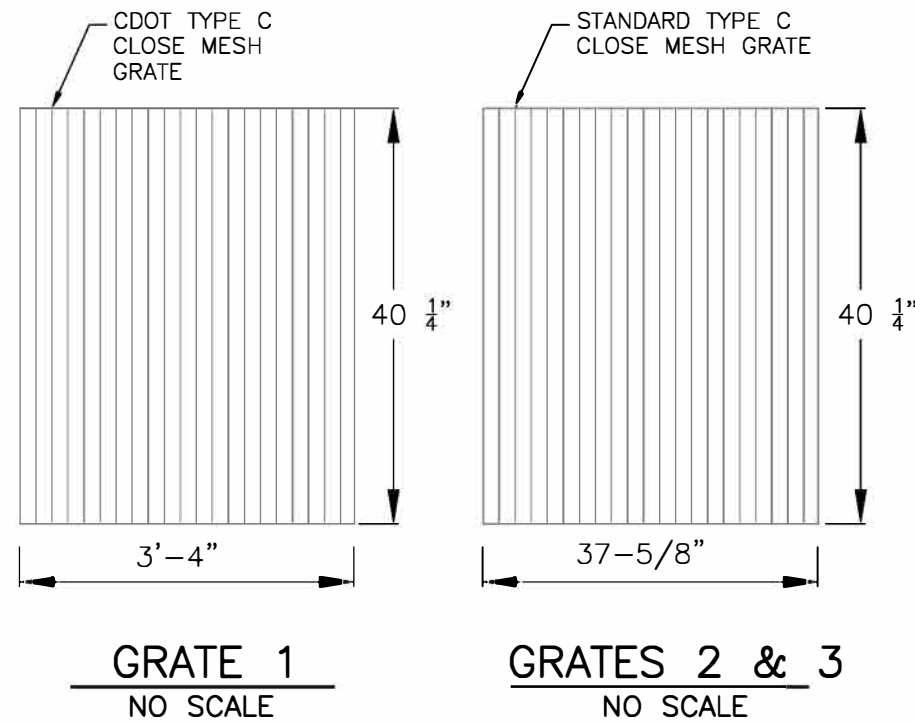
SHEET NUMBER  
C9.4

TOTAL SHEETS: 21



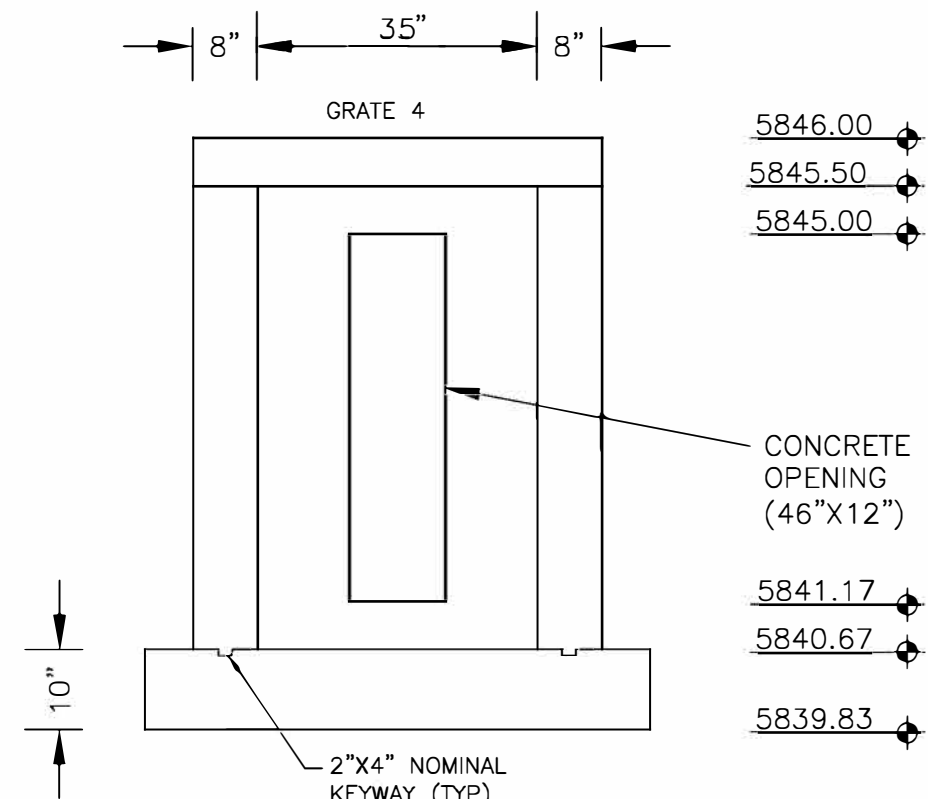


NOTE:  
AFTER CONCRETE STRUCTURE HAS BEEN POURED  
ALL GRATE DIMENSIONS SHALL BE FIELD VERIFIED  
PRIOR TO GRATE CONSTRUCTION

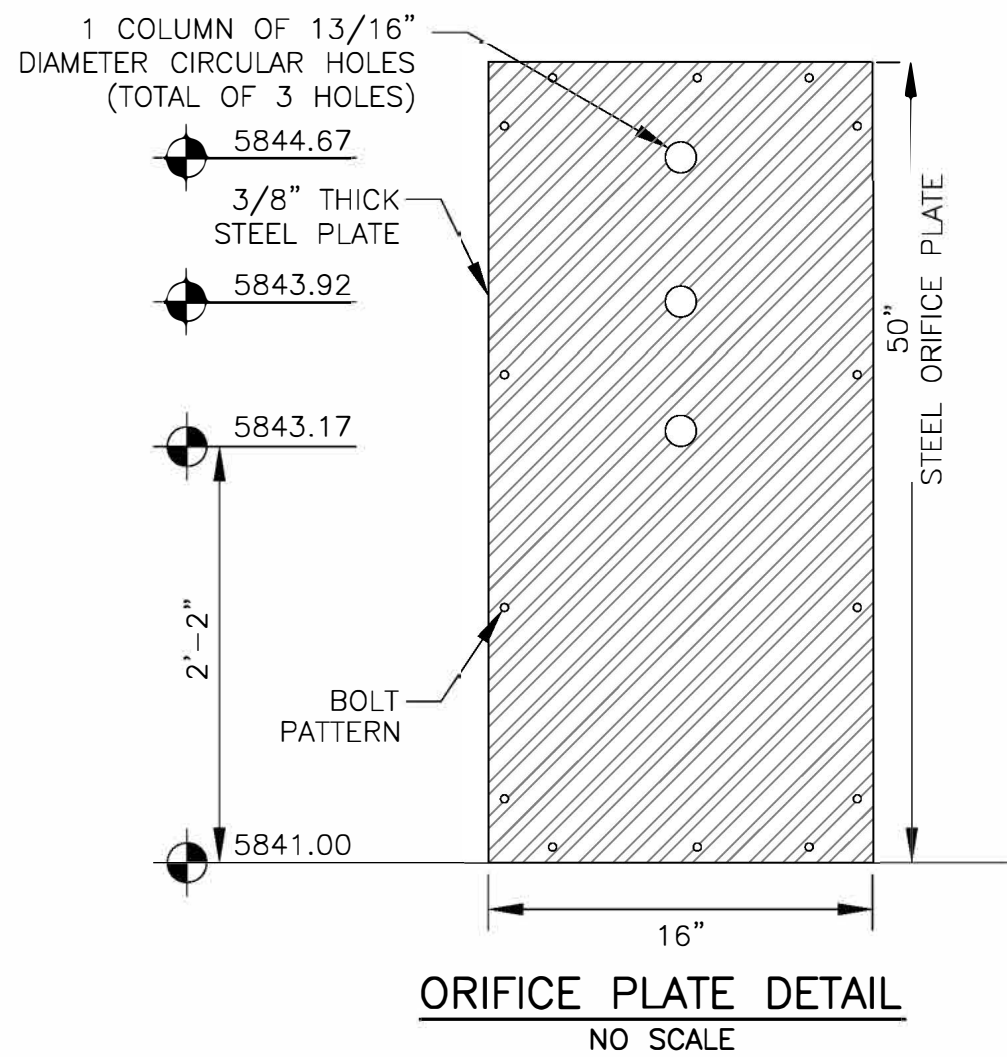
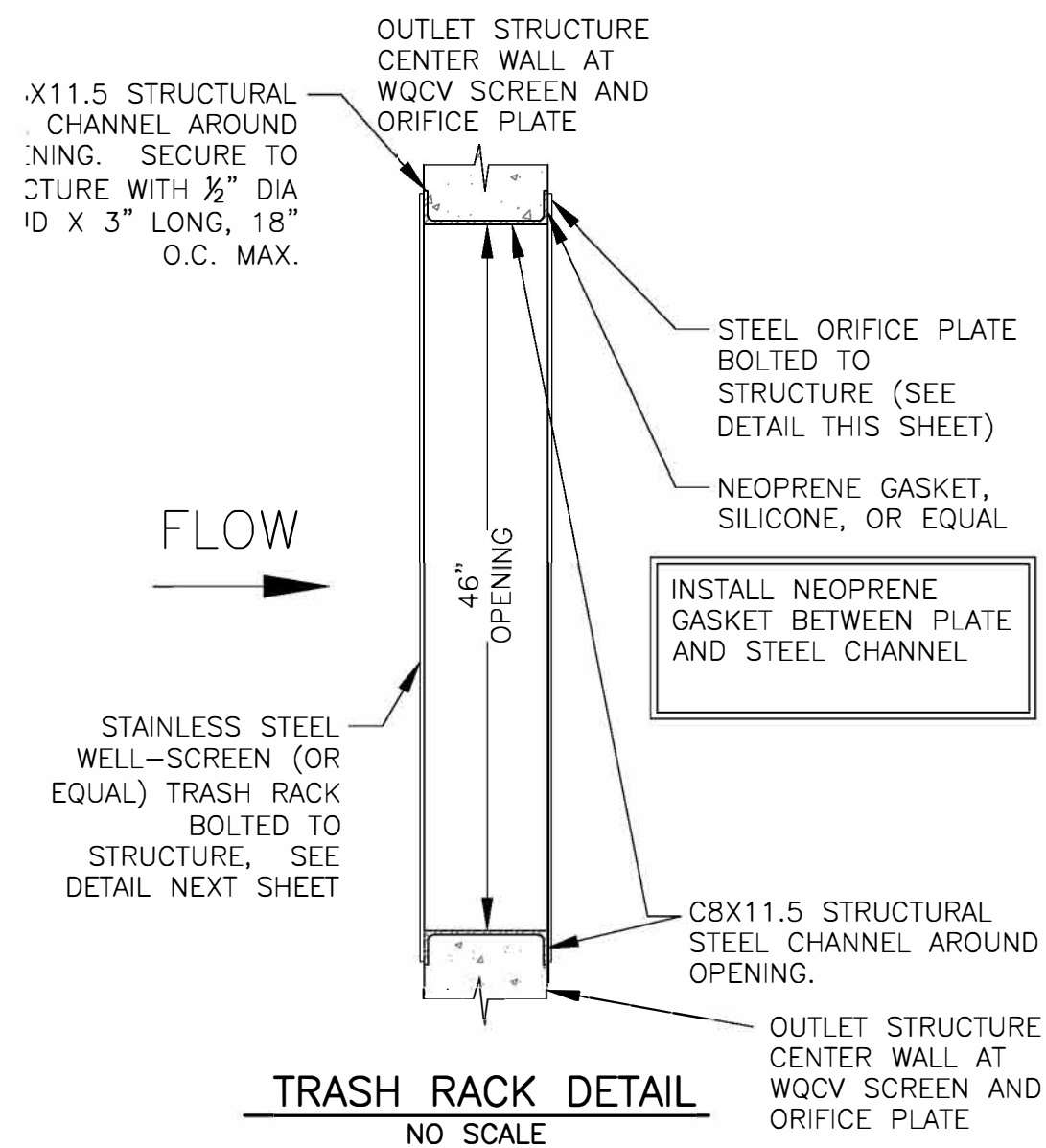


NOTE A:  
SLOT FOR CLOSE MESH GRATES

OUTLET STRUCTURE DETAIL - SECTION A-A  
NO SCALE



OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE

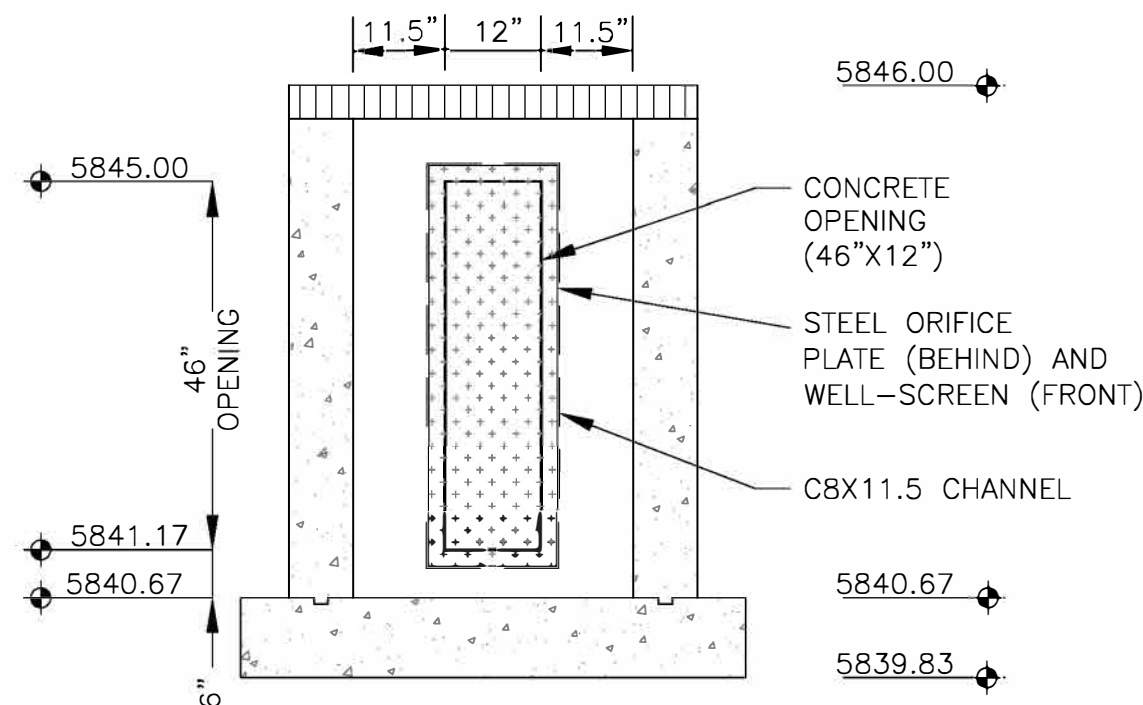


#### OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

- 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.
- 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

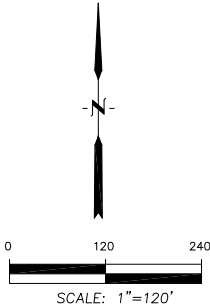
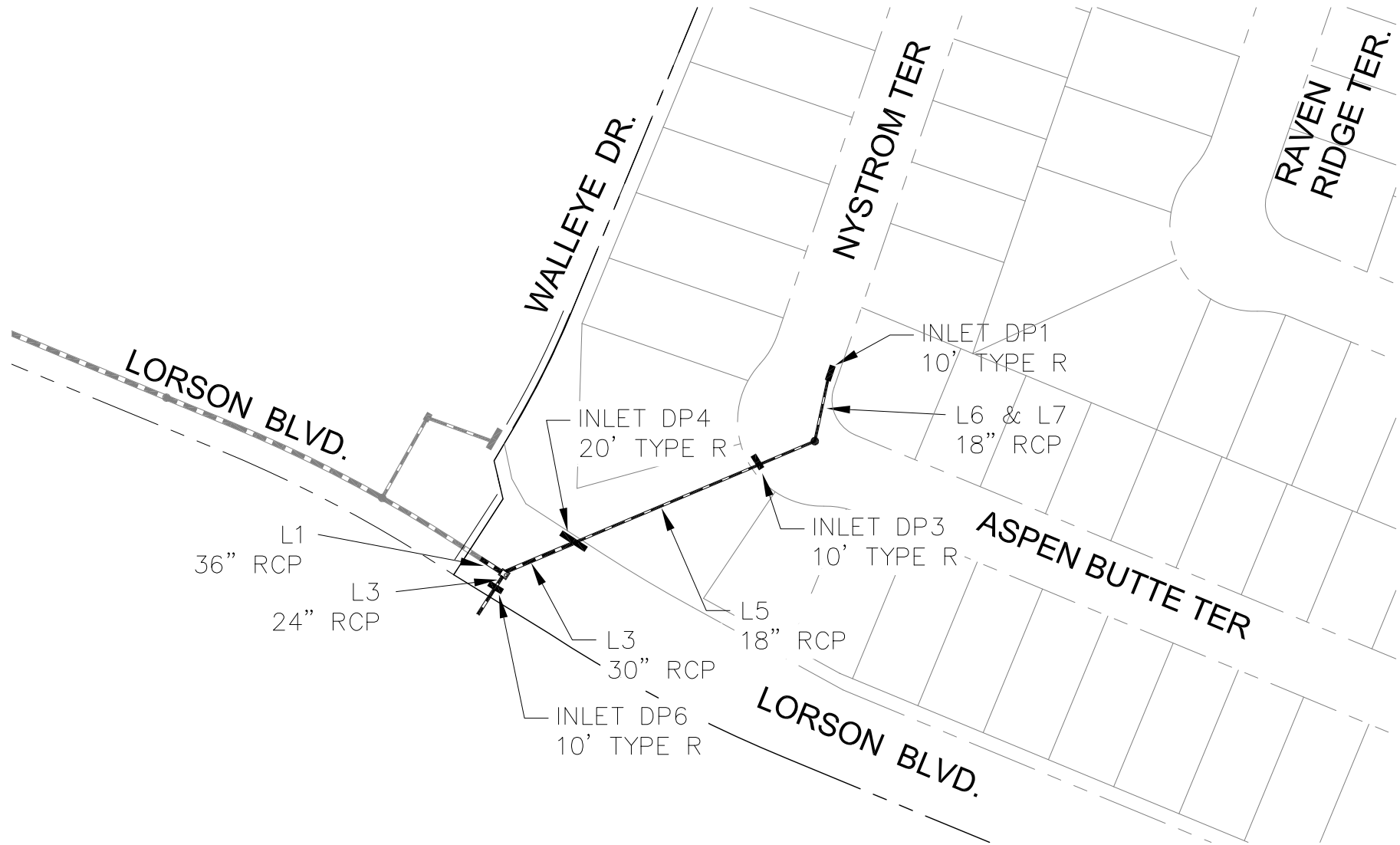


OUTLET STRUCTURE DETAIL - SECTION B-B  
NO SCALE



P: 100.100.064.dwg 100.064-storm-schematic.dwg Mar 19, 2021 - 8:02am

BASINS C1 STORM SCHEMATIC




STORM SEWER SCHEMATIC  
BASINS C1  
THE RIDGE AT LORSON RANCH

DATE	MARCH, 2021
PROJECT NO.	100.064
SHEET NUMBER	1
TOTAL SHEETS:	1

DRAWN: RLS  
DESIGNED: LAB  
CHECKED: LAB

PROJECT: THE RIDGE AT LORSON RANCH  
FONTAINE BLVD., WALLEYE DR  
EL PASO COUNTY, COLORADO

PREPARED FOR: LORSON, LLC  
212 N. WAHSATCH AVE., SUITE 301  
COLORADO 80903  
(719) 635-2200  
CONTACT: JEFF MARK



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

# Storm Sewer Summary Report

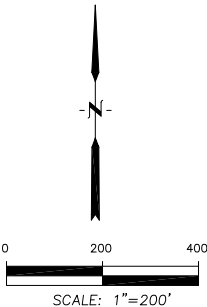
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	1	36.80	36 c	20.5	5798.38	5798.69	1.509	5800.33	5800.62	0.91	5800.62	End
2	2	15.00	24 c	8.0	5799.69	5799.81	1.525	5801.18	5801.18	n/a	5801.18	1
3	3	12.00	24 c	25.2	5799.91	5800.16	0.992	5801.62	5801.58	0.39	5801.97	2
4	4	21.80	30 c	51.4	5799.19	5799.70	0.993	5801.23	5801.26	n/a	5801.26 j	1
5	5	8.30	18 c	149.1	5800.70	5811.21	7.049	5801.63	5812.31	n/a	5812.31	4
6	6	5.60	18 c	39.8	5811.71	5812.09	0.953	5812.71	5812.99	n/a	5812.99 j	5
7	7	5.60	18 c	46.3	5812.49	5812.95	0.993	5813.27	5813.86	0.39	5814.25	6
C1 basins 5yr storm							Number of lines: 7			Run Date: 03-18-2021		
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	65.80	36 c	20.5	5798.38	5798.69	1.509	5801.00	5801.29	1.59	5801.29	End
2	2	25.70	24 c	8.0	5799.69	5799.81	1.512	5801.84*	5801.94*	0.52	5802.46	1
3	3	20.00	24 c	25.2	5800.00	5800.25	0.992	5802.87*	5803.07*	0.63	5803.70	2
4	4	40.10	30 c	51.4	5799.19	5799.70	0.993	5801.84*	5802.33*	0.52	5802.85	1
5	5	18.10	18 c	149.1	5801.20	5811.71	7.049	5802.85	5813.16	n/a	5813.16 j	4
6	6	12.20	18 c	39.8	5811.71	5812.11	1.001	5814.08*	5814.62*	0.64	5815.26	5
7	7	12.20	18 c	46.3	5812.49	5812.96	1.014	5815.26*	5815.89*	0.74	5816.63	6
C1 basins 100yr storm							Number of lines: 7			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.												

P: 100.100.064.dwg 100.064-storm-schematic.dwg Mar 19, 2021 - 8:29am

# BASINS C3 STORM SCHEMATIC



<b>CORE</b> <b>ENGINEERING GROUP</b> 15004 1ST AVE. S. BURNSVILLE, MN 55306 PH: 719.570.1100 CONTACT: RICHARD L. SCHINDLER, P.E. EMAIL: Rich@ceg1.com	
DATE	
DESCRIPTION	
NO.	
PROJECT	THE RIDGE AT LORSON RANCH FONTAINE BLVD., WALLEYE DR EL PASO COUNTY, COLORADO
PREPARED FOR	LORSON, LLC 212 N. WAHSATCH AVE., SUITE 301 COLORADO 80903 CONTACT: JEFF MARK
DRAWN: RLS	
DESIGNED: LAB	
CHECKED: LAB	
STORM SEWER SCHEMATIC BASINS C3 THE RIDGE AT LORSON RANCH	
DATE	MARCH, 2021
PROJECT NO.	100.064
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	115.0	54 c	38.4	5775.60	5776.70	2.869	5779.89	5779.78	1.53	5779.78	End
2	2	89.80	48 c	183.5	5777.70	5780.82	1.700	5780.51	5783.62	n/a	5783.62	1
3	3	89.80	48 c	307.6	5781.12	5790.01	2.890	5784.25	5792.81	n/a	5792.81	2
4	4	89.80	48 c	110.3	5790.30	5791.62	1.197	5793.44	5794.42	n/a	5794.42	3
5	5	80.60	48 c	102.4	5791.82	5793.05	1.201	5795.20	5795.71	n/a	5795.71	4
6	6	73.40	48 c	142.7	5793.05	5794.76	1.198	5796.46	5797.29	0.12	5797.29	5
7	7	65.00	42 c	104.4	5795.36	5796.61	1.197	5797.77	5799.08	n/a	5799.08	6
8	8	57.80	42 c	141.7	5796.92	5801.92	3.530	5799.77	5804.25	0.22	5804.25	7
9	9	49.40	36 c	135.8	5802.38	5805.38	2.209	5804.61	5807.62	n/a	5807.62	8
10	10	43.80	36 c	98.2	5805.58	5809.02	3.502	5808.21	5811.13	n/a	5811.13 j	9
11	11	33.50	36 c	57.5	5809.32	5810.48	2.016	5811.84	5812.33	n/a	5812.33 j	10
12	12	33.50	36 c	66.7	5810.69	5812.02	1.996	5812.82	5813.87	n/a	5813.87 j	11
13	13	33.50	36 c	35.9	5812.02	5812.74	2.005	5814.36	5814.59	n/a	5814.59 j	12
14	14	26.00	30 c	165.8	5813.24	5817.72	2.702	5814.99	5819.42	n/a	5819.42 j	13
15	15	17.60	24 c	245.7	5818.20	5822.14	1.604	5819.76	5823.63	n/a	5823.63 j	14
16	16	9.30	18 c	245.6	5822.64	5830.50	3.201	5823.96	5831.66	n/a	5831.66 j	15
17	17	9.20	18 c	7.9	5794.12	5794.44	4.057	5795.42	5795.60	n/a	5795.60	4
18	18	7.20	18 c	27.3	5795.76	5796.03	0.990	5796.73	5797.05	0.20	5797.05	5
19	19	8.40	18 c	8.0	5797.26	5797.58	4.003	5798.13	5798.69	0.56	5798.69	6
20	20	7.20	18 c	27.3	5798.78	5799.05	0.991	5800.07	5800.08	n/a	5800.27 j	7
21	21	8.40	18 c	8.0	5803.88	5804.20	4.020	5805.02	5805.31	0.00	5805.31	8
22	22	10.30	18 c	7.4	5810.82	5811.52	9.416	5811.66	5812.75	0.34	5813.09	10
23	23	7.50	18 c	7.5	5814.24	5814.54	4.004	5815.14	5815.59	0.51	5815.59	13
24	24	8.40	18 c	7.6	5818.70	5818.78	1.046	5819.90	5819.89	0.56	5820.45	14
25	25	8.30	18 c	10.1	5822.64	5822.74	0.996	5823.84	5823.84	0.55	5824.40	15
26	26	5.60	18 c	28.0	5807.28	5807.54	0.933	5808.65	5808.65	0.02	5808.68	9
27	27	7.00	24 c	17.8	5779.20	5779.94	4.149	5781.08	5780.88	0.14	5781.03	1
28	28	18.20	30 c	64.4	5778.80	5779.44	0.994	5781.10	5781.02	0.10	5781.12	1
29	29	18.20	30 c	172.1	5780.00	5786.88	3.997	5781.38	5788.31	n/a	5788.31	28
30	30	9.70	18 c	123.9	5787.88	5791.52	2.939	5788.66	5792.71	0.26	5792.71	29
31	31	8.50	24 c	15.9	5787.98	5788.30	2.005	5788.81	5789.33	0.17	5789.33	29
C3 basins 5yr storm							Number of lines: 31			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.												

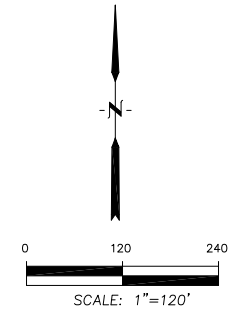
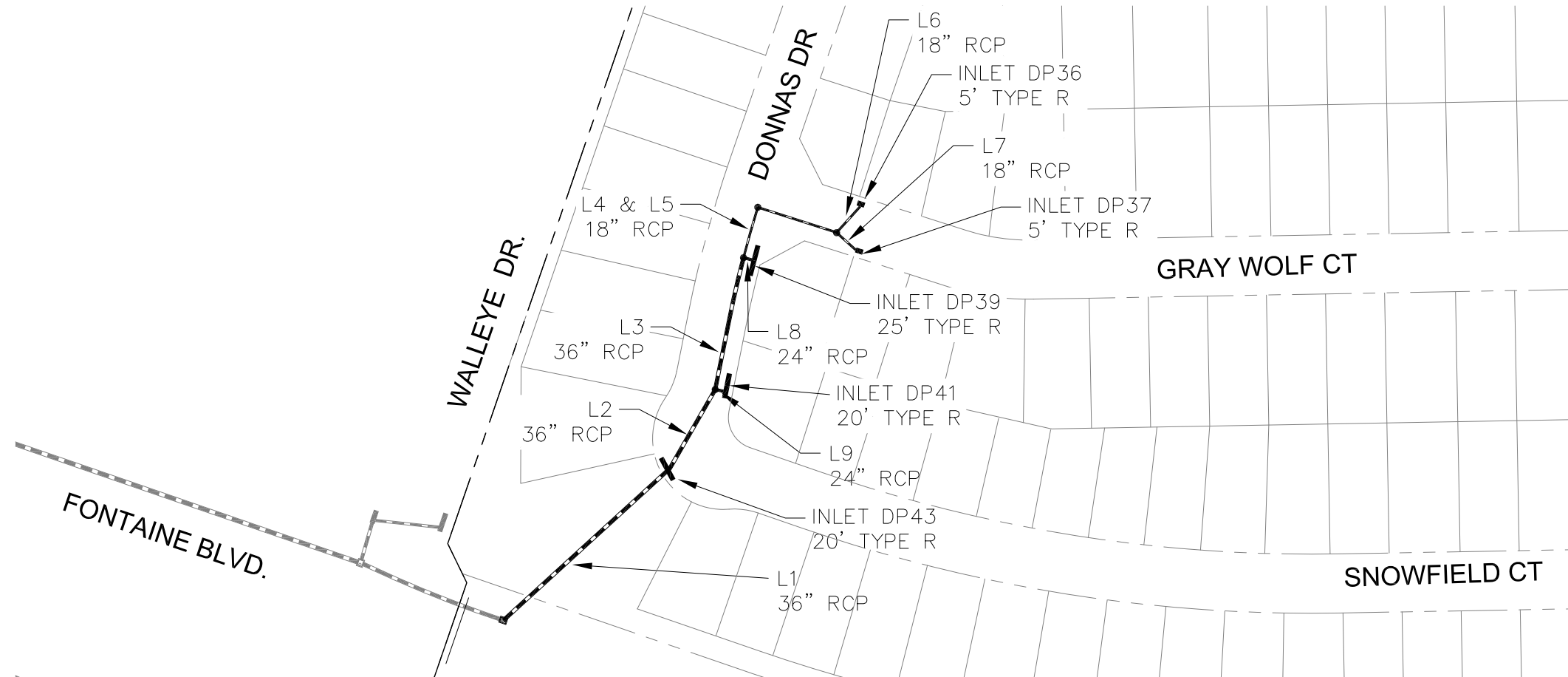


# Storm Sewer Summary Report

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	225.4	54 c	38.4	5775.60	5776.70	2.869	5779.89	5780.88	n/a	5780.88	End
2	2	153.9	48 c	183.5	5777.70	5780.82	1.700	5781.88	5784.45	0.38	5784.45	1
3	3	153.9	48 c	307.6	5781.12	5790.01	2.890	5784.68	5793.64	1.28	5793.64	2
4	4	153.9	48 c	110.3	5790.30	5791.62	1.197	5793.87	5795.25	0.26	5795.25	3
5	5	133.4	48 c	102.4	5791.82	5793.05	1.201	5796.06	5796.78	0.19	5796.97	4
6	6	132.7	48 c	142.7	5793.05	5794.76	1.198	5797.09	5798.21	n/a	5798.21	5
7	7	118.6	42 c	104.4	5795.36	5796.61	1.197	5798.86*	5800.31*	0.24	5800.55	6
8	8	115.5	42 c	141.7	5796.92	5801.92	3.530	5800.67	5805.14	n/a	5805.14	7
9	9	99.20	36 c	135.8	5802.38	5805.38	2.209	5805.14	5808.28	0.63	5808.28	8
10	10	88.50	36 c	98.2	5805.58	5809.02	3.502	5808.97	5811.86	0.76	5811.86	9
11	11	67.30	36 c	57.5	5809.32	5810.48	2.016	5812.99*	5813.58*	1.41	5814.99	10
12	12	67.30	36 c	66.7	5810.69	5812.02	1.996	5814.99*	5815.67*	0.21	5815.88	11
13	13	67.30	36 c	35.9	5812.02	5812.74	2.005	5815.88*	5816.24*	0.70	5816.95	12
14	14	46.90	30 c	165.8	5813.24	5817.72	2.702	5816.95	5819.98	n/a	5819.98	13
15	15	30.40	24 c	245.7	5818.20	5822.14	1.604	5820.09	5824.12	0.73	5824.85	14
16	16	14.80	18 c	245.6	5822.64	5830.50	3.201	5825.22	5831.90	n/a	5831.90 j	15
17	17	20.50	18 c	7.9	5794.12	5794.44	4.057	5795.72*	5796.02*	2.09	5798.12	4
18	18	11.30	18 c	27.3	5795.76	5796.03	0.990	5798.19*	5798.51*	0.25	5798.76	5
19	19	20.70	18 c	8.0	5797.26	5797.58	4.003	5798.47*	5799.51*	2.13	5801.64	6
20	20	13.10	18 c	27.3	5798.78	5799.05	0.991	5802.06*	5802.48*	0.34	5802.82	7
21	21	16.30	18 c	8.0	5803.88	5804.20	4.020	5806.24*	5806.43*	0.00	5806.43	8
22	22	21.20	18 c	7.4	5810.82	5811.12	4.033	5812.16*	5812.72*	2.24	5814.96	10
23	23	20.40	18 c	7.5	5814.24	5814.54	4.004	5816.95*	5817.23*	2.07	5819.30	13
24	24	16.50	18 c	7.6	5818.70	5818.78	1.046	5820.20*	5820.39*	1.36	5821.74	14
25	25	15.60	18 c	10.1	5822.64	5822.74	0.996	5825.10*	5825.32*	1.21	5826.53	15
26	26	10.70	18 c	28.0	5806.88	5807.14	0.929	5810.84*	5811.13*	0.06	5811.18	9
27	27	28.70	24 c	17.8	5779.20	5779.94	4.149	5782.91*	5783.20*	0.52	5783.72	1
28	28	42.80	30 c	64.4	5778.80	5779.44	0.994	5783.03*	5783.73*	0.24	5783.97	1
29	29	42.80	30 c	172.1	5780.00	5786.88	3.997	5783.97	5789.07	0.14	5789.07	28
30	30	15.30	18 c	123.9	5787.88	5791.52	2.939	5789.27	5792.93	0.49	5792.93	29
31	31	27.50	24 c	15.9	5787.98	5788.30	2.005	5789.41*	5790.54*	0.48	5791.01	29
C3 basins 100yr storm							Number of lines: 31			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.												



# BASINS C5 STORM SCHEMATIC



STORM SEWER SCHEMATIC  
BASINS C5  
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021
PROJECT NO.
100.064
SHEET NUMBER
1
TOTAL SHEETS: 1

DRAWN:	RLS	
DESIGNED:	LAB	
CHECKED:	LAB	
NO.	DESCRIPTION	DATE
PROJECT: <b>THE RIDGE AT LORSON RANCH</b> FONTAINE BLVD - WALLER DR EL PASO COUNTY, COLORADO		PREPARED FOR: <b>LORSON, LLC</b> 212 N. WAHSATCH AVE., SUITE 301 COLORADO SPRINGS, COLORADO 80903 (719) 633-8000 COURTESY OF LORSON, LLC

**CORE**  
**ENGINEERING GROUP**

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

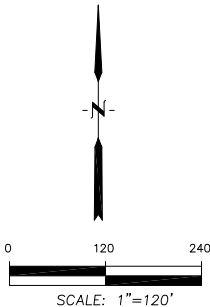
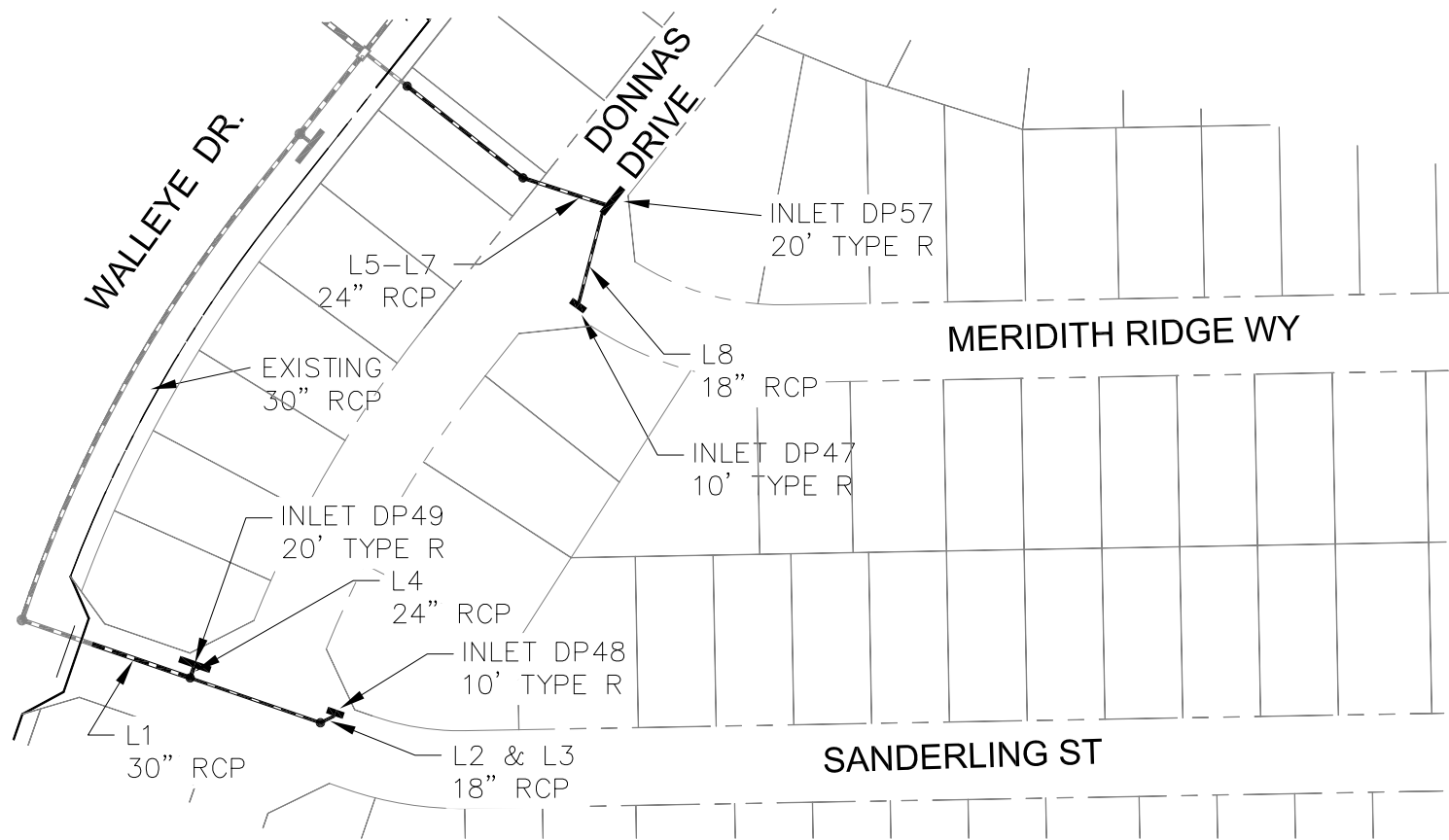
# Storm Sewer Summary Report

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		42.30	36 c	190.8	5782.00	5788.40	3.354	5784.83	5790.47	n/a	5790.47 j	End
2		32.30	36 c	77.0	5789.50	5790.37	1.130	5791.17	5792.18	0.80	5792.18	1
3		23.00	36 c	121.5	5790.47	5791.49	0.839	5792.83	5793.02	n/a	5793.02 j	2
4		7.50	18 c	38.1	5793.00	5793.38	0.998	5793.94	5794.43	0.50	5794.93	3
5		7.50	18 c	70.0	5793.58	5794.28	1.000	5795.15	5795.39	0.41	5795.80	4
6		4.10	18 c	30.4	5794.48	5794.82	1.119	5796.14	5796.17	0.09	5796.27	5
7		3.40	18 c	23.5	5794.48	5794.81	1.406	5796.17	5796.19	0.06	5796.25	5
8		15.50	24 c	10.8	5792.50	5792.62	1.109	5793.68	5794.30	0.47	5794.77	3
9		9.30	24 c	14.0	5791.37	5791.65	2.002	5792.86	5792.73	n/a	5792.73 j	2
C5 basins 5yr storm							Number of lines: 9			Run Date: 03-18-2021		
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		87.10	36 c	190.8	5782.00	5787.80	3.039	5784.83	5790.63	1.38	5790.63	End
2		62.10	36 c	77.0	5788.70	5790.37	2.169	5791.90	5792.88	n/a	5792.88	1
3		37.00	36 c	121.5	5790.47	5791.44	0.797	5793.75	5794.03	0.50	5794.54	2
4		10.50	18 c	38.1	5793.00	5793.38	0.998	5794.54	5794.87	0.55	5795.42	3
5		10.50	18 c	70.0	5793.58	5794.28	1.000	5795.42*	5796.12*	0.50	5796.63	4
6		5.70	18 c	30.4	5794.48	5794.82	1.119	5797.02*	5797.10*	0.16	5797.27	5
7		4.80	18 c	23.5	5794.48	5794.81	1.406	5797.06*	5797.11*	0.11	5797.23	5
8		26.50	24 c	10.8	5792.50	5792.72	2.034	5794.54	5794.65	1.13	5795.78	3
9		25.10	24 c	14.0	5791.37	5791.65	2.002	5793.39	5793.42	1.13	5794.55	2
C5 basins 100yr storm							Number of lines: 9			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown).												

BASINS C8.1 & C8.4 STORM SCHEMATIC



STORM SEWER SCHEMATIC  
BASINS C8.1 & C8.4  
THE RIDGE AT LORSON RANCH

DATE  
MARCH, 2021  
PROJECT NO.  
100.064  
SHEET NUMBER  
1  
TOTAL SHEETS: 1

NO. DESCRIPTION DATE  
DRAWN: RLS  
DESIGNED: LAB  
CHECKED: LAB  
PROJECT: THE RIDGE AT LORSON RANCH  
FONTAINE BLVD., WALLEYE DR  
EL PASO COUNTY, COLORADO  
PREPARED FOR: LORSON, LLC  
212 N. WAHSATCH AVE., SUITE 301  
COLORADO 80903  
CONTACT: JEFF MARK

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

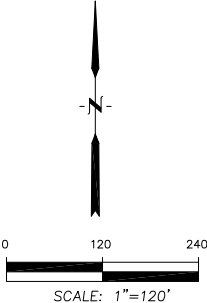
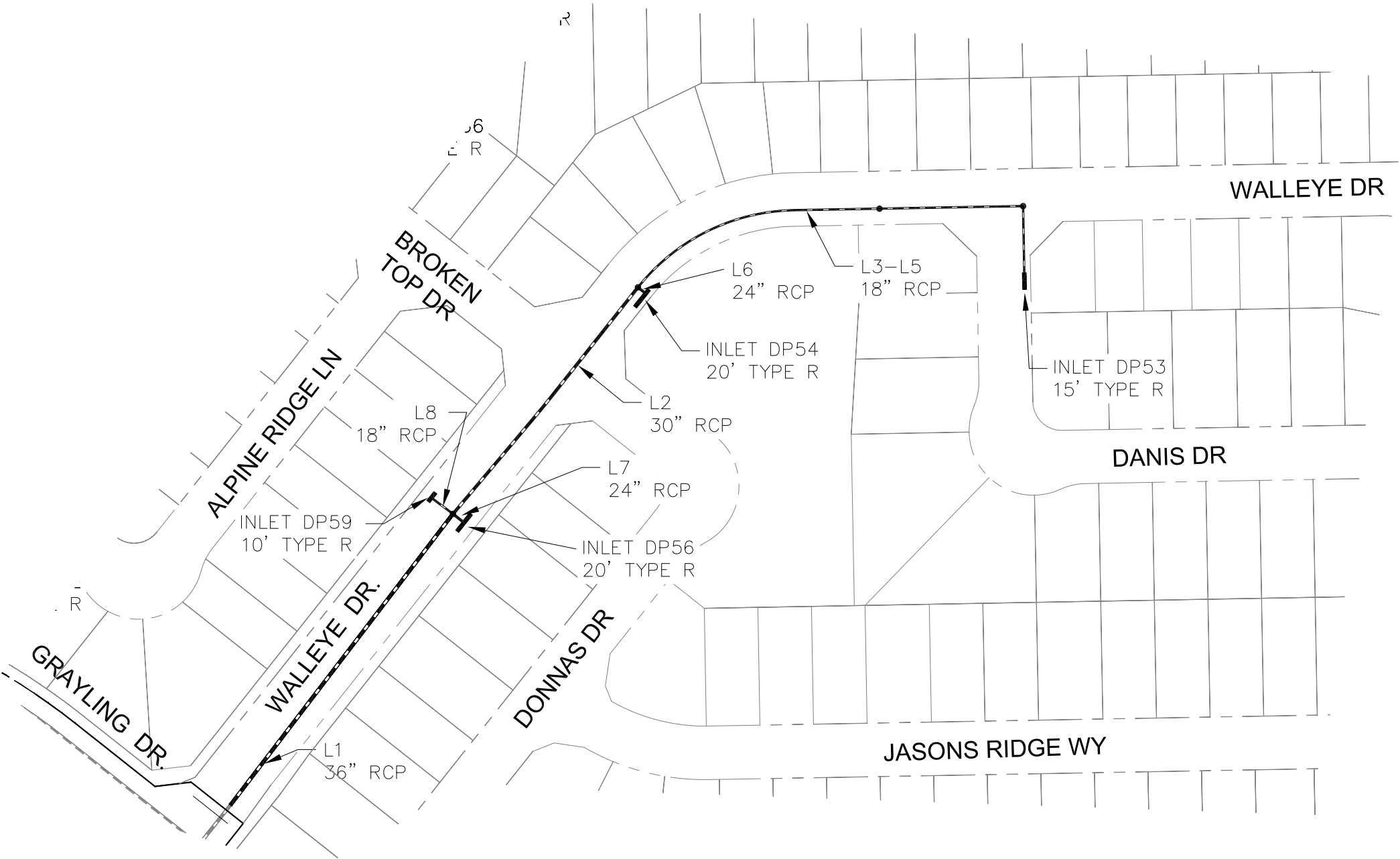
# Storm Sewer Summary Report

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		11.10	30 c	67.8	5796.22	5796.92	1.032	5798.38	5798.33	0.24	5798.56	End
2		3.40	18 c	70.9	5798.90	5800.32	2.003	5799.39	5801.02	n/a	5801.02	1
3		3.40	18 c	14.9	5800.52	5800.82	2.012	5801.24	5801.52	n/a	5801.52 j	2
4		7.70	24 c	9.5	5798.10	5798.48	3.987	5798.71	5800.16	0.12	5800.27	1
5		17.10	24 c	36.5	5792.52	5793.43	2.492	5794.44	5794.90	n/a	5794.90 j	End
6		17.10	24 c	94.9	5793.88	5801.00	7.504	5795.18	5802.47	0.31	5802.47	5
7		17.10	24 c	55.5	5801.30	5802.13	1.496	5802.75	5803.60	1.12	5803.60	6
8		6.10	18 c	68.5	5803.23	5803.92	1.007	5804.16	5804.86	0.42	5804.86	7
C8.1 basins 5yr storm							Number of lines: 8			Run Date: 03-18-2021		
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		27.00	30 c	67.8	5796.22	5796.92	1.032	5798.38	5798.66	n/a	5798.66 j	End
2		6.20	18 c	70.9	5798.90	5800.32	2.003	5799.58	5801.27	n/a	5801.27	1
3		6.20	18 c	14.9	5800.52	5800.82	2.012	5801.51	5801.77	n/a	5801.77 j	2
4		20.80	24 c	9.5	5798.40	5798.78	3.997	5799.35*	5801.99*	0.68	5802.67	1
5		28.10	24 c	36.5	5792.52	5793.43	2.492	5794.44	5795.26	n/a	5795.26 j	End
6		28.10	24 c	94.9	5793.88	5801.00	7.504	5795.37	5802.83	0.57	5802.83	5
7		28.10	24 c	55.5	5801.30	5802.13	1.496	5802.97	5804.02	1.95	5805.97	6
8		9.10	18 c	68.5	5803.23	5803.92	1.007	5806.86*	5807.37*	0.41	5807.79	7
C8.1 basins 100yr storm							Number of lines: 8			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.												

BASINS C8.3 STORM SCHEMATIC




DESCRIPTION		DATE
PROJECT:		
THE RIDGE AT LORSON RANCH		
212 N. WAHSATCH AVE., SUITE 301		
COLORADO SPRINGS, COLORADO 80903		
CONTACT: RICHARD L. SCHINDLER, P.E.		
EMAIL: Rich@ceg1.com		

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC  
BASINS C8.3  
THE RIDGE AT LORSON RANCH

DATE
MARCH, 2021
PROJECT NO.
100.064
SHEET NUMBER
1
TOTAL SHEETS: 1



CORE

ENGINEERING GROUP

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

# Storm Sewer Summary Report

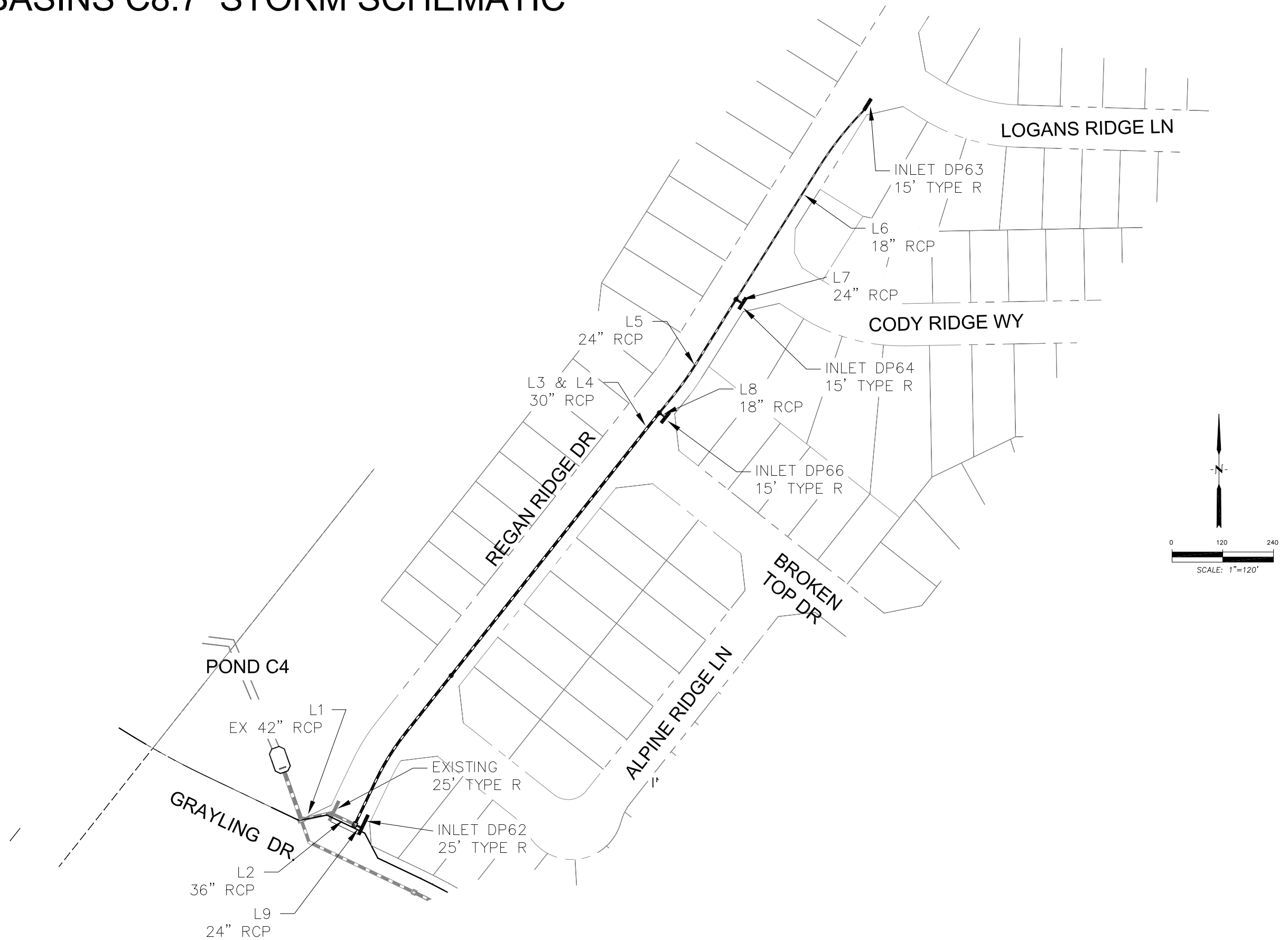
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		32.70	36 c	388.3	5792.00	5797.44	1.401	5794.98	5799.26	n/a	5799.26 j	End
2		21.40	30 c	218.5	5797.94	5800.62	1.227	5799.79	5802.17	n/a	5802.17 j	1
3		9.70	18 c	212.9	5801.62	5809.62	3.758	5802.40	5810.81	0.38	5810.81	2
4		9.70	18 c	213.7	5809.82	5817.64	3.660	5810.99	5818.83	0.65	5818.83	3
5		9.70	18 c	61.5	5817.95	5818.86	1.480	5819.01	5820.05	0.65	5820.05	4
6		11.70	24 c	8.0	5801.50	5801.74	3.003	5802.65	5802.95	n/a	5802.95	2
7		9.00	24 c	9.9	5798.44	5798.64	2.028	5799.96	5799.87	0.31	5800.18	1
8		5.90	18 c	25.1	5798.94	5799.19	0.997	5799.91	5800.12	0.41	5800.12	1
C8.3 basins 5yr storm							Number of lines: 8			Run Date: 03-18-2021		
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		73.30	36 c	388.3	5792.00	5797.44	1.401	5794.98	5800.15	n/a	5800.15	End
2		40.20	30 c	218.5	5797.94	5800.62	1.227	5800.96	5802.78	1.24	5804.02	1
3		16.20	18 c	212.9	5801.62	5809.62	3.758	5804.02	5811.05	n/a	5811.05 j	2
4		16.20	18 c	213.7	5809.82	5817.64	3.660	5811.10	5819.07	1.35	5819.07	3
5		16.20	18 c	61.5	5817.95	5818.86	1.480	5819.45*	5820.91*	1.31	5822.22	4
6		24.00	24 c	8.0	5801.50	5801.74	3.003	5804.35*	5804.44*	0.91	5805.34	2
7		32.80	24 c	9.9	5798.44	5798.64	2.028	5800.31	5800.55	1.75	5802.30	1
8		8.90	18 c	25.1	5798.94	5799.19	0.997	5801.61*	5801.79*	0.39	5802.18	1
C8.3 basins 100yr storm							Number of lines: 8			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.												

## BASINS C8.7 STORM SCHEMATIC



# STORM SEWER SCHEMATIC BASINS C8.7 THE RIDGE AT LORSON RANCH

DATE  
MARCH, 2021

---

PROJECT NO.  
100.064

---

SHEET NUMBER  
1

TOTAL SHEETS: 1


NO.	DESCRIPTION	DATE
DRAWN:	RLS	
DESIGNED:	LAB	
CHECKED:	LAB	

PROJECT: THE RIDGE AT LORSON RANCH  
 FONTAINE BLVD - WALLEYE DR  
 EL PASO COUNTY, COLORADO

PREPARED FOR: LORSON, LLC  
 212 N. WAHSATCH AVE., SUITE 301  
 COLORADO SPRINGS, COLORADO 80903  
 (719) 636-3200  
 C:\C\B\

**CORE**  
**ENGINEERING GROUP**

15004 1ST AVE. S.  
BURNSVILLE, MN 55306  
PHONE: 763.719.5700  
CONTACT: RICHARD L. SCHINDLER, P.E.  
EMAIL: [Richce@coreg.com](mailto:Richce@coreg.com)



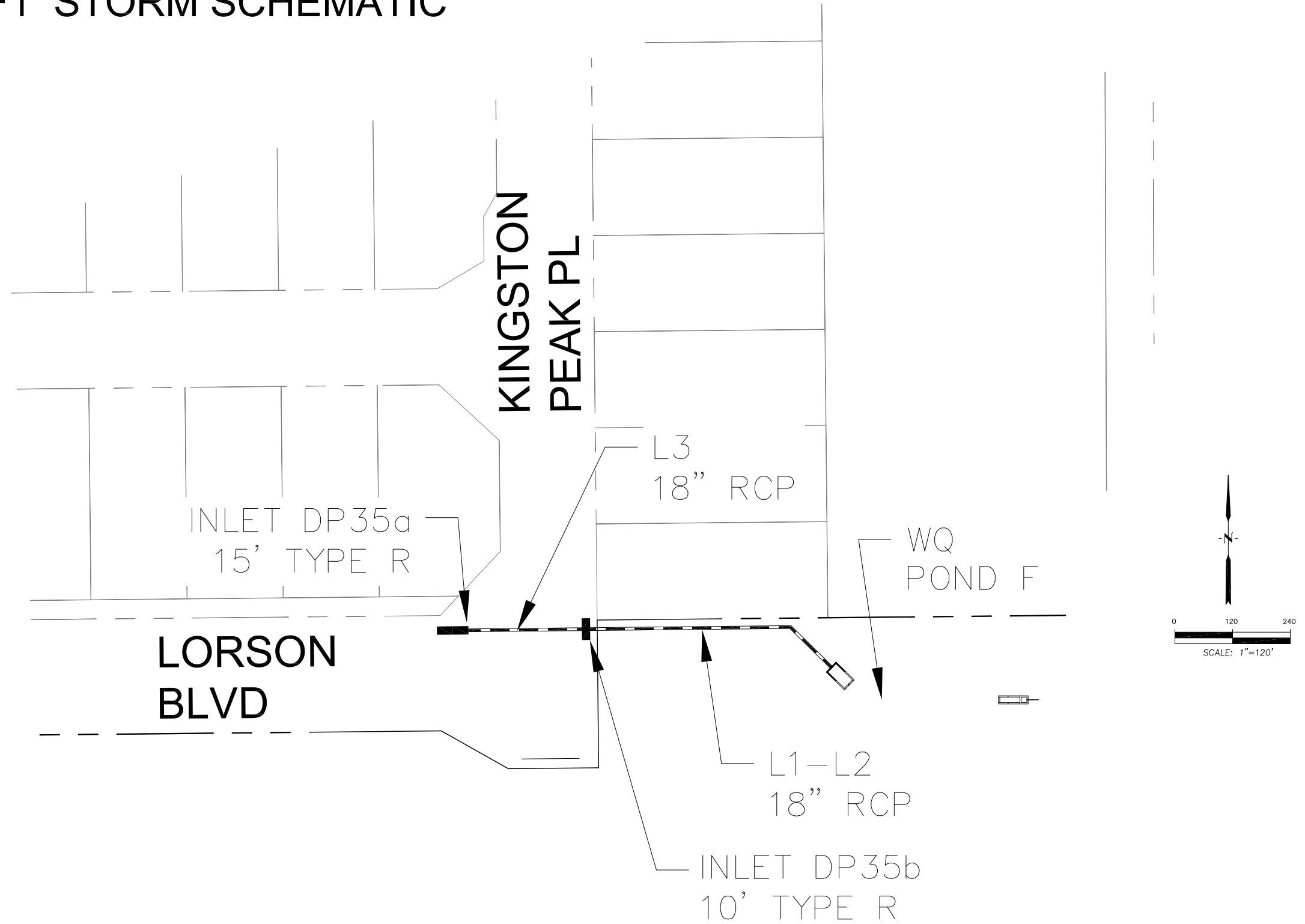
# Storm Sewer Summary Report

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		34.50	42 c	36.0	5778.08	5779.02	2.611	5781.58	5781.47	0.28	5781.75	End
2		33.00	36 c	31.0	5779.52	5779.89	1.194	5781.77	5781.72	0.33	5781.72	1
3		21.50	30 c	211.2	5780.39	5784.82	2.098	5782.25	5786.37	n/a	5786.37 j	2
4		21.50	30 c	394.6	5785.15	5798.76	3.449	5786.78	5800.31	n/a	5800.31 j	3
5		20.00	24 c	168.5	5799.30	5806.04	3.999	5800.38	5807.62	0.87	5807.62	4
6		10.20	18 c	269.2	5807.50	5816.38	3.298	5808.28	5817.60	0.68	5817.60	5
7		9.80	24 c	11.2	5807.10	5807.32	1.968	5808.35	5808.43	0.47	5808.43	5
8		1.50	18 c	10.7	5799.80	5800.01	1.956	5800.98	5800.97	0.02	5801.00	4
9		14.30	24 c	7.3	5780.39	5780.46	0.955	5782.14	5782.14	0.40	5782.54	2
C8.7 basins 5yr storm							Number of lines: 9			Run Date: 03-18-2021		
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		86.30	42 c	36.0	5778.08	5779.02	2.611	5781.58	5781.87	1.30	5781.87	End
2		76.50	36 c	31.0	5779.52	5779.89	1.194	5782.14	5782.70	0.77	5783.47	1
3		45.20	30 c	211.2	5780.39	5784.82	2.098	5784.07	5787.05	n/a	5787.05	2
4		45.20	30 c	394.6	5785.15	5798.76	3.449	5787.22	5800.99	n/a	5800.99	3
5		33.40	24 c	168.5	5799.30	5806.04	3.999	5800.99	5807.95	n/a	5807.95	4
6		15.90	18 c	269.2	5807.50	5816.38	3.298	5808.55	5817.81	n/a	5817.81	5
7		17.50	24 c	11.2	5807.10	5807.32	1.968	5809.27	5809.32	0.48	5809.80	5
8		11.80	18 c	10.7	5799.80	5800.01	1.956	5801.78*	5801.92*	0.69	5802.61	4
9		37.40	24 c	7.3	5780.39	5780.46	0.955	5783.47*	5783.67*	2.20	5785.87	2
C8.7 basins 100yr storm							Number of lines: 9			Run Date: 03-18-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown).												


# BASINS F1 STORM SCHEMATIC



DRAWN:	RLS	
DESIGNED:	LAB	
CHECKED:	LAB	
NO.	DESCRIPTION	DATE
PROJECT:	PREPARED FOR:	
THE RIDGE AT LORSON RANCH FONTAINE BLVD - WALLEYE DR EL PASO COUNTY, COLORADO		
LORSON, LLC 212 N. WAHSATCH AVE., SUITE 301 COLORADO SPRINGS, COLORADO 80903 (719) 635-3200 CONTACT: JEFF MARK		

STORM SEWER SCHEMATIC  
BASINS F1  
THE RIDGE AT LORSON RANCH

DATE	MARCH, 2021
PROJECT NO.	100.064
SHEET NUMBER	1
TOTAL SHEETS:	1

 **CORE**  
**ENGINEERING GROUP**

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

# 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	3	7.80	18 c	51.1	5844.50	5845.52	1.997	5845.57	5846.59	n/a	5846.59 j	End
2		7.80	18 c	106.7	5845.52	5854.05	7.998	5846.81	5855.12	n/a	5855.12 j	1
3		5.90	18 c	82.6	5854.38	5855.21	1.006	5855.47	5856.14	n/a	5856.14 j	2
F1 basins 5yr storm							Number of lines: 3			Run Date: 07-17-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; j - Line contains hyd. jump.												

# Storm Sewer Summary Report

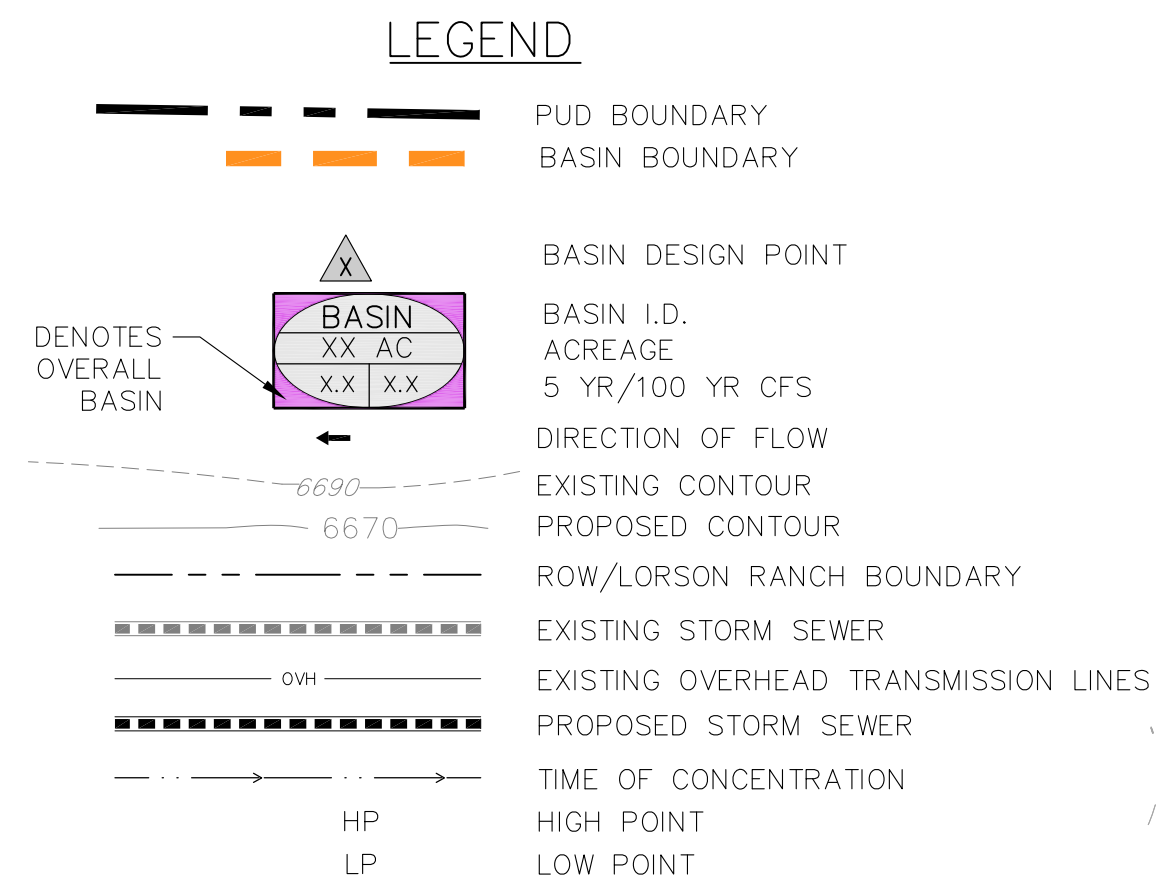
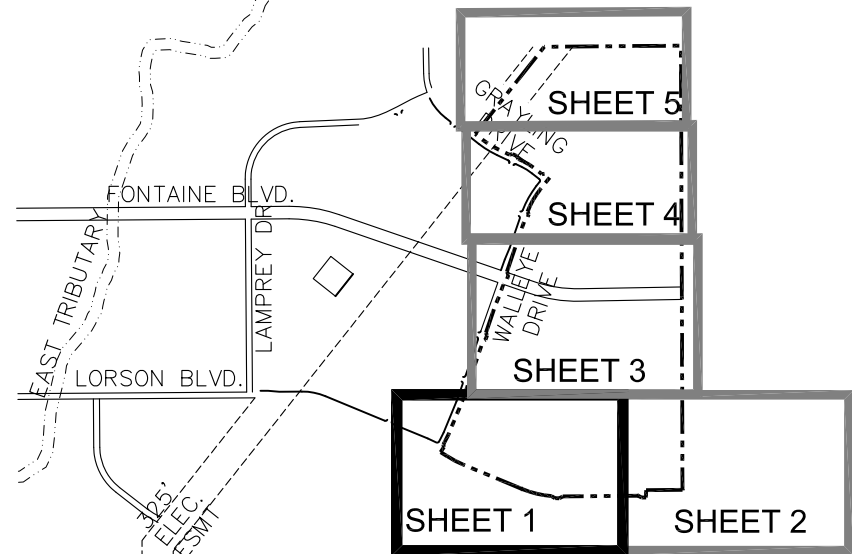
Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	3	17.60	18 c	51.1	5844.50	5845.52	1.997	5845.95*	5847.33*	1.06	5848.39	End
2		17.60	18 c	106.7	5845.52	5854.05	7.998	5848.39	5855.50	n/a	5855.50 j	1
3		13.20	18 c	82.6	5854.38	5855.21	1.006	5856.21*	5857.51*	0.87	5858.38	2
F1 basins 100yr storm							Number of lines: 3			Run Date: 07-17-2021		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.												

# MAP POCKET









**DETENTION POND AREAS:**

1. C1 BASINS DRAIN TO POND C1
2. C3 & C4 BASINS DRAIN TO POND C2.1
3. C5 BASINS DRAIN TO POND C2.2
4. C8 BASINS DRAIN TO POND C4
5. F1.3-F1.4 BASINS DRAIN TO WQ POND F (NO DETENTION, WQ ONLY)

\*ALL DETENTION PONDS HAVE BEEN CONSTRUCTED PER SF 21-010 AND EGP 20-005 (THE HILLS AT LORSON RANCH) EXCEPT WQ POND F

\*\*SEE POND EXHIBIT FOR POND LOCATIONS

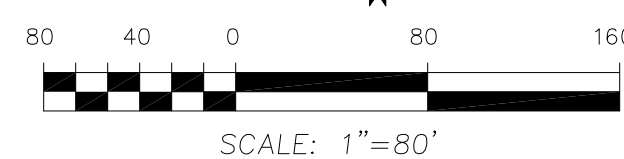
RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
1a	12.8	28.3	FUTURE FLOW IN 24" STUB
1	5.6	12.2	STREET FLOW
2	2.7	5.9	STREET FLOW
3	8.3	18.1	FLOW IN STORM SEWER
4	8.9	21.6	STREET FLOW
5	17.2	36.1	FLOW IN STORM SEWER
6	3.0	6.6	STREET FLOW
7	36.8	65.8	FLOW IN EX. 36" STM
12	9.9	21.8	STREET FLOW
13	8.5	24.3	STREET FLOW
14	17.6	30.4	FLOW IN STORM SEWER
15	8.7	27.3	STREET FLOW
16	26.0	46.9	FLOW IN STORM SEWER
17	7.5	26.7	STREET FLOW
18	33.5	67.3	FLOW IN STORM SEWER
19	10.3	28.8	STREET FLOW
20	43.8	88.5	FLOW IN STORM SEWER

Recommend grading a swale from the inlet to southwest in case of overflow.

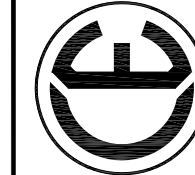
See comment on next sheet

UNPLATTED

Provide DP at south property line to compare existing and proposed flows



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BURNSVILLE, MN 55306  
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FAX: 763.570.0001  
EMAIL: Rich@cegi.com



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

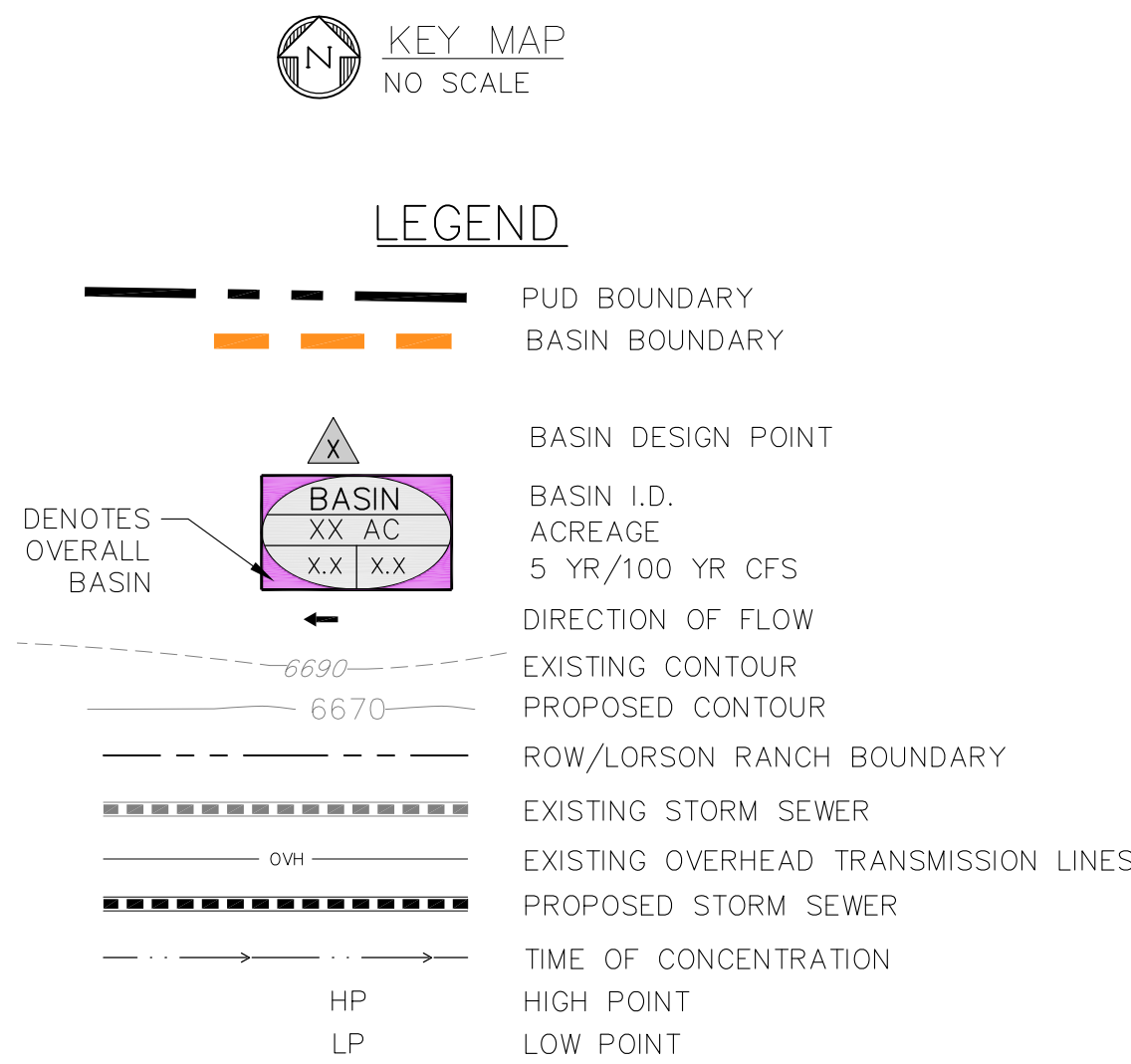
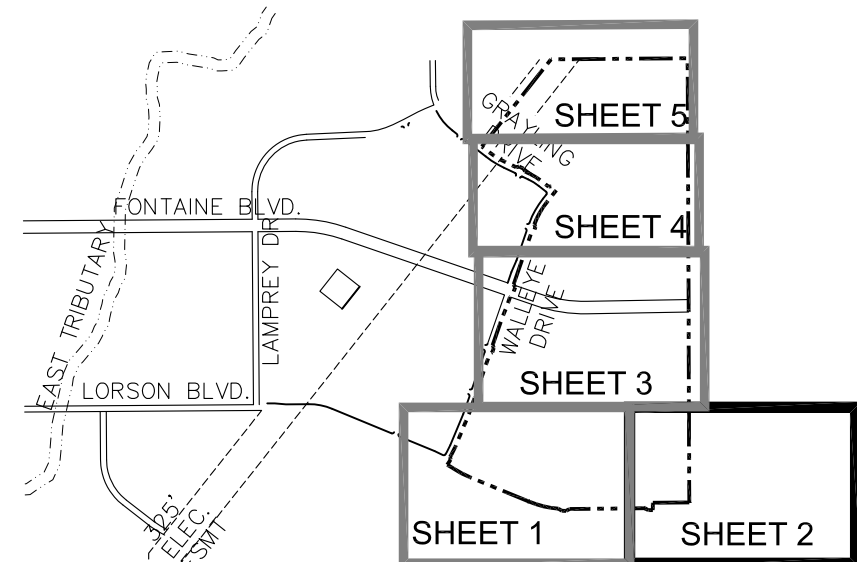
THE RIDGE AT LORSON RANCH  
FONTAINE BLVD. - WALLEVE DRIVE  
EL PASO COUNTY, COLORADO

DRAWN: RLB  
DESIGNED: LRB  
CHECKED: LRB

DEVELOPED CONDITIONS  
THE RIDGE AT LORSON RANCH  
X

DATE: JULY, 2021  
PROJECT NO.: 100.064  
SHEET NUMBER: 1  
TOTAL SHEETS: 5





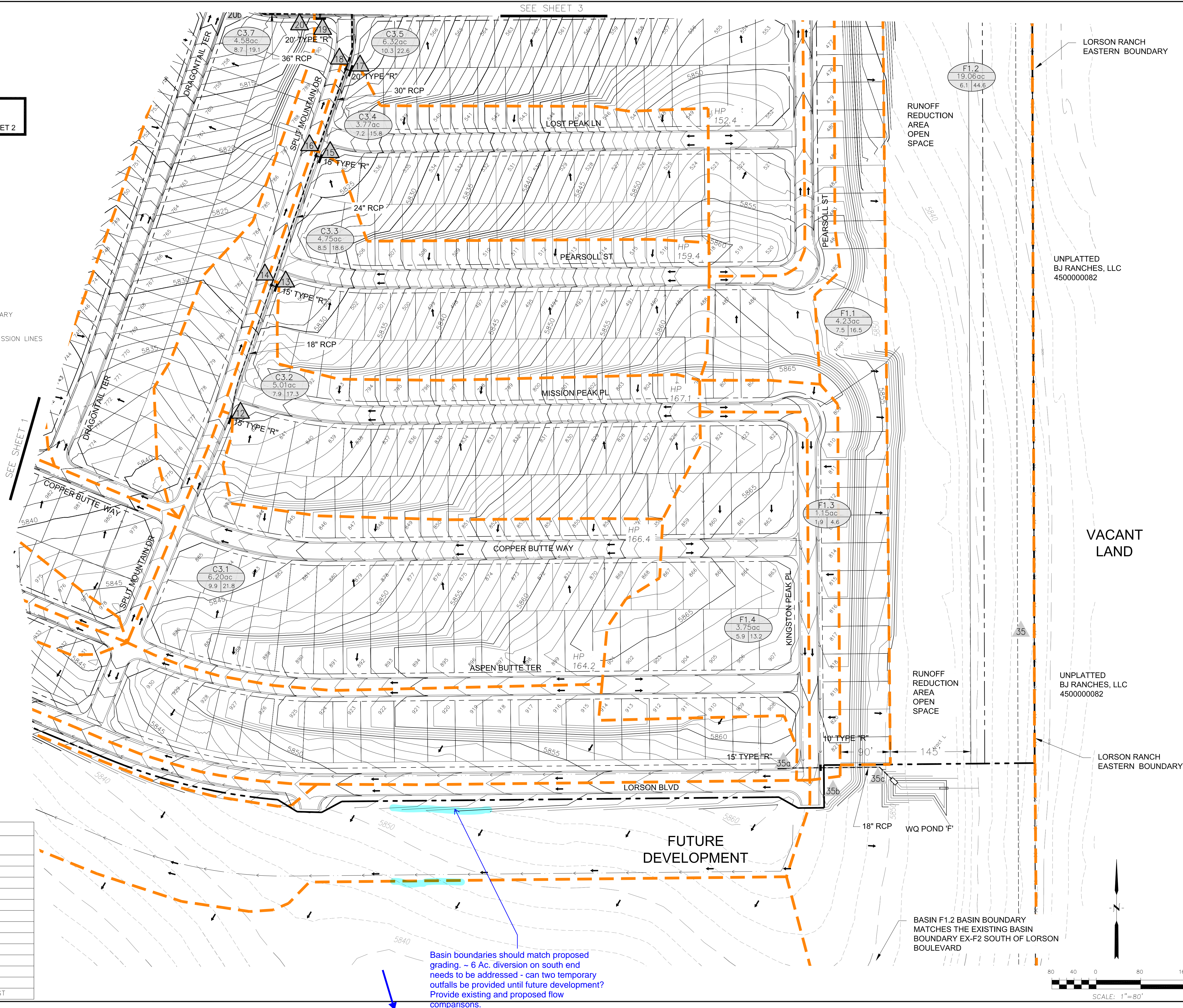
DETENTION POND AREAS:

1. C1 BASINS DRAIN TO POND C1
2. C3 & C4 BASINS DRAIN TO POND C2.1
3. C5 BASINS DRAIN TO POND C2.2
4. C8 BASINS DRAIN TO POND C4
5. F1.3-F1.4 BASINS DRAIN TO WQ POND F (NO DETENTION, WQ ONLY)

\*ALL DETENTION PONDS HAVE BEEN CONSTRUCTED PER SF 21-010 AND EGP 20-005 (THE HILLS AT LORSON RANCH) EXCEPT WQ POND F

\*\*SEE POND EXHIBIT FOR POND LOCATIONS

RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
12	9.9	21.8	STREET FLOW
13	8.5	24.3	STREET FLOW
14	17.6	30.4	FLOW IN STORM SEWER
15	8.7	27.3	STREET FLOW
16	26.0	46.9	FLOW IN STORM SEWER
17	7.5	26.7	STREET FLOW
18	33.5	67.3	FLOW IN STORM SEWER
19	10.3	28.8	STREET FLOW
20	43.8	88.5	FLOW IN STORM SEWER
35a	5.9	13.2	STREET FLOW
35b	1.9	4.6	STREET FLOW
35c	7.8	17.6	FLOW STORM SEWER
35	12.0	71.3	FLOW OFFSITE TO THE EAST

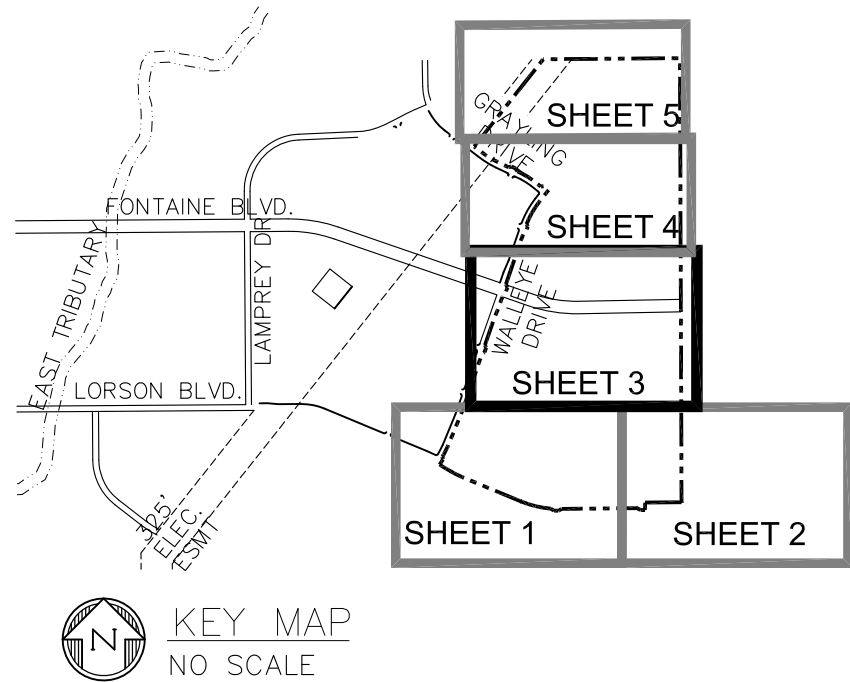


Basin boundaries should match proposed grading. ~ 6 Ac. diversion on south end needs to be addressed - can two temporary outfalls be provided until future development? Provide existing and proposed flow comparisons.



RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
17	7.5	26.7	STREET FLOW
18	33.5	67.3	FLOW IN STORM SEWER
19	10.3	28.8	STREET FLOW
20	43.8	88.5	FLOW IN STORM SEWER
20a	5.6	12.3	STREET FLOW
20b	49.4	99.2	FLOW IN STORM SEWER
21	7.2	17.5	STREET FLOW
23	8.7	26.7	STREET FLOW
24	57.8	115.5	FLOW IN STORM SEWER
24a	65.0	118.6	FLOW IN STORM SEWER
25	10.0	26.4	STREET FLOW
27	8.4	28.3	STREET FLOW
28	73.4	132.7	FLOW IN STORM SEWER
28a	80.6	133.4	FLOW IN STORM SEWER
29	9.2	27.8	STREET FLOW
30	89.8	153.9	FLOW IN STORM SEWER

RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
31	10.5	23.2	STREET FLOW
32	10.3	27.5	STREET FLOW
32a	18.2	42.8	FLOW IN STORM SEWER
33	7.0	28.7	STREET FLOW AT EX. INLET
34	115.0	225.4	FLOW IN EX. 54" STM
36	11.4	25.2	STREET FLOW
37	7.4	16.3	STREET FLOW
38	7.5	10.5	FLOW IN STORM SEWER
39	12.7	34.0	STREET FLOW
40	23.0	37.0	FLOW IN STORM SEWER
41	9.3	27.7	STREET FLOW
42	32.3	62.1	FLOW IN STORM SEWER
43	10.0	24.5	STREET FLOW
44	42.3	87.1	FLOW INTO EX. STORM SEWER
45	7.7	17.1	STREET FLOW AT EX. INLET

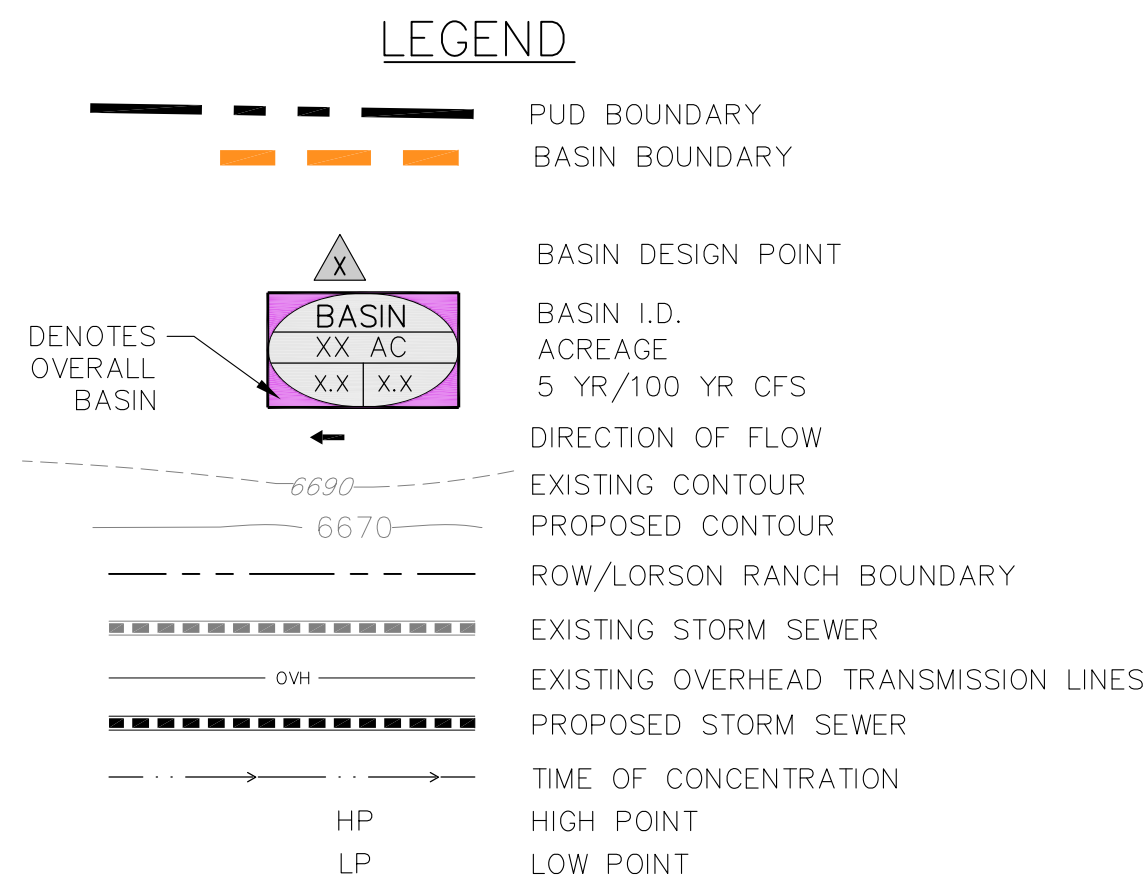


**DETENTION POND AREAS:**

1. C1 BASINS DRAIN TO POND C1
2. C3 & C4 BASINS DRAIN TO POND C2.1
3. C5 BASINS DRAIN TO POND C2.2
4. C8 BASINS DRAIN TO POND C4
5. F1.3-F1.4 BASINS DRAIN TO WQ POND F (NO DETENTION, WQ ONLY)

\*ALL DETENTION PONDS HAVE BEEN CONSTRUCTED PER SF 21-010 AND EGP 20-005 (THE HILLS AT LORSON RANCH) EXCEPT WQ POND F

\*\*SEE POND EXHIBIT FOR POND LOCATIONS



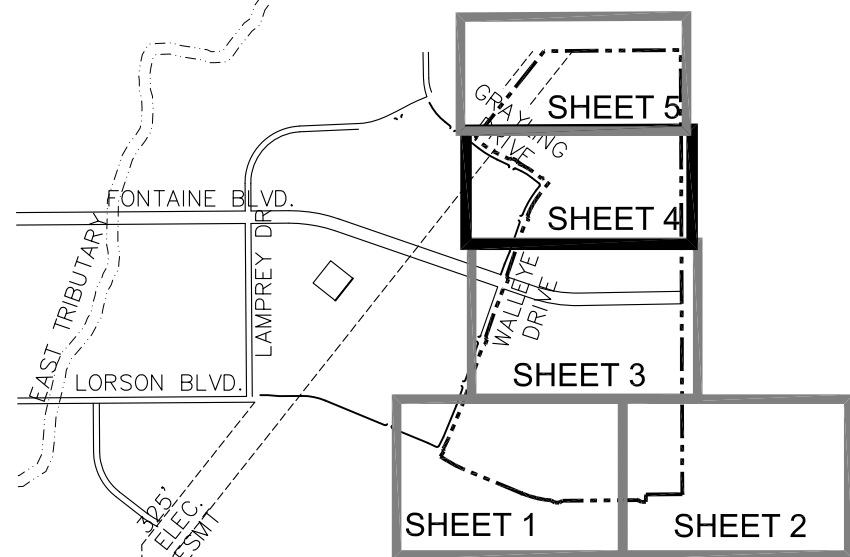
**CORE ENGINEERING GROUP**  
15004 1ST AVE. S.  
BURNSVILLE, MN 55306  
PH: 612-570-0000  
FAX: 612-570-0001  
EMAIL: Rich@cegi.com

**THE RIDGE AT LORSON RANCH**  
212 N. WAHSAUGH AVE. SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

**DEVELOPED CONDITIONS**  
**THE RIDGE AT LORSON RANCH**

DATE: JULY, 2021  
PROJECT NO: 100.064  
SHEET NUMBER: 3  
TOTAL SHEETS: 5





KEY MAP  
NO SCALE

RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
36	11.4	25.2	STREET FLOW
37	7.4	16.3	STREET FLOW
38	7.5	10.5	FLOW IN STORM SEWER
39	12.7	34.0	STREET FLOW
40	23.0	37.0	FLOW IN STORM SEWER
41	9.3	27.7	STREET FLOW
42	32.3	62.1	FLOW IN STORM SEWER
43	10.0	24.5	STREET FLOW
44	42.3	87.1	FLOW INTO EX. STORM SEWER
45	7.7	17.1	STREET FLOW AT EX. INLET
47	7.5	16.4	STREET FLOW
48	3.4	7.6	STREET FLOW

RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
49	7.7	27.7	STREET FLOW
50	11.1	27.0	FLOW INTO EX. STORM SEWER
51	4.5	26.0	STREET FLOW AT EX. INLET
52	15.6	53.0	FLOW IN EX. STORM SEWER
53	10.6	26.5	STREET FLOW
54	11.8	37.6	STREET FLOW
55	21.4	40.2	FLOW IN STORM SEWER
56	9.0	32.8	STREET FLOW
57	11.0	24.1	STREET FLOW
58	17.1	28.1	FLOW IN STORM SEWER
59	7.0	15.5	STREET FLOW
60	32.7	73.3	FLOW IN STORM SEWER

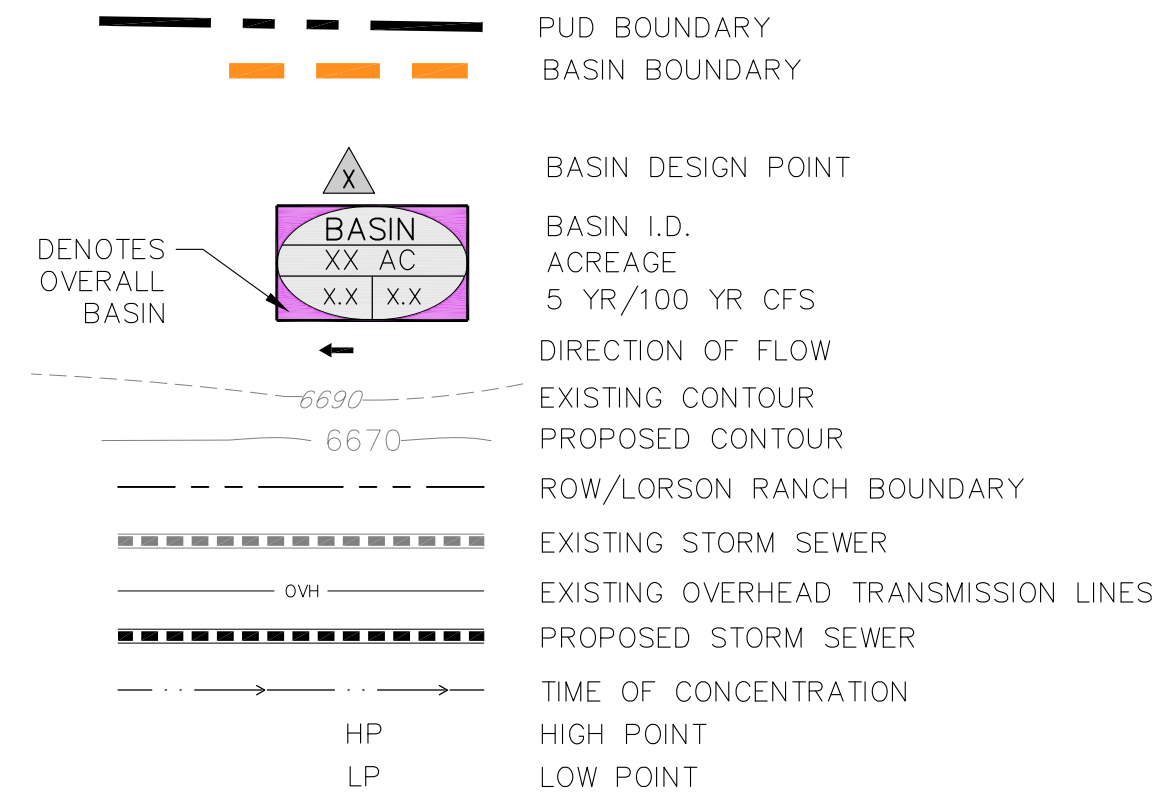
#### DETENTION POND AREAS:

1. C1 BASINS DRAIN TO POND C1
2. C3 & C4 BASINS DRAIN TO POND C2.1
3. C5 BASINS DRAIN TO POND C2.2
4. C8 BASINS DRAIN TO POND C4
5. F1.3-F1.4 BASINS DRAIN TO WQ POND F (NO DETENTION, WQ ONLY)

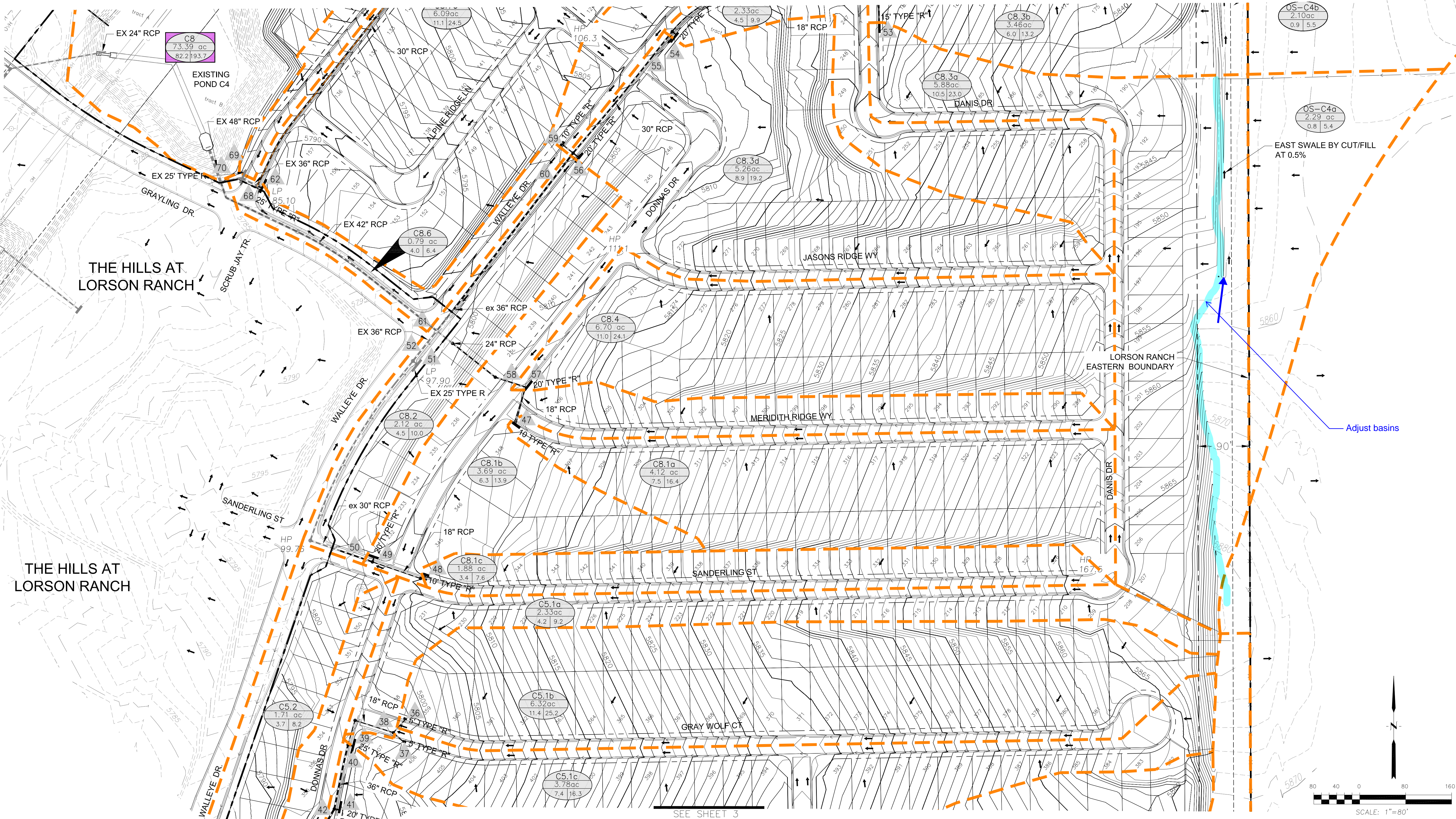
\*ALL DETENTION PONDS HAVE BEEN CONSTRUCTED PER SF 21-010 AND EGP 20-005 (THE HILLS AT LORSON RANCH) EXCEPT WQ POND F

\*\*SEE POND EXHIBIT FOR POND LOCATIONS

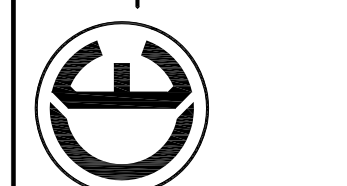
#### LEGEND



SEE SHEET 5



**CORE**  
ENGINEERING GROUP



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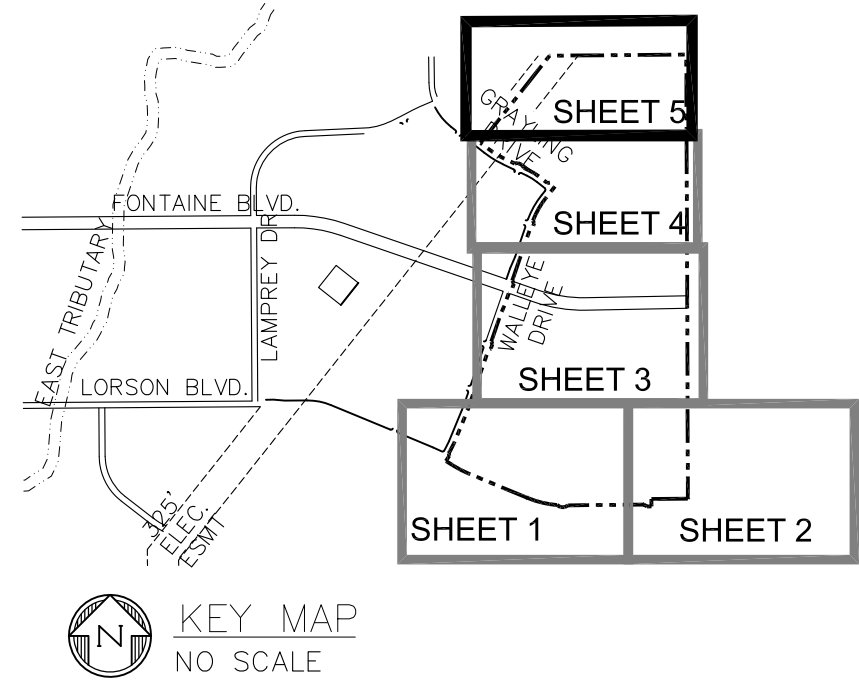
PROJECT: THE RIDGE AT LORSON RANCH  
PREPARED FOR: LORSON, LLC  
212 N. WAHSAUGH AVE. SUITE 301  
COLORADO SPRINGS, COLORADO 80903  
(719) 635-3200  
CONTACT: JEFF MARK

DRAWN: RL6  
DESIGNED: LB  
CHECKED: LB

DEVELOPED CONDITIONS  
THE RIDGE AT LORSON RANCH  
X

DATE: JULY, 2021  
PROJECT NO.: 100.064  
SHEET NUMBER: 4  
TOTAL SHEETS: 5





RUNOFF SUMMARY			
D.P.	5 YEAR cfs	100 YEAR cfs	NOTES
62	14.3	37.4	STREET FLOW
63	11.5	25.6	STREET FLOW
63a	6.9	39.9	OFFSITE FLOW
64	10.7	30.6	STREET FLOW
65	20.0	33.4	FLOW IN STORM SEWER
66	1.5	14.5	STREET FLOW
67	21.5	45.2	FLOW IN STORM SEWER
68	33.0	76.5	FLOW INTO EX. STORM SEWER
69	9.3	26.9	STREET FLOW AT EX. INLET
70	34.5	86.3	FLOW IN EX. 42" STORM SEWER

DETENTION POND AREAS:

1. C1 BASINS DRAIN TO POND C1
2. C3 & C4 BASINS DRAIN TO POND C2.1
3. C5 BASINS DRAIN TO POND C2.2
4. C8 BASINS DRAIN TO POND C4
5. F1.3-F1.4 BASINS DRAIN TO WQ POND F (NO DETENTION, WQ ONLY)

\*ALL DETENTION PONDS HAVE BEEN CONSTRUCTED PER SF 21-010 AND EGP 20-005 (THE HILLS AT LORSON RANCH) EXCEPT WQ POND F

\*\*SEE POND EXHIBIT FOR POND LOCATIONS

