# FINAL DRAINAGE PLAN

# FONTAINE BOULEVARD AND LAMPREY DRIVE

**DECEMBER 20, 2017**

***Prepared for:***

Lorson, LLC
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Project No. 100.041

CORE ENGINEERING GROUP

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## ENGINEER'S STATEMENT

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

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

## OWNER'S STATEMENT

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

Lorson, LLC Date

By
Jeff Mark

Title
Manager

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

## FLOODPLAIN STATEMENT

To the best of my knowledge and belief, this development is located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. 08041C0957 F and 08041C1000 F, dated March 17, 1997 and modified by modified per LOMR Case No. 14-08-0534P. (See Appendix A, FEMA FIRM Exhibit)

Richard L. Schindler, #33997 Date

## EL PASO COUNTY

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

Jennifer Irvine Date
County Engineer/ECM Administrator

Conditions: ______________________________

## 1.0 LOCATION and DESCRIPTION

Fontaine Boulevard and Lamprey Drive will serve as the main access points for Lorson Ranch East subdivision. Lorson Ranch East is located east of the East Tributary of Jimmy Camp Creek. The site is located on approximately 275 acres of vacant land. Future plans are to develop this site into single-family residential developments. Also included in this report and plan is the proposed layout for Lorson Ranch East which is located east of the East Tributary of Jimmy Camp Creek. The land is currently owned by Lorson LLC or its nominees for Lorson Ranch.

The site is located in the West 1/2 of Sections 14 & 23, South ½ of Section 13, and the North ½ of Section 24, Township 15 South and Range 65 West of the 6$^{th}$ Principal Meridian. The property is bounded on the north by un-platted land in Banning Lewis Ranch and Rolling Hills Ranch, on the east by unplatted land and a 325' electric easement in Lorson Ranch, the west by The East Tributary of Jimmy Camp Creek, and the south by unplatted land in Lorson Ranch. For reference, a vicinity map is included in Appendix A of this report.

Fontaine Boulevard will be constructed from Old Glory Drive east 3,500 feet to the 325' electrical line easement. Lamprey Drive will be constructed from Fontaine Boulevard north and east 2,100 feet. Both of these streets will include a trunk line storm sewer system that will serve Lorson Ranch East and the remaining development in Lorson Ranch East of the 325' electric line easement.

Conformance with applicable Drainage Basin Planning Studies

There is an existing (unapproved) DBPS for Jimmy Camp Creek prepared by Wilson & Company in 1987, and is referenced in this report. The only major drainage improvements for this study area according to the 1987 Wilson study was the reconstruction of the East Tributary of Jimmy Camp Creek (East Tributary). In 2014 a portion of the East Tributary was reconstructed from Fontaine Boulevard south 2,800 feet in accordance with the 1987 study. This section of the East Tributary included a trapezoidal channel section with 6:1 side slopes and a sand bottom. 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. Per the Kiowa DBPS concept the preferred channel improvements include selective channel armoring on outer bends and a low flow channel for the East Tributary. Channel improvements in the East Tributary are potentially reimbursable against drainage fees for future development but need to go through the county process for reimbursement. The only major infrastructure not shown in the Kiowa DBPS is the future bridge for Fontaine Boulevard and Lorson Boulevard on the East Tributary. The Fontaine Boulevard bridge is considered to be potentially reimbursable but must go through the county process for reimbursement. The Lorson Boulevard bridge is not considered reimbursable.

Conformance with Lorson East MDDP & PDR by Core Engineering Group

Core Engineering Group has submitted a MDDP for Lorson East which covers this drainage area and the East Tributary. This FDR conforms to the MDDP and PDR for Lorson East and is referenced in this report. The major infrastructure to be constructed in this FDR site includes the East Tributary reconstruction north of Fontaine Boulevard (Kiowa report), bridge over the East Tributary at Fontaine Blvd (Kiowa report), storm sewer in Fontaine Boulevard and Lamprey Drive, and storm sewer oversizing for emergency overflow conveyance in Fontaine Boulevard.

Reconstruction of the East Tributary of Jimmy Camp Creek

The Kiowa DBPS shows the East Tributary to be protected using selective armoring (soil rip rap) at the outside stream bends (500' minimum radius) and a stabilized low flow channel. The East Tributary can be divided into three different sections, south, middle, and north. The first section (south) is from the south property line east and north to design point ET-3 (see drainage map) and is roughly 2,900 feet in length. The south section is not adjacent to this preliminary plan but it will be armored in accordance

(separate submittal)

with the Kiowa DBPS in the future as development occurs. The 100-year flow rate for design is 5,500cfs for the south section. The middle section is from Design Point ET-3 north 2,800 feet to the future extension of Fontaine Boulevard. The channel for this section was reconstructed and stabilized in 2014 in accordance with the 1987 Wilson DBPS. The only infrastructure left to construct are the bridges over the creek at Fontaine Boulevard and Lorson Boulevard for the middle section. LOMR Case No. 14-08-0534P was approved by FEMA for this middle section. The northern section is from Fontaine Boulevard and extends north to the north property line. The north section will be constructed in conformance with the Kiowa DBPS during the first phase of development east of the East Tributary. The channel consists of a stabilized low flow channel and soil rip rap armored outer bends. Kiowa Engineering has submitted construction plans to El Paso County for this section of creek including bridges for Lorson Boulevard and Fontaine Boulevard. A CLOMR for the creek and bridge construction is currently submitted to FEMA under Case No. 17-08-1043R. The 100-year flow rate for design is from FEMA FIS data and is from 4,400cfs to 4,750cfs for this section. The low flow channel is sized using 10% of the 100-yr FEMA flow rates and is from 440cfs to 475cfs.

Lorson Ranch East is located within the ***"Jimmy Camp Creek Drainage Basin"***, which is a fee basin in El Paso County.

## 2.0 DRAINAGE CRITERIA

The supporting drainage design and calculations were performed in accordance with the City of Colorado Springs and El Paso County "Drainage Criteria Manual (DCM)", dated November, 1991, the El Paso County "Engineering Criteria Manual", Chapter 6 and Section 3.2.1 Chapter 13 of the City of Colorado Springs Drainage Criteria Manual dated May 2014, and the UDFCD "Urban Storm Drainage Criteria Manual" Volumes 1, 2 and 3 for inlet sizing and full spectrum ponds. No deviations from these published criteria are requested for this site. The proposed improvements to the Lorson Ranch Development will be in substantial compliance with the "Jimmy Camp Creek Drainage Basin Planning Study", prepared by Kiowa Engineering Corp., Colorado Springs, CO.

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 is required for Lorson Ranch East. Detention pond calculations will be finalized when the first final plat for Lorson Ranch East is submitted.

Fontaine Blvd. to be constructed after approval of detention pond design(?)

## 3.0 EXISTING HYDROLOGICAL CONDITIONS

The 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 Lorson Ranch East property as Ascalon sandy loam (4%); Manzanola clay loam (17%); Midway clay loam (5%): Nelson-Tassel fine Sandy loam (50%); Razor clay loam (10%); and Wiley silt loam (13%) [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 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 will 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 |
|---|---|---|---|---|---|
| 2-Ascalon Sandy Loam - (4%) | B | Moderate | Moderate | Slow to Medium | Moderate |
| 3-Ascalon Sandy Loam - (9%) | B | Moderate | Moderate | Slow to Medium | Moderate |
| 52-Manzanola Clay Loam (17%) | C | High | Slow | Medium | Moderate |
| 54-Midway Clay Loam (5%) | C | High | Slow | Medium to Rapid | Moderate to High |
| 56-Nelson – Tassel Fine Sandy Loam (50%) | B | Moderate | Moderately Rapid | Slow | Moderate |
| 75-Razor Clay Loam (10%) | C | High | Slow | Medium | Moderate |
| 108-Wiley Silt Loam (13%) | B | Moderate | Moderate | Medium | Moderate |

Excerpts from the SCS “Soil Survey of El Paso County Area, Colorado” [2] 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, within existing transmission towers, is adjacent to this site on the east side of this portion of the development and will be set aside as open space in the future. It is the intent of this drainage report to utilize some of the open space under the towers for detention of storm flows.

The FMIC (irrigation canal) that runs parallel with the East Tributary through this site was decommissioned in 2006 and will be filled in during the early grading process. For the purpose of existing drainage calculations the canal was ignored and all flow was assumed to flow to the East Tributary.

Portions of the site are 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 08041C0957 F & 08041C1000 F, effective 17 March 1997 [2]. Floodplain along the East Tributary was modified per LOMR Case No. 14-08-0534P (see appendix). Floodplain designations include Zone AE and Zone X within the property boundary. A portion of this map is provided in ***Appendix A*** for reference. A CLOMR for the creek and bridge construction which includes grading to remove some areas from the current floodplain is currently submitted to FEMA under Case No. 17-08-1043R.

The existing basins for this large site were taken from the Lorson Ranch East MDDP East of the East Tributary. A map has been included in the appendix.

Basin EX-A1
This 4.28 acre basin is in the northwest corner of the site and includes part of the East Tributary. Under existing conditions, this area contributes 1.1 cfs and 8.0 cfs to the East Tributary for 5-year and 100-year events respectively. This basin comprises of the East Tributary and will not be developed in the future.

Overall Basin EX-C flows to Design Point 2
This is the largest existing basin at 452.97 acres which includes approximately the northern half of the site. This basin is an overall existing basin including Basins EX-C1 to EX-C10. There are two offsite basins (OS-C6.1 and OS-C5.1) which flow onto the site from the north and east and are included in the flow at Design Point 2. Under existing conditions, this basin contributes 141.0 cfs and 458.0 cfs for the 5-year and 100-year events respectively at Design Point 2. Design Point 2 is located at the East Tributary and all flow is routed to the East Tributary in an existing swale that is eroded and is not armored. The storm sewer infrastructure in Fontaine Boulevard and Lamprey Drive will serve this basin.

Existing flow at Design Pt. 18
This condition will occur after the 66" storm sewer from Pond C5 is constructed east to the future Wacissa Drive terminating in a temporary sediment basin and 84" standpipe. This condition will exist until the adjacent residential areas are developed. The 66" storm sewer will accept existing runoff from the NE from Basin EX3 (158ac). The existing 100year flow is estimated to be 210cfs. The capacity of the 66" storm sewer is 230cfs in the future conditions.

Existing flow at Design Pt. 27
This condition will occur after the 42" storm sewer north from Fontaine Boulevard is constructed. The 42" storm sewer will collect runoff from a temporary swale at Design Point 27. This condition will exist until the adjacent residential areas are developed. The 42" storm sewer will accept existing runoff from the SE from Basin EX2 (80ac). The existing 100year flow is estimated to be 110cfs which does not exceed the capacity of the 42" storm sewer.

Existing flow at Design Pt. 3f
This condition will occur after the 54" storm sewer in Fontaine Boulevard is constructed. The 54" storm sewer will collect runoff from a temporary swale at Design Point 3f. This condition will exist until development in Phase 2 of Lorson Ranch East constructs the ponds under the electric line. The 54" storm sewer will accept existing runoff from the SE from Basin EX1 (120ac). The existing 100year flow is estimated to be 176cfs which does not exceed the capacity of the 54" storm sewer which is 200cfs in the future conditions.

## 4.0 DEVELOPED HYDROLOGICAL CONDITIONS

Hydrology for the **Lorson Ranch East** 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.

Since the majority of this site will consist of import material, soil type C/D has been assumed for the hydrologic conditions because mass grading will occur and soil types will be moved around. This approach will provide a more conservative approach to designing the storm sewer infrastructure. 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 the City of Colorado Springs/El Paso County Drainage Criteria Manual.

The hydrology analysis necessary for sizing the storm sewer system is preliminary for residential areas and final design for areas directly tributary to Fontaine Boulevard and Lamprey Drive. The tributary residential areas will be finalized when the final plats are prepared.

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

<u>Overall Basin C</u>
Overall Basin C includes all of the “C” basins that drain to Pond C5. This basin was included to provide sizing data to design Pond C5 WQ and EURV in the full spectrum worksheets. The total size of this basin is 171 acres and comprises of residential development. There is runoff from a future school site which has been included for water quality in Pond C5. The future school site will be required to detain runoff to existing flow rates to several storm outfall points provided on Lamprey Drive and Fontaine Boulevard.

<u>Basin A1</u>
Basins A1 consists of flow from backyards and the East Tributary of Jimmy Camp Creek. Runoff is directed north to the East Tributary of Jimmy Camp Creek. See the appendix for detailed calculations. See Section 6.0 for water quality discussions.

<u>Basin C12</u>
Basin C12 consists of future residential development located South of Tolt Drive and Lamprey Drive. Runoff will be directed north in the future curb/gutter to Design Point 2 in Tolt Drive. The future peak developed flow from this basin is 33.0cfs and 73.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C13</u>
Basin C13 consists of future school site NE of Lamprey Drive and Fontaine Boulevard. Runoff will be directed west internally to a 30” storm sewer stub from Lamprey Drive at Design Point 6c. The peak developed flow from this basin will be required to be detained to pre-development conditions on the school site with a release rate not to exceed 7.6cfs and 40.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C13.1</u>
Basin C13.1 consists of runoff from Lamprey Drive on the south side. Runoff will be directed west in the curb/gutter to Design Point 6b in Lamprey Drive where it will be collected by a Type R inlet. The developed flow from this basin is 6.4cfs and 11.5cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C14</u>
Basin C14 consists of runoff from Fontaine Bouevard on the north side. Runoff will be directed west in the curb/gutter to Design Point 33 in Lamprey Drive where it will be collected by a Type R inlet. The developed flow from this basin is 6.6cfs and 13.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C14.1</u>
Basin C14.1 consists of runoff from the future school site to Fontaine Bouevard on the north side. Runoff will be directed south internally to Design Point 19c in Fontaine Boulevard where it will be

collected by a Type R inlet. The peak developed flow from this basin will be required to be detained to pre-development conditions on the school site with a release rate not to exceed 2.4cfs and 12.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C14.2</u>
Basin C14.2 consists of runoff from Fontaine Bouevard on the north side. Runoff will be directed in the curb/gutter to Design Point 19c in Fontaine Boulevard where it will be collected by a Type R inlet. The developed flow from this basin is 5.8cfs and 11.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.1</u>
Basin C15.1 consists of runoff from areas under the electric easement and residential development. Runoff will be directed west to Design Point 21 in a swale where it will be collected by a storm sewer. The developed flow from this basin is 6.9cfs and 22.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.2</u>
Basin C15.2 consists of runoff from areas under the electric easement, MVEA substation, and residential development. Runoff will be directed west to Design Point 21 in a swale where it will be collected by a storm sewer. The developed flow from this basin is 7.6cfs and 19.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.3-C15.4</u>
These basins consist of runoff from residential development. Runoff will be directed north to Design Point 23 in curb/gutter where it will be collected by a Type R inlet on Tillamook Drive. The developed flow from these basins is 9.0cfs and 20.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.5</u>
This basin consists of runoff from residential development. Runoff will be directed north to Design Point 24 in curb/gutter. The developed flow from these basins is 5.9cfs and 13.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.6</u>
This basin consists of runoff from residential development and Rockcastle Drive. Runoff will be directed west in Rockcastle Drive. The developed flow from these basins is 3.3cfs and 7.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.7</u>
This basin consists of runoff from residential development and Rockcastle Drive. Runoff will be directed west in Rockcastle Drive. The developed flow from these basins is 3.9cfs and 8.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.8</u>
Basin C15.8 consists of runoff from Fontaine Boulevard on the south side, residential lots, Rockcastle Drive, and open space under the existing electric lines. Runoff will be directed north in the curb/gutter to Design Point 20 in Fontaine Boulevard where it will be collected by a Type R inlet. The developed flow from this basin is 5.2cfs and 13.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

<u>Basin C15.9</u>

Basin C15.9 consists of runoff from Fontaine Boulevard on the south side. Runoff will be directed west in the curb/gutter. The developed flow from this basin is 4.9cfs and 11.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.10

Basin C15.10 consists of runoff from Fontaine Boulevard on the south side, and residential lots. Runoff will be directed west in the curb/gutter to Design Point 29 at the SE corner of the Fontaine Boulevard/Lamprey Drive intersection where it will be collected by a Type R inlet. The developed flow from this basin is 1.2cfs and 2.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.11

These basins consist of runoff from residential development and Vedder/Rockcastle Drive. Runoff will be directed north to Design Point 25 in curb/gutter where it will be collected by a Type R inlet on Rockcastle Drive. The developed flow from these basins is 6.1cfs and 13.7cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.12

This basin consists of runoff from residential development and Rockcastle Drive. Runoff will be directed west in Rockcastle Drive to Design Point 25 where it will be collected by a Type R inlet. The developed flow from these basins is 1.2cfs and 2.6cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.13

Basin C15.13 consists of runoff from residential development and Vedder/Rockcastle Drive. Runoff will be directed north to Design Point 26 in curb/gutter where it will be collected by a Type R inlet on Rockcastle Drive. The developed flow from this basin is 4.5cfs and 10.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.14

These basins consist of runoff from residential development and Lamprey Drive. Runoff will be directed north to Design Point 29 in curb/gutter where it will be collected by a Type R inlet on Lamprey Drive. The developed flow from this basin is 2.9cfs and 6.4cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C15.15

These basins consist of runoff from residential development and Lamprey Drive. Runoff will be directed north to Design Point 30 in curb/gutter where it will be collected by a Type R inlet on Lamprey Drive. The developed flow from this basin is 7.2cfs and 16.0cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.1

Basin C16.1 consists of residential development located NE of Yamhill and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive and then south to Design Point 3 to a proposed Type "R" inlet in Yamhill Drive. The peak developed flow from this basin is 6.0cfs and 13.3cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.2

Basin C16.2 consists of residential development and Lamprey Drive. Runoff is directed west in curb/gutter in Lamprey Drive and to Design Point 3 to a proposed Type "R" inlet in Yamhill Drive. The peak developed flow from this basin is 3.6cfs and 7.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.3
Basin C16.3 consists of residential development located NE of Shavers Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive and then south to Design Point 6a to a proposed Type “R” inlet in Shavers Drive. The peak developed flow from this basin is 3.6cfs and 7.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.4
Basin C16.4 consists of residential development located east of Shavers Drive on Lamprey Drive. Runoff is directed west in curb/gutter in Lamprey Drive and to Design Point 8 to a proposed Type “R” inlet in Shavers Drive. The peak developed flow from this basin is 1.7cfs and 3.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.5, C16.6, C16.7, C16.8, C16.9, C16.10
Basin C16.5-C16.10 consists of residential development located NE of Yamhill Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Design Point 4 in Mumford Drive. See the appendix for detailed calculations for these basins.

Basin C16.11, C16.12, C16.13
Basin C16.11-C16.13 consists of residential development located NE of Napa Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Type “R” inlet at Design Point 6 in Mumford Drive. See the appendix for detailed calculations for these basins.

Mumford?

two proposed inlets

Basin C16.14 & C16.15
Basin C16.14 & C16.15 consist of residential development located north of Shavers Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Mumford Drive to Design Point 6a and Design Point 7 to a proposed Type “R” inlet in Shavers Drive. See the appendix for detailed calculations.

Shavers

Basin C16.16 & C16.17
Basin C16.16 & C16.17 consist of residential development located NE of Clarion Drive and Lamprey Drive. Runoff is directed southwest in curb/gutter in Lamprey Drive to a proposed Type “R” inlet in Clarion Drive at Design Point 10. See the appendix for detailed calculations.

and Clarion and Mumford

Basin C16.18
Basin C16.18 consists of residential development located North of Clarion Drive and Mumford Drive. Runoff is directed south in curb/gutter in Mumford Drive to Design Point 10a to a proposed Type “R” inlet in Mumford Drive. The peak developed flow from this basin is 5.5cfs and 12.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.19
Basin C16.19 consists of residential development located on Clarion Drive. Runoff is directed southwest in curb/gutter in Clarion Drive to Design Point 16 to a proposed Type “R” inlet in Wacissa Drive. The peak developed flow from this basin is 3.1cfs and 6.9cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C16.20, C16.21
Basins C16.20 and C16.21 consist of residential development located on Nash and Wacissa Drive. Runoff is directed southwest in curb/gutter in Nash and Wacissa Drive to Design Point 12a to a proposed Type “R” inlet in Nash Drive. See the appendix for detailed calculations

Basin C16.22 & C16.23
Basins C16.22 & C16.23 consist of residential development located on Nash Drive. Runoff is directed southwest in curb/gutter in Nash Drive to Design Point 12 to a proposed Type “R” inlet in Nash Drive. See the appendix for detailed calculations

Basin C16.24?

Basin C16.25

Basins C16.25 consists of residential development located on Wacissa Drive. Runoff is directed south in curb/gutter in Wacissa Drive to Design Point 17 to a proposed Type “R” inlet in Wacissa Drive. See the appendix for detailed calculations

Basin C16.26

Basins C16.26 consists of residential development located on Mumford Drive. Runoff is directed north in curb/gutter in Mumford Drive to Design Point 10b to a proposed Type “R” inlet at Mumford/Clarion Drive. See the appendix for detailed calculations

Basin C16.27

Basins C16.27 consists of residential development located on Mumford Drive. Runoff is directed north in curb/gutter in Mumford Drive to Design Point 10c to a proposed Type “R” inlet at Mumford/Clarion Drive. See the appendix for detailed calculations

Basin C16.28 & C16.29

Basins C16.28 & C16.29 consist of residential development located on Clarion, Wacissa, Zealand, Ballona Drive. Runoff is directed northwest in curb/gutter in Wacissa Drive to Design Point 16 to a proposed Type “R” inlet in Wacissa Drive. See the appendix for detailed calculations

Basin C16.30

Basins C16.30 consists of residential development located on Wacissa and Tarbell Drive. Runoff is directed south in curb/gutter in Wacissa Drive to Design Point 14 to a proposed Type “R” inlet in Wacissa Drive. See the appendix for detailed calculations

Basin C16.31

Basins C16.31 consists of backyards of houses on Wacissa Drive, East Tributary, and open space. Runoff is directed overland to the East Tributary. See Section 6.0 for water quality discussions for backyards. See the appendix for detailed calculations

Basin C16.32

Basins C16.32 consists of residential development located on Wacissa and Mumford Drive. Runoff is directed north in curb/gutter in Wacissa Drive to Design Point 17 to a proposed Type “R” inlet. See the appendix for detailed calculations

Basin C16.33

Basins C16.33 consist of flow from Lamprey Drive and Fontaine Boulevard. Runoff is directed in curb/gutter in to a proposed Type “R” inlet in the NE corner of Fontaine Boulevard and Lamprey Drive at Design Point 33. See the appendix for detailed calculations

Basin C16.34

Basins C16.34 consists of flow from Lamprey Drive and the adjacent backyards. Runoff is directed south in curb/gutter in to a proposed Type “R” inlet in the NW corner of Fontaine Boulevard and Lamprey Drive at Design Point 34. See the appendix for detailed calculations

Basin C16.35

Basins C16.35 consists of flow from residential development and Fontaine Boulevard. Runoff is directed south and west in curb/gutter in to a proposed Type “R” inlet in the NE corner of Fontaine Boulevard and Edisto Drive at Design Point 35. See the appendix for detailed calculations

Basin C16.36

Basins C16.36 consists of flow from residential development and Pond C5. Runoff is directly tributary to Pond C5. See the appendix for detailed calculations

Basin C17.1

Basin C17.1 consists of residential development located in Weiser and Matta Drives. Runoff is directed northwest in curb/gutter to Design Point 38 to a proposed Type “R” inlet in Matta Drive. The peak developed flow from this basin is 5.9cfs and 13.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.1a

Basin C17.1a consists of residential development located in Weiser, Pigeon, and Aliso Drives. Runoff is directed north in curb/gutter to Design Point 28 to a proposed Type “R” inlet in Weiser Drive. The peak developed flow from this basin is 5.3cfs and 11.8cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.2

Basin C17.2 consists of residential development located in Chaplin, Pigeon, Aliso, and Matta Drives. Runoff is directed north in curb/gutter to Design Point 39 to a proposed Type “R” inlet in Matta Drive. The peak developed flow from this basin is 8.6cfs and 19.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.3

Basin C17.3 consists of residential development located in Lamine and Matta Drives. Runoff is directed north in curb/gutter to Design Point 40 to a proposed Type “R” inlet in Lamine Drive. The peak 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 C17.4

Basin C17.4 consists of residential development located in Matta Drive. Runoff is directed west in curb/gutter to Design Point 40 to a proposed Type “R” inlet in Lamine Drive. The peak developed flow from this basin is 3.2cfs and 7.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.5

Basin C17.5 consists of residential development and Fontaine Boulevard. Runoff is directed west in curb/gutter to Design Point 40 to a proposed Type “R” inlet in Lamine Drive. The peak developed flow from this basin is 6.7cfs and 22.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.6

Basin C17.6 consists of residential development located in Lamine Drive. Runoff is directed north in curb/gutter to Design Point 41 to a proposed Type “R” inlet in Lamine Drive. The peak developed flow from this basin is 1.9cfs and 6.1cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.7

Basin C17.7 consists of backyards of houses on Lamine Drive, East Tributary, and open space. Runoff is directed overland to the East Tributary. See Section 6.0 for water quality discussions for backyards. See the appendix for detailed calculations

Basin C17.8

Basin C17.8 consists of residential development and Fontaine Boulevard on the north side. Runoff is directed west in curb/gutter to Design Point 42 to a proposed Type “R” inlet in Fontaine Boulevard. The peak developed flow from this basin is 3.2cfs and 7.2cfs for the 5/100-year storm event. See the appendix for detailed calculations.

Basin C17.9

Basin C17.9 consists of existing residential development in Meadows 3 and Fontaine Boulevard. Runoff is directed in curb/gutter to Design Point 47 to a proposed Type "R" inlet in Fontaine Boulevard on the south side. The peak developed flow from this basin is 7.8cfs and 13.9cfs for the 5/100-year storm event. See the appendix for detailed calculations. This basin will flow north to existing Pond B1. Pond B1 has been sized for this flow per the Pioneer Landing Filing No. 2 Final drainage report.

Basin C17.10

Basin C17.10 consists of existing residential development in Pioneer Landing and Fontaine Boulevard. Runoff is directed in curb/gutter to Design Point 48 to a proposed Type "R" inlet in Fontaine Boulevard on the north side. The peak developed flow from this basin is 8.9cfs and 16.0cfs for the 5/100-year storm event. See the appendix for detailed calculations. This basin will flow north to existing Pond B1. Pond B1 has been sized for this flow per the Pioneer Landing Filing No. 2 final drainage report.

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

## 5.0 HYDRAULIC SUMMARY

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

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

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

| | Residential Local | | Residential Collector | | Principal Arterial | |
|---|---|---|---|---|---|---|
| Street Slope | 5-year | 100-year | 5-year | 100-year | 5-year | 100-year |
| 0.5% | 6.3 | 26.4 | 9.7 | 29.3 | 9.5 | 28.5 |
| 0.6% | 6.9 | 28.9 | 10.6 | 32.1 | 10.4 | 31.2 |
| 0.7% | 7.5 | 31.2 | 11.5 | 34.6 | 11.2 | 33.7 |
| 0.8% | 8.0 | 33.4 | 12.3 | 37.0 | 12.0 | 36.0 |
| 0.9% | 8.5 | 35.4 | 13.0 | 39.3 | 12.7 | 38.2 |
| 1.0% | 9.0 | 37.3 | 13.7 | 41.4 | 13.4 | 40.2 |
| 1.4% | 10.5 | 44.1 | 16.2 | 49.0 | 15.9 | 47.6 |
| 1.8% | 12.0 | 45.4 | 18.4 | 50.4 | 18.0 | 50.4 |
| 2.2% | 13.3 | 42.8 | 19.4 | 47.5 | 19.5 | 47.5 |
| 2.6% | 14.4 | 40.7 | 18.5 | 45.1 | 18.5 | 45.1 |
| 3.0% | 15.5 | 39.0 | 17.7 | 43.2 | 17.8 | 43.2 |
| 3.5% | 16.7 | 37.2 | 16.9 | 41.3 | 17.0 | 41.3 |
| 4.0% | 17.9 | 35.7 | 16.2 | 39.7 | 16.3 | 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)

It is the intent of this report to construct inlets on Fontaine Boulevard located at the ultimate 4-lane curb location so reconstruction of inlets will not be necessary when Fontaine is widened.

Provide DPs (19c, 20, 42 and 47?)

Design Point 1

Design Point 1 is located at the East Tributary of Jimmy Camp Creek on the north property line. A swale along the north property line will re-direct offsite runoff from Basin OS-C11 westward to the East Tributary so the lots are not burdened with offsite flows. The swale is a "V" swale, 2.5' deep, and at a minimum slope of 1%, and conveys the runoff from the 100-year storm event of 21cfs at a depth of 1.3' deep. The total flow is 9.4cfs and 21cfs in the 5/100-year storm events

Design Point 2

Design Point 2 is located at the south side of the intersection of Tolt Drive and Lamprey Drive.

This design point is sized to accommodate future flows from Basin C12 when it is developed as residential lots per the MDDP. A 30" RCP will be stubbed to this area to collect the flows. Future development will be required to construct storm sewer and inlets to collect runoff. Flow from upstream tributary areas (non-developed) are calculated in Basin C12-ex. Detention Pond C2 and Pond C3 will need to be partially constructed to reduce the runoff from Basin C12-ex to 24.9cfs and 41.8cfs in the 5 & 100-year storm events

(5-year storm)

**Tributary Basins:** C12
**Inlet/MH Number:** n/a
**Upstream flowby:** 0
**Total Street Flow:**

**Flow Intercepted:** 33.0 cfs
**Flow Bypassed:**
**Inlet Size:** n/a – storm sewer installed in future development

**Street Capacity:**

(100-year storm)

**Tributary Basins:** C12
**Inlet/MH Number:** n/a
**Upstream flowby:** 0
**Total Street Flow:**

**Flow Intercepted:** 40.5 cfs
**Flow Bypassed:** 33.0 cfs to Inlet 6b
**Inlet Size:** n/a – storm sewer installed in future development

***Comments:*** Street slope = 0.9%, capacity = 39.3cfs (half street) is okay

Design Point 3

Design Point 3 is located at the SE corner of Yamhill Drive and Mumford Drive

(5-year storm)

**Tributary Basins:** C16.1 & C16.2
**Inlet/MH Number:** Inlet DP3
**Upstream flowby:** 0cfs
**Total Street Flow:** 8.9cfs

**Flow Intercepted:** 8.9 cfs
**Flow Bypassed:** 0
**Inlet Size:** 10' Type R Inlet, sump

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

(100-year storm)

**Tributary Basins:** C16.1 & C16.2
**Inlet/MH Number:** Inlet DP3
**Upstream flowby:** 0
**Total Street Flow:** 20.1cfs

**Flow Intercepted:** 20.1 cfs
**Flow Bypassed:** 0
**Inlet Size:** 15' Type R Inlet, sump

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

Design Point 4 is located at the NW corner of Yamhill and Mumford Drive

(5-year storm)
**Tributary Basins:** C16.5 - C16.10 **Inlet/MH Number:** Inlet DP4
**Upstream flowby:** 0 **Total Street Flow:** 10.47cfs

**Flow Intercepted:** 9.67 cfs **Flow Bypassed:** 0.8cfs to Inlet DP6
**Inlet Size:** 15' Type R Inlet, on-grade

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

(100-year storm)
**Tributary Basins:** C16.5 - C16.10 **Inlet/MH Number:** Inlet DP4
**Upstream flowby:** 0 **Total Street Flow:** 21.88cfs

**Flow Intercepted:** 14.98 cfs **Flow Bypassed:** 6.9cfs to Inlet DP6
**Inlet Size:** 15' Type R Inlet, on-grade

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

Design Point 5

Design Point 5 is located at the SW corner of Yamhill and Mumford Drives. This is a small drainage basin that needs a 5' Type R inlet to drain the curb. The total flow is 0.3cfs and 0.6cfs in the 5/100 year storm events. For this report the tributary basin wasn't calculated but will need to be verified in the final drainage report.

Design Point 6

Design Point 6 is located at the NW corner of Napa Drive and Mumford Drive

(5-year storm)
**Tributary Basins:** C16.10-C16.13 **Inlet/MH Number:** Inlet DP6a
**Upstream flowby:** 0.8cfs **Total Street Flow:** 12.82cfs

**Flow Intercepted:** 11.05cfs **Flow Bypassed:** 1.77cfs to Inlet DP6a
**Inlet Size:** 15' type R, on-grade

**Street Capacity:** Street slope = 2.5%, capacity = 14.1cfs, inlet needed

(100-year storm)
**Tributary Basins:** C16.10-C16.13 **Inlet/MH Number:** Inlet DP6a
**Upstream flowby:** 6.9cfs **Total Street Flow:** 32.62cfs

**Flow Intercepted:** 17.87cfs **Flow Bypassed:** 14.75cfs to Inlet DP6a
**Inlet Size:** 15' type R, on-grade

**Street Capacity:** Street slope = 2.5%, capacity = 40.7cfs (half street) is okay

Design Point 6a

Design Point 6a is located at the SW corner of Shavers Drive and Mumford Drive

(5-year storm)

**Tributary Basins:** C16.15 | **Inlet/MH Number:** Inlet DP6a
**Upstream flowby:** 1.77cfs | **Total Street Flow:** 6.61cfs

**Flow Intercepted:** 5.71cfs | **Flow Bypassed:** 0.9 cfs to Inlet DP8
**Inlet Size:** 10' type R, on-grade

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

(100-year storm)

**Tributary Basins:** C16.15 | **Inlet/MH Number:** Inlet DP6a
**Upstream flowby:** 14.75cfs | **Total Street Flow:** 24.87cfs

**Flow Intercepted:** 11.17cfs | **Flow Bypassed:** 13.7cfs to Inlet DP8
**Inlet Size:** 10' type R, on-grade

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

Design Point 6c

Design Point 6c is located at the east side of the intersection of Clarion Drive and Lamprey Drive at a low point. A 30" RCP will be stubbed to the school site to collect the flows from Basin C13 (school site). The school site will be required to construct on-site storm sewer/inlets and on-site detention ponds to collect/detain runoff. Water quality for Basin C13 will be provided in Pond C5. Runoff rates from this basin are required to be reduced to pre-developed flows of 7.6cfs in the 5-year and 40.5cfs in the 100-year storm events to the 30" RCP stub.

Design Point 6b

Design Point 6b is located at the east side of the intersection of Clarion Drive and Lamprey Drive at a low point in Lamprey Drive.

(5-year storm)

**Tributary Basins:** C13.1 | **Inlet/MH Number:** Inlet DP6b
**Upstream flowby:** 0 cfs | **Total Street Flow:** 6.8cfs

**Flow Intercepted:** 6.8cfs | **Flow Bypassed:**
**Inlet Size:** 15' type R, sump

**Street Capacity:** Street slope = 1.5%, capacity = 11cfs

(100-year storm)

**Tributary Basins:** C13.1 | **Inlet/MH Number:** Inlet DP6b
**Upstream flowby:** 33.0cfs | **Total Street Flow:** 40.5cfs

**Flow Intercepted:** 20.3cfs | **Flow Bypassed:** 20.2cfs to Inlet DP16
**Inlet Size:** 15' type R, sump

**Street Capacity:** Street slope = 1.5%, capacity = 44.1cfs (half street) is okay

DP10b, DP10c then DP16?

Design Point 7

Design Point 7 is a small drainage basin (C16.14) that needs a 5' Type R inlet to drain the curb in the NW corner of Shavers Drive and Lamprey Drive. The total flow is 0.3cfs and 0.6cfs in the 5/100 year storm events. There are no bypass flows for this inlet.

Design Point 8

Design Point 8 is located at the NE corner of Shavers Drive and Lamprey Drive

(5-year storm)

**Tributary Basins:** C16.3-C16.4 | **Inlet/MH Number:** Inlet DP8

**Upstream flowby:** 0.9cfs | **Total Street Flow:** 6.2cfs

**Flow Intercepted:** 6.20cfs | **Flow Bypassed:** 0

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

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

(100-year storm)

**Tributary Basins:** C16.3-C16.4 | **Inlet/MH Number:** Inlet DP8

**Upstream flowby:** 13.7cfs | **Total Street Flow:** 25.2cfs

**Flow Intercepted:** 16.3cfs | **Flow Bypassed:** 8.9cfs to Inlet DP10

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

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

Design Point 9

Design Point 9 is located at the intersection of Shavers Drive and Lamprey Drive and is the flow in the storm sewer. The total flow in the storm sewer is 75.68cfs/105.3cfs in the 5/100 year storm events.

Design Point 10

Design Point 10 is located at the NE corner of Clarion Drive and Mumford Drive

(5-year storm)

**Tributary Basins:** C16.16-C16.17 | **Inlet/MH Number:** Inlet DP10

**Upstream flowby:** 0 cfs | **Total Street Flow:** 6.0cfs

**Flow Intercepted:** 6.0cfs | **Flow Bypassed:** 0 cfs

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

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

(100-year storm)

**Tributary Basins:** C16.16-C16.17 | **Inlet/MH Number:** Inlet DP10

**Upstream flowby:** 8.9cfs | **Total Street Flow:** 12.5cfs

**Flow Intercepted:** 12.5cfs | **Flow Bypassed:** 8.5cfs to Inlet DP10a

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

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

Design Point 10a

Design Point 10a is located at the NW corner of Clarion Drive and Mumford Drive

(5-year storm)

**Tributary Basins:** C16.18 **Inlet/MH Number:** Inlet DP10a

**Upstream flowby:** **Total Street Flow:** 5.7cfs

**Flow Intercepted:** 5.7cfs **Flow Bypassed:** 0 cfs

**Inlet Size:** 15' type R, sump

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

(100-year storm)

**Tributary Basins:** C16.18 **Inlet/MH Number:** Inlet DP10a

**Upstream flowby:** 8.5cfs **Total Street Flow:** 20.7cfs

**Flow Intercepted:** 20.7cfs **Flow Bypassed:** 0cfs

**Inlet Size:** 15' type R, sump

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

Design Point 10b

Design Point 10b is located at the SE corner of Clarion Drive and Mumford Drive

(5-year storm)

**Tributary Basins:** C16.26 **Inlet/MH Number:** Inlet DP10b

**Upstream flowby:** **Total Street Flow:** 3.2cfs

**Flow Intercepted:** 3.2cfs **Flow Bypassed:**

**Inlet Size:** 5' type R, sump

verify

**Street Capacity:** Street slope = 0.7%, capacity = 7.5cfs

(100-year storm)

**Tributary Basins:** C16.26 **Inlet/MH Number:** Inlet DP10b

**Upstream flowby:** **Total Street Flow:** 6.9cfs

**Flow Intercepted:** 6.9cfs **Flow Bypassed:** 0

**Inlet Size:** 5' type R, sump

**Street Capacity:** Street slope = 0.7%, capacity = 31.2cfs (half street) is okay

20?

Design Point 10c

Design Point 10c is located at the SW corner of Clarion Drive and Mumford Drive

(5-year storm)

**Tributary Basins:** C16.27 **Inlet/MH Number:** Inlet DP10c
**Upstream flowby:** **Total Street Flow:** 0.6cfs

**Flow Intercepted:** 0.6cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Street slope = 0.7%, capacity = 7.5cfs

(100-year storm)

**Tributary Basins:** C16.27 **Inlet/MH Number:** Inlet DP10c
**Upstream flowby:** 0 **Total Street Flow:** 1.3cfs

**Flow Intercepted:** 1.3cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

verify

**Street Capacity:** Street slope = 0.7%, capacity = 31.2cfs (half street) is okay

west

Design Point 11

Design Point 11 is located at the east side of Clarion Drive and Mumford Drive and is the flow in the storm sewer. The total flow in the storm sewer is 105.5cfs/154.8cfs in the 5/100 year storm events.

Design Point 12

Design Point 12 is located east of Wacissa Drive on the north side of Nash Drive.

(5-year storm)

**Tributary Basins:** C16.22-C16.23 **Inlet/MH Number:** Inlet DP12
**Upstream flowby:** **Total Street Flow:** 8.0cfs

**Flow Intercepted:** 6.43cfs **Flow Bypassed:** 1.6cfs to Inlet DP13
**Inlet Size:** 10' type R, on-grade

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

(100-year storm)

**Tributary Basins:** C16.22-C16.23 **Inlet/MH Number:** Inlet DP12
**Upstream flowby:** **Total Street Flow:** 16.65cfs

**Flow Intercepted:** 9.35cfs **Flow Bypassed:** 7.3cfs to Inlet DP13
**Inlet Size:** 10' type R, on-grade

**Street Capacity:** Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 12a

Design Point 12a is located east of Wacissa Drive on the south side of Nash Drive.

(5-year storm)

**Tributary Basins:** C16.20-C16.21
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP12a
**Total Street Flow:** 8.78cfs

**Flow Intercepted:** 6.78cfs
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 2.0cfs to Inlet DP13

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

(100-year storm)

**Tributary Basins:** C16.20-C16.21
**Upstream flowby:**

**Inlet/MH Number:** Inlet DP12a
**Total Street Flow:** 18.28cfs

**Flow Intercepted:** 9.78cfs
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 8.5cfs to Inlet DP13

**Street Capacity:** Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 13

Design Point 13 is located in the SE corner of Wacissa Drive and Nash Drive.

(5-year storm)

**Tributary Basins:** C16.24
**Upstream flowby:** 3.6cfs

**Inlet/MH Number:** Inlet DP13
**Total Street Flow:** 8.35cfs

**Flow Intercepted:** 6.55cfs
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 1.8cfs to Inlet DP16

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

(100-year storm)

**Tributary Basins:** C16.24
**Upstream flowby:** 15.8cfs

**Inlet/MH Number:** Inlet DP13
**Total Street Flow:** 25.48cfs

**Flow Intercepted:** 11.28cfs
**Inlet Size:** 10' type R, on-grade

**Flow Bypassed:** 14.2cfs to Inlet DP16

**Street Capacity:** Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 14

Design Point 14 is located in the NW of Wacissa Drive and Nash Drive.

(5-year storm)

**Tributary Basins:** C16.30 **Inlet/MH Number:** Inlet DP14
**Upstream flowby:** 0cfs **Total Street Flow:** 7.05cfs

**Flow Intercepted:** 5.95cfs **Flow Bypassed:** 1.1cfs to Inlet DP17
**Inlet Size:** 10’ type R, on-grade

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

(100-year storm)

**Tributary Basins:** C16.30 **Inlet/MH Number:** Inlet DP14
**Upstream flowby:** 0cfs **Total Street Flow:** 14.44cfs

**Flow Intercepted:** 8.74cfs **Flow Bypassed:** 5.7cfs to Inlet DP17
**Inlet Size:** 10’ type R, on-grade

**Street Capacity:** Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 15

Design Point 15 is located in the SW of Wacissa Drive and Nash Drive and is the flow in the storm sewer. The total flow in the storm sewer is 25.69cfs/39.15cfs in the 5/100 year storm events.

Design Point 16

Design Point 16 is located in the SE corner of Wacissa Drive and Clarion Drive.

(5-year storm)

**Tributary Basins:** C16.19, C16.28, C16.29 **Inlet/MH Number:** Inlet DP16
**Upstream flowby:** 1.8cfs **Total Street Flow:** 12.8cfs

**Flow Intercepted:** 12.8cfs **Flow Bypassed:** 0
**Inlet Size:** 25’ type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 9.0cfs, almost half of street flow is from the south. Capacity okay.

(100-year storm)

**Tributary Basins:** C16.19, C16.28, C16.29 **Inlet/MH Number:** Inlet DP16
**Upstream flowby:** 34.4cfs **Total Street Flow:** 57.3cfs

**Flow Intercepted:** 37.4cfs **Flow Bypassed:** 19.9cfs to Inlet DP17
**Inlet Size:** 25’ type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 35.4cfs (half street)

Design Point 17
Design Point 17 is located in the SW corner of Wacissa Drive and Clarion Drive.

(5-year storm)
**Tributary Basins:** C16.25+C16.32 **Inlet/MH Number:** Inlet DP17
**Upstream flowby:** 1.10cfs **Total Street Flow:** 3.9cfs

**Flow Intercepted:** 3.9cfs **Flow Bypassed:**
**Inlet Size:** 25' type R, sump

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

(100-year storm)
**Tributary Basins:** C16.25+C16.32 **Inlet/MH Number:** Inlet DP17
**Upstream flowby:** 25.6cfs **Total Street Flow:** 31.6cfs

**Flow Intercepted:** 31.6cfs **Flow Bypassed:** 0
**Inlet Size:** 25' type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 35.4cfs (half street) is okay

Design Point 18
Design Point 18 is located west of Clarion Drive and Wacissa Drive and is the total flow in the pipe into Pond C5. The total pipe flow is 147.9cfs in the 5-year and 230.8cfs in the 100-year. The trapezoidal emergency overflow swale from Wacissa Drive to Pond C5 is 1.0' deep, 27' wide bottom, 4:1 side slopes, 2% slope, velocity of 7.59cfs, and has a flow depth of 0.98 feet, Q100=230cfs.

Design Point 19a
Design Point 19a is located on the south side of Fontaine Boulevard east of Rockcastle Drive and is the outflow pipe for future pond C2.3 located under the electric line easement. This 30" RCP outflow pipe will also function as the outflow pipe for interim Pond C2.3. The total future pipe flow is 4.0cfs in the 5-year and 46.0cfs in the 100-year storm which conforms to the outflow rates in the Lorson Ranch East MDDP for Pond C2.3. Interim pipe flows are 17cfs in the 5-year and 57cfs in the 100-year storm. See section 6.1 for further discussion of interim pond C2.3

Design Point 19b
Design Point 19b is located on the north side of Fontaine Boulevard east of Rockcastle Drive and is the outflow pipe for future pond C2.2 located under the electric line easement. This 30" RCP outflow pipe will also function as the outflow pipe for interim Pond C2.2. The total allowed future pipe flow is 6.0cfs in the 5-year and 41.0cfs in the 100-year storm which conforms to the outflow rates in the Lorson Ranch East MDDP for Pond C2.2. Interim pipe flows are 17cfs in the 5-year and 44cfs in the 100-year storm. See section 6.1 for further discussion of interim pond C2.2

Design Point 19d
Design Point 19d is located at the SE of Fontaine Boulevard and Rockcastle Drive and is the emergency outflow conveyance pipe for future pond C2.3 as discussed in the MDDP. This 42" RCP outflow pipe will accept 70cfs in an emergency overflow event from Pond C2.3. The conveyance structure is a 20' CDOT Type R inlet with an 18" throat opening and 2' high concrete inflow apron from the spillway to the structure. The structure will be constructed/designed in Phase 2.

Design Point 19e

Design Point 19e is located at the NE of Fontaine Boulevard and Rockcastle Drive and is the emergency outflow conveyance pipe for future pond C2.2 as discussed in the MDDP. This 48" RCP outflow pipe will accept 130cfs in an emergency overflow event from Pond C2.2. The conveyance structure is a 25' CDOT Type R inlet with an 18" throat opening and 2' high concrete inflow apron from the spillway to the structure. The structure will be constructed/designed in Phase 2.

Design Point 20a

Design Point 20a is located on the south side of Fontaine Boulevard south of Rockcastle Drive and is the outflow pipe for future pond C1 located under the electric line easement. This 18" RCP outflow pipe will also function as the outflow pipe for interim Pond C1. The total allowed pipe flow is 4.0cfs in the 5-year and 18.0cfs in the 100-year which conforms to the outflow rates in the Lorson Ranch East MDDP for Pond C1

Design Point 3f

Design Point 3f is located on the north side of Fontaine Boulevard at Rockcastle Drive and is the outflow pipe for Ponds C2.2, Pond C2.3, and Pond C1. The total allowed pipe flow is 14.0cfs in the 5-year and 131.0cfs in the 100-year which conforms to the outflow rates in the Lorson Ranch East MDDP for the ponds. This section of storm sewer has been oversized to accept 200cfs in a 54" RCP to account for emergency overflow conveyances from the future ponds as detailed in the MDDP.

Design Point 19c

Design Point 19c is located north side of Fontaine Boulevard north of the electric substation.

(5-year storm)

**Tributary Basins:** C14.1, C14.2 **Inlet/MH Number:** Inlet DP19c
**Upstream flowby:** **Total Street Flow:** 5.6cfs

**Flow Intercepted:** 5.66cfs **Flow Bypassed:** 0.8cfs to Inlet DP33
**Inlet Size:** 10' type R, on-grade

**Street Capacity:** Street slope = 1.0%, capacity = 13.0cfs, okay

(100-year storm)

**Tributary Basins:** C14.1, C14.2 **Inlet/MH Number:** Inlet DP19c
**Upstream flowby:** **Total Street Flow:** 18.7 cfs

**Flow Intercepted:** 10.62cfs **Flow Bypassed:** 11.5cfs to Inlet DP33
**Inlet Size:** 10' type R, on-grade

**Street Capacity:** Street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 20

Design Point 20 is located south side of Fontaine Boulevard north of the electric substation.

(5-year storm)

**Tributary Basins:** C15.8 **Inlet/MH Number:** Inlet DP20

**Upstream flowby:** **Total Street Flow:** 5.2cfs

**Flow Intercepted:** 5.2cfs **Flow Bypassed:**

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

**Street Capacity:** Street slope = 1.0%, capacity = 13.0cfs, okay

(100-year storm)

**Tributary Basins:** C15.8 **Inlet/MH Number:** Inlet DP20

**Upstream flowby:** **Total Street Flow:** 13.4cfs

**Flow Intercepted:** 11.3cfs **Flow Bypassed:** 2.1cfs to Inlet DP29

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

**Street Capacity:** Street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 21

Design Point 21 is located west of the electric substation and is the surface runoff collected at a 30" end section (Line 22). The total flow in the storm sewer is from Basin C15.1+Basin C15.2 for a total flow of 13.55cfs/35.92cfs in the 5/100 year storm events in the storm sewer. The trapezoidal overflow swale between the lots is 1.0' deep, 5:1 side slopes, 10' wide bottom, 1% slope, velocity of 4.29cfs, and has a flow depth of 0.76 feet.

Design Point 23

Design Point 23 is located on Tillamook Drive north of Rockcastle Drive

(5-year storm)

**Tributary Basins:** C15.3&C15.4 **Inlet/MH Number:** Inlet DP23

**Upstream flowby:** **Total Street Flow:** 8.73cfs

**Flow Intercepted:** 8.43cfs **Flow Bypassed:** 0.3cfs to Inlet DP25

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

**Street Capacity:** Street slope = 1.1%, capacity = 9.2cfs, okay

(100-year storm)

**Tributary Basins:** C15.3&C15.4 **Inlet/MH Number:** Inlet DP23

**Upstream flowby:** **Total Street Flow:** 18.69cfs

**Flow Intercepted:** 13.69cfs **Flow Bypassed:** 5.0cfs to Inlet DP25

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

**Street Capacity:** Street slope = 1.1%, capacity = 38cfs (half street) is okay

Design Point 24

Design Point 24 is located in the south of Rockcastle Drive on Tillamook Drive and is the flow in the storm sewer. The total flow in the storm sewer is 20.64cfs/51.77cfs in the 5/100 year storm events.

Design Point 25

Design Point 25 is located on the south side of Rockcastle Drive east of Vedder Drive

(5-year storm)

**Tributary Basins:** C15.5,C15.6,C15.11, C15.12 **Inlet/MH Number:** Inlet DP25

**Upstream flowby:** 0.3cfs **Total Street Flow:** 16.0cfs

**Flow Intercepted:** 16.0cfs **Flow Bypassed:**

**Inlet Size:** 20’ type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 9.0cfs, okay since half flow from each side

(100-year storm)

**Tributary Basins:** C15.5,C15.6,C15.11, C15.12 **Inlet/MH Number:** Inlet DP25

**Upstream flowby:** **Total Street Flow:** 38.9cfs

**Flow Intercepted:** 31.7cfs **Flow Bypassed:** 7.2cfs to Inlet DP26

**Inlet Size:** 20’ type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 37.3cfs (half street) is okay since half flow from each side

Design Point 26

Design Point 26 is located on the north side of Rockcastle Drive east of Vedder Drive.

(5-year storm)

**Tributary Basins:** C15.7, C15.13 **Inlet/MH Number:** Inlet DP26

**Upstream flowby:** **Total Street Flow:** 8.4cfs

**Flow Intercepted:** 8.4cfs **Flow Bypassed:**

**Inlet Size:** 20’ type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 9.0cfs, okay since half of flow is from each side.

(100-year storm)

**Tributary Basins:** C15.7, C15.13 **Inlet/MH Number:** Inlet DP26

**Upstream flowby:** 7.2cfs **Total Street Flow:** 26.0cfs

**Flow Intercepted:** 26.0cfs **Flow Bypassed:**

**Inlet Size:** 20’ type R, sump

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

Design Point 27

Design Point 27 is located in the north of Design Point 26 and is the flow in the storm sewer. The total flow in the storm sewer is 38.11cfs/92.58cfs in the 5/100 year storm events. The trapezoidal overflow swale between the lots is 1.0’ deep, 4:1 side slopes, 15’ wide bottom, 1% slope, velocity of 5.41cfs, and has a flow depth of 1.0 feet.

Design Point 32

Design Point 32 is located north of Design Point 27 on Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer is 23.2cfs/163.4cfs in the 5/100 year storm events.

Design Point 32a

Design Point 32a is located west of Design Point 32 on Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer is 56.8cfs/252.9cfs in the 5/100 year storm events. This section of storm sewer has been oversized to 66" RCP to account for 200cfs from emergency overflow conveyances as detailed in the MDDP for future upstream ponds.

Design Point 28

Design Point 28 is located on Weiser Drive north of Pigeon Drive.

(5-year storm)

**Tributary Basins:** C17.1a — **Inlet/MH Number:** Inlet DP28

**Upstream flowby:** — **Total Street Flow:** 5.3cfs

**Flow Intercepted:** 5.3cfs — **Flow Bypassed:**

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

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

(100-year storm)

**Tributary Basins:** C17.1a — **Inlet/MH Number:** Inlet DP28

**Upstream flowby:** — **Total Street Flow:** 11.56cfs

**Flow Intercepted:** 10.36cfs — **Flow Bypassed:** 1.2cfs to Inlet DP38

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

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

Design Point 29

Design Point 29 is located SE corner of Fontaine Boulevard and Lamprey Drive.

(5-year storm)

**Tributary Basins:** C15.9, C15.10, C15.14 — **Inlet/MH Number:** Inlet DP29

**Upstream flowby:** — **Total Street Flow:** 8.6cfs

**Flow Intercepted:** 8.6cfs — **Flow Bypassed:**

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

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

(100-year storm)

**Tributary Basins:** C15.9, C15.10, C15.14 — **Inlet/MH Number:** Inlet DP29

**Upstream flowby:** 2.1cfs — **Total Street Flow:** 20.8cfs

**Flow Intercepted:** 16.3cfs — **Flow Bypassed:** 4.5cfs to Inlet DP30

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

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

Design Point 30

Design Point 30 is located on Lamprey Drive south of Fontaine Boulevard in the SW corner

(5-year storm)

**Tributary Basins:** C15.15 **Inlet/MH Number:** Inlet DP30

**Upstream flowby:** **Total Street Flow:** 7.2cfs

**Flow Intercepted:** 7.2cfs **Flow Bypassed:**

**Inlet Size:** 15' type R, sump

**Street Capacity:** Lamprey Drive Street slope = 1.8%, capacity = 18.4cfs, okay

(100-year storm)

**Tributary Basins:** C15.15 **Inlet/MH Number:** Inlet DP30

**Upstream flowby:** 4.5cfs **Total Street Flow:** 20.1cfs

**Flow Intercepted:** 20.1cfs **Flow Bypassed:**

**Inlet Size:** 15' type R, sump

**Street Capacity:** Lamprey Drive Street slope = 1.8%, capacity = 50.4cfs (half street) is okay

Design Point 31

Design Point 31 is located downstream of Design Point 30 in Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer (Line 12) is a total flow of 19.36cfs/42.12cfs in the 5/100 year storm events in the storm sewer.

Design Point 33

Design Point 33 is located in the northeast corner of Lamprey Drive and Fontaine Boulevard.

(5-year storm)

**Tributary Basins:** C16.33, C14 **Inlet/MH Number:** Inlet DP33

**Upstream flowby:** 0.8cfs **Total Street Flow:** 8.2cfs

**Flow Intercepted:** 8.2cfs **Flow Bypassed:**

**Inlet Size:** 15' type R, sump

**Street Capacity:** Fontaine street slope = 1.0%, capacity = 13.5cfs, okay

(100-year storm)

**Tributary Basins:** C16.33, C14 **Inlet/MH Number:** Inlet DP33

**Upstream flowby:** 11.5cfs **Total Street Flow:** 26.3cfs

**Flow Intercepted:** 20.3cfs **Flow Bypassed:** 6.0cfs to Inlet DP34

**Inlet Size:** 15' type R, sump

**Street Capacity:** Fontaine street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 34
Design Point 34 is located northwest corner of Lamprey Drive and Fontaine Boulevard

(5-year storm)
**Tributary Basins:** C16.34 **Inlet/MH Number:** Inlet DP34
**Upstream flowby:** **Total Street Flow:** 0.9cfs

**Flow Intercepted:** 0.9cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Lamprey Drive street slope = 0.8%, capacity = 12.0cfs, okay

(100-year storm)
**Tributary Basins:** C16.34 **Inlet/MH Number:** Inlet DP34
**Upstream flowby:** 6.0cfs **Total Street Flow:** 8.0cfs

**Flow Intercepted:** 8.0cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Lamprey Drive street slope = 0.8%, capacity = 37.0cfs (half street) is okay

Design Point 34a
Design Point 34a is located downstream of Design Point 34 in Fontaine Boulevard and is the flow in the storm sewer. The total flow in the storm sewer (Line 3) is a total flow of 74.7cfs/298.3cfs in the 5/100 year storm events in the storm sewer. This section of storm sewer has been oversized to 66" RCP to account for 200cfs from emergency overflow conveyances as detailed in the MDDP for future upstream ponds.

Design Point 35
Design Point 35 is located in the NE corner of Edisto Drive and Fontaine Boulevard.

(5-year storm)
**Tributary Basins:** C16.35 **Inlet/MH Number:** Inlet DP35
**Upstream flowby:** **Total Street Flow:** 2.8cfs

**Flow Intercepted:** 2.8cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Fontaine Boulevard street slope = 1.0 %, capacity = 13.5cfs, okay

(100-year storm)
**Tributary Basins:** C16.35 **Inlet/MH Number:** Inlet DP35
**Upstream flowby:** **Total Street Flow:** 6.1cfs

**Flow Intercepted:** 6.1cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Fontaine Boulevard street slope = 1.0%, capacity = 40.0cfs (half street) is okay

Design Point 36

Design Point 36 is a small drainage basin that needs a 5' Type R inlet to drain the curb in the NW corner of Edisto Drive and Fontaine Boulevard. The total flow is 0.3cfs and 0.6cfs in the 5/100 year storm events. There are no bypass flows for this inlet.

Design Point 37

Design Point 37 is located downstream of Design Point 36 in Fontaine Boulevard just west of Edisto Drive and is the flow in the storm sewer. The total flow in the storm sewer (Line 2) is 75cfs/300.0cfs in the 5/100 year storm events in the storm sewer. This section of storm sewer has been oversized to 66" RCP to account for 200cfs from emergency overflow conveyances as detailed in the MDDP for future upstream ponds.

east of

Design Point 38

Design Point 38 is located in the SE corner of Chaplin Drive and Matta Drive.

(5-year storm)

**Tributary Basins:** C17.1 | **Inlet/MH Number:** Inlet DP38

**Upstream flowby:** | **Total Street Flow:** 5.9cfs

**Flow Intercepted:** 5.9cfs | **Flow Bypassed:**

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

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

(100-year storm)

**Tributary Basins:** C17.1 | **Inlet/MH Number:** Inlet DP39

**Upstream flowby:** 1.2cfs | **Total Street Flow:** 14.43cfs

**Flow Intercepted:** 11.83cfs | **Flow Bypassed:** 2.6cfs to Inlet DP39

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

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

Design Point 39

Design Point 39 is located in the SW corner of Chaplin Drive and Matta Drive.

(5-year storm)
**Tributary Basins:** C17.2 **Inlet/MH Number:** Inlet DP39
**Upstream flowby:** **Total Street Flow:** 8.61cfs

**Flow Intercepted:** 8.41cfs **Flow Bypassed:** 0.2cfs to Inlet DP40
**Inlet Size:** 15' type R, on-grade

**Street Capacity:** Street slope = 3.5%, capacity = 16.7cfs is okay

(100-year storm)
**Tributary Basins:** C17.2 **Inlet/MH Number:** Inlet DP39
**Upstream flowby:** 24.0cfs **Total Street Flow:** 21.53cfs

**Flow Intercepted:** 14.93cfs **Flow Bypassed:** 6.6cfs to Inlet DP40
**Inlet Size:** 15' type R, on-grade

**Street Capacity:** Street slope = 3.5%, capacity = 37.2cfs (half street) is okay

Design Point 40

Design Point 40 is located at a low point in the SE corner of Lamine Drive and Fontaine Boulevard.

(5-year storm)
**Tributary Basins:** C17.3-C17.5 **Inlet/MH Number:** Inlet DP40
**Upstream flowby:** 0.2cfs **Total Street Flow:** 12.9cfs

**Flow Intercepted:** 12.9cfs **Flow Bypassed:**
**Inlet Size:** 20' type R, sump

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

(100-year storm)
**Tributary Basins:** C17.3-C17.5 **Inlet/MH Number:** Inlet DP40
**Upstream flowby:** 6.6cfs **Total Street Flow:** 39.4cfs

**Flow Intercepted:** 26.0cfs **Flow Bypassed:** 13.4cfs to Inlet DP41
**Inlet Size:** 20' type R, sump

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

Design Point 41

Design Point 41 is located at a low point in the SW corner of Lamine Drive and Fontaine Boulevard.

(5-year storm)
**Tributary Basins:** C17.6 **Inlet/MH Number:** Inlet DP41
**Upstream flowby:** **Total Street Flow:** 2.0cfs

**Flow Intercepted:** 2.0cfs **Flow Bypassed:**
**Inlet Size:** 20' type R, sump

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

(100-year storm)
**Tributary Basins:** C17.6 **Inlet/MH Number:** Inlet DP41
**Upstream flowby:** 13.4cfs **Total Street Flow:** 19.3cfs

**Flow Intercepted:** 19.3cfs **Flow Bypassed:**
**Inlet Size:** 20' type R, sump

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

Design Point 42

Design Point 42 is located on the north side of Fontaine Boulevard just east of the East Tributary of JCC north of Lamine Drive.

(5-year storm)
**Tributary Basins:** C17.8 **Inlet/MH Number:** Inlet DP43
**Upstream flowby:** **Total Street Flow:** 3.2cfs

**Flow Intercepted:** 3.2cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 13.0cfs, okay

(100-year storm)
**Tributary Basins:** C17.8 **Inlet/MH Number:** Inlet DP43
**Upstream flowby:** **Total Street Flow:** 7.2cfs

**Flow Intercepted:** 7.2cfs **Flow Bypassed:**
**Inlet Size:** 5' type R, sump

**Street Capacity:** Street slope = 1.0%, capacity = 40cfs (half street) is okay

Design Point 43

Design Point 43 is located downstream of Design Point 42 in Fontaine Boulevard just east of Lamine Drive and is the flow in the storm sewer. The total flow in the storm sewer (Line 33) is 27.33cfs/65.94cfs in the 5/100-year storm events in the storm sewer.

Design Point 44

Design Point 44 is located on the south side of Pond C5 and is the total storm sewer flow from the south into Pond C5. The flow into Pond C5 from the south is from (Line 1+Line 33) and is 102.5cfs/365.9cfs in the 5/100-year storm events in the storm sewer.

Design Point 45

Design Point 45 is the total developed flow into Pond C5. We did not use the flow rates from the storm sewer system as in other design points because the storm system flows used fixed release rates (no hydrographs used) from the upstream ponds which results in much larger flows than using the actual hydraulic model of the ponds/storm. Therefore, we used the flow amount from the Lorson Ranch East MDDP Hydraflow hydraulic model of the storm ponds and sewer system. The hydraflow model from the MDDP has not changed and is the best representation of the actual flow entering the Pond C5. The flow into Pond C5 is 167.5.0cfs/519.1cfs in the 5/100-year storm events in the storm sewer.

Design Point 46

Design Point 46 is the total developed flow from Pond C5 into the East Tributary. This flow rate was taken from the Lorson Ranch East MDDP Hydraflow hydraulic model of the storm ponds and sewer system. The hydraflow model from the MDDP has not changed and is the best representation of the actual flow from Pond C5. The outflow from Pond C5 is 126.3cfs/453.2.0cfs in the 5/100-year storm events in the storm sewer (Design Pt 7c in MDDP). The pre-developed flows entering the East Tributary at this design point are 141.0cfs/458.0cfs in the 5/100-year storm events (Design Pt 2 in MDDP). The developed discharge is slightly below pre-developed conditions which conforms to the design criteria (90% of pre-developed) set by El Paso County. The MDDP has modeled the entire “C” Basin and Pond C5 and shows the time to peak of Pond C5 to be 30 minutes which matches the existing conditions time of concentration closely as shown on the hydrograph of Pond C5. The Hydrograph of Pond C5 peaks at 420cfs around 30 minutes and then falls off sharply to around 100cfs at 60 minutes. At 60 minutes the upstream detention ponds enter Pond C5 and level the release rate off until around 2.5 hours where the flows are reduced to around 30cfs. The pond is nearly empty at around 6 hours. According to the Kiowa Engineering DBPS, the peak flows in the East Tributary at this outfall point occur at around 6 hours at which our outfall rates are minimal and will have little to no impact to the East Tributary flows. See Pond C5 for additional information and the Lorson East MDDP. See Section 6.1 for interim flows at this design point.

Design Point 47

Design Point 47 is located in a low point in Fontaine Boulevard west of the East Tributary on the south side of Fontaine. Flows from this basin have already been included in the pond modeling (including water quality) of Pond B1 which was constructed as part of Pioneer Landing 2.

(5-year storm)
**Tributary Basins:** C17.9 **Inlet/MH Number:** Inlet DP47
**Upstream flowby:** **Total Street Flow:** 7.8cfs

**Flow Intercepted:** 7.8cfs **Flow Bypassed:**
**Inlet Size:** 10' type R, sump

**Street Capacity:** Street slope = 0.6%, capacity = 10.4cfs, okay

(100-year storm)
**Tributary Basins:** C17.9 **Inlet/MH Number:** Inlet DP47
**Upstream flowby:** **Total Street Flow:** 13.9cfs

**Flow Intercepted:** 13.9cfs **Flow Bypassed:**
**Inlet Size:** 10' type R, sump

**Street Capacity:** Street slope = 0.6%, capacity = 31.2cfs (half street) is okay

Design Point 48

Design Point 48 is located in a low point in Fontaine Boulevard west of the East Tributary on the north side of Fontaine. Flows from this basin have already been included in the pond modeling (including water quality) of Pond B1 which was constructed as part of Pioneer Landing 2.

(5-year storm)
**Tributary Basins:** C17.10 **Inlet/MH Number:** Inlet DP48
**Upstream flowby:** **Total Street Flow:** 8.9cfs

**Flow Intercepted:** 8.9cfs **Flow Bypassed:**
**Inlet Size:** 10' type R, sump

**Street Capacity:** Street slope = 0.6%, capacity = 10.4cfs, okay

(100-year storm)
**Tributary Basins:** C17.10 **Inlet/MH Number:** Inlet DP48
**Upstream flowby:** **Total Street Flow:** 16.0cfs

**Flow Intercepted:** 16.0cfs **Flow Bypassed:**
**Inlet Size:** 10' type R, sump

**Street Capacity:** Street slope = 0.6%, capacity = 31.2cfs (half street) is okay

Design Point 49

Design Point 49 is located northeast of Design Point 48 in Fontaine Boulevard and is the total flow from the Fontaine Boulevard storm sewer system entering Pond B1. According to the final drainage report for Fontaine Boulevard prepared by Pentacor Engineering in 2006 the flow in the existing 42" storm sewer (P-40) is 37.6cfs in the 5-year and 62.1cfs in the 100 year storm events. The 42" has a constructed slope of 0.4%. When combined with the flow from the two new inlets the total pipe flow will be 54.3cfs in the 5-year and 92.0cfs in the 100-year storm events downstream to Pond B1. The proposed storm sewer into Pond B1 will be a 48" RCP at 0.5% slope with a capacity of 99cfs.

## 6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for Lorson Ranch East is required per El Paso County criteria. We have implemented the Full Spectrum approach for detention for Lorson Ranch East per the Denver Urban Drainage Districts specifications. There is one permanent full spectrum pond (Pond C5) that serves Fontaine Boulevard and Lamprey Drive in Lorson Ranch East. Pond C5 incorporates storm water quality features and complies with the Lorson Ranch East MDDP and PDR. In the future several detention ponds are proposed under the electric transmission line easement to be constructed in Phase 2 of Lorson Ranch East. Phase 2 ponds are sized and built to handle future developed flows east of the electric easement but do not have full spectrum outlet structures or water quality features at this time. The Phase 2 ponds are to reduce the upstream existing runoff from large existing tributary basins flowing overland west onto this site. As development progresses east of the powerline easement Phase 2 ponds will require full spectrum outlet structures to be built. See Section 6.1 for Phase 2 Detention Pond Discussions and their impacts to the downstream flows entering the East Tributary.

Full Spectrum Pond Construction Requirements

Design calculations for full spectrum Pond C5 are referenced but not included in this report. Pond C5 design will be finalized in the first plat for Lorson Ranch East.

Provide info for Pond B1, and prev. report excerpts in appendix.

## 6.1 PHASE 2 DETENTION PONDS and INTERIM FLOWS AT THE EAST TRIBUTARY

This section will discuss Phase 2 detention ponds located at the midpoint of the "C" basin. Additional discussion of how Phase 2 ponds affect flow rates at three main design points (DP46) that convey all developed/interim runoff into the East Tributary is included in this section. The proposed Phase 2 ponds are located partially under an existing electric transmission line easement at the midpoint of the basin. Phase 2 ponds are sized and built to handle future developed flows east of the electric easement but do not have full spectrum outlet structures or water quality features at this time. These Phase 2 ponds are to reduce the upstream existing runoff from large existing tributary basins flowing west overland across the powerline easement onto this site. The detention ponds do not have full spectrum or water quality features and are strictly to reduce the upstream existing runoff from large tributary basins. The ponds drain via storm sewer pipe with a small rip rap berm in front of it to prevent sediment from entering the pipe. It is the intent to change these ponds to full spectrum ponds when areas east of the powerlines develop.

Phase 2 Pond Construction Requirements

Phase 2 pond construction is only for rough grading as detailed on the Early Grading plans for Lorson Ranch East included in the Preliminary Plan submittal. Phase 2 ponds include a 10' wide gravel access road on a 15' wide bench at a maximum 10% slope to the pond bottom. Phase 2 pond outlets consist of a storm sewer outfall and flared end section with a small rip rap berm to prevent sediment from entering the pipe and an emergency overflow weir all sized for future flows. Soil borings, embankment, slope, compaction requirements, and other Geotechnical requirements can be found in the geotechnical report for the Lorson Ranch East Detention ponds prepared by RMG.

Detention Pond C1

This is a detention pond located east of the electric substation and detains runoff from Basin C15-ex which is a large 55-acre existing basin. Pond C1 is needed in Phase 2 when lots east of Lamprey Drive, south of Fontaine Boulevard, near the substation and Rockcastle Drive are graded/developed. Timing the construction of Interim Pond C1 will be provided in the final drainage report for the adjacent lots. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 24cfs/134cfs in the 5-year and 100-year storm event
- Detained flows: 4.0cfs/10.0cfs in the 5-year and 100-year storm event
- Pipe Outlet: 18” RCP at 0.5%
- 5-yr WSEL= 5746.90, 100-yr WSEL=5749.46
- Volume: 0.8 ac-ft storage in 5-year, 4.3 acre-ft storage in 100-year
- Spillway sized for future developed flow = 175cfs, Inv=5753.00, 28’ wide, 3’ deep, flow depth=1.44’deep
- Spillway swale to Fontaine: 175cfs, 50’ btm, 0.3% slope, 2’ deep, 4:1 sides, velocity=3.3cfs, flow depth=1.05’

Detention Pond C2.2

This is a detention pond located on the north side of Fontaine Boulevard at the electric easement and detains runoff from a portion of Basin C14-ex which is a large 119-acre existing basin and from Pond C3. Pond C2.2 reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Fontaine Boulevard. The pond has a 30” outlet pipe that flows to Fontaine Boulevard from north of Fontaine. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 32cfs/132cfs in the 5-year and 100-year storm event
- Detained flows: 17cfs/44cfs in the 5-year and 100-year storm event
- Pipe Outlet: 30” RCP at 0.5%
- 5-yr WSEL= 5747.12, 100-yr WSEL=5750.07
- Volume: 0.5ac-ft storage in 5-year, 2.9acre-ft storage in 100-year
- Pond C2.2 spillway sized for future developed flow = 138cfs, Inv=5754.00, 30’ wide, 3’ deep, flow depth=1.48’

Detention Pond C2.3

This is a detention pond located on the south side of Fontaine Boulevard at the electric easement and detains runoff from a portion of Basin C14-ex which is a large 119-acre existing basin. Pond C2.3 reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Fontaine Boulevard from the south. The pond has a 30” outlet pipe that flows to Fontaine Boulevard. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 37cfs/171cfs in the 5-year and 100-year storm event
- Detained flows: 17cfs/57cfs in the 5-year and 100-year storm event
- Pipe Outlet: 30” RCP at 0.5%
- 5-yr WSEL= 5748.02, 100-yr WSEL=5753.00
- Volume: 0.8ac-ft storage in 5-year, 4.3acre-ft storage in 100-year
- Pond C2.3 spillway sized for future developed flow = 111cfs, Inv=5753.00, 20’ wide, 3.0’ deep, flow depth=1.3’, see MDDP

Detention Pond C3

This is a detention pond located north of Fontaine Boulevard and detains runoff from Basin C12-ex which is a large 100-acre existing basin. Pond C3 flows to Pond C2.2 and reduces the size of storm sewer necessary to convey drainage east to the East Tributary of JCC in Fontaine Boulevard. Pond C3 is connected by a 24” storm sewer to Pond C2.2. This pond was modeled in Hydraflow and does not include water quality features.

- Incoming flows: 45cfs/250cfs in the 5-year and 100-year storm event

- Detained flows: 13cfs/32cfs in the 5-year and 100-year storm event
- Pipe Outlet: 21” RCP draining to Pond C2.2
- 5-yr WSEL= 5759.72, 100-yr WSEL=5763.35
- Volume: 1.2ac-ft storage in 5-year, 5.5acre-ft storage in 100-year
- Spillway sized for future developed flow = 134cfs, Inv=5764.50, 20’ wide, 3.5’ deep, 1.46’ flow depth

126/453?

<u>Interim Flows at Design Point 46</u>
Design Point 46 is located downstream of Pond C5 next to the East Tributary. The future developed flows from Pond C5 is 121.0cfs/443.0cfs in the 5/100-year storm events (Design Pt 7c in MDDP). The interim flows are 151cfs/425cfs in the 5/100-year storm events which include upstream flows from Phase 2 ponds. These flows at the creek are slightly higher than developed flows but are still less than pre-development flows as calculated in the MDDP for the 100-year storm event. The pre-developed flows entering the East Tributary at this design point are 141.0cfs/458.0cfs in the 5/100-year storm events. (Design Pt 2 in MDDP). There are no negative impacts downstream due to the interim ponds in the “C” basins.

## 6.2 EMERGENCY OVERFLOW CONVEYANCE FOR PONDS C1, C2.2, C2.3, AND C3

The MDDP for Lorson East discussed an emergency overflow condition for detention ponds which have emergency overflow structures directed to Fontaine Bouelvard. The storm sewer system in Fontaine Boulevard must be oversized to handle 200cfs which is the future rate determined by the MDDP for an emergency overflow event from Ponds C2.2 and C2.3. In the future we propose to construct two emergency overflow structures, one at Pond C2.2 and one at Pond C2.3. The structures will incorporate a CDOT type R structure modified with an 18” throat opening and a concrete apron from the spillway concrete wall to the structure. Pond C2.2 consists of a 25’ Type R structure with a 48” RCP outfall pipe to collect 114cfs from an emergency overflow event on the north side of Fontaine Boulevard from Pond C2.2 spillway. Pond C2.3 consists of a 20’ Type R structure with a 42” RCP outfall pipe to collect 86cfs from an emergency overflow event on the south side of Fontaine Boulevard from Pond C2.3 spillway. Pond C1 does not require a special overflow structure and can be discharged over the spillway and channel to Fontaine Boulevard overland. An additional flow calculation has been provided for the C15-C17 storm sewer system in the hydraulic storm sewer modeling program in Appendix. The storm sewer was sized by adding the pond flows (200cfs) along Fontaine Boulevard resulting in a sewer sized for the on-site 100-year flows plus additional capacity for the emergency conveyance/pond outflows. The construction plans for the storm sewer on Fontaine Boulevard will include a HGL and flow rates for the overflow conveyance event (Q100+conveyance).

## 7.0 DRAINAGE AND BRIDGE FEES

Lorson Ranch East 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 be constructing the major drainage infrastructure as part of the district improvements. There are no drainage/bridge fees associated with this FDR because we are not platting land with this construction plan set.

## 8.0 CONCLUSIONS

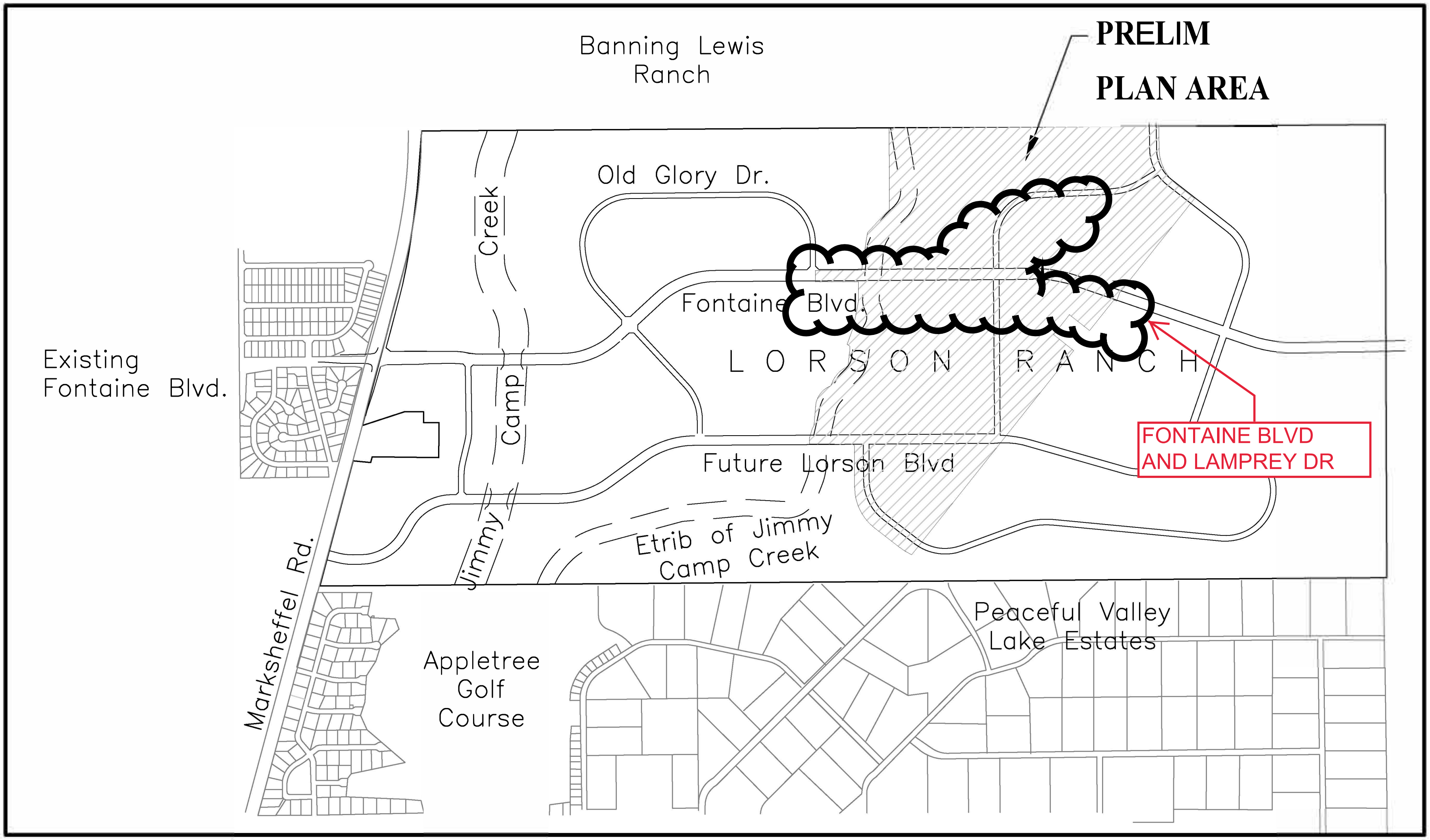
This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development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

- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- The East Tributary of Jimmy Camp Creek will be reconstructed within this study area north of Fontaine Boulevard.
- A bridge over the East Tributary will be required at Fontaine Boulevard
- Detention and water quality for this study area will be provided in one permanent pond.

## 9.0 REFERENCES


1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs “Drainage Criteria Manual, Volume 2
5. El Paso County “Engineering Criteria Manual”
6. Lorson Ranch East MDDP, June 30, 2017 by Core Engineering.
7. Final Drainage Report for Fontaine Boulevard, Old Glory Drive, and Marksheffel Road Phase 1 Improvements, Dated February 6, 2006, Revised September 7, 2006, by Pentacor Engineering.
8. Final construction plans “Fontaine Boulevard and East Fork Jimmy Camp Creek Channel Design”, Dated March 10, 2017, by Kiowa Engineering Corporation
9. 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.
10. Kiowa Engineering Corporation “Final Bridge and Channel Design Report, CDR 16-009” revised August 24, 2017
11. Preliminary Drainage Repot for Lorson Ranch East, Dated December 18,2017 prepared by Core Engineering Group

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




N

## VICINITY MAP

NO SCALE

CORE
ENGINEERING GROUP

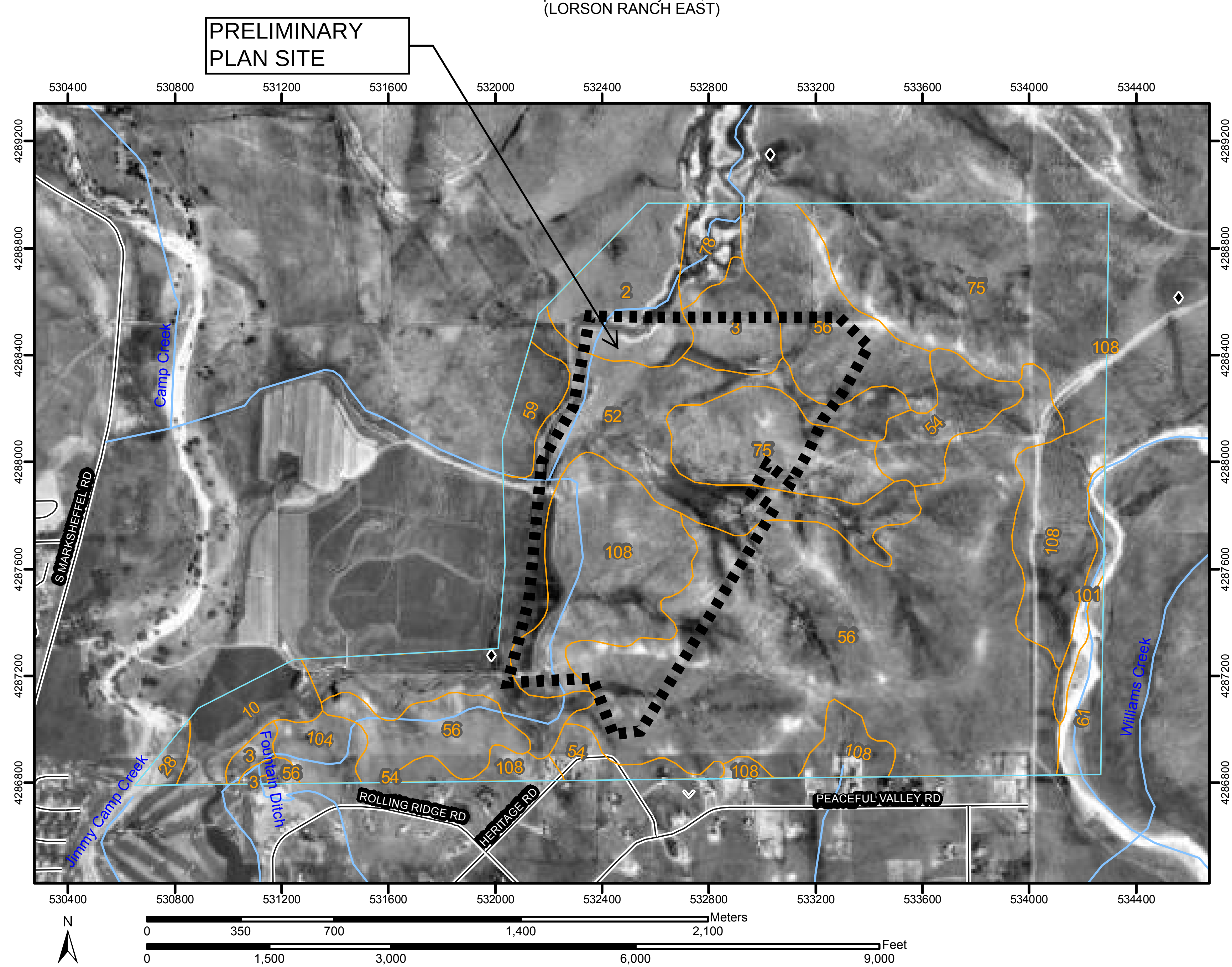
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100

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

LORSON RANCH EAST
VICINITY MAP

| SCALE: | DATE: | FIGURE NO. |
| --- | --- | --- |
| NTS | JUNE 30, 2017 | -- |

Soil Map–El Paso County Area, Colorado
(LORSON RANCH EAST)



## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Units

**Special Point Features**

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

**Special Line Features**

- Gully
- Short Steep Slope
- Other

**Political Features**

**Municipalities**

- Cities
- Urban Areas

**Water Features**

- Oceans
- Streams and Canals

**Transportation**

- Rails

**Roads**

- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

## MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

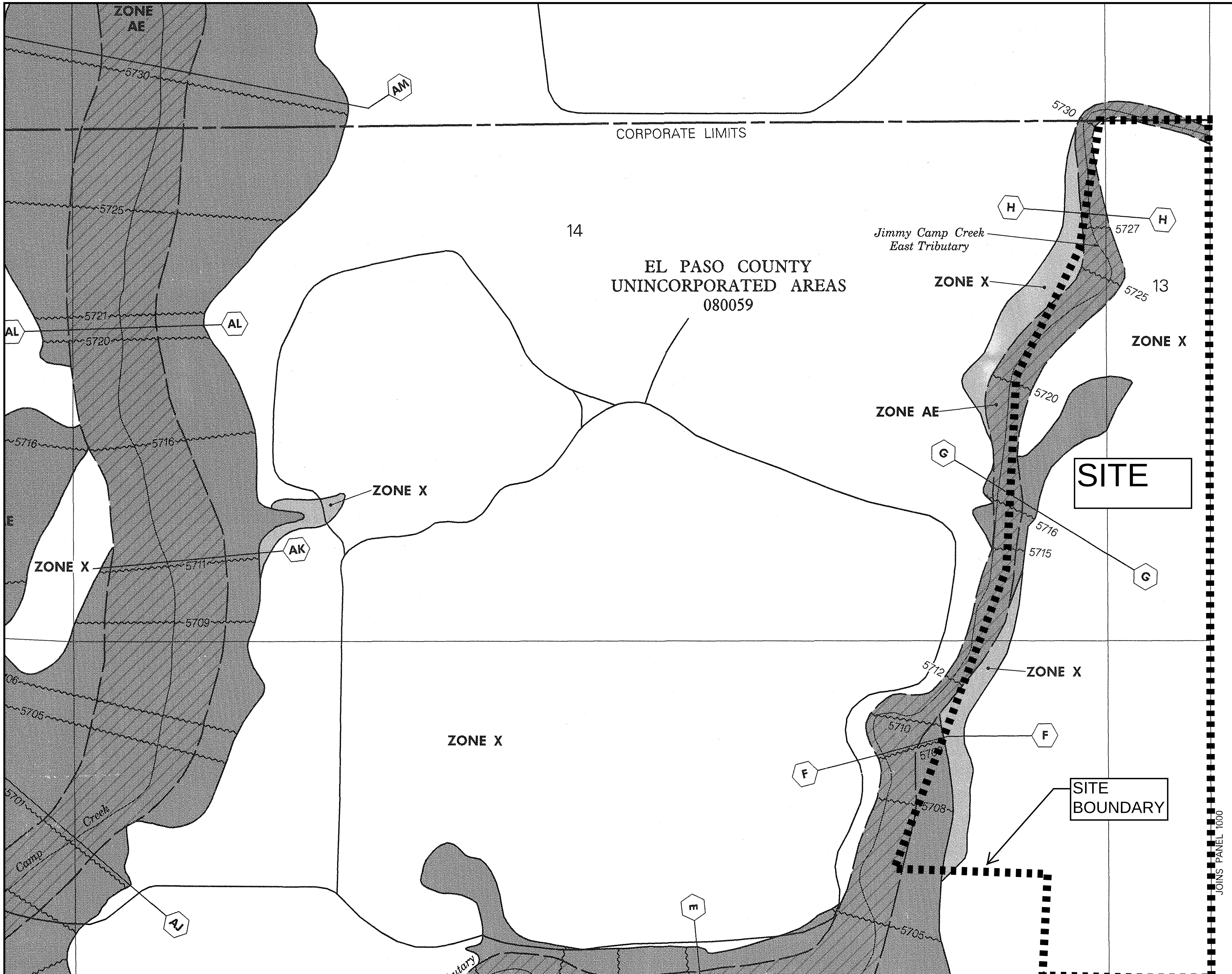
Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 5, Jan 15, 2008

Date(s) aerial images were photographed: 1999

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| El Paso County Area, Colorado (CO625) | | | |
|---|---|---|---|
| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
| 2 | Ascalon sandy loam, 1 to 3 percent slopes | 54.4 | 4.2% |
| 3 | Ascalon sandy loam, 3 to 9 percent slopes | 32.6 | 2.5% |
| 10 | Blendon sandy loam, 0 to 3 percent slopes | 29.0 | 2.2% |
| 28 | Ellicott loamy coarse sand, 0 to 5 percent slopes | 5.5 | 0.4% |
| 52 | Manzanola clay loam, 1 to 3 percent slopes | 180.3 | 14.0% |
| 54 | Midway clay loam, 3 to 25 percent slopes | 46.2 | 3.6% |
| 56 | Nelson-Tassel fine sandy loams, 3 to 18 percent slopes | 476.6 | 37.0% |
| 59 | Nunn clay loam, 0 to 3 percent slopes | 16.8 | 1.3% |
| 61 | Olney sandy loam, 3 to 5 percent slopes | 18.8 | 1.5% |
| 75 | Razor-Midway complex | 213.9 | 16.6% |
| 78 | Sampson loam, 0 to 3 percent slopes | 16.4 | 1.3% |
| 101 | Ustic Torrifluvents, loamy | 11.3 | 0.9% |
| 104 | Vona sandy loam, 1 to 3 percent slopes | 17.4 | 1.4% |
| 108 | Wiley silt loam, 3 to 9 percent slopes | 170.2 | 13.2% |
| Totals for Area of Interest (AOI) | | 1,289.3 | 100.0% |




APPROXIMATE SCALE IN FEET

500 0 500

**NATIONAL FLOOD INSURANCE PROGRAM**

# FIRM

## FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

**PANEL 957 OF 1300**

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

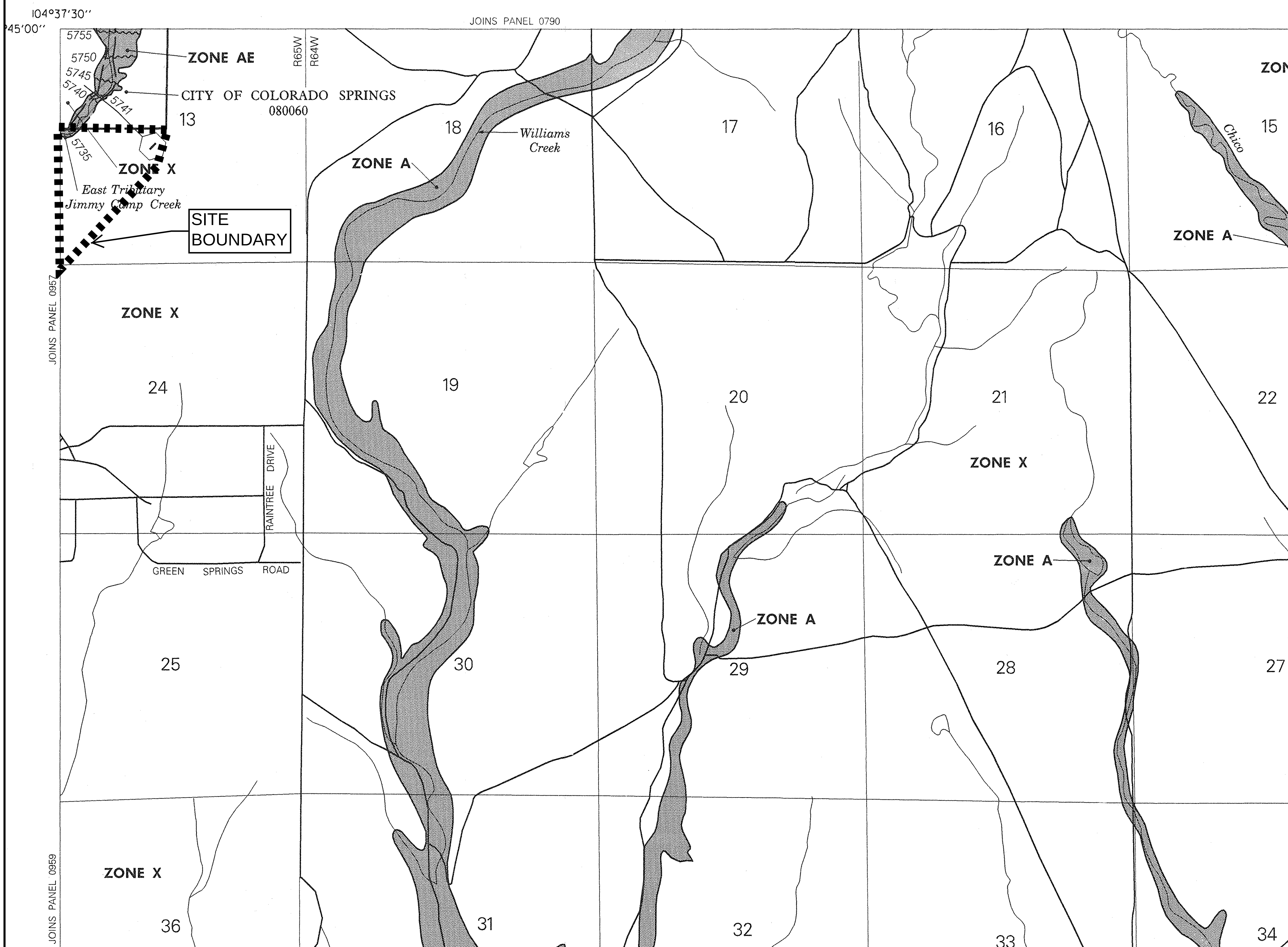
| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| COLORADO SPRINGS, CITY OF | 080060 | 0957 | F |
| EL PASO COUNTY, UNINCORPORATED AREAS | 080059 | 0957 | F |
| FOUNTAIN, CITY OF | 080061 | 0957 | F |

**MAP NUMBER**
**08041C0957 F**

**EFFECTIVE DATE:**
**MARCH 17, 1997**

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov




APPROXIMATE SCALE IN FEET

2000 0 2000

**NATIONAL FLOOD INSURANCE PROGRAM**

# FIRM
## FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

**PANEL 1000 OF 1300**
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| COLORADO SPRINGS, CITY OF | 080060 | 1000 | F |
| EL PASO COUNTY, UNINCORPORATED AREAS | 080059 | 1000 | F |

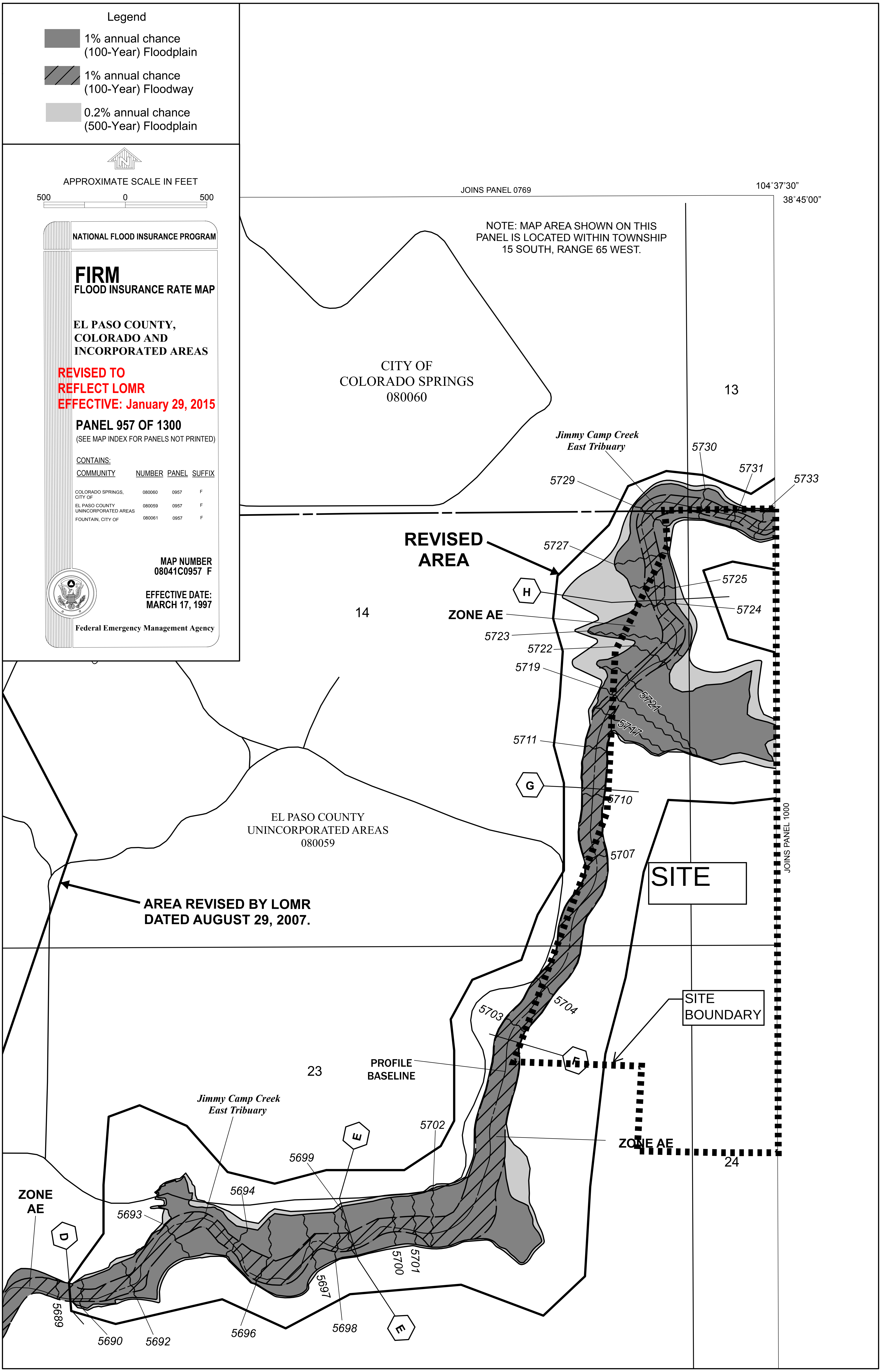
**MAP NUMBER**
**08041C1000 F**

**EFFECTIVE DATE:**
**MARCH 17, 1997**

FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



Legend
1% annual chance (100-Year) Floodplain
1% annual chance (100-Year) Floodway
0.2% annual chance (500-Year) Floodplain
APPROXIMATE SCALE IN FEET
500 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS
REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015
PANEL 957 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
COLORADO SPRINGS, CITY OF 080060 0957 F
EL PASO COUNTY UNINCORPORATED AREAS 080059 0957 F
FOUNTAIN, CITY OF 080061 0957 F
MAP NUMBER 08041C0957 F
EFFECTIVE DATE: MARCH 17, 1997
Federal Emergency Management Agency
JOINS PANEL 0769
104°37'30"
38°45'00"
NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 15 SOUTH, RANGE 65 WEST.
CITY OF COLORADO SPRINGS 080060
13
14
23
24
Jimmy Camp Creek East Tribuary
REVISED AREA
ZONE AE
EL PASO COUNTY UNINCORPORATED AREAS 080059
AREA REVISED BY LOMR DATED AUGUST 29, 2007.
SITE
SITE BOUNDARY
JOINS PANEL 1000
PROFILE BASELINE
5730
5731
5733
5729
5727
5725
5724
5723
5722
5719
5721
5717
5711
5710
5707
5704
5703
5702
5699
5694
5693
5700
5701
5697
5696
5698
5692
5690
5689
H
G
F
E
D

Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain

APPROXIMATE SCALE IN FEET

2,000 0 2,000

NATIONAL FLOOD INSURANCE PROGRAM

# FIRM

## FLOOD INSURANCE RATE MAP

## EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

## PANEL 1000 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| COLORADO SPRINGS, CITY OF | 080060 | 1000 | F |
| EL PASO COUNTY, UNINCORPORATED AREAS | 080059 | 1000 | F |

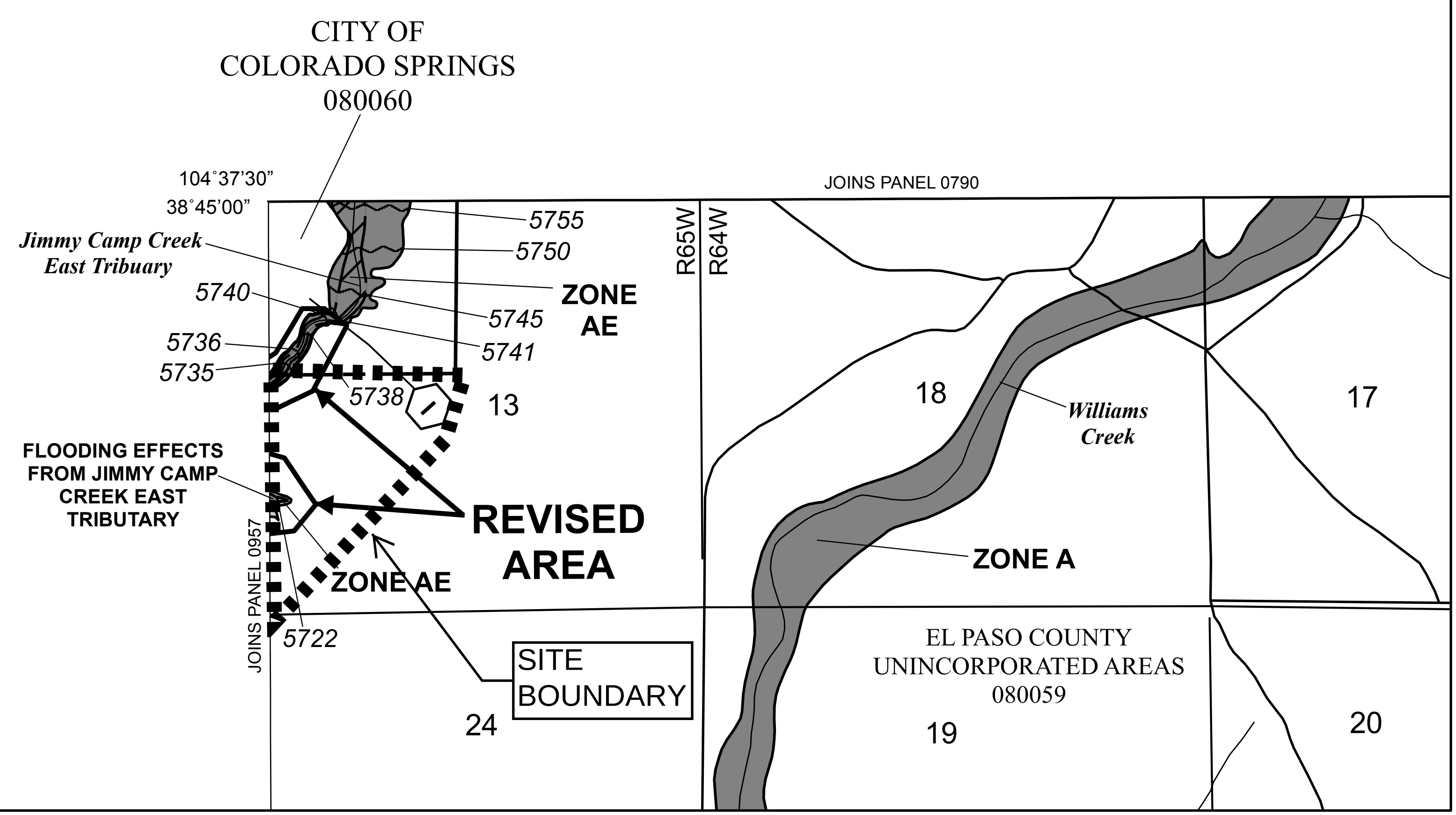
**REVISED TO REFLECT LOMR EFFECTIVE: January 29, 2015**

MAP NUMBER 08041C1000 F

EFFECTIVE DATE: MARCH 17, 1997

Federal Emergency Management Agency

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 15 SOUTH, RANGE 64 WEST AND TOWNSHIP 16 SOUTH, RANGE 65 WEST.



## APPENDIX B – HYDROLOGY CALCULATIONS

**Table 6-6. Runoff Coefficients for Rational Method**
(Source: UDFCD 2001)

| Land Use or Surface Characteristics | Percent Impervious | Runoff Coefficients | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2-year | | 5-year | | 10-year | | 25-year | | 50-year | | 100-year | |
| | | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D | HSG A&B | HSG C&D |
| Business | | | | | | | | | | | | | |
| Commercial Areas | 95 | 0.79 | 0.80 | 0.81 | 0.82 | 0.83 | 0.84 | 0.85 | 0.87 | 0.87 | 0.88 | 0.88 | 0.89 |
| Neighborhood Areas | 70 | 0.45 | 0.49 | 0.49 | 0.53 | 0.53 | 0.57 | 0.58 | 0.62 | 0.60 | 0.65 | 0.62 | 0.68 |
| | | | | | | | | | | | | | |
| Residential | | | | | | | | | | | | | |
| 1/8 Acre or less | 65 | 0.41 | 0.45 | 0.45 | 0.49 | 0.49 | 0.54 | 0.54 | 0.59 | 0.57 | 0.62 | 0.59 | 0.65 |
| 1/4 Acre | 40 | 0.23 | 0.28 | 0.30 | 0.35 | 0.36 | 0.42 | 0.42 | 0.50 | 0.46 | 0.54 | 0.50 | 0.58 |
| 1/3 Acre | 30 | 0.18 | 0.22 | 0.25 | 0.30 | 0.32 | 0.38 | 0.39 | 0.47 | 0.43 | 0.52 | 0.47 | 0.57 |
| 1/2 Acre | 25 | 0.15 | 0.20 | 0.22 | 0.28 | 0.30 | 0.36 | 0.37 | 0.46 | 0.41 | 0.51 | 0.46 | 0.56 |
| 1 Acre | 20 | 0.12 | 0.17 | 0.20 | 0.26 | 0.27 | 0.34 | 0.35 | 0.44 | 0.40 | 0.50 | 0.44 | 0.55 |
| | | | | | | | | | | | | | |
| Industrial | | | | | | | | | | | | | |
| Light Areas | 80 | 0.57 | 0.60 | 0.59 | 0.63 | 0.63 | 0.66 | 0.66 | 0.70 | 0.68 | 0.72 | 0.70 | 0.74 |
| Heavy Areas | 90 | 0.71 | 0.73 | 0.73 | 0.75 | 0.75 | 0.77 | 0.78 | 0.80 | 0.80 | 0.82 | 0.81 | 0.83 |
| | | | | | | | | | | | | | |
| Parks and Cemeteries | 7 | 0.05 | 0.09 | 0.12 | 0.19 | 0.20 | 0.29 | 0.30 | 0.40 | 0.34 | 0.46 | 0.39 | 0.52 |
| Playgrounds | 13 | 0.07 | 0.13 | 0.16 | 0.23 | 0.24 | 0.31 | 0.32 | 0.42 | 0.37 | 0.48 | 0.41 | 0.54 |
| Railroad Yard Areas | 40 | 0.23 | 0.28 | 0.30 | 0.35 | 0.36 | 0.42 | 0.42 | 0.50 | 0.46 | 0.54 | 0.50 | 0.58 |
| | | | | | | | | | | | | | |
| Undeveloped Areas | | | | | | | | | | | | | |
| Historic Flow Analysis-- Greenbelts, Agriculture | 2 | 0.03 | 0.05 | 0.09 | 0.16 | 0.17 | 0.26 | 0.26 | 0.38 | 0.31 | 0.45 | 0.36 | 0.51 |
| Pasture/Meadow | 0 | 0.02 | 0.04 | 0.08 | 0.15 | 0.15 | 0.25 | 0.25 | 0.37 | 0.30 | 0.44 | 0.35 | 0.50 |
| Forest | 0 | 0.02 | 0.04 | 0.08 | 0.15 | 0.15 | 0.25 | 0.25 | 0.37 | 0.30 | 0.44 | 0.35 | 0.50 |
| Exposed Rock | 100 | 0.89 | 0.89 | 0.90 | 0.90 | 0.92 | 0.92 | 0.94 | 0.94 | 0.95 | 0.95 | 0.96 | 0.96 |
| Offsite Flow Analysis (when landuse is undefined) | 45 | 0.26 | 0.31 | 0.32 | 0.37 | 0.38 | 0.44 | 0.44 | 0.51 | 0.48 | 0.55 | 0.51 | 0.59 |
| | | | | | | | | | | | | | |
| Streets | | | | | | | | | | | | | |
| Paved | 100 | 0.89 | 0.89 | 0.90 | 0.90 | 0.92 | 0.92 | 0.94 | 0.94 | 0.95 | 0.95 | 0.96 | 0.96 |
| Gravel | 80 | 0.57 | 0.60 | 0.59 | 0.63 | 0.63 | 0.66 | 0.66 | 0.70 | 0.68 | 0.72 | 0.70 | 0.74 |
| | | | | | | | | | | | | | |
| Drive and Walks | 100 | 0.89 | 0.89 | 0.90 | 0.90 | 0.92 | 0.92 | 0.94 | 0.94 | 0.95 | 0.95 | 0.96 | 0.96 |
| Roofs | 90 | 0.71 | 0.73 | 0.73 | 0.75 | 0.75 | 0.77 | 0.78 | 0.80 | 0.80 | 0.82 | 0.81 | 0.83 |
| Lawns | 0 | 0.02 | 0.04 | 0.08 | 0.15 | 0.15 | 0.25 | 0.25 | 0.37 | 0.30 | 0.44 | 0.35 | 0.50 |

## 3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration ($t_c$) consists of an initial time or overland flow time ($t_i$) plus the travel time ($t_t$) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time ($t_i$) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion ($t_t$) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

# Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SCS Runoff | 458.13 | 6 | 384 | 2,456,980 | ---- | ------ | ------ | EX-C |
| 2 | SCS Runoff | 178.11 | 6 | 372 | 667,589 | ---- | ------ | ------ | EX1 |
| 3 | SCS Runoff | 106.13 | 6 | 372 | 406,031 | ---- | ------ | ------ | EX2 |
| 4 | SCS Runoff | 209.60 | 6 | 372 | 801,911 | ---- | ------ | ------ | EX3 |

| | | |
|---|---|---|
| existing Flows.gpw | Return Period: 100 Year | Wednesday, Dec 20 2017, 9:45 AM |

# Hydrograph Plot

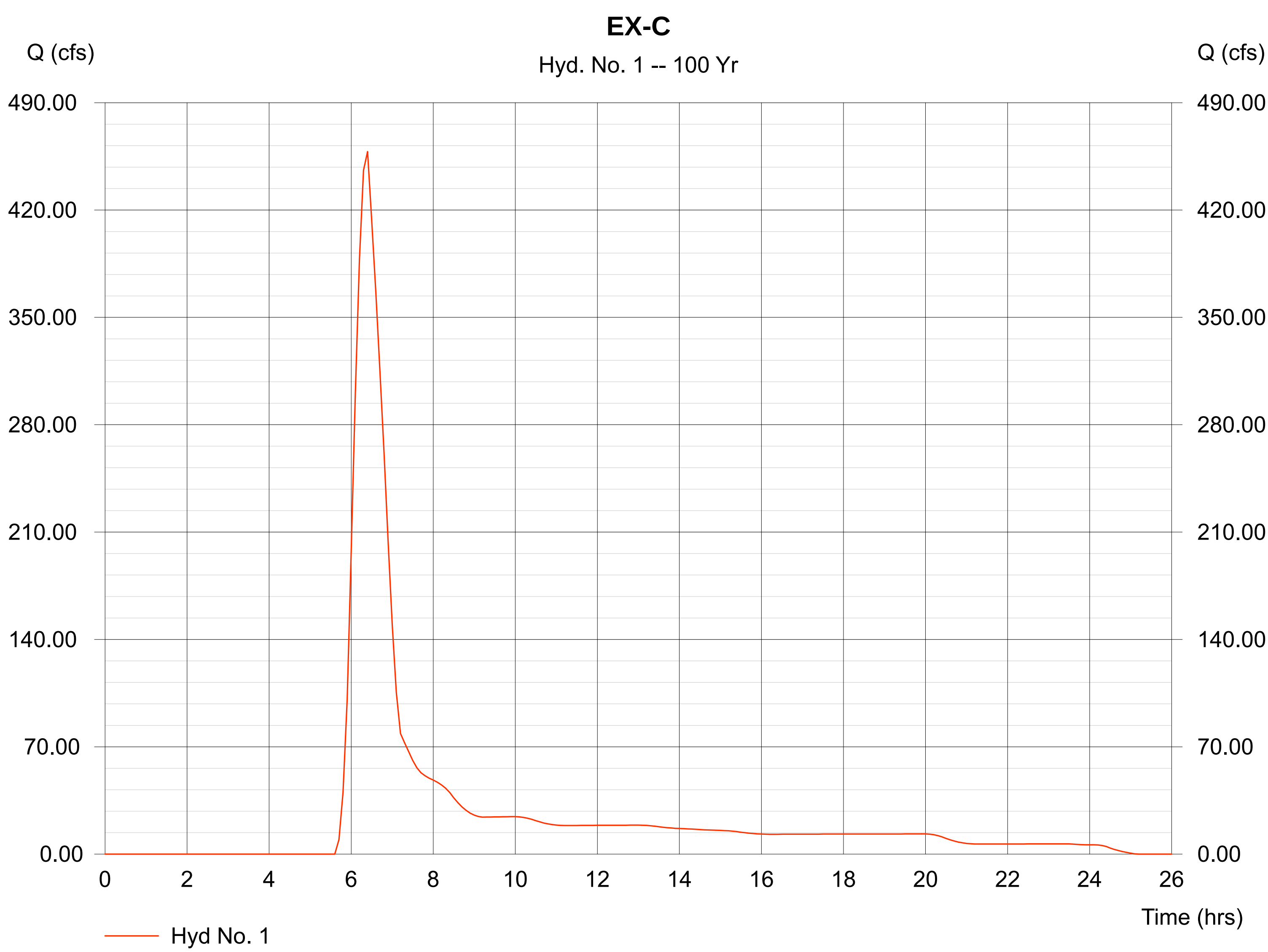
Hydraflow Hydrographs by Intelisolve — Wednesday, Dec 20 2017, 9:46 AM

## Hyd. No. 1

EX-C

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 458.13 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 452.970 ac | Curve number | = 69 |
| Basin Slope | = 0.0 % | Hydraulic length | = 7400 ft |
| Tc method | = USER | Time of conc. (Tc) | = 49.50 min |
| Total precip. | = 4.40 in | Distribution | = Custom |
| Storm duration | = CSpring_IIA-6min.cds | Shape factor | = 484 |

Hydrograph Volume = 2,456,980 cuft



# Hydrograph Plot

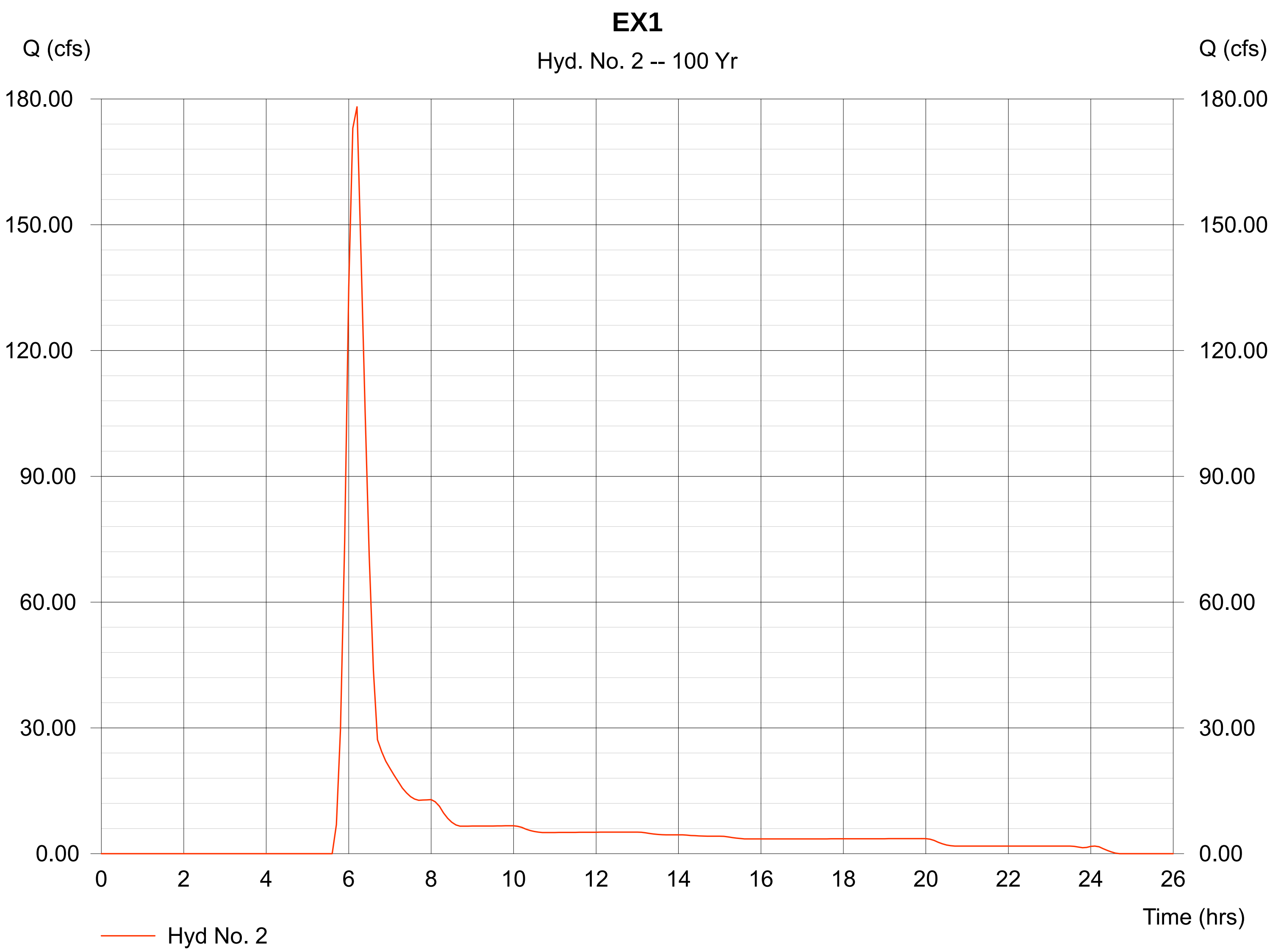
Hydraflow Hydrographs by Intelisolve | Wednesday, Dec 20 2017, 9:46 AM

## Hyd. No. 2

EX1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 178.11 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 120.000 ac | Curve number | = 69 |
| Basin Slope | = 3.0 % | Hydraulic length | = 3000 ft |
| Tc method | = USER | Time of conc. (Tc) | = 25.00 min |
| Total precip. | = 4.40 in | Distribution | = Custom |
| Storm duration | = CSpring_IIA-6min.cds | Shape factor | = 484 |

Hydrograph Volume = 667,589 cuft



# Hydrograph Plot

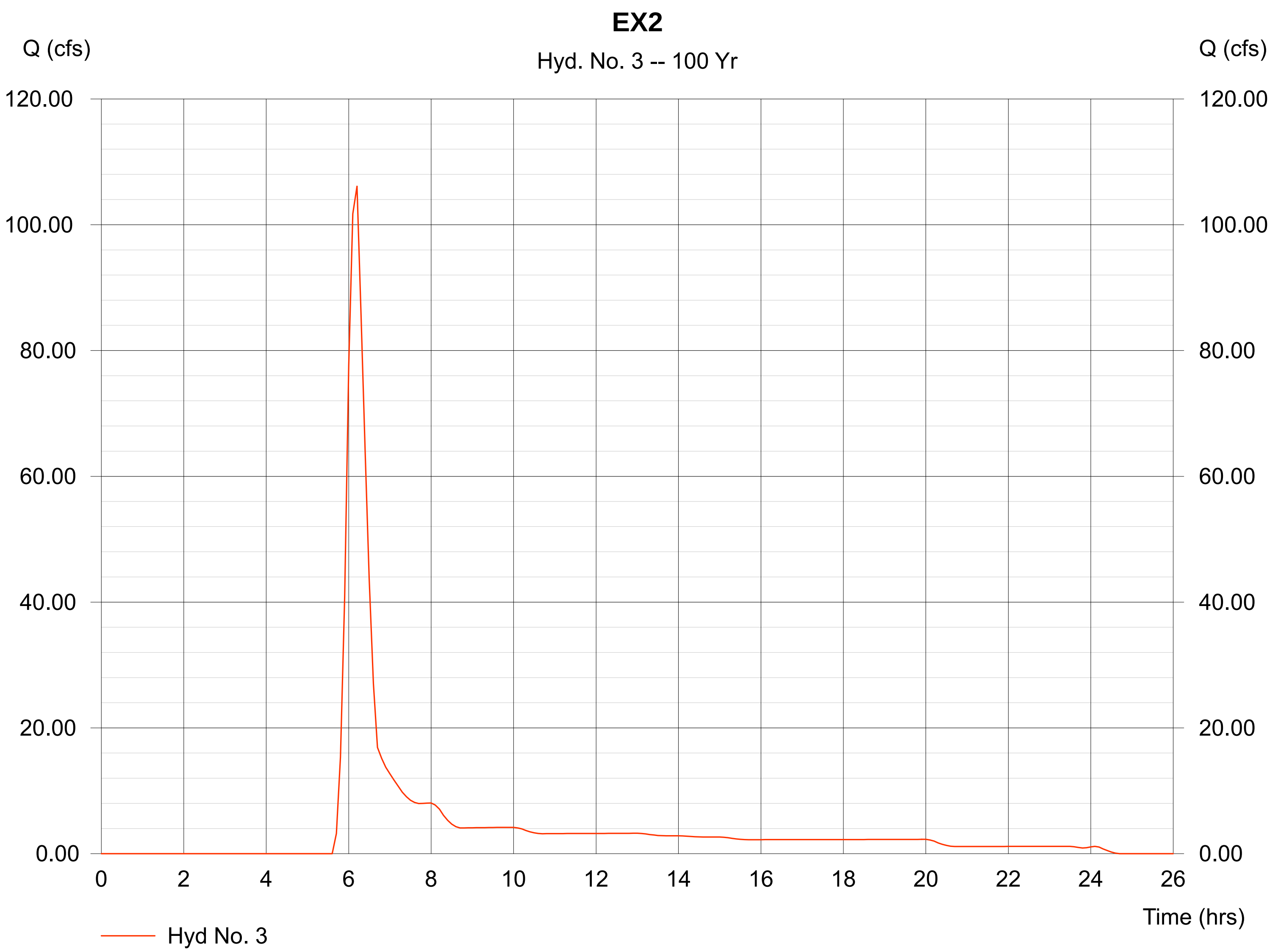
Hydraflow Hydrographs by Intelisolve — Wednesday, Dec 20 2017, 9:46 AM

## Hyd. No. 3

EX2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 106.13 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 80.000 ac | Curve number | = 67 |
| Basin Slope | = 0.0 % | Hydraulic length | = 3000 ft |
| Tc method | = USER | Time of conc. (Tc) | = 25.00 min |
| Total precip. | = 4.40 in | Distribution | = Custom |
| Storm duration | = CSpring_IIA-6min.cds | Shape factor | = 484 |

Hydrograph Volume = 406,031 cuft



# Hydrograph Plot

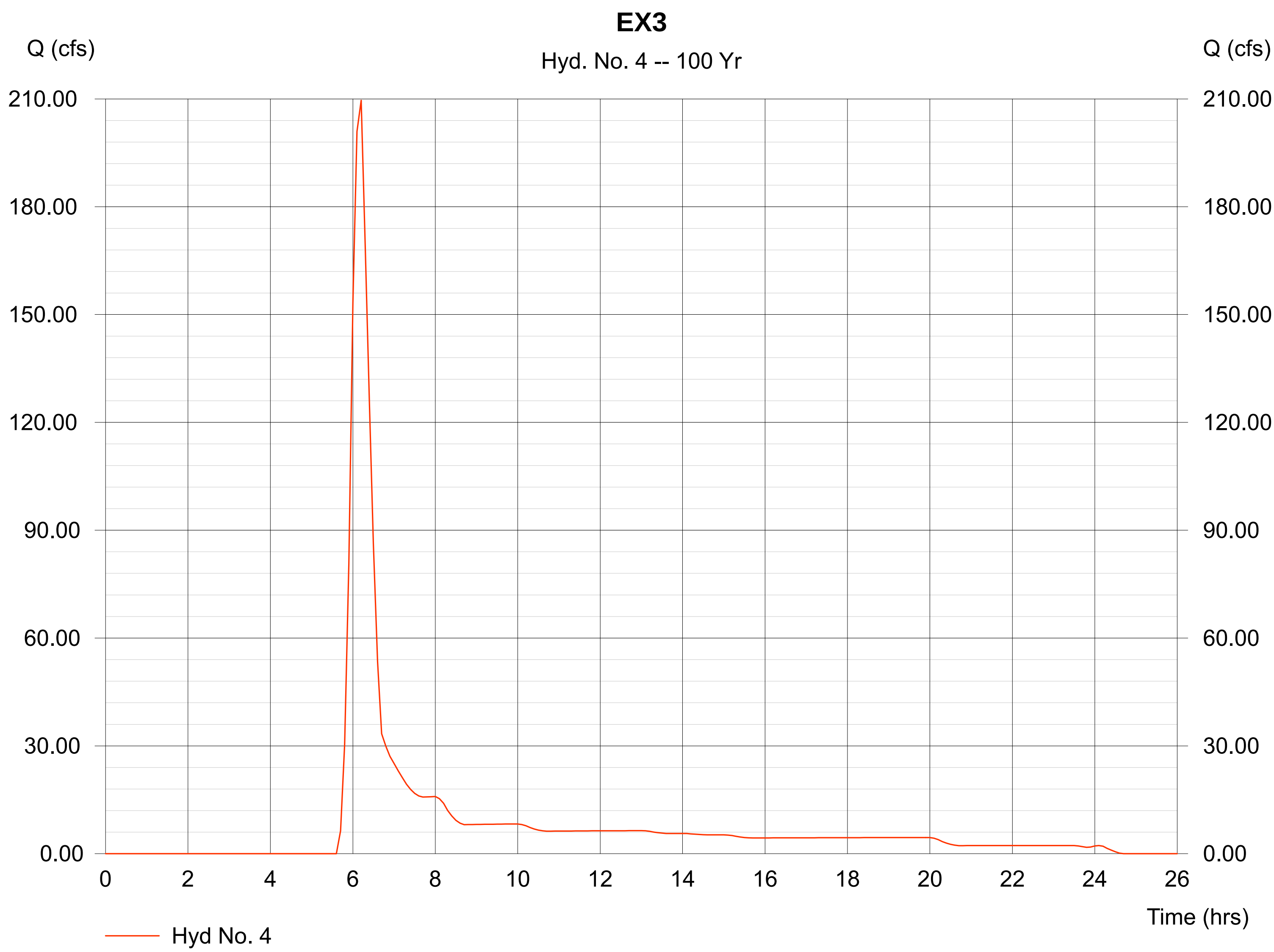


## Hyd. No. 4

EX3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 209.60 cfs |
| Storm frequency | = 100 yrs | Time interval | = 6 min |
| Drainage area | = 158.000 ac | Curve number | = 67 |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = USER | Time of conc. (Tc) | = 29.00 min |
| Total precip. | = 4.40 in | Distribution | = Custom |
| Storm duration | = CSpring_IIA-6min.cds | Shape factor | = 484 |

Hydrograph Volume = 801,911 cuft



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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - Year Event, Proposed Conditions**

| Street or Basin | Design Point | Area Design | Direct Runoff: Area (A) | Direct Runoff: Runoff Coeff. (C) | Direct Runoff: tc | Direct Runoff: CA | Direct Runoff: i | Direct Runoff: Q | Total Runoff: tc | Total Runoff: Σ (CA) | Total Runoff: i | Total Runoff: Q | Street: Slope | Street: Street Flow | Pipe: Design Flow | Pipe: Slope | Pipe: Pipe Size | Travel Time: Length | Travel Time: Velocity | Travel Time: tt | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| OS-C9 | | | 5.24 | 0.49 | 11.09 | 2.57 | 3.97 | 10.2 | | | | | | | | | | | | | |
| C10 | | | 12.92 | 0.49 | 17.87 | 6.33 | 3.26 | 20.6 | | | | | | | | | | | | | |
| OS-C11 | | | 6.48 | 0.49 | 21.69 | 3.18 | 2.97 | 9.4 | | | | | | | | | | | | | |
| C12 | | | 20.52 | 0.49 | 17.56 | 10.05 | 3.28 | 33.0 | | | | | | | | | | | | | |
| C13 | | | 19.21 | 0.16 | 30.35 | 3.07 | 2.46 | 7.6 | | | | | | | | | | | | | |
| C13.1 | | | 1.63 | 0.90 | 8.57 | 1.47 | 4.36 | 6.4 | | | | | | | | | | | | | |
| C14 | | | 2.36 | 0.66 | 9.25 | 1.56 | 4.25 | 6.6 | | | | | | | | | | | | | |
| C14.1 | | | 4.10 | 0.16 | 13.89 | 0.66 | 3.64 | 2.4 | | | | | | | | | | | | | |
| C14.2 | | | 1.65 | 0.68 | 5.12 | 1.12 | 5.13 | 5.8 | | | | | | | | | | | | | |
| C16.1 | | | 2.68 | 0.49 | 7.55 | 1.31 | 4.55 | 6.0 | | | | | | | | | | | | | |
| C16.2 | | | 1.82 | 0.49 | 10.97 | 0.89 | 3.99 | 3.6 | | | | | | | | | | | | | |
| C16.3 | | | 1.78 | 0.49 | 10.35 | 0.87 | 4.08 | 3.6 | | | | | | | | | | | | | |
| C16.4 | | | 0.81 | 0.49 | 8.40 | 0.40 | 4.39 | 1.7 | | | | | | | | | | | | | |
| C16.5 | | | 0.50 | 0.49 | 5.63 | 0.25 | 4.99 | 1.2 | | | | | | | | | | | | | |
| C16.6 | | | 1.43 | 0.49 | 10.27 | 0.70 | 4.09 | 2.9 | | | | | | | | | | | | | |
| C16.7 | | | 0.54 | 0.49 | 7.60 | 0.26 | 4.54 | 1.2 | | | | | | | | | | | | | |
| C16.8 | | | 0.53 | 0.49 | 6.43 | 0.26 | 4.79 | 1.2 | | | | | | | | | | | | | |
| C16.9 | | | 1.60 | 0.49 | 7.62 | 0.78 | 4.54 | 3.6 | | | | | | | | | | | | | |
| C16.10 | | | 0.52 | 0.49 | 6.35 | 0.25 | 4.81 | 1.2 | | | | | | | | | | | | | |
| C16.11 | | | 0.38 | 0.49 | 9.76 | 0.19 | 4.17 | 0.8 | | | | | | | | | | | | | |
| C16.12 | | | 1.82 | 0.49 | 6.89 | 0.89 | 4.69 | 4.2 | | | | | | | | | | | | | |
| C16.13 | | | 3.62 | 0.49 | 11.45 | 1.77 | 3.93 | 7.0 | | | | | | | | | | | | | |
| C16.14 | | | 0.10 | 0.49 | 5.01 | 0.05 | 5.17 | 0.3 | | | | | | | | | | | | | |
| C16.15 | | | 2.28 | 0.49 | 9.77 | 1.12 | 4.16 | 4.7 | | | | | | | | | | | | | |
| C16.16 | | | 1.29 | 0.49 | 13.31 | 0.63 | 3.70 | 2.3 | | | | | | | | | | | | | |
| C16.17 | | | 1.64 | 0.49 | 12.39 | 0.80 | 3.81 | 3.1 | | | | | | | | | | | | | |
| C16.18 | | | 2.96 | 0.49 | 12.69 | 1.45 | 3.77 | 5.5 | | | | | | | | | | | | | |
| C16.19 | | | 1.65 | 0.49 | 11.98 | 0.81 | 3.86 | 3.1 | | | | | | | | | | | | | |
| C16.20 | | | 2.84 | 0.49 | 10.38 | 1.39 | 4.07 | 5.7 | | | | | | | | | | | | | |
| C16.21 | | | 1.78 | 0.49 | 13.36 | 0.87 | 3.69 | 3.2 | | | | | | | | | | | | | |
| C16.22 | | | 2.88 | 0.49 | 14.17 | 1.41 | 3.61 | 5.1 | | | | | | | | | | | | | |
| C16.23 | | | 1.46 | 0.49 | 14.05 | 0.72 | 3.62 | 2.6 | | | | | | | | | | | | | |
| C16.24 | | | 2.79 | 0.49 | 17.10 | 1.37 | 3.32 | 4.5 | | | | | | | | | | | | | |
| C16.25 | | | 0.43 | 0.49 | 11.04 | 0.21 | 3.98 | 0.8 | | | | | | | | | | | | | |

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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - Year Event, Proposed Conditions**

| Street or Basin | Design Point | Direct Runoff | | | | | | | Total Runoff | | | | Street | | Pipe | | | Travel Time | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Area Design | Area (A) | Runoff Coeff. (C) | tc | CA | i | Q | tc | Σ (CA) | i | Q | Slope | Street Flow | Design Flow | Slope | Pipe Size | Length | Velocity | tt | |
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| C16.26 | | | 1.42 | 0.49 | 11.66 | 0.70 | 3.90 | 2.7 | | | | | | | | | | | | | |
| C16.27 | | | 0.23 | 0.49 | 5.95 | 0.11 | 4.91 | 0.6 | | | | | | | | | | | | | |
| C16.28 | | | 2.09 | 0.49 | 12.65 | 1.02 | 3.78 | 3.9 | | | | | | | | | | | | | |
| C16.29 | | | 2.01 | 0.49 | 12.98 | 0.98 | 3.74 | 3.7 | | | | | | | | | | | | | |
| C16.30 | | | 4.54 | 0.49 | 20.36 | 2.22 | 3.06 | 6.8 | | | | | | | | | | | | | |
| C16.31 | | | 9.90 | 0.23 | 20.56 | 2.28 | 3.05 | 6.9 | | | | | | | | | | | | | |
| C16.32 | | | 0.97 | 0.49 | 12.20 | 0.48 | 3.83 | 1.8 | | | | | | | | | | | | | |
| C16.33 | | | 0.21 | 0.90 | 5.00 | 0.19 | 5.17 | 1.0 | | | | | | | | | | | | | |
| C16.34 | | | 0.38 | 0.49 | 6.95 | 0.19 | 4.67 | 0.9 | | | | | | | | | | | | | |
| C16.35 | | | 1.46 | 0.49 | 11.60 | 0.72 | 3.91 | 2.8 | | | | | | | | | | | | | |
| C16.36 | | | 7.70 | 0.23 | 14.79 | 1.77 | 3.54 | 6.3 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C15.1 | | | 7.10 | 0.30 | 18.04 | 2.13 | 3.24 | 6.9 | | | | | | | | | | | | | |
| C15.2 | | | 4.63 | 0.42 | 11.51 | 1.94 | 3.92 | 7.6 | | | | | | | | | | | | | |
| C15.3 | | | 3.60 | 0.49 | 13.83 | 1.76 | 3.64 | 6.4 | | | | | | | | | | | | | |
| C15.4 | | | 1.25 | 0.49 | 9.05 | 0.61 | 4.28 | 2.6 | | | | | | | | | | | | | |
| C15.5 | | | 2.90 | 0.49 | 9.86 | 1.42 | 4.15 | 5.9 | | | | | | | | | | | | | |
| C15.6 | | | 1.80 | 0.49 | 12.88 | 0.88 | 3.75 | 3.3 | | | | | | | | | | | | | |
| C15.7 | | | 2.07 | 0.49 | 11.73 | 1.01 | 3.89 | 3.9 | | | | | | | | | | | | | |
| C15.8 | | | 3.76 | 0.40 | 15.51 | 1.50 | 3.47 | 5.2 | | | | | | | | | | | | | |
| C15.9 | | | 2.27 | 0.49 | 8.22 | 1.11 | 4.42 | 4.9 | | | | | | | | | | | | | |
| C15.10 | | | 0.60 | 0.49 | 9.85 | 0.29 | 4.15 | 1.2 | | | | | | | | | | | | | |
| C15.11 | | | 3.20 | 0.49 | 11.58 | 1.57 | 3.91 | 6.1 | | | | | | | | | | | | | |
| C15.12 | | | 0.61 | 0.49 | 11.47 | 0.30 | 3.92 | 1.2 | | | | | | | | | | | | | |
| C15.13 | | | 2.35 | 0.49 | 11.49 | 1.15 | 3.92 | 4.5 | | | | | | | | | | | | | |
| C15.14 | | | 1.32 | 0.49 | 8.11 | 0.65 | 4.44 | 2.9 | | | | | | | | | | | | | |
| C15.15 | | | 4.02 | 0.49 | 13.72 | 1.97 | 3.65 | 7.2 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C17.1a | | | 2.81 | 0.49 | 12.11 | 1.38 | 3.84 | 5.3 | | | | | | | | | | | | | |
| C17.1 | | | 2.68 | 0.49 | 7.69 | 1.31 | 4.52 | 5.9 | | | | | | | | | | | | | |
| C17.2 | | | 4.11 | 0.49 | 9.19 | 2.01 | 4.26 | 8.6 | | | | | | | | | | | | | |
| C17.3 | | | 2.21 | 0.49 | 9.78 | 1.08 | 4.16 | 4.5 | | | | | | | | | | | | | |
| C17.4 | | | 1.98 | 0.49 | 17.58 | 0.97 | 3.28 | 3.2 | | | | | | | | | | | | | |
| C17.5 | | | 3.72 | 0.49 | 13.41 | 1.82 | 3.69 | 6.7 | | | | | | | | | | | | | |

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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - Year Event, Proposed Conditions**

| | | Direct Runoff | | | | | | | Total Runoff | | | | Street | | Pipe | | | Travel Time | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street or Basin | Design Point | Area Design | Area (A) | Runoff Coeff. (C) | tc | CA | i | Q | tc | Σ (CA) | i | Q | Slope | Street Flow | Design Flow | Slope | Pipe Size | Length | Velocity | tt | Remarks |
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| C17.6 | | | 1.04 | 0.49 | 13.89 | 0.51 | 3.64 | 1.9 | | | | | | | | | | | | | |
| C17.7 | | | 2.68 | 0.49 | 7.62 | 1.31 | 4.54 | 6.0 | | | | | | | | | | | | | |
| C17.8 | | | 1.52 | 0.55 | 12.41 | 0.84 | 3.81 | 3.2 | | | | | | | | | | | | | |
| C17.9 | | | 1.73 | 0.90 | 5.65 | 1.56 | 4.99 | 7.8 | | | | | | | | | | | | | |
| C17.10 | | | 2.34 | 0.90 | 9.34 | 2.11 | 4.23 | 8.9 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| D1.1 | | | 5.09 | 0.49 | 18.38 | 2.49 | 3.22 | 8.0 | | | | | | | | | | | | | |
| D1.2 | | | 1.10 | 0.49 | 6.86 | 0.54 | 4.69 | 2.5 | | | | | | | | | | | | | |
| D1.3 | | | 0.86 | 0.49 | 10.65 | 0.42 | 4.03 | 1.7 | | | | | | | | | | | | | |
| D1.4 | | | 2.80 | 0.49 | 12.39 | 1.37 | 3.81 | 5.2 | | | | | | | | | | | | | |
| D1.5 | | | 5.15 | 0.49 | 9.43 | 2.52 | 4.22 | 10.6 | | | | | | | | | | | | | |
| D1.6 | | | 5.10 | 0.49 | 16.74 | 2.50 | 3.36 | 8.4 | | | | | | | | | | | | | |
| D1.7 | | | 3.50 | 0.49 | 10.40 | 1.72 | 4.07 | 7.0 | | | | | | | | | | | | | |
| D1.8 | | | 1.70 | 0.49 | 12.37 | 0.83 | 3.81 | 3.2 | | | | | | | | | | | | | |
| D1.9 | | | 2.20 | 0.49 | 12.70 | 1.08 | 3.77 | 4.1 | | | | | | | | | | | | | |
| D1.10 | | | 5.50 | 0.49 | 13.39 | 2.70 | 3.69 | 9.9 | | | | | | | | | | | | | |
| D1.11 | | | 1.40 | 0.49 | 12.38 | 0.69 | 3.81 | 2.6 | | | | | | | | | | | | | |
| D1.12 | | | 4.45 | 0.24 | 14.08 | 1.07 | 3.62 | 3.9 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| D2.1 | | | 3.14 | 0.49 | 14.87 | 1.54 | 3.53 | 5.4 | | | | | | | | | | | | | |
| D2.2 | | | 1.11 | 0.49 | 11.93 | 0.54 | 3.86 | 2.1 | | | | | | | | | | | | | |
| D2.3 | | | 2.80 | 0.27 | 14.09 | 0.76 | 3.61 | 2.7 | | | | | | | | | | | | | |
| D2.4 | | | 3.33 | 0.29 | 13.48 | 0.97 | 3.68 | 3.6 | | | | | | | | | | | | | |
| D2.5 | | | 3.93 | 0.49 | 7.40 | 1.93 | 4.58 | 8.8 | | | | | | | | | | | | | |
| D2.6 | | | 2.13 | 0.49 | 10.37 | 1.04 | 4.07 | 4.3 | | | | | | | | | | | | | |
| D2.7 | | | 2.98 | 0.49 | 7.22 | 1.46 | 4.62 | 6.7 | | 5.11 | | | | | | | | | | | |
| D2.8 | | | 3.70 | 0.49 | 9.24 | 1.81 | 4.25 | 7.7 | | | | | | | | | | | | | |
| D2.9 | | | 3.15 | 0.49 | 14.83 | 1.54 | 3.54 | 5.5 | | | | | | | | | | | | | |
| D2.10 | | | 0.80 | 0.49 | 6.24 | 0.39 | 4.84 | 1.9 | | | | | | | | | | | | | |
| D2.11 | | | 0.40 | 0.90 | 3.68 | 0.36 | 5.63 | 2.0 | | | | | | | | | | | | | |
| D2.12 | | | 2.78 | 0.49 | 11.27 | 1.36 | 3.95 | 5.4 | | | | | | | | | | | | | |
| D2.13 | | | 2.51 | 0.49 | 17.67 | 1.23 | 3.28 | 4.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| E1.1 | | | 1.41 | 0.49 | 7.40 | 0.69 | 4.58 | 3.2 | | | | | | | | | | | | | |

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **5 - Year Event, Proposed Conditions**

| Street or Basin | Design Point | Area Design | Direct Runoff: Area (A) | Runoff Coeff. (C) | tc | CA | i | Q | Total Runoff: tc | Σ (CA) | i | Q | Street: Slope | Street Flow | Pipe: Design Flow | Slope | Pipe Size | Travel Time: Length | Velocity | tt | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| E1.2 | | | 3.61 | 0.49 | 10.20 | 1.77 | 4.10 | 7.3 | | | | | | | | | | | | | |
| E1.3 | | | 6.81 | 0.20 | 15.70 | 1.36 | 3.45 | 4.7 | | 0.25 | | | | | | | | | | | |
| E1.4 | | | 0.65 | 0.49 | 9.92 | 0.32 | 4.14 | 1.3 | | | | | | | | | | | | | |
| E1.5 | | | 1.95 | 0.49 | 8.86 | 0.96 | 4.31 | 4.1 | | | | | | | | | | | | | |
| E1.6 | | | 2.32 | 0.49 | 10.94 | 1.14 | 3.99 | 4.5 | | | | | | | | | | | | | |
| E1.7 | | | 3.50 | 0.38 | 14.72 | 1.33 | 3.55 | 4.7 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C12a-ex | | | 27 | 0.15 | 15.69 | 4.05 | 3.45 | 14 | | | | | | | | | | | | | |
| C12-ex | | | 73 | 0.15 | 24.19 | 10.95 | 2.80 | 31 | | | | | | | | | | | | | |
| C14-ex | | | 119 | 0.15 | 29.17 | 17.85 | 2.52 | 45 | | | | | | | | | | | | | |
| C15-ex | | | 55 | 0.15 | 22.61 | 8.25 | 2.91 | 24 | | | | | | | | | | | | | |
| D1-ex | | | 17 | 0.15 | 17.78 | 2.55 | 3.27 | 8 | | | | | | | | | | | | | |
| E1-ex | | | 57 | 0.15 | 21.72 | 8.55 | 2.97 | 25 | | | | | | | | | | | | | |
| E2-ex | | | 30 | 0.26 | 16.78 | 7.67 | 3.35 | 26 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **100 - Year Event, Proposed Conditions**

| | | Direct Runoff | | | | | | | Total Runoff | | | | Street | | Pipe | | | Travel Time | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Street or Basin | Design Point | Area Design | Area (A) | Runoff Coeff. (C) | tc | CA | i | Q | tc | Σ (CA) | i | Q | Slope | Street Flow | Design Flow | Slope | Pipe Size | Length | Velocity | tt | Remarks |
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| OS-C9 | | | 5.24 | 0.65 | 11.09 | 3.41 | 6.67 | 22.7 | | | | | | | | | | | | | |
| C10 | | | 12.92 | 0.65 | 17.87 | 8.40 | 5.47 | 45.9 | | | | | | | | | | | | | |
| OS-C11 | | | 6.48 | 0.65 | 21.69 | 4.21 | 4.98 | 21.0 | | | | | | | | | | | | | |
| C12 | | | 20.52 | 0.65 | 17.56 | 13.34 | 5.51 | 73.5 | | | | | | | | | | | | | |
| C13 | | | 19.21 | 0.51 | 30.35 | 9.80 | 4.13 | 40.5 | | | | | | | | | | | | | |
| C13.1 | | | 1.63 | 0.96 | 8.57 | 1.56 | 7.32 | 11.5 | | | | | | | | | | | | | |
| C14 | | | 2.36 | 0.81 | 9.25 | 1.91 | 7.13 | 13.6 | | | | | | | | | | | | | |
| C14.1 | | | 4.10 | 0.51 | 13.89 | 2.09 | 6.10 | 12.8 | | | | | | | | | | | | | |
| C14.2 | | | 1.65 | 0.82 | 5.12 | 1.35 | 8.62 | 11.7 | | | | | | | | | | | | | |
| C16.1 | | | 2.68 | 0.65 | 7.55 | 1.74 | 7.64 | 13.3 | | | | | | | | | | | | | |
| C16.2 | | | 1.82 | 0.65 | 10.97 | 1.18 | 6.70 | 7.9 | | | | | | | | | | | | | |
| C16.3 | | | 1.78 | 0.65 | 10.35 | 1.16 | 6.85 | 7.9 | | | | | | | | | | | | | |
| C16.4 | | | 0.81 | 0.65 | 8.40 | 0.53 | 7.37 | 3.9 | | | | | | | | | | | | | |
| C16.5 | | | 0.50 | 0.65 | 5.63 | 0.33 | 8.38 | 2.7 | | | | | | | | | | | | | |
| C16.6 | | | 1.43 | 0.65 | 10.27 | 0.93 | 6.87 | 6.4 | | | | | | | | | | | | | |
| C16.7 | | | 0.54 | 0.65 | 7.60 | 0.35 | 7.62 | 2.7 | | | | | | | | | | | | | |
| C16.8 | | | 0.53 | 0.65 | 6.43 | 0.34 | 8.05 | 2.8 | | | | | | | | | | | | | |
| C16.9 | | | 1.60 | 0.65 | 7.62 | 1.04 | 7.62 | 7.9 | | | | | | | | | | | | | |
| C16.10 | | | 0.52 | 0.65 | 6.35 | 0.34 | 8.08 | 2.7 | | | | | | | | | | | | | |
| C16.11 | | | 0.38 | 0.65 | 9.76 | 0.25 | 6.99 | 1.7 | | | | | | | | | | | | | |
| C16.12 | | | 1.82 | 0.65 | 6.89 | 1.18 | 7.87 | 9.3 | | | | | | | | | | | | | |
| C16.13 | | | 3.62 | 0.65 | 11.45 | 2.35 | 6.59 | 15.5 | | | | | | | | | | | | | |
| C16.14 | | | 0.10 | 0.65 | 5.01 | 0.07 | 8.67 | 0.6 | | | | | | | | | | | | | |
| C16.15 | | | 2.28 | 0.65 | 9.77 | 1.48 | 6.99 | 10.4 | | | | | | | | | | | | | |
| C16.16 | | | 1.29 | 0.65 | 13.31 | 0.84 | 6.21 | 5.2 | | | | | | | | | | | | | |
| C16.17 | | | 1.64 | 0.65 | 12.39 | 1.07 | 6.39 | 6.8 | | | | | | | | | | | | | |
| C16.18 | | | 2.96 | 0.65 | 12.69 | 1.92 | 6.33 | 12.2 | | | | | | | | | | | | | |
| C16.19 | | | 1.65 | 0.65 | 11.98 | 1.07 | 6.48 | 6.9 | | | | | | | | | | | | | |
| C16.20 | | | 2.84 | 0.65 | 10.38 | 1.85 | 6.84 | 12.6 | | | | | | | | | | | | | |
| C16.21 | | | 1.78 | 0.65 | 13.36 | 1.16 | 6.20 | 7.2 | | | | | | | | | | | | | |
| C16.22 | | | 2.88 | 0.65 | 14.17 | 1.87 | 6.05 | 11.3 | | | | | | | | | | | | | |
| C16.23 | | | 1.46 | 0.65 | 14.05 | 0.95 | 6.08 | 5.8 | | | | | | | | | | | | | |
| C16.24 | | | 2.79 | 0.65 | 17.10 | 1.81 | 5.58 | 10.1 | | | | | | | | | | | | | |

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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **100 - Year Event, Proposed Conditions**

| Street or Basin | Design Point | Area Design | Direct Runoff Area (A) | Runoff Coeff. (C) | tc | CA | i | Q | Total Runoff tc | Σ (CA) | i | Q | Street Slope | Street Flow | Pipe Design Flow | Slope | Pipe Size | Travel Time Length | Velocity | tt | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| C16.25 | | | 0.43 | 0.65 | 11.04 | 0.28 | 6.68 | 1.9 | | | | | | | | | | | | | |
| C16.26 | | | 1.42 | 0.65 | 11.66 | 0.92 | 6.55 | 6.0 | | | | | | | | | | | | | |
| C16.27 | | | 0.23 | 0.65 | 5.95 | 0.15 | 8.24 | 1.2 | | | | | | | | | | | | | |
| C16.28 | | | 2.09 | 0.65 | 12.65 | 1.36 | 6.34 | 8.6 | | | | | | | | | | | | | |
| C16.29 | | | 2.01 | 0.65 | 12.98 | 1.31 | 6.28 | 8.2 | | | | | | | | | | | | | |
| C16.30 | | | 4.54 | 0.65 | 20.36 | 2.95 | 5.14 | 15.2 | | | | | | | | | | | | | |
| C16.31 | | | 9.90 | 0.54 | 20.56 | 5.35 | 5.12 | 27.4 | | | | | | | | | | | | | |
| C16.32 | | | 0.97 | 0.65 | 12.20 | 0.63 | 6.43 | 4.1 | | | | | | | | | | | | | |
| C16.33 | | | 0.21 | 0.96 | 5.00 | 0.20 | 8.68 | 1.7 | | | | | | | | | | | | | |
| C16.34 | | | 0.38 | 0.65 | 6.95 | 0.25 | 7.85 | 1.9 | | | | | | | | | | | | | |
| C16.35 | | | 1.46 | 0.65 | 11.60 | 0.95 | 6.56 | 6.2 | | | | | | | | | | | | | |
| C16.36 | | | 7.70 | 0.54 | 14.79 | 4.16 | 5.95 | 24.7 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C15.1 | | | 7.10 | 0.57 | 18.04 | 4.05 | 5.45 | 22.0 | | | | | | | | | | | | | |
| C15.2 | | | 4.63 | 0.63 | 11.51 | 2.92 | 6.58 | 19.2 | | | | | | | | | | | | | |
| C15.3 | | | 3.60 | 0.65 | 13.83 | 2.34 | 6.12 | 14.3 | | | | | | | | | | | | | |
| C15.4 | | | 1.25 | 0.65 | 9.05 | 0.81 | 7.18 | 5.8 | | | | | | | | | | | | | |
| C15.5 | | | 2.90 | 0.65 | 9.86 | 1.89 | 6.97 | 13.1 | | | | | | | | | | | | | |
| C15.6 | | | 1.80 | 0.65 | 12.88 | 1.17 | 6.29 | 7.4 | | | | | | | | | | | | | |
| C15.7 | | | 2.07 | 0.65 | 11.73 | 1.35 | 6.53 | 8.8 | | | | | | | | | | | | | |
| C15.8 | | | 3.76 | 0.61 | 15.51 | 2.29 | 5.83 | 13.4 | | | | | | | | | | | | | |
| C15.9 | | | 2.27 | 0.65 | 8.22 | 1.48 | 7.43 | 11.0 | | | | | | | | | | | | | |
| C15.10 | | | 0.60 | 0.65 | 9.85 | 0.39 | 6.97 | 2.7 | | | | | | | | | | | | | |
| C15.11 | | | 3.20 | 0.65 | 11.58 | 2.08 | 6.56 | 13.7 | | | | | | | | | | | | | |
| C15.12 | | | 0.61 | 0.65 | 11.47 | 0.40 | 6.59 | 2.6 | | | | | | | | | | | | | |
| C15.13 | | | 2.35 | 0.65 | 11.49 | 1.53 | 6.58 | 10.1 | | | | | | | | | | | | | |
| C15.14 | | | 1.32 | 0.65 | 8.11 | 0.86 | 7.46 | 6.4 | | | | | | | | | | | | | |
| C15.15 | | | 4.02 | 0.65 | 13.72 | 2.61 | 6.14 | 16.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C17.1a | | | 2.81 | 0.65 | 12.11 | 1.83 | 6.45 | 11.8 | | | | | | | | | | | | | |
| C17.1 | | | 2.68 | 0.65 | 7.69 | 1.74 | 7.59 | 13.2 | | | | | | | | | | | | | |
| C17.2 | | | 4.11 | 0.65 | 9.19 | 2.67 | 7.15 | 19.1 | | | | | | | | | | | | | |
| C17.3 | | | 2.21 | 0.65 | 9.78 | 1.44 | 6.99 | 10.0 | | | | | | | | | | | | | |

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **100 - Year Event, Proposed Conditions**

| Street or Basin | Design Point | Direct Runoff: Area Design | Direct Runoff: Area (A) | Direct Runoff: Runoff Coeff. (C) | Direct Runoff: tc | Direct Runoff: CA | Direct Runoff: i | Direct Runoff: Q | Total Runoff: tc | Total Runoff: Σ (CA) | Total Runoff: i | Total Runoff: Q | Street: Slope | Street: Street Flow | Pipe: Design Flow | Pipe: Slope | Pipe: Pipe Size | Travel Time: Length | Travel Time: Velocity | Travel Time: tt | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| C17.4 | | | 1.98 | 0.65 | 17.58 | 1.29 | 5.51 | 7.1 | | | | | | | | | | | | | |
| C17.5 | | | 3.72 | 0.96 | 13.41 | 3.57 | 6.19 | 22.1 | | | | | | | | | | | | | |
| C17.6 | | | 1.04 | 0.96 | 13.89 | 1.00 | 6.10 | 6.1 | | | | | | | | | | | | | |
| C17.7 | | | 2.68 | 0.65 | 7.62 | 1.74 | 7.62 | 13.3 | | | | | | | | | | | | | |
| C17.8 | | | 1.52 | 0.74 | 12.41 | 1.12 | 6.39 | 7.2 | | | | | | | | | | | | | |
| C17.9 | | | 1.73 | 0.96 | 5.65 | 1.66 | 8.37 | 13.9 | | | | | | | | | | | | | |
| C17.10 | | | 2.34 | 0.96 | 9.34 | 2.25 | 7.10 | 16.0 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| D1.1 | | | 5.09 | 0.65 | 18.38 | 3.31 | 5.40 | 17.9 | | | | | | | | | | | | | |
| D1.2 | | | 1.10 | 0.65 | 6.86 | 0.72 | 7.88 | 5.6 | | | | | | | | | | | | | |
| D1.3 | | | 0.86 | 0.65 | 10.65 | 0.56 | 6.77 | 3.8 | | | | | | | | | | | | | |
| D1.4 | | | 2.80 | 0.65 | 12.39 | 1.82 | 6.39 | 11.6 | | | 33.03 | | | | | | | | | | |
| D1.5 | | | 5.15 | 0.65 | 9.43 | 3.35 | 7.08 | 23.7 | | | | | | | | | | | | | |
| D1.6 | | | 5.10 | 0.65 | 16.74 | 3.32 | 5.63 | 18.7 | | | 47.79 | | | | | | | | | | |
| D1.7 | | | 3.50 | 0.65 | 10.40 | 2.28 | 6.83 | 15.5 | | | | | | | | | | | | | |
| D1.8 | | | 1.70 | 0.65 | 12.37 | 1.11 | 6.40 | 7.1 | | | | | | | | | | | | | |
| D1.9 | | | 2.20 | 0.65 | 12.70 | 1.43 | 6.33 | 9.1 | | | | | | | | | | | | | |
| D1.10 | | | 5.50 | 0.65 | 13.39 | 3.58 | 6.20 | 22.2 | | | | | | | | | | | | | |
| D1.11 | | | 1.40 | 0.65 | 12.38 | 0.91 | 6.39 | 5.8 | | | | | | | | | | | | | |
| D1.12 | | | 4.45 | 0.57 | 14.08 | 2.54 | 6.07 | 15.4 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| D2.1 | | | 3.14 | 0.65 | 14.87 | 2.04 | 5.93 | 12.1 | | | | | | | | | | | | | |
| D2.2 | | | 1.11 | 0.65 | 11.93 | 0.72 | 6.49 | 4.7 | | | | | | | | | | | | | |
| D2.3 | | | 2.80 | 0.57 | 14.09 | 1.60 | 6.07 | 9.7 | | | | | | | | | | | | | |
| D2.4 | | | 3.33 | 0.58 | 13.48 | 1.93 | 6.18 | 11.9 | | | | | | | | | | | | | |
| D2.5 | | | 3.93 | 0.65 | 7.40 | 2.55 | 7.69 | 19.6 | | | | | | | | | | | | | |
| D2.6 | | | 2.13 | 0.65 | 10.37 | 1.38 | 6.84 | 9.5 | | | | | | | | | | | | | |
| D2.7 | | | 2.98 | 0.65 | 7.22 | 1.94 | 7.75 | 15.0 | | | | | | | | | | | | | |
| D2.8 | | | 3.70 | 0.65 | 9.24 | 2.41 | 7.13 | 17.2 | | | | | | | | | | | | | |
| D2.9 | | | 3.15 | 0.65 | 14.83 | 2.05 | 5.94 | 12.2 | | | | | | | | | | | | | |
| D2.10 | | | 0.95 | 0.65 | 6.24 | 0.62 | 8.12 | 5.0 | | | | | | | | | | | | | |
| D2.11 | | | 0.40 | 0.96 | 3.68 | 0.38 | 9.45 | 3.6 | | | | | | | | | | | | | |
| D2.12 | | | 2.78 | 0.65 | 11.27 | 1.81 | 6.63 | 12.0 | | | | | | | | | | | | | |
| D2.13 | | | 2.51 | 0.65 | 17.67 | 1.63 | 5.50 | 9.0 | | | | | | | | | | | | | |

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage
Design Storm: **100 - Year Event, Proposed Conditions**

| Street or Basin | Design Point | Direct Runoff: Area Design | Area (A) | Runoff Coeff. (C) | tc | CA | i | Q | Total Runoff: tc | Σ (CA) | i | Q | Street: Slope | Street Flow | Pipe: Design Flow | Slope | Pipe Size | Travel Time: Length | Velocity | tt | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ac. | | min. | | in/hr | cfs | min | | in/hr | cfs | % | cfs | cfs | % | in | ft | ft/sec | min | |
| | | | | | | | | | | | | | | | | | | | | | |
| E1.1 | | | 1.41 | 0.65 | 7.40 | 0.92 | 7.69 | 7.0 | | | | | | | | | | | | | |
| E1.2 | | | 3.61 | 0.65 | 10.20 | 2.35 | 6.88 | 16.1 | | | | | | | | | | | | | |
| E1.3 | | | 6.81 | 0.55 | 15.70 | 3.75 | 5.80 | 21.7 | | 0.57 | | | | | | | | | | | |
| E1.4 | | | 0.65 | 0.65 | 9.92 | 0.42 | 6.95 | 2.9 | | | | | | | | | | | | | |
| E1.5 | | | 1.95 | 0.65 | 8.86 | 1.27 | 7.24 | 9.2 | | | | | | | | | | | | | |
| E1.6 | | | 2.32 | 0.65 | 10.94 | 1.51 | 6.71 | 10.1 | | | | | | | | | | | | | |
| E1.7 | | | 3.50 | 0.64 | 14.72 | 2.24 | 5.96 | 13.3 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| C12a-ex | | | 27 | 0.50 | 15.69 | 13.50 | 5.80 | 78 | | | | | | | | | | | | | |
| C12-ex | | | 73 | 0.50 | 24.19 | 36.50 | 4.71 | 172 | | | | | | | | | | | | | |
| C14-ex | | | 119 | 0.50 | 29.17 | 59.50 | 4.23 | 252 | | | | | | | | | | | | | |
| C15-ex | | | 55 | 0.50 | 22.61 | 27.50 | 4.88 | 134 | | | | | | | | | | | | | |
| D1-ex | | | 17 | 0.50 | 17.78 | 8.50 | 5.48 | 47 | | | | | | | | | | | | | |
| E1-ex | | | 57 | 0.50 | 21.72 | 28.50 | 4.98 | 142 | | | | | | | | | | | | | |
| E2-ex | | | 30 | 0.55 | 16.78 | 16.23 | 5.63 | 91 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

| Sub-Basin Data | | | | Initial Overland Time ($t_i$) | | | | Travel Time ($t_t$) | | | | | $t_c$ Check (urbanized Basins) | | Final $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN or DESIGN | $C_5$ | AREA (A) acres | NRCS Convey. | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_i$ minutes | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_t$ minutes | Computed $t_c$ Minutes | TOTAL LENGTH (L) feet | Regional tc tc=(L/180)+10 minutes | USDCM Recommended $t_c=t_i+t_t$ (min) |
| OS-C9 | 0.49 | 5.24 | 15.0 | 100.00 | 4.18% | 0.24 | 6.87 | 777.0 | 4.18% | 3.07 | 4.22 | 11.09 | 877.00 | 14.87 | 11.09 |
| C10 | 0.49 | 12.92 | 15.0 | 100.00 | 2.00% | 0.19 | 8.76 | 904.0 | 4.98% | 3.35 | 4.50 | | | | |
| | | | 20.0 | | | | | 466.0 | 0.71% | 1.69 | 4.61 | 17.87 | 1470.00 | 18.17 | 17.87 |
| OS-C11 | 0.49 | 6.48 | 15.0 | 100.00 | 3.00% | 0.22 | 7.66 | 2005.0 | 2.51% | 2.38 | 14.06 | 21.73 | 2105.00 | 21.69 | 21.69 |
| C12 | 0.49 | 20.52 | 15.0 | 100.00 | 3.00% | 0.22 | 7.66 | 969.0 | 1.34% | 1.74 | 9.30 | | | | |
| | | | 20.0 | | | | | 292.0 | 0.60% | 1.55 | 3.14 | 20.11 | 1361.00 | 17.56 | 17.56 |
| C13 | 0.16 | 24.54 | 15.0 | 100.00 | 1.00% | 0.10 | 16.97 | 1620.0 | 2.90% | 2.55 | 10.57 | 27.54 | 1720.00 | 19.56 | 19.56 |
| C13.1 | 0.90 | 1.70 | 20.0 | 55.00 | 15.04% | 0.84 | 1.09 | 1232.0 | 1.65% | 2.57 | 7.99 | 9.09 | 1287.00 | 17.15 | 9.09 |
| C14 | 0.66 | 2.36 | 20.0 | 55.00 | 12.00% | 0.35 | 2.59 | 1083.0 | 1.51% | 2.46 | 7.34 | 9.94 | 1138.00 | 16.32 | 9.94 |
| C14.1 | 0.16 | 4.10 | 15.0 | 100.00 | 1.00% | 0.10 | 16.97 | 544.0 | 3.49% | 2.80 | 3.24 | 20.21 | 644.00 | 13.58 | 13.58 |
| C14.2 | 0.66 | 1.65 | 15.0 | 52.00 | 1.92% | 0.19 | 4.62 | 807.0 | 1.80% | 2.01 | 6.68 | 11.30 | 859.00 | 14.77 | 11.30 |
| C16.1 | 0.49 | 2.68 | 15.0 | 30.00 | 18.33% | 0.22 | 2.31 | 150.0 | 2.67% | 2.45 | 1.02 | | | | |
| | | | 20.0 | | | | | 850.0 | 2.82% | 3.36 | 4.22 | 7.55 | 1030.00 | 15.72 | 7.55 |
| C16.2 | 0.49 | 1.82 | 20.0 | 27.00 | 3.00% | 0.11 | 3.98 | 1332.0 | 2.52% | 3.17 | 6.99 | 10.97 | 1359.00 | 17.55 | 10.97 |
| C16.3 | 0.49 | 1.78 | 20.0 | 89.00 | 3.37% | 0.21 | 6.96 | 530.0 | 1.70% | 2.61 | 3.39 | 10.35 | 619.00 | 13.44 | 10.35 |
| C16.4 | 0.49 | 0.81 | 20.0 | 45.00 | 3.33% | 0.15 | 4.97 | 563.0 | 1.87% | 2.73 | 3.43 | 8.40 | 608.00 | 13.38 | 8.40 |
| C16.5 | 0.49 | 0.50 | 20.0 | 30.00 | 3.33% | 0.12 | 4.06 | 370.0 | 3.85% | 3.92 | 1.57 | 5.63 | 400.00 | 12.22 | 5.63 |
| C16.6 | 0.49 | 1.43 | 15.0 | 98.00 | 5.10% | 0.26 | 6.37 | 238.0 | 3.78% | 2.92 | 1.36 | | | | |
| | | | 20.0 | | | | | 437.0 | 2.06% | 2.87 | 2.54 | 10.27 | 773.00 | 14.29 | 10.27 |
| C16.7 | 0.49 | 0.54 | 15.0 | 85.00 | 4.24% | 0.22 | 6.30 | 110.0 | 3.18% | 2.67 | 0.69 | | | | |
| | | | 20.0 | | | | | 123.0 | 2.85% | 3.38 | 0.61 | 7.60 | 318.00 | 11.77 | 7.60 |
| C16.8 | 0.49 | 0.53 | 20.0 | 25.00 | 4.00% | 0.12 | 3.49 | 488.0 | 1.91% | 2.76 | 2.94 | 6.43 | 513.00 | 12.85 | 6.43 |
| C16.9 | 0.49 | 1.60 | 15.0 | 59.00 | 4.24% | 0.19 | 5.25 | 108.0 | 2.31% | 2.28 | 0.79 | | | | |
| | | | 20.0 | | | | | 330.0 | 3.03% | 3.48 | 1.58 | 7.62 | 497.00 | 12.76 | 7.62 |
| C16.10 | 0.49 | 0.52 | 20.0 | 28.00 | 2.14% | 0.10 | 4.53 | 397.0 | 3.32% | 3.64 | 1.82 | 6.35 | 425.00 | 12.36 | 6.35 |
| C16.11 | 0.49 | 0.38 | 15.0 | 89.00 | 2.00% | 0.18 | 8.27 | 75.0 | 2.80% | 2.51 | 0.50 | | | | |
| | | | 20.0 | | | | | 120.0 | 1.00% | 2.00 | 1.00 | 9.76 | 284.00 | 11.58 | 9.76 |
| C16.12 | 0.49 | 1.82 | 20.0 | 18.00 | 2.22% | 0.08 | 3.59 | 603.0 | 2.32% | 3.05 | 3.30 | 6.89 | 621.00 | 13.45 | 6.89 |
| C16.13 | 0.49 | 3.62 | 15.0 | 30.00 | 18.33% | 0.22 | 2.31 | 150.0 | 2.67% | 2.45 | 1.02 | | | | |
| | | | 20.0 | | | | | 1326.0 | 1.85% | 2.72 | 8.12 | 11.45 | 1506.00 | 18.37 | 11.45 |
| C16.14 | 0.49 | 0.10 | 20.0 | 33.00 | 2.84% | 0.12 | 4.48 | 71.0 | 1.28% | 2.26 | 0.52 | 5.01 | 104.00 | 10.58 | 5.01 |
| C16.15 | 0.49 | 2.28 | 15.0 | 100.00 | 7.30% | 0.29 | 5.72 | 183.0 | 4.48% | 3.17 | 0.96 | | | | |
| | | | 20.0 | | | | | 443.0 | 1.42% | 2.38 | 3.10 | 9.77 | 726.00 | 14.03 | 9.77 |
| C16.16 | 0.49 | 1.29 | 20.0 | 90.00 | 2.22% | 0.19 | 8.03 | 731.0 | 1.33% | 2.31 | 5.28 | 13.31 | 821.00 | 14.56 | 13.31 |
| C16.17 | 0.49 | 1.64 | 20.0 | 84.00 | 2.50% | 0.19 | 7.46 | 703.0 | 1.41% | 2.37 | 4.93 | 12.39 | 787.00 | 14.37 | 12.39 |

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley — Job No: 100.040
Date: August 16, 2016, June 30, 2017 — Project: Lorson Ranch East Preliminary Drainage
Checked By: Leonard Beasley

| Sub-Basin Data | | | | Initial Overland Time ($t_i$) | | | | Travel Time ($t_t$) | | | | | $t_c$ Check (urbanized Basins) | | Final $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN or DESIGN | $C_5$ | AREA (A) acres | NRCS Convey. | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_i$ minutes | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_t$ minutes | Computed $t_c$ Minutes | TOTAL LENGTH (L) feet | Regional tc tc=(L/180)+10 minutes | USDCM Recommended $t_c=t_i+t_t$ (min) |
| C16.18 | 0.49 | 2.96 | 15.0 | 70.00 | 2.71% | 0.18 | 6.63 | 112.0 | 2.14% | 2.19 | 0.85 | | | | |
| | | | 20.0 | | | | | 724.0 | 1.34% | 2.32 | 5.21 | 12.69 | 906.00 | 15.03 | 12.69 |
| C16.19 | 0.49 | 1.65 | 15.0 | 100.00 | 2.37% | 0.20 | 8.28 | 98.0 | 2.37% | 2.31 | 0.71 | | | | |
| | | | 20.0 | | | | | 358.0 | 1.00% | 2.00 | 2.98 | 11.98 | 556.00 | 13.09 | 11.98 |
| C16.20 | 0.49 | 2.84 | 20.0 | 37.00 | 2.00% | 0.12 | 5.33 | 786.0 | 1.68% | 2.59 | 5.05 | 10.38 | 823.00 | 14.57 | 10.38 |
| C16.21 | 0.49 | 1.78 | 15.0 | 100.00 | 2.43% | 0.20 | 8.22 | 48.0 | 2.43% | 2.34 | 0.34 | | | | |
| | | | 20.0 | | | | | 621.0 | 1.16% | 2.15 | 4.80 | 13.36 | 769.00 | 14.27 | 13.36 |
| C16.22 | 0.49 | 2.88 | 15.0 | 100.00 | 2.50% | 0.20 | 8.14 | 138.0 | 2.55% | 1.41 | 1.63 | | | | |
| | | | 20.0 | | | | | 512.0 | 0.88% | 1.88 | 4.55 | 14.32 | 750.00 | 14.17 | 14.17 |
| C16.23 | 0.49 | 1.46 | 15.0 | 91.00 | 2.09% | 0.18 | 8.24 | 153.0 | 1.76% | 1.41 | 1.81 | | | | |
| | | | 20.0 | | | | | 526.0 | 1.20% | 2.19 | 4.00 | 14.05 | 770.00 | 14.28 | 14.05 |
| C16.24 | 0.49 | 2.79 | 20.0 | 89.00 | 2.00% | 0.18 | 8.27 | 1189.0 | 1.14% | 2.14 | 9.28 | 17.55 | 1278.00 | 17.10 | 17.10 |
| C16.25 | 0.49 | 0.43 | 20.0 | 100.00 | 2.00% | 0.19 | 8.76 | 269.0 | 0.97% | 1.97 | 2.28 | 11.04 | 369.00 | 12.05 | 11.04 |
| C16.26 | 0.49 | 1.42 | 20.0 | 84.00 | 2.00% | 0.17 | 8.03 | 380.0 | 0.76% | 1.74 | 3.63 | 11.66 | 464.00 | 12.58 | 11.66 |
| C16.27 | 0.49 | 0.23 | 20.0 | 28.00 | 2.00% | 0.10 | 4.64 | 132.0 | 0.70% | 1.67 | 1.31 | 5.95 | 160.00 | 10.89 | 5.95 |
| C16.28 | 0.49 | 2.09 | 20.0 | 100.00 | 2.30% | 0.20 | 8.37 | 485.0 | 0.89% | 1.89 | 4.28 | 12.65 | 585.00 | 13.25 | 12.65 |
| C16.29 | 0.49 | 2.01 | 20.0 | 100.00 | 2.00% | 0.19 | 8.76 | 480.0 | 0.90% | 1.90 | 4.22 | 12.98 | 580.00 | 13.22 | 12.98 |
| C16.30 | 0.49 | 4.54 | 15.0 | 100.00 | 8.00% | 0.30 | 5.55 | 168.0 | 2.86% | 1.41 | 1.99 | | | | |
| | | | 20.0 | | | | | 1658.0 | 1.16% | 2.15 | 12.83 | 20.36 | 1926.00 | 20.70 | 20.36 |
| C16.31 | 0.23 | 9.90 | 10.0 | 100.00 | 3.30% | 0.16 | 10.59 | 334.0 | 3.80% | 1.41 | 3.95 | | | | |
| | | | 15.0 | | | | | 1467.0 | 1.16% | 1.62 | 15.13 | 29.67 | 1901.00 | 20.56 | 20.56 |
| C16.32 | 0.49 | 0.97 | 20.0 | 60.00 | 2.00% | 0.15 | 6.79 | 570.0 | 0.77% | 1.75 | 5.41 | 12.20 | 630.00 | 13.50 | 12.20 |
| C16.33 | 0.90 | 0.21 | 20.0 | 18.00 | 2.22% | 0.25 | 1.18 | 194.0 | 0.92% | 1.92 | 1.69 | 2.86 | 212.00 | 11.18 | 2.86 |
| C16.34 | 0.49 | 0.38 | 20.0 | 32.00 | 2.00% | 0.11 | 4.96 | 200.0 | 0.70% | 1.67 | 1.99 | 6.95 | 232.00 | 11.29 | 6.95 |
| C16.35 | 0.49 | 1.46 | 15.0 | 100.00 | 2.00% | 0.19 | 8.76 | 30.0 | 2.00% | 2.12 | 0.24 | | | | |
| | | | 20.0 | | | | | 337.0 | 1.16% | 2.15 | 2.61 | 11.60 | 467.00 | 12.59 | 11.60 |
| C16.36 | 0.23 | 7.70 | 10.0 | 100.00 | 2.30% | 0.14 | 11.93 | 111.0 | 0.72% | 0.85 | 2.18 | | | | |
| | | | 10.0 | | | | | 34.0 | 32.35% | 5.69 | 0.10 | | | | |
| | | | 15.0 | | | | | 617.0 | 0.50% | 1.06 | 9.70 | 23.91 | 862.00 | 14.79 | 14.79 |
| C15.1 | 0.30 | 7.10 | 15.0 | 100.00 | 4.50% | 0.19 | 8.79 | 747.0 | 3.41% | 1.41 | 8.83 | | | | |
| | | | 15.0 | | | | | 600.0 | 1.92% | 2.08 | 4.81 | 22.43 | 1447.00 | 18.04 | 18.04 |
| C15.2 | 0.42 | 4.63 | 15.0 | 100.00 | 6.20% | 0.25 | 6.72 | 604.0 | 1.97% | 2.11 | 4.78 | 11.51 | 704.00 | 13.91 | 11.51 |
| C15.3 | 0.49 | 3.60 | 15.0 | 100.00 | 2.05% | 0.19 | 8.69 | 161.0 | 3.35% | 1.41 | 1.90 | | | | |
| | | | 20.0 | | | | | 658.0 | 2.87% | 3.39 | 3.24 | 13.83 | 919.00 | 15.11 | 13.83 |

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

| Sub-Basin Data | | | | Initial Overland Time ($t_i$) | | | | Travel Time ($t_t$) | | | | | $t_c$ Check (urbanized Basins) | | Final $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN or DESIGN | $C_5$ | AREA (A) acres | NRCS Convey. | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_i$ minutes | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_t$ minutes | Computed $t_c$ Minutes | TOTAL LENGTH (L) feet | Regional tc $t_c$=(L/180)+10 minutes | USDCM Recommended $t_c=t_i+t_t$ (min) |
| C15.4 | 0.49 | 1.25 | 15.0 | 91.00 | 7.14% | 0.28 | 5.49 | 100.0 | 2.60% | 1.41 | 1.18 | | | | |
| | | | 20.0 | | | | | 406.0 | 2.02% | 2.84 | 2.38 | 9.05 | 597.00 | 13.32 | 9.05 |
| C15.5 | 0.49 | 2.90 | 20.0 | 35.00 | 2.00% | 0.11 | 5.18 | 979.0 | 3.04% | 3.49 | 4.68 | 9.86 | 1014.00 | 15.63 | 9.86 |
| C15.6 | 0.49 | 1.80 | 15.0 | 59.00 | 1.36% | 0.13 | 7.64 | 100.0 | 2.00% | 2.12 | 0.79 | | | | |
| | | | 20.0 | | | | | 731.0 | 1.87% | 2.73 | 4.45 | 12.88 | 890.00 | 14.94 | 12.88 |
| C15.7 | 0.49 | 2.07 | 20.0 | 39.00 | 2.05% | 0.12 | 5.43 | 966.0 | 1.63% | 2.55 | 6.31 | 11.73 | 1005.00 | 15.58 | 11.73 |
| C15.8 | 0.40 | 3.76 | 15.0 | 100.00 | 7.00% | 0.25 | 6.65 | 89.0 | 11.35% | 5.05 | 0.29 | | | | |
| | | | 15.0 | | | | | 463.0 | 0.60% | 1.16 | 6.64 | | | | |
| | | | 20.0 | | | | | 240.0 | 1.08% | 2.08 | 1.92 | 15.51 | 892.00 | 14.96 | 15.51 |
| C15.9 | 0.49 | 2.27 | 15.0 | 53.00 | 1.20% | 0.12 | 7.55 | 96.0 | 3.02% | 2.61 | 0.61 | | | | |
| | | | 20.0 | | | | | 8.6 | 1.61% | 2.54 | 0.06 | 8.22 | 157.55 | 10.88 | 8.22 |
| C15.10 | 0.49 | 0.60 | 15.0 | 100.00 | 2.20% | 0.20 | 8.49 | 37.0 | 2.20% | 2.22 | 0.28 | | | | |
| | | | 20.0 | | | | | 160.0 | 1.51% | 2.46 | 1.09 | 9.85 | 297.00 | 11.65 | 9.85 |
| C15.11 | 0.49 | 3.20 | 20.0 | 74.00 | 4.19% | 0.21 | 5.90 | 1105.0 | 2.63% | 3.24 | 5.68 | 11.58 | 1179.00 | 16.55 | 11.58 |
| C15.12 | 0.49 | 0.61 | 15.0 | 100.00 | 2.16% | 0.20 | 8.54 | 34.0 | 2.16% | 2.20 | 0.26 | | | | |
| | | | 20.0 | | | | | 321.0 | 1.00% | 2.00 | 2.68 | 11.47 | 455.00 | 12.53 | 11.47 |
| C15.13 | 0.49 | 2.35 | 20.0 | 52.00 | 2.12% | 0.14 | 6.20 | 967.0 | 2.32% | 3.05 | 5.29 | 11.49 | 1019.00 | 15.66 | 11.49 |
| C15.14 | 0.49 | 1.32 | 20.0 | 33.00 | 1.82% | 0.11 | 5.19 | 595.0 | 2.89% | 3.40 | 2.92 | 8.11 | 628.00 | 13.49 | 8.11 |
| C15.15 | 0.49 | 4.02 | 20.0 | 100.00 | 2.88% | 0.21 | 7.77 | 1111.0 | 2.42% | 3.11 | 5.95 | 13.72 | 1211.00 | 16.73 | 13.72 |
| C17.1a | 0.49 | 2.81 | 20.0 | 90.00 | 2.00% | 0.18 | 8.31 | 733.0 | 2.58% | 3.21 | 3.80 | 12.11 | 823.00 | 14.57 | 12.11 |
| C17.1 | 0.49 | 2.68 | 15.0 | 28.00 | 18.57% | 0.21 | 2.22 | 160.0 | 2.88% | 2.55 | 1.05 | | | | |
| | | | 20.0 | | | | | 530.0 | 1.00% | 2.00 | 4.42 | 7.69 | 718.00 | 13.99 | 7.69 |
| C17.2 | 0.49 | 4.11 | 20.0 | 33.00 | 2.00% | 0.11 | 5.03 | 903.0 | 3.27% | 3.62 | 4.16 | 9.19 | 936.00 | 15.20 | 9.19 |
| C17.3 | 0.49 | 2.21 | 15.0 | 100.00 | 8.40% | 0.31 | 5.46 | 152.0 | 4.47% | 3.17 | 0.80 | | | | |
| | | | 20.0 | | | | | 416.0 | 0.97% | 1.97 | 3.52 | 9.78 | 668.00 | 13.71 | 9.78 |
| C17.4 | 0.49 | 1.98 | 20.0 | 36.00 | 2.00% | 0.11 | 5.26 | 1579.0 | 1.14% | 2.14 | 12.32 | 17.58 | 1615.00 | 18.97 | 17.58 |
| C17.5 | 0.49 | 3.72 | 15.0 | 66.00 | 7.73% | 0.24 | 4.56 | 77.0 | 4.63% | 3.23 | 0.40 | | | | |
| | | | 20.0 | | | | | 1050.0 | 1.07% | 2.07 | 8.46 | 13.41 | 1193.00 | 16.63 | 13.41 |
| C17.6 | 0.49 | 1.04 | 20.0 | 94.00 | 1.06% | 0.15 | 10.47 | 527.0 | 1.65% | 2.57 | 3.42 | 13.89 | 621.00 | 13.45 | 13.89 |
| C17.7 | 0.49 | 2.68 | 15.0 | 90.00 | 4.44% | 0.23 | 6.39 | 107.0 | 0.93% | 1.45 | 1.23 | 7.62 | 197.00 | 11.09 | 7.62 |
| C17.8 | 0.55 | 1.52 | 20.0 | 100.00 | 3.00% | 0.24 | 6.91 | 643.0 | 0.95% | 1.95 | 5.50 | 12.41 | 743.00 | 14.13 | 12.41 |
| C17.9 | 0.90 | 1.73 | 20.0 | 31.00 | 2.00% | 0.32 | 1.60 | 464.0 | 0.91% | 1.91 | 4.05 | 5.65 | 495.00 | 12.75 | 5.65 |
| C17.10 | 0.90 | 2.34 | 20.0 | 45.00 | 2.00% | 0.39 | 1.93 | 723.0 | 0.66% | 1.62 | 7.42 | 9.34 | 768.00 | 14.27 | 9.34 |
| D1.1 | 0.49 | 5.09 | 20.0 | 100.00 | 1.50% | 0.17 | 9.63 | 1484.0 | 2.00% | 2.83 | 8.74 | 18.38 | 1584.00 | 18.80 | 18.38 |
| D1.2 | 0.49 | 1.10 | 15.0 | 65.00 | 7.85% | 0.24 | 4.50 | 81.0 | 2.72% | 2.47 | 0.55 | | | | |

**CORE ENGINEERING GROUP**

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

Calculated By: Leonard Beasley — Job No: 100.040

Date: August 16, 2016, June 30, 2017 — Project: Lorson Ranch East Preliminary Drainage

Checked By: Leonard Beasley

| Sub-Basin Data | | | | Initial Overland Time ($t_i$) | | | | Travel Time ($t_t$) | | | | | $t_c$ Check (urbanized Basins) | | Final $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN or DESIGN | $C_5$ | AREA (A) acres | NRCS Convey. | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_i$ minutes | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_t$ minutes | Computed $t_c$ Minutes | TOTAL LENGTH (L) feet | Regional $t_c$ $t_c=(L/180)+10$ minutes | USDCM Recommended $t_c=t_i+t_t$ (min) |
| | | | 20.0 | | | | | 309.0 | 2.01% | 2.84 | 1.82 | 6.86 | 455.00 | 12.53 | 6.86 |
| D1.3 | 0.49 | 0.86 | 20.0 | 100.00 | 2.60% | 0.21 | 8.03 | 420.0 | 1.79% | 2.68 | 2.62 | 10.65 | 520.00 | 12.89 | 10.65 |
| D1.4 | 0.49 | 2.80 | 15.0 | 100.00 | 1.60% | 0.18 | 9.43 | 33.0 | 2.42% | 2.33 | 0.24 | | | | |
| | | | 20.0 | | | | | 582.0 | 3.18% | 3.57 | 2.72 | 12.39 | 715.00 | 13.97 | 12.39 |
| D1.5 | 0.49 | 5.15 | 20.0 | 36.00 | 4.22% | 0.15 | 4.11 | 1132.0 | 3.14% | 3.54 | 5.32 | 9.43 | 1168.00 | 16.49 | 9.43 |
| D1.6 | 0.49 | 5.10 | 20.0 | 90.00 | 1.44% | 0.16 | 9.26 | 1421.0 | 2.51% | 3.17 | 7.47 | 16.74 | 1511.00 | 18.39 | 16.74 |
| D1.7 | 0.49 | 3.50 | 15.0 | 90.00 | 12.33% | 0.33 | 4.56 | 107.0 | 3.74% | 2.90 | 0.61 | | | | |
| | | | 20.0 | | | | | 781.0 | 1.55% | 2.49 | 5.23 | 10.40 | 978.00 | 15.43 | 10.40 |
| D1.8 | 0.49 | 1.70 | 20.0 | 45.00 | 1.11% | 0.11 | 7.14 | 1004.0 | 2.56% | 3.20 | 5.23 | 12.37 | 1049.00 | 15.83 | 12.37 |
| D1.9 | 0.49 | 2.20 | 20.0 | 50.00 | 2.00% | 0.13 | 6.20 | 1265.0 | 2.63% | 3.24 | 6.50 | 12.70 | 1315.00 | 17.31 | 12.70 |
| D1.10 | 0.49 | 5.50 | 20.0 | 47.00 | 2.49% | 0.14 | 5.59 | 1460.0 | 2.43% | 3.12 | 7.80 | 13.39 | 1507.00 | 18.37 | 13.39 |
| D1.11 | 0.49 | 1.40 | 20.0 | 50.00 | 2.00% | 0.13 | 6.20 | 951.0 | 1.64% | 2.56 | 6.19 | 12.38 | 1001.00 | 15.56 | 12.38 |
| D1.12 | 0.24 | 4.45 | 15.0 | 95.00 | 7.16% | 0.20 | 7.90 | 177.0 | 6.78% | 3.91 | 0.76 | | | | |
| | | | 15.0 | | | | | 463.0 | 0.50% | 1.06 | 7.28 | 15.93 | 735.00 | 14.08 | 14.08 |
| D2.1 | 0.49 | 3.14 | 15.0 | 100.00 | 2.32% | 0.20 | 8.34 | 90.0 | 2.32% | 2.28 | 0.66 | | | | |
| | | | 20.0 | | | | | 897.0 | 1.62% | 2.55 | 5.87 | 14.87 | 1087.00 | 16.04 | 14.87 |
| D2.2 | 0.49 | 1.11 | 15.0 | 100.00 | 1.70% | 0.18 | 9.24 | 167.0 | 3.47% | 2.79 | 1.00 | | | | |
| | | | 20.0 | | | | | 218.0 | 1.15% | 2.14 | 1.69 | 11.93 | 485.00 | 12.69 | 11.93 |
| D2.3 | 0.27 | 2.80 | 15.0 | 100.00 | 2.10% | 0.14 | 11.73 | 344.0 | 4.77% | 3.28 | 1.75 | | | | |
| | | | 20.0 | | | | | 292.0 | 3.20% | 3.58 | 1.36 | 14.84 | 736.00 | 14.09 | 14.09 |
| D2.4 | 0.29 | 3.33 | 15.0 | 100.00 | 4.50% | 0.19 | 8.90 | 386.0 | 6.30% | 3.76 | 1.71 | | | | |
| | | | 20.0 | | | | | 487.0 | 2.00% | 2.83 | 2.87 | 13.48 | 973.00 | 15.41 | 13.48 |
| D2.5 | 0.49 | 3.93 | 15.0 | 61.00 | 14.75% | 0.29 | 3.54 | 219.0 | 2.19% | 2.22 | 1.64 | | | | |
| | | | 20.0 | | | | | 447.0 | 2.82% | 3.36 | 2.22 | 7.40 | 727.00 | 14.04 | 7.40 |
| D2.6 | 0.49 | 2.13 | 15.0 | 100.00 | 3.00% | 0.22 | 7.66 | 20.0 | 2.50% | 2.37 | 0.14 | | | | |
| | | | 20.0 | | | | | 528.0 | 2.94% | 3.43 | 2.57 | 10.37 | 648.00 | 13.60 | 10.37 |
| D2.7 | 0.49 | 2.98 | 20.0 | 25.00 | 2.00% | 0.10 | 4.38 | 631.0 | 3.44% | 3.71 | 2.84 | 7.22 | 656.00 | 13.64 | 7.22 |
| D2.8 | 0.49 | 3.70 | 15.0 | 35.00 | 15.71% | 0.22 | 2.63 | 162.0 | 2.34% | 2.29 | 1.18 | | | | |
| | | | 20.0 | | | | | 665.0 | 1.04% | 2.04 | 5.43 | 9.24 | 862.00 | 14.79 | 9.24 |
| D2.9 | 0.49 | 3.15 | 20.0 | 75.00 | 1.87% | 0.16 | 7.76 | 1342.0 | 2.50% | 3.16 | 7.07 | 14.83 | 1417.00 | 17.87 | 14.83 |
| D2.10 | 0.49 | 0.80 | 20.0 | 17.00 | 2.00% | 0.08 | 3.61 | 392.0 | 1.54% | 2.48 | 2.63 | 6.24 | 409.00 | 12.27 | 6.24 |
| D2.11 | 0.90 | 0.40 | 20.0 | 10.00 | 2.00% | 0.18 | 0.91 | 278.0 | 0.70% | 1.67 | 2.77 | 3.68 | 288.00 | 11.60 | 3.68 |
| D2.12 | 0.49 | 2.78 | 20.0 | 100.00 | 5.20% | 0.26 | 6.39 | 1009.0 | 2.97% | 3.45 | 4.88 | 11.27 | 1109.00 | 16.16 | 11.27 |
| D2.13 | 0.49 | 2.51 | 20.0 | 20.00 | 2.00% | 0.09 | 3.92 | 2334.0 | 2.00% | 2.83 | 13.75 | 17.67 | 2354.00 | 23.08 | 17.67 |

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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: August 16, 2016, June 30, 2017
Checked By: Leonard Beasley

Job No: 100.040
Project: Lorson Ranch East Preliminary Drainage

| Sub-Basin Data | | | | Initial Overland Time ($t_i$) | | | | Travel Time ($t_t$) | | | | | $t_c$ Check (urbanized Basins) | | Final $t_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN or DESIGN | $C_5$ | AREA (A) acres | NRCS Convey. | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_i$ minutes | LENGTH (L) feet | SLOPE (S) % | VELOCITY (V) ft/sec | $t_t$ minutes | Computed $t_c$ Minutes | TOTAL LENGTH (L) feet | Regional tc tc=(L/180)+10 minutes | USDCM Recommended $t_c=t_i+t_t$ (min) |
| E1.1 | 0.49 | 1.41 | 15.0 | 92.00 | 9.24% | 0.30 | 5.07 | 145.0 | 2.75% | 2.49 | 0.97 | | | | |
| | | | 20.0 | | | | | 296.0 | 3.31% | 3.64 | 1.36 | 7.40 | 533.00 | 12.96 | 7.40 |
| E1.2 | 0.49 | 3.61 | 15.0 | 100.00 | 6.60% | 0.28 | 5.91 | 203.0 | 5.22% | 3.43 | 0.99 | | | | |
| | | | 20.0 | | | | | 563.0 | 2.01% | 2.84 | 3.31 | 10.20 | 866.00 | 14.81 | 10.20 |
| E1.3 | 0.20 | 6.81 | 15.0 | 100.00 | 4.80% | 0.17 | 9.68 | 763.0 | 5.22% | 3.43 | 3.71 | | | | |
| | | | 20.0 | | | | | 415.0 | 2.24% | 2.99 | 2.31 | 15.70 | 1278.00 | 17.10 | 15.70 |
| E1.4 | 0.49 | 0.65 | 15.0 | 100.00 | 2.00% | 0.19 | 8.76 | 20.0 | 2.00% | 2.12 | 0.16 | | | | |
| | | | 20.0 | | | | | 165.0 | 1.87% | 2.73 | 1.01 | 9.92 | 285.00 | 11.58 | 9.92 |
| E1.5 | 0.49 | 1.95 | 20.0 | 30.00 | 2.00% | 0.10 | 4.80 | 729.0 | 2.24% | 2.99 | 4.06 | 8.86 | 759.00 | 14.22 | 8.86 |
| E1.6 | 0.49 | 2.32 | 20.0 | 100.00 | 5.12% | 0.26 | 6.42 | 566.0 | 1.09% | 2.09 | 4.52 | 10.94 | 666.00 | 13.70 | 10.94 |
| E1.7 | 0.38 | 3.50 | 15.0 | 100.00 | 4.50% | 0.21 | 7.91 | 155.0 | 7.95% | 4.23 | 0.61 | | | | |
| | | | 20.0 | | | | | 769.0 | 1.07% | 2.07 | 6.20 | 14.72 | 1024.00 | 15.69 | 14.72 |
| C12a-ex | 0.15 | 27 | 7.0 | 300.00 | 4.00% | 0.27 | 18.80 | 725.0 | 4.97% | 1.56 | 7.74 | 26.54 | 1025.00 | 15.69 | 15.69 |
| C12-ex | 0.15 | 73 | 7.0 | 300.00 | 5.33% | 0.29 | 17.10 | 2250.0 | 4.53% | 1.49 | 25.17 | 42.27 | 2550.00 | 24.17 | 24.17 |
| C14-ex | 0.15 | 119 | 7.0 | 300.00 | 3.00% | 0.24 | 20.67 | 3150.0 | 3.37% | 1.29 | 40.86 | 61.53 | 3450.00 | 29.17 | 29.17 |
| D15-ex | 0.15 | 55 | 7.0 | 300.00 | 3.83% | 0.26 | 19.07 | 1970.0 | 2.61% | 1.13 | 29.03 | 48.11 | 2270.00 | 22.61 | 22.61 |
| D1-ex | 0.15 | 17 | 7.0 | 300.00 | 2.67% | 0.23 | 21.48 | 1100.0 | 4.55% | 1.49 | 12.28 | 33.76 | 1400.00 | 17.78 | 17.78 |
| E1-ex | 0.15 | 57 | 7.0 | 300.00 | 4.67% | 0.28 | 17.87 | 1810.0 | 3.73% | 1.35 | 22.31 | 40.18 | 2110.00 | 21.72 | 21.72 |
| E2-ex | 0.26 | 29.50 | 15.0 | 100.00 | 2.70% | 0.15 | 10.93 | 200.0 | 2.70% | 1.41 | 2.36 | | | | |
| C17.2 | 0.49 | 4.11 | 20.0 | 33.00 | 2.00% | 0.11 | 5.03 | 903.0 | 3.27% | 3.62 | 4.16 | 9.19 | 936.00 | 15.20 | 9.19 |

## APPENDIX C – HYDRAULIC CALCULATIONS

# Channel Report



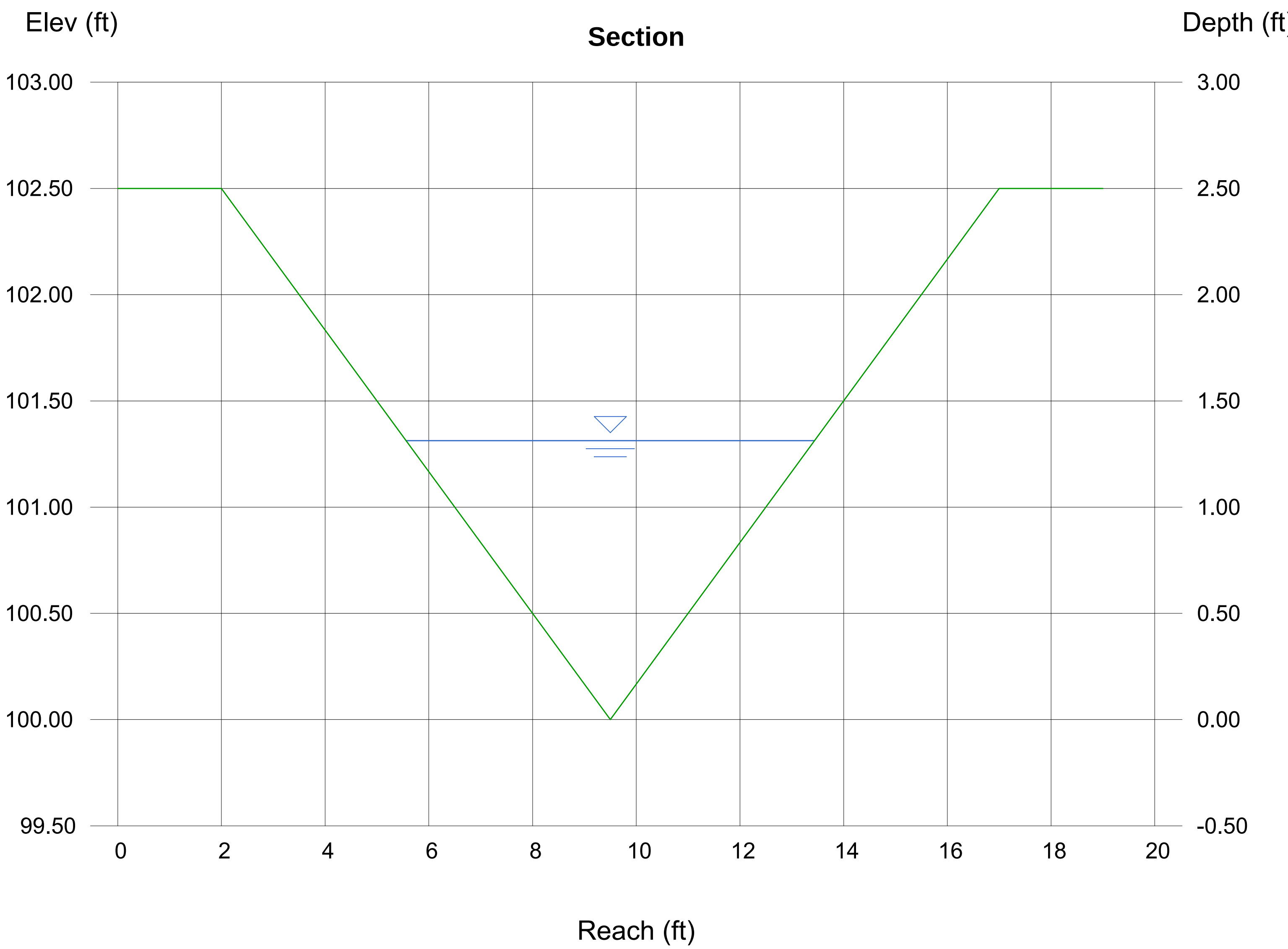
## Basin OS-C11 Swale - North Diversion Swale

**Triangular**
Side Slope (z:1) = 3.00
Total Depth (ft) = 2.50

Invert Elev (ft) = 100.00
Slope (%) = 1.00
N-Value = 0.025

**Calculations**
Compute by: Q vs Depth
No. Increments = 40

**Highlighted**
Depth (ft) = 1.31
Q (cfs) = 22.39
Area (sqft) = 5.17
Velocity (ft/s) = 4.33
Wetted Perim (ft) = 8.30
Crit Depth, Yc (ft) = 1.22
Top Width (ft) = 7.88
EGL (ft) = 1.60



# Channel Report



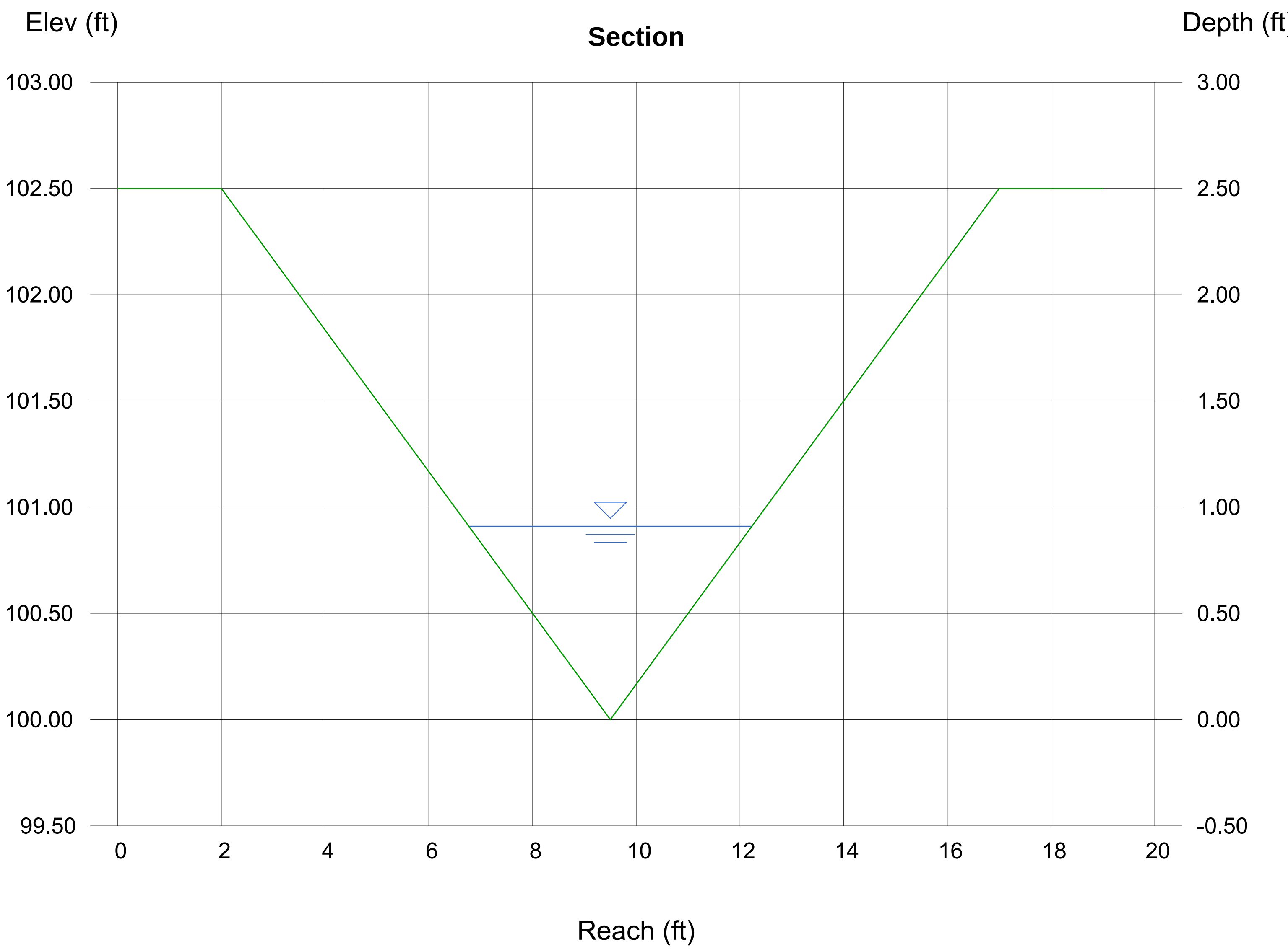
## North Diversion Swale @ 7.0% slope

**Triangular**
Side Slope (z:1) = 3.00
Total Depth (ft) = 2.50

Invert Elev (ft) = 100.00
Slope (%) = 7.00
N-Value = 0.025

**Calculations**
Compute by: Known Q
Known Q (cfs) = 22.00

**Highlighted**
Depth (ft) = 0.91
Q (cfs) = 22.00
Area (sqft) = 2.48
Velocity (ft/s) = 8.86
Wetted Perim (ft) = 5.76
Crit Depth, Yc (ft) = 1.28
Top Width (ft) = 5.46
EGL (ft) = 2.13



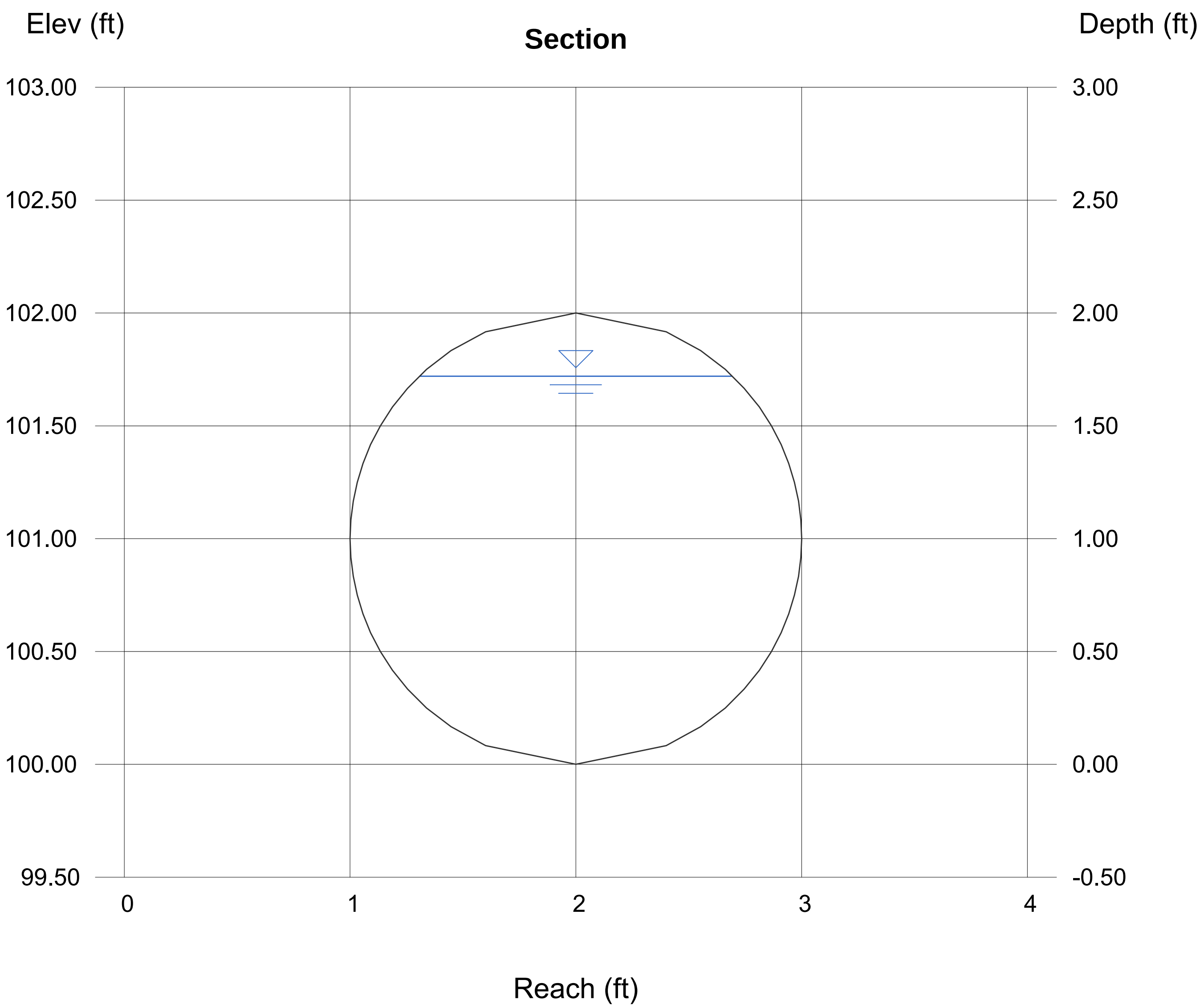
# Channel Report

Hydraflow Express by Intelisolve | Thursday, Sep 8 2016, 12:9 PM

## 24-inch from Des.Pt 47 to Des.Pt.48

| | |
|---|---|
| **Circular** | |
| Diameter (ft) | = 2.00 |
| | |
| Invert Elev (ft) | = 100.00 |
| Slope (%) | = 0.50 |
| N-Value | = 0.013 |
| | |
| **Calculations** | |
| Compute by: | Known Q |
| Known Q (cfs) | = 16.60 |

| | |
|---|---|
| **Highlighted** | |
| Depth (ft) | = 1.72 |
| Q (cfs) | = 16.60 |
| Area (sqft) | = 2.87 |
| Velocity (ft/s) | = 5.77 |
| Wetted Perim (ft) | = 4.75 |
| Crit Depth, Yc (ft) | = 1.47 |
| Top Width (ft) | = 1.39 |
| EGL (ft) | = 2.24 |



# Channel Report

Hydraflow Express by Intelisolve | Friday, Sep 9 2016, 2:42 PM

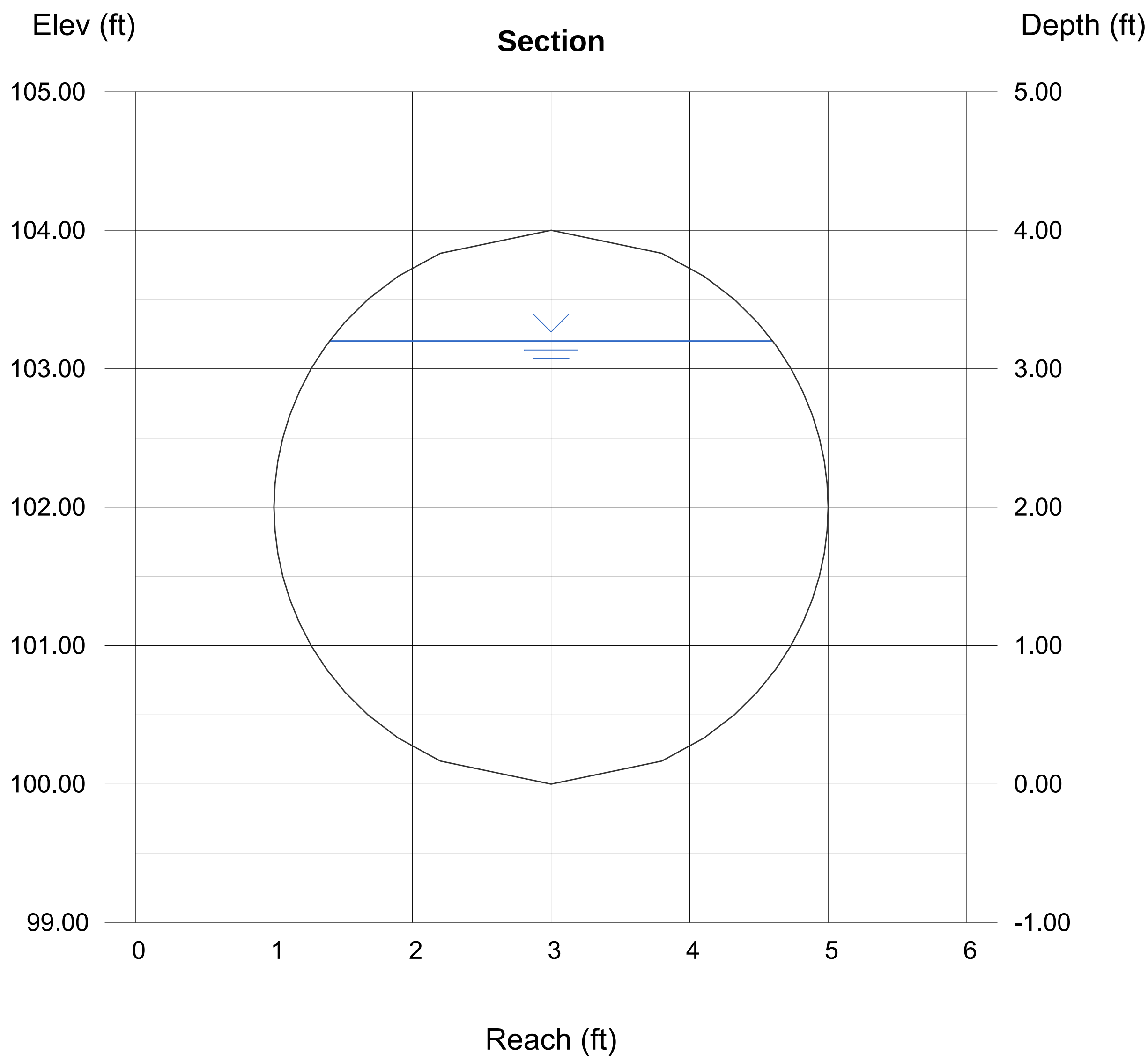
## 48-inch storm sewer at Des.Pt. 49 into Pond B1

**Circular**
Diameter (ft) = 4.00

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.013

**Calculations**
Compute by: Q vs Depth
No. Increments = 10

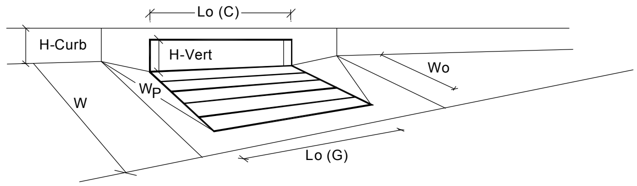
**Highlighted**
Depth (ft) = 3.20
Q (cfs) = 99.32
Area (sqft) = 10.78
Velocity (ft/s) = 9.21
Wetted Perim (ft) = 8.86
Crit Depth, Yc (ft) = 2.80
Top Width (ft) = 3.20
EGL (ft) = 4.52



# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

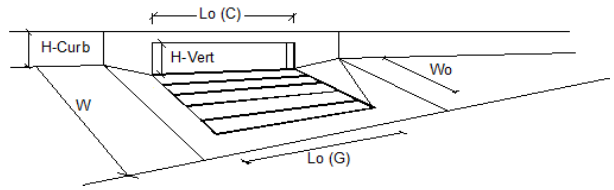
**Inlet ID =** **Inlet DP-3 (C16.1+C16.2)**




| | | | | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 15.00 | 15.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.31 | 1.31 | |
| Clogging Factor for Multiple Units | Clog = | 0.04 | 0.04 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 12.45 | 21.18 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 11.90 | 20.25 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 30.33 | 33.57 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 29.00 | 32.11 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 18.07 | 24.80 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 17.28 | 23.72 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **11.90** | **20.25** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 15.00 | 15.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **11.9** | **20.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 8.9 | 20.1 | cfs |

# INLET ON A CONTINUOUS GRADE

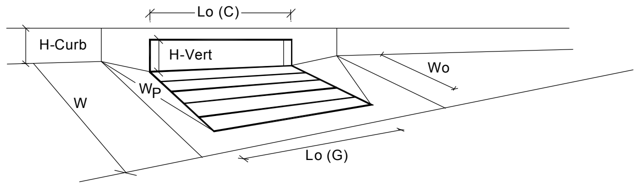
**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-4 (Basins C16.5-16.10)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 10.4 | 21.9 | cfs |
| Water Spread Width | T = | 15.3 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.2 | 6.5 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.9 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.391 | 0.290 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 6.4 | 15.5 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 4.1 | 6.4 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.45 | 4.25 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 4.3 | 5.2 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.2 | 9.5 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.093 | 0.075 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 18.91 | 30.59 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 15.00 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 9.8 | 15.4 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 9.7 | 15.0 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.8 | 6.9 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | Q = | **9.67** | **14.98** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | $Q_b$ = | **0.8** | **6.9** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | C% = | **93** | **68** | **%** |

# INLET IN A SUMP OR SAG LOCATION

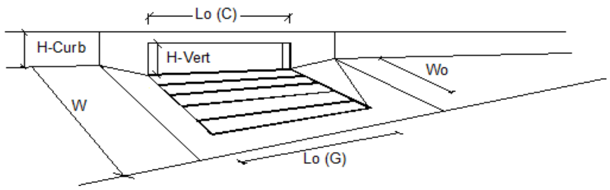
**Project =** **Lorson East Prelim Plan #100.040**
**Inlet ID =** **Inlet DP-5**




| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 20.7 | 27.0 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 0.9 | 2.4 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 0.6 | cfs |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-6 (Basins C16.10-16.13 + bypass from Inlet DP-4)

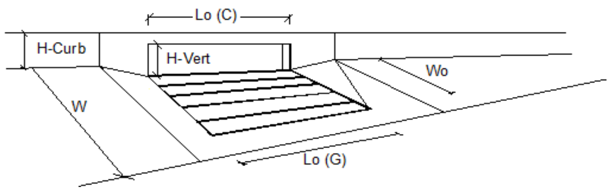



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MINOR & MAJOR STORM** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 12.9 | 32.6 | cfs |
| Water Spread Width | T = | 17.0 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 6.1 | 8.2 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.5 | 2.6 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.312 | 0.229 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 8.9 | 23.7 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 4.0 | 7.0 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 1.9 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 3.74 | 6.64 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.4 | 4.6 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 9.1 | 11.2 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.079 | 0.063 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 21.89 | 37.78 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 15.00 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 11.3 | 18.4 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 11.0 | 17.9 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 1.8 | 14.7 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | Q = | **11.05** | **17.87** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | $Q_b$ = | **1.8** | **14.7** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | C% = | **86** | **55** | **%** |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040

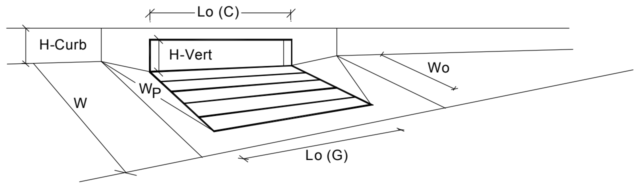
**Inlet ID:** Inlet DP-6a (Basins C16.15+ bypass from DP-6)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 6.6 | 24.9 | cfs |
| Water Spread Width | T = | 14.6 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.0 | 7.5 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 1.9 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.409 | 0.247 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 3.9 | 18.2 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 2.7 | 6.0 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.7 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.25 | 5.70 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 2.9 | 4.2 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.0 | 10.5 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.097 | 0.066 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 14.16 | 32.65 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i$ = | 5.9 | 11.7 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Effective (Unclogged) Length | $L_e$ = | 8.75 | 8.75 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 5.7 | 11.2 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.9 | 13.7 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **5.71** | **11.17** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.9** | **13.7** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **86** | **45** | **%** |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**
**Inlet ID =** **Inlet DP-6b (C13.1+ bypass from C12)**

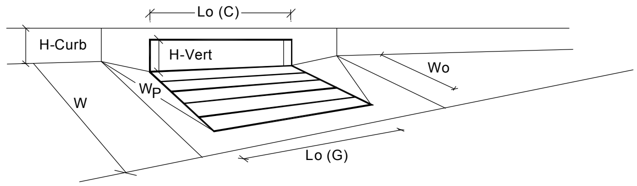



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 15.00 | 15.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.31 | 1.31 | |
| Clogging Factor for Multiple Units | Clog = | 0.04 | 0.04 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 12.45 | 21.18 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 11.90 | 20.25 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 30.33 | 33.57 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 29.00 | 32.11 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 18.07 | 24.80 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 17.28 | 23.72 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **11.90** | **20.25** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 15.00 | 15.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 20.7 | 27.0 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 0.2 | 1.7 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **11.9** | **20.3** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 6.8 | 40.5 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

**Inlet ID =** Inlet DP-7 (Basin C16.14)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |

| Grate Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |

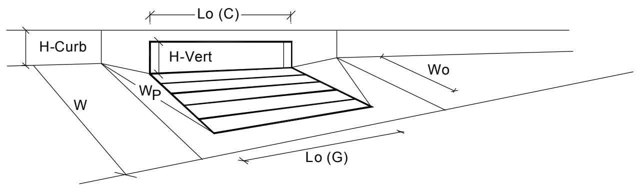
| Curb Opening Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |

| Resultant Street Conditions | | MINOR | MAJOR | |
|---|---|---|---|---|
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 20.7 | 27.0 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 0.9 | 2.4 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 0.3 | 0.6 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

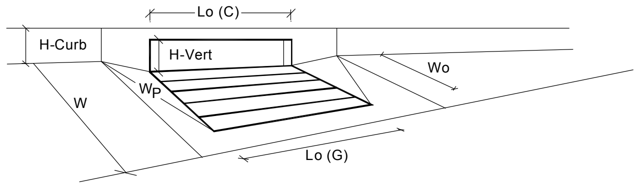
**Inlet ID =** **Inlet DP-8 (Basins C16.3+C16.4+ bypass from DP-6a)**




| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 10.72 | 17.34 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 10.05 | 16.26 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 20.22 | 22.38 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 18.96 | 20.98 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 13.69 | 18.32 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 12.84 | 17.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **10.05** | **16.26** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 10.00 | 10.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 20.7 | 27.0 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 0.9 | 2.4 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **10.1** | **16.3** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 6.2 | 25.2 | cfs |

# INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040
Inlet ID = Inlet DP-10 (C16.16+C16.17+bypass from Inlet DP-8)

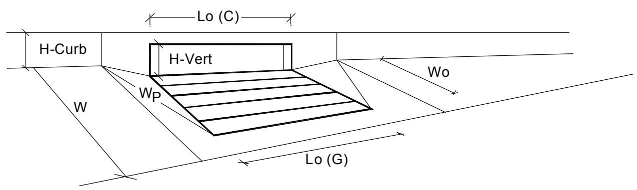



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 10.72 | 17.34 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 10.05 | 16.26 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 20.22 | 22.38 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 18.96 | 20.98 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 13.69 | 18.32 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 12.84 | 17.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **10.05** | **16.26** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 10.00 | 10.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **10.1** | **16.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 6.0 | 12.5 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

**Inlet ID =** **Inlet DP-10a (C16.18+bypass from Inlet DP-8)**

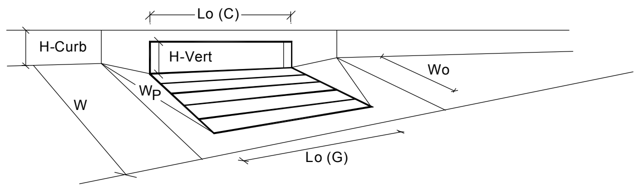



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 15.00 | 15.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.31 | 1.31 | |
| Clogging Factor for Multiple Units | Clog = | 0.04 | 0.04 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 12.45 | 21.18 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 11.90 | 20.25 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 30.33 | 33.57 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 29.00 | 32.11 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 18.07 | 24.80 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 17.28 | 23.72 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **11.90** | **20.25** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 15.00 | 15.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **11.9** | **20.3** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 5.7 | 20.7 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

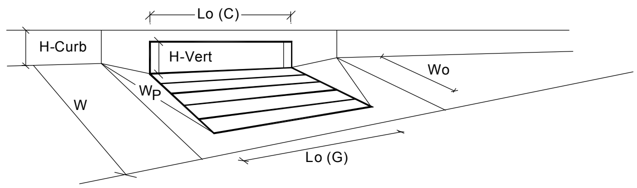
**Inlet ID =** **Inlet DP-10b (C16.26)**




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 3.2 | 6.9 | cfs |

# INLET IN A SUMP OR SAG LOCATION

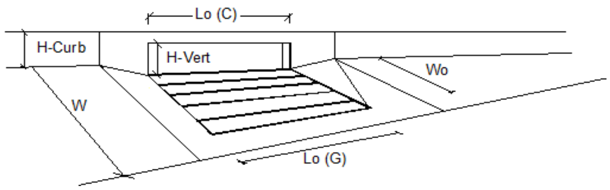
**Project =** **Lorson East Prelim Plan #100.040**
**Inlet ID =** **Inlet DP-10c (C16.27)**




| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 0.6 | 1.3 | cfs |

# INLET ON A CONTINUOUS GRADE

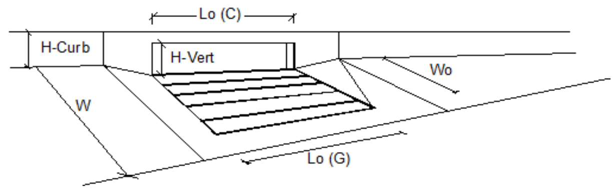
**Project:** **Lorson East Prelim Plan #100.040**
**Inlet ID:** **Inlet DP-12 (Basins C16.22-C16.23)**




| | | | | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 8.0 | 16.6 | cfs |
| Water Spread Width | T = | 15.2 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.2 | 6.4 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.8 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.392 | 0.293 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 4.9 | 11.7 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 3.1 | 4.9 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.44 | 4.17 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.3 | 4.0 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.2 | 9.4 | inches |
| **Grate Analysis (Calculated)** | | 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 | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.094 | 0.075 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 16.05 | 25.73 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i$ = | 6.6 | 9.7 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Effective (Unclogged) Length | $L_e$ = | 8.75 | 8.75 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 6.4 | 9.3 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 1.6 | 7.3 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **6.43** | **9.35** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **1.6** | **7.3** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **80** | **56** | **%** |

# INLET ON A CONTINUOUS GRADE

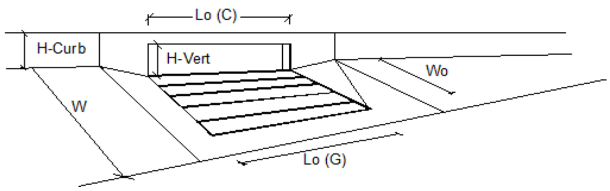
**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-12a (Basins C16.20-16.21)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 8.8 | 18.3 | cfs |
| Water Spread Width | T = | 15.8 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.3 | 6.6 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 1.0 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.377 | 0.282 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 5.5 | 13.1 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 3.3 | 5.2 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.1 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.62 | 4.46 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.4 | 4.1 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.3 | 9.6 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.091 | 0.073 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 17.07 | 27.35 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i$ = | 7.0 | 10.2 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Effective (Unclogged) Length | $L_e$ = | 8.75 | 8.75 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 6.8 | 9.8 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 2.0 | 8.5 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **6.78** | **9.78** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **2.0** | **8.5** | **cfs** |
| **Capture Percentage = $Q_a/Q_o$ =** | **C% =** | **77** | **53** | **%** |

# INLET ON A CONTINUOUS GRADE

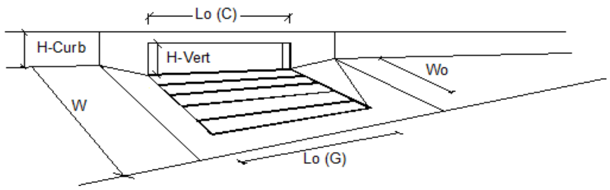
**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-13 (Basins C16.24 + bypass from Inlet DP-12 & Inlet DP12a)




| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 8.3 | 25.5 | cfs |
| Water Spread Width | T = | 16.0 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.4 | 7.5 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 1.9 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.372 | 0.245 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 5.2 | 18.7 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 3.1 | 6.1 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.8 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.69 | 5.78 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.1 | 4.3 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.4 | 10.5 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.090 | 0.066 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 16.47 | 33.07 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i$ = | 6.8 | 11.8 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Effective (Unclogged) Length | $L_e$ = | 8.75 | 8.75 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 6.5 | 11.3 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 1.8 | 14.2 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | Q = | **6.55** | **11.28** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | $Q_b$ = | **1.8** | **14.2** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | C% = | **79** | **44** | **%** |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-14 (Basin C16.30)

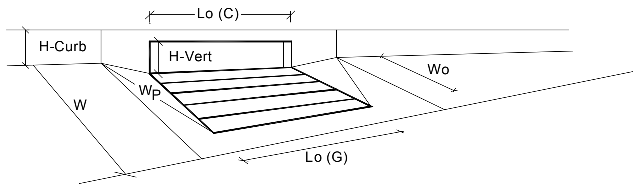



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 7.1 | 14.5 | cfs |
| Water Spread Width | T = | 15.0 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.1 | 6.3 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.7 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.398 | 0.298 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 4.3 | 10.2 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 2.8 | 4.3 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.36 | 4.05 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.0 | 3.6 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.1 | 9.3 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.095 | 0.076 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 14.79 | 23.61 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i$ = | 6.1 | 9.1 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Effective (Unclogged) Length | $L_e$ = | 8.75 | 8.75 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 6.0 | 8.7 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 1.1 | 5.7 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **5.95** | **8.74** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **1.1** | **5.7** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **84** | **60** | **%** |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

**Inlet ID =** **Inlet DP-16 (Basin C16.19+Basin C16.28+Basin C16.29+bypass from Inlet DP-6b+bypass from Inlet 13)**

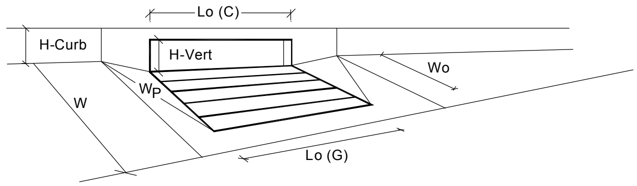



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| **Grate Information** | ☑ Override Depths | 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) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 30.00 | 30.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Units | Clog = | 0.02 | 0.02 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 22.48 | 38.26 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 21.98 | 37.41 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 60.66 | 67.15 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 59.31 | 65.66 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 34.34 | 47.14 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 33.58 | 46.09 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **21.98** | **37.41** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 30.00 | 30.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **22.0** | **37.4** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 12.8 | 57.3 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

**Inlet ID =** Inlet DP-17 (Basin C16.25+Basin C16.32+bypass from Inlet DP-14+bypass from Inlet 16)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 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) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |

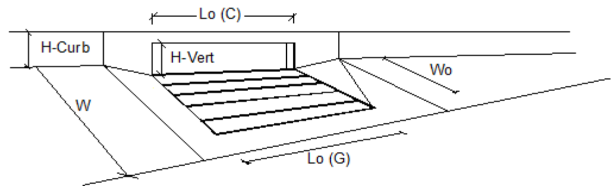
| Grate Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |

| Curb Opening Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 19.14 | 32.57 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 18.63 | 31.70 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 50.55 | 55.95 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 49.20 | 54.47 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 28.92 | 39.70 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 28.16 | 38.64 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **18.63** | **31.70** | **cfs** |

| Resultant Street Conditions | | MINOR | MAJOR | |
|---|---|---|---|---|
| Total Inlet Length | L = | 25.00 | 25.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **18.6** | **31.7** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 3.9 | 31.6 | cfs |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-19c (Basins C14.1+C14.2)

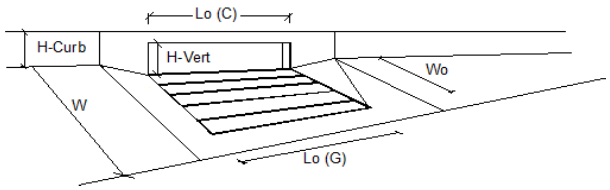



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 10.00 | 10.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 6.5 | 22.1 | cfs |
| Water Spread Width | T = | 14.3 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.0 | 7.2 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 1.6 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.416 | 0.259 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 3.8 | 16.1 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 2.7 | 5.6 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.4 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.18 | 5.24 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.0 | 4.2 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.0 | 10.2 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.098 | 0.069 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 14.00 | 30.53 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 10.00 | 10.00 | ft |
| Interception Capacity | $Q_i$ = | 5.8 | 11.1 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| Clogging Coefficient | CurbCoef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet | CurbClog = | 0.06 | 0.06 | |
| Effective (Unclogged) Length | $L_e$ = | 8.75 | 8.75 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 5.7 | 10.6 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.8 | 11.5 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **5.66** | **10.62** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.8** | **11.5** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **87** | **48** | **%** |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040

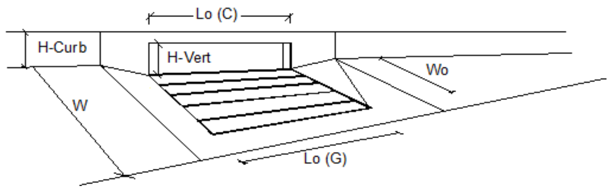
**Inlet ID:** Inlet DP-20 (Basin C15.8)




| | | | | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 5.2 | 13.4 | cfs |
| Water Spread Width | T = | 12.9 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 4.6 | 6.1 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.5 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.459 | 0.313 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 2.8 | 9.2 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 2.4 | 4.2 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 1.79 | 3.71 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 2.9 | 3.6 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 7.6 | 9.1 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.106 | 0.079 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 12.07 | 22.45 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 12.07 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 5.2 | 11.6 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 5.2 | 11.3 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.0 | 2.1 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | Q = | **5.20** | **11.33** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | $Q_b$ = | **0.0** | **2.1** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | C% = | **100** | **85** | **%** |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040
**Inlet ID:** Inlet DP-23 (Basins C15.3+C15.4)

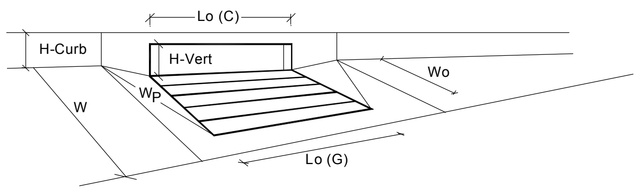



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 8.7 | 18.7 | cfs |
| Water Spread Width | T = | 16.0 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 5.4 | 6.7 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 1.1 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.373 | 0.276 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 5.5 | 13.5 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 3.2 | 5.1 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.1 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 2.68 | 4.64 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.2 | 4.0 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 8.4 | 9.7 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.090 | 0.072 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 16.94 | 27.66 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 15.00 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 8.5 | 14.0 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 8.4 | 13.7 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.3 | 5.0 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | Q = | **8.43** | **13.69** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | $Q_b$ = | **0.3** | **5.0** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | C% = | **97** | **73** | **%** |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

**Inlet ID =** Inlet DP-25 (Basin C15.5+C15.6+C15.11+C12+bypass from Inlet DP-23)

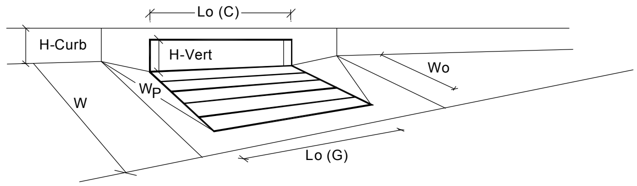



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | ☑ Override Depths | | | |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 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) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 19.14 | 32.57 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 18.63 | 31.70 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 50.55 | 55.95 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 49.20 | 54.47 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 28.92 | 39.70 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 28.16 | 38.64 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **18.63** | **31.70** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 25.00 | 25.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **18.6** | **31.7** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 16.0 | 38.9 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

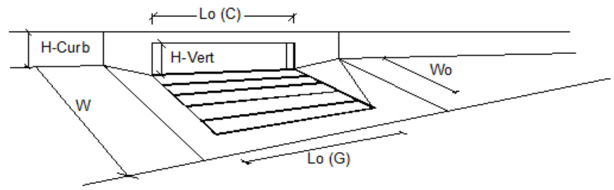
**Inlet ID =** **Inlet DP-26 (Basin C15.7+C15.13+bypass from Inlet DP-25)**




| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| **Grate Information** | | MINOR | MAJOR | ☑ Override Depths |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 20.00 | 20.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 15.79 | 26.87 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 15.27 | 25.98 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 40.44 | 44.76 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 39.09 | 43.28 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 23.50 | 32.26 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 22.72 | 31.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **15.27** | **25.98** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 20.00 | 20.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **15.3** | **26.0** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 8.4 | 26.0 | cfs |

# INLET ON A CONTINUOUS GRADE

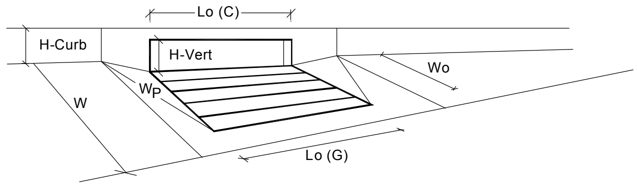
**Project:** **Lorson East Prelim Plan #100.040**
**Inlet ID:** **Inlet DP-28 (Basin C17.1a)**




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 5.3 | 11.5 | cfs |
| Water Spread Width | T = | 10.8 | 15.1 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 4.1 | 5.1 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.0 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.541 | 0.396 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 2.4 | 7.0 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 2.9 | 4.6 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 1.29 | 2.39 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 4.1 | 4.8 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 7.1 | 8.1 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.122 | 0.094 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 12.04 | 20.09 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 12.04 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 5.3 | 10.5 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 5.3 | 10.4 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.0 | 1.2 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **5.30** | **10.36** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.0** | **1.2** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **100** | **90** | **%** |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040
**Inlet ID =** Inlet DP-29 (Basin C15.9+C15.10+C15.14+bypass from Inlet DP-20)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | ☑ Override Depths | |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |

| Grate Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |

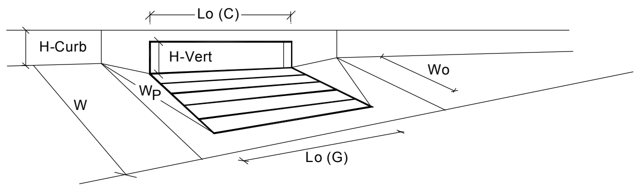
| Curb Opening Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 10.72 | 17.34 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 10.05 | 16.26 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 20.22 | 22.38 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 18.96 | 20.98 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 13.69 | 18.32 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 12.84 | 17.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **10.05** | **16.26** | **cfs** |

| Resultant Street Conditions | | MINOR | MAJOR | |
|---|---|---|---|---|
| Total Inlet Length | L = | 10.00 | 10.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **10.1** | **16.3** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 8.6 | 20.8 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

**Inlet ID =** Inlet DP-30 (Basin C15.15+bypass from Inlet DP-29 in 100-yr)

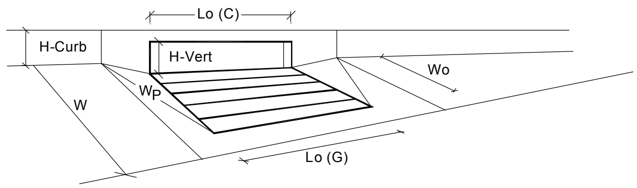



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | ☑ Override Depths | |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 15.00 | 15.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.31 | 1.31 | |
| Clogging Factor for Multiple Units | Clog = | 0.04 | 0.04 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 12.45 | 21.18 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 11.90 | 20.25 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 30.33 | 33.57 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 29.00 | 32.11 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 18.07 | 24.80 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 17.28 | 23.72 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **11.90** | **20.25** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 15.00 | 15.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **11.9** | **20.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 7.2 | 20.1 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

**Inlet ID =** **Inlet DP-33 (Basin C14+C16.33+bypass from Inlet DP-19c)**

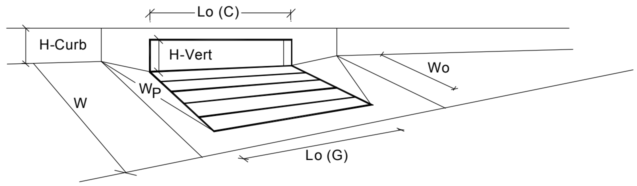



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 15.00 | 15.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.31 | 1.31 | |
| Clogging Factor for Multiple Units | Clog = | 0.04 | 0.04 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 12.45 | 21.18 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 11.90 | 20.25 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 30.33 | 33.57 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 29.00 | 32.11 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 18.07 | 24.80 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 17.28 | 23.72 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **11.90** | **20.25** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 15.00 | 15.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **11.9** | **20.3** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 8.2 | 26.3 | cfs |

# INLET IN A SUMP OR SAG LOCATION

Project = Lorson East Prelim Plan #100.040

Inlet ID = Inlet DP-34 (Basin C34+bypass from Inlet DP-33)

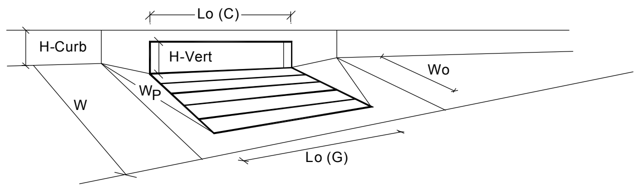



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 0.9 | 8.0 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** **Lorson East Prelim Plan #100.040**

**Inlet ID =** **Inlet DP-35 (Basin C16.35)**

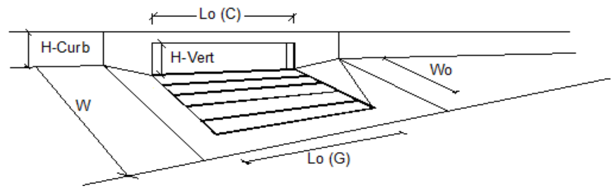



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 2.8 | 6.1 | cfs |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040

**Inlet ID:** Inlet DP-38 (Basin C17.1+bypass from Inlet DP-28)

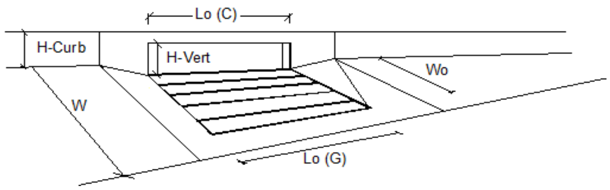



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | $Q_o$ = | 5.9 | 14.4 | cfs |
| Water Spread Width | T = | 13.6 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 4.8 | 6.2 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.6 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.437 | 0.304 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 3.3 | 10.0 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 2.6 | 4.4 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 1.98 | 3.91 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 3.0 | 3.7 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 7.8 | 9.2 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.102 | 0.077 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 13.12 | 23.51 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 13.12 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 5.9 | 12.1 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | $Q_a$ = | 5.9 | 11.8 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | $Q_b$ = | 0.0 | 2.6 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **5.90** | **11.83** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.0** | **2.6** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **100** | **82** | **%** |

# INLET ON A CONTINUOUS GRADE

**Project:** Lorson East Prelim Plan #100.040

**Inlet ID:** Inlet DP-39 (Basin C17.2+bypass from Inlet DP-38)

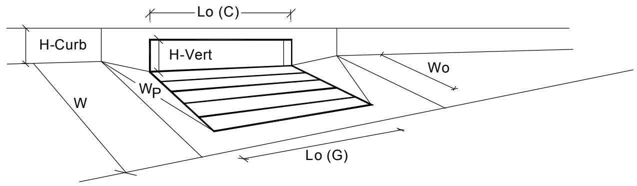



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{LOCAL}$ = | 3.0 | 3.0 | inches |
| Total Number of Units in the Inlet (Grate or Curb Opening) | No = | 1 | 1 | |
| Length of a Single Unit Inlet (Grate or Curb Opening) | $L_o$ = | 15.00 | 15.00 | ft |
| Width of a Unit Grate (cannot be greater than W from Q-Allow) | $W_o$ = | N/A | N/A | ft |
| Clogging Factor for a Single Unit Grate (typical min. value = 0.5) | $C_f$-G = | N/A | N/A | |
| Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1) | $C_f$-C = | 0.10 | 0.10 | |
| **Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'** | | MINOR | MAJOR | |
| **Design Discharge for Half of Street (from Sheet *Q-Peak*)** | **$Q_o$ =** | 8.6 | 21.6 | cfs |
| Water Spread Width | T = | 12.5 | 17.0 | ft |
| Water Depth at Flowline (outside of local depression) | d = | 4.5 | 5.9 | inches |
| Water Depth at Street Crown (or at $T_{MAX}$) | $d_{CROWN}$ = | 0.0 | 0.3 | inches |
| Ratio of Gutter Flow to Design Flow | $E_o$ = | 0.473 | 0.326 | |
| Discharge outside the Gutter Section W, carried in Section $T_x$ | $Q_x$ = | 4.5 | 14.5 | cfs |
| Discharge within the Gutter Section W | $Q_w$ = | 4.1 | 7.0 | cfs |
| Discharge Behind the Curb Face | $Q_{BACK}$ = | 0.0 | 0.0 | cfs |
| Flow Area within the Gutter Section W | $A_W$ = | 1.69 | 3.45 | sq ft |
| Velocity within the Gutter Section W | $V_W$ = | 5.1 | 6.2 | fps |
| Water Depth for Design Condition | $d_{LOCAL}$ = | 7.5 | 8.9 | inches |
| **Grate Analysis (Calculated)** | | MINOR | MAJOR | |
| Total Length of Inlet Grate Opening | L = | N/A | N/A | ft |
| Ratio of Grate Flow to Design Flow | $E_{o\text{-}GRATE}$ = | N/A | N/A | |
| **Under No-Clogging Condition** | | 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 | $R_x$ = | N/A | N/A | |
| Interception Capacity | $Q_i$ = | N/A | N/A | cfs |
| **Under Clogging Condition** | | 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 | $R_x$ = | 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 |
| **Curb or Slotted Inlet Opening Analysis (Calculated)** | | MINOR | MAJOR | |
| Equivalent Slope $S_e$ (based on grate carry-over) | $S_e$ = | 0.109 | 0.081 | ft/ft |
| Required Length $L_T$ to Have 100% Interception | $L_T$ = | 16.50 | 30.17 | ft |
| **Under No-Clogging Condition** | | MINOR | MAJOR | |
| Effective Length of Curb Opening or Slotted Inlet (minimum of L, $L_T$) | L = | 15.00 | 15.00 | ft |
| Interception Capacity | $Q_i$ = | 8.5 | 15.3 | cfs |
| **Under Clogging Condition** | | MINOR | MAJOR | |
| 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 | $L_e$ = | 13.03 | 13.03 | ft |
| **Actual Interception Capacity** | **$Q_a$ =** | 8.4 | 14.9 | cfs |
| **Carry-Over Flow = $Q_{b(GRATE)}$-$Q_a$** | **$Q_b$ =** | 0.2 | 6.6 | cfs |
| **Summary** | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity** | **Q =** | **8.41** | **14.93** | **cfs** |
| **Total Inlet Carry-Over Flow (flow bypassing inlet)** | **$Q_b$ =** | **0.2** | **6.6** | **cfs** |
| **Capture Percentage = $Q_a$/$Q_o$ =** | **C% =** | **98** | **69** | **%** |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

**Inlet ID =** Inlet DP-40 (Basin C17.3+C17.4+C17.5+bypass from Inlet DP-39)




| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 20.00 | 20.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |

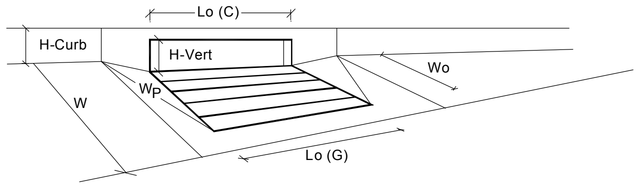
| Grate Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |

| Curb Opening Flow Analysis (Calculated) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 15.79 | 26.87 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 15.27 | 25.98 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 40.44 | 44.76 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 39.09 | 43.28 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 23.50 | 32.26 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 22.72 | 31.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **15.27** | **25.98** | **cfs** |

| Resultant Street Conditions | | MINOR | MAJOR | |
|---|---|---|---|---|
| Total Inlet Length | L = | 20.00 | 20.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **15.3** | **26.0** | **cfs** |
| WARNING: Inlet Capacity less than Q Peak for MAJOR Storm | $Q_{PEAK\ REQUIRED}$ = | 12.9 | 39.4 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040
**Inlet ID =** Inlet DP-41 (Basin C17.6+bypass from Inlet DP-40 in 100yr)

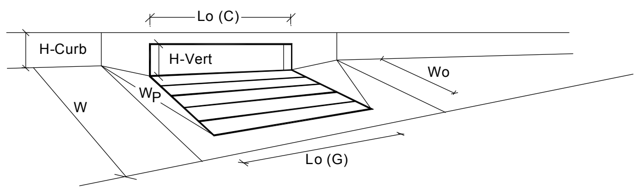



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | ☑ Override Depths | |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 20.00 | 20.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.33 | 1.33 | |
| Clogging Factor for Multiple Units | Clog = | 0.03 | 0.03 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 15.79 | 26.87 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 15.27 | 25.98 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 40.44 | 44.76 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 39.09 | 43.28 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 23.50 | 32.26 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 22.72 | 31.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **15.27** | **25.98** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 20.00 | 20.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **15.3** | **26.0** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 1.9 | 19.3 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

**Inlet ID =** Inlet DP-42 (Basin C17.8)

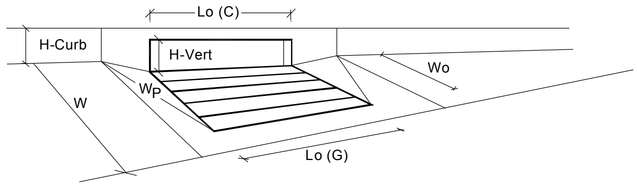



| Design Information (Input) | | MINOR | MAJOR | |
|---|---|---|---|---|
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| ☑ Override Depths | | | | |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 5.00 | 5.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.00 | 1.00 | |
| Clogging Factor for Multiple Units | Clog = | 0.10 | 0.10 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 7.06 | 10.97 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 6.35 | 9.87 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 10.11 | 11.19 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 9.10 | 10.07 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 7.86 | 10.30 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 7.07 | 9.27 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **6.35** | **9.27** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 5.00 | 5.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **6.4** | **9.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 3.2 | 7.2 | cfs |

# INLET IN A SUMP OR SAG LOCATION

**Project =** Lorson East Prelim Plan #100.040

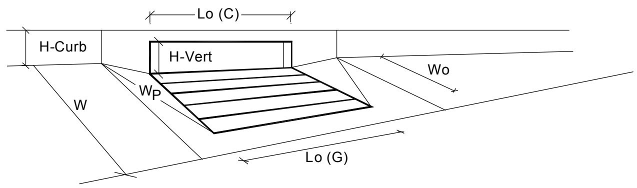
**Inlet ID =** Inlet DP-47 (Basin C17.9)




| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | MINOR | MAJOR | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | | | | ☑ Override Depths |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 10.72 | 17.34 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 10.05 | 16.26 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 20.22 | 22.38 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 18.96 | 20.98 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 13.69 | 18.32 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 12.84 | 17.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **10.05** | **16.26** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 10.00 | 10.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **10.1** | **16.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 7.9 | 13.9 | cfs |

# INLET IN A SUMP OR SAG LOCATION

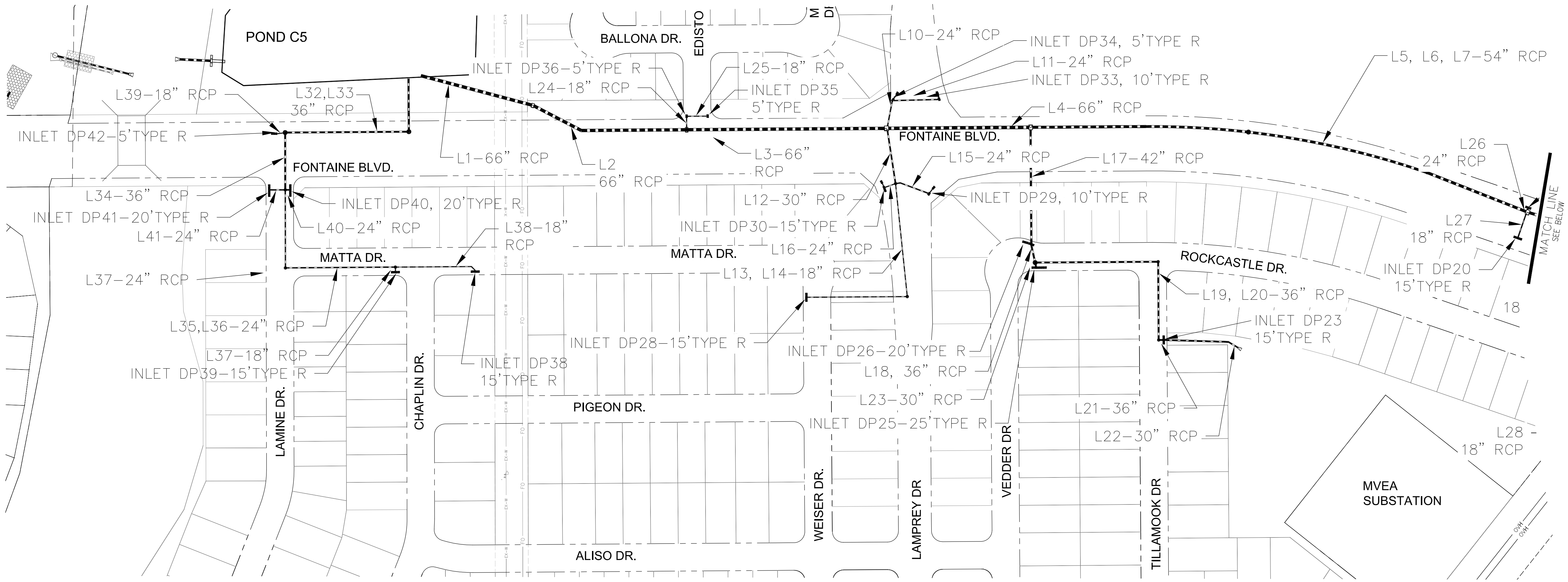
**Project =** **Lorson East Prelim Plan #100.040**
**Inlet ID =** **Inlet DP-48 (Basin C17.10)**

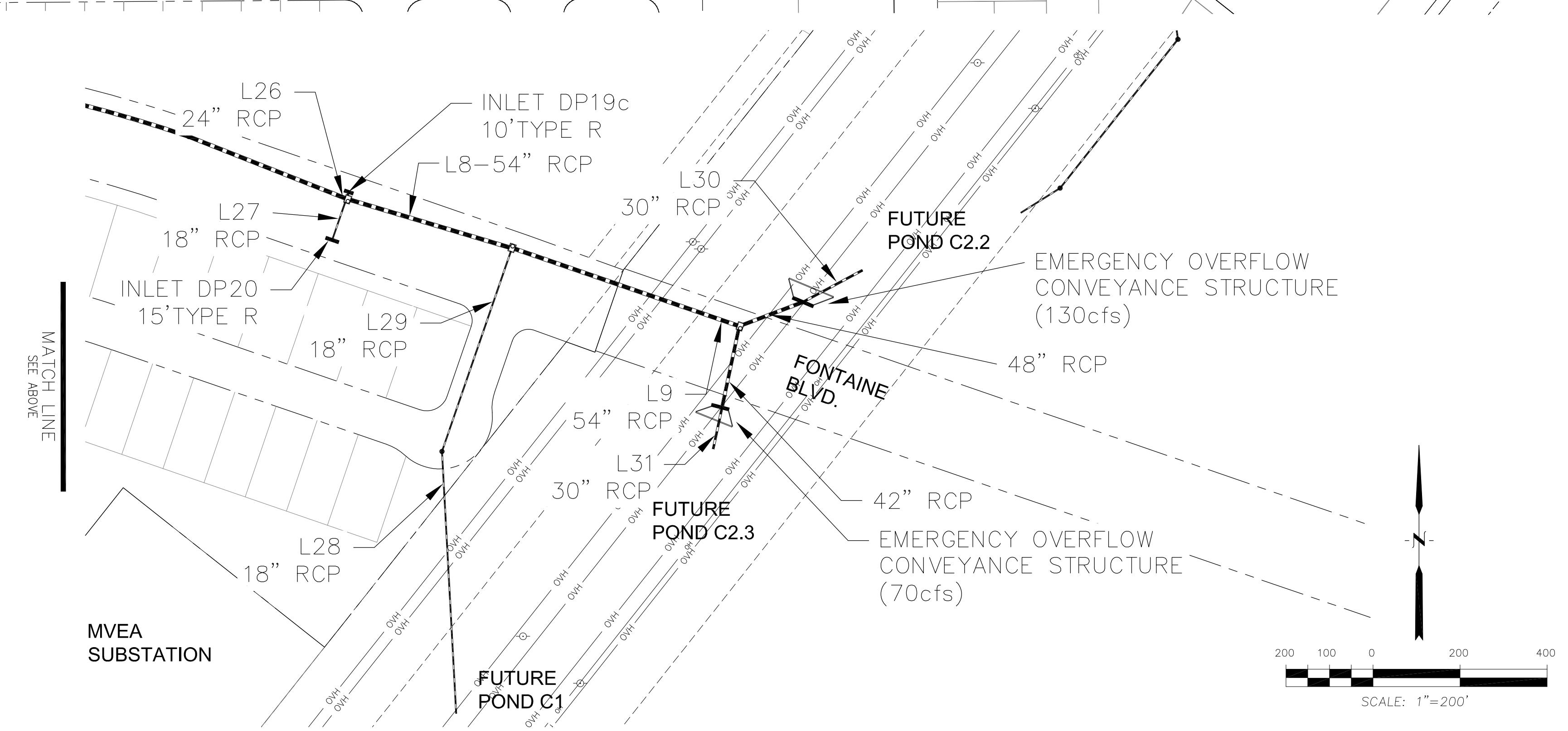



| | | MINOR | MAJOR | |
|---|---|---|---|---|
| **Design Information (Input)** | | | | |
| Type of Inlet | Inlet Type = | CDOT Type R Curb Opening | | |
| Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow') | $a_{local}$ = | 3.00 | 3.00 | inches |
| Number of Unit Inlets (Grate or Curb Opening) | No = | 1 | 1 | |
| Water Depth at Flowline (outside of local depression) | Ponding Depth = | 6.5 | 8.0 | inches |
| | ☑ Override Depths | | | |
| **Grate Information** | | MINOR | MAJOR | |
| Length of a Unit Grate | $L_o$ (G) = | N/A | N/A | feet |
| Width of a Unit Grate | $W_o$ = | N/A | N/A | feet |
| Area Opening Ratio for a Grate (typical values 0.15-0.90) | $A_{ratio}$ = | N/A | N/A | |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70) | $C_f$ (G) = | N/A | N/A | |
| Grate Weir Coefficient (typical value 2.15 - 3.60) | $C_w$ (G) = | N/A | N/A | |
| Grate Orifice Coefficient (typical value 0.60 - 0.80) | $C_o$ (G) = | N/A | N/A | |
| **Curb Opening Information** | | MINOR | MAJOR | |
| Length of a Unit Curb Opening | $L_o$ (C) = | 10.00 | 10.00 | feet |
| Height of Vertical Curb Opening in Inches | $H_{vert}$ = | 6.00 | 6.00 | inches |
| Height of Curb Orifice Throat in Inches | $H_{throat}$ = | 6.00 | 6.00 | inches |
| Angle of Throat (see USDCM Figure ST-5) | Theta = | 63.40 | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet) | $W_p$ = | 2.00 | 2.00 | feet |
| Clogging Factor for a Single Curb Opening (typical value 0.10) | $C_f$ (C) = | 0.10 | 0.10 | |
| Curb Opening Weir Coefficient (typical value 2.3-3.7) | $C_w$ (C) = | 3.60 | 3.60 | |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70) | $C_o$ (C) = | 0.67 | 0.67 | |
| **Grate Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | N/A | N/A | |
| Clogging Factor for Multiple Units | Clog = | N/A | N/A | |
| **Grate Capacity as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{wa}$ = | N/A | N/A | cfs |
| **Grate Capacity as a Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{oa}$ = | N/A | N/A | cfs |
| **Grate Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | N/A | N/A | cfs |
| Interception with Clogging | $Q_{ma}$ = | N/A | N/A | cfs |
| **Resulting Grate Capacity (assumes clogged condition)** | $Q_{Grate}$ = | **N/A** | **N/A** | **cfs** |
| **Curb Opening Flow Analysis (Calculated)** | | MINOR | MAJOR | |
| Clogging Coefficient for Multiple Units | Coef = | 1.25 | 1.25 | |
| Clogging Factor for Multiple Units | Clog = | 0.06 | 0.06 | |
| **Curb Opening as a Weir (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{wi}$ = | 10.72 | 17.34 | cfs |
| Interception with Clogging | $Q_{wa}$ = | 10.05 | 16.26 | cfs |
| **Curb Opening as an Orifice (based on UDFCD - CSU 2010 Study)** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{oi}$ = | 20.22 | 22.38 | cfs |
| Interception with Clogging | $Q_{oa}$ = | 18.96 | 20.98 | cfs |
| **Curb Opening Capacity as Mixed Flow** | | MINOR | MAJOR | |
| Interception without Clogging | $Q_{mi}$ = | 13.69 | 18.32 | cfs |
| Interception with Clogging | $Q_{ma}$ = | 12.84 | 17.18 | cfs |
| **Resulting Curb Opening Capacity (assumes clogged condition)** | $Q_{Curb}$ = | **10.05** | **16.26** | **cfs** |
| **Resultant Street Conditions** | | MINOR | MAJOR | |
| Total Inlet Length | L = | 10.00 | 10.00 | feet |
| Resultant Street Flow Spread (based on sheet *Q-Allow* geometry) | T = | 39.3 | 52.1 | ft.>T-Crown |
| Resultant Flow Depth at Street Crown | $d_{CROWN}$ = | 2.7 | 4.2 | inches |
| | | MINOR | MAJOR | |
| **Total Inlet Interception Capacity (assumes clogged condition)** | $Q_a$ = | **10.1** | **16.3** | **cfs** |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK) | $Q_{PEAK\ REQUIRED}$ = | 8.9 | 16.0 | cfs |

## APPENDIX E– STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

# BASIN C15 - C17 STORM SCHEMATIC




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

| NO. | DESCRIPTION | DATE |
|---|---|---|
| | | |

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

PROJECT: LORSON RANCH EAST
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C15 - C17
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
2

TOTAL SHEETS: 3

# 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 | L1 | 71.78 | 66 c | 147.3 | 5709.00 | 5710.58 | 1.073 | 5713.23 | 5712.89 | n/a | 5712.89 j | End |
| 2 | L2 | 74.17 | 66 c | 383.5 | 5711.05 | 5715.17 | 1.074 | 5713.63 | 5717.52 | n/a | 5717.52 j | 1 |
| 3 | L3 | 74.71 | 66 c | 373.9 | 5715.17 | 5718.90 | 0.998 | 5718.28 | 5721.25 | n/a | 5721.25 j | 2 |
| 4 | L4 | 56.87 | 54 c | 249.3 | 5719.80 | 5722.30 | 1.003 | 5721.98 | 5724.46 | n/a | 5724.46 j | 3 |
| 5 | L5 | 23.22 | 54 c | 228.8 | 5722.70 | 5726.20 | 1.530 | 5725.31 | 5727.58 | n/a | 5727.58 j | 4 |
| 6 | L6 | 24.61 | 54 c | 494.6 | 5726.50 | 5733.40 | 1.395 | 5728.03 | 5734.82 | n/a | 5734.82 j | 5 |
| 7 | L7 | 25.27 | 54 c | 194.1 | 5733.50 | 5735.50 | 1.030 | 5735.29 | 5736.94 | n/a | 5736.94 j | 6 |
| 8 | L8 | 14.00 | 54 c | 219.8 | 5735.50 | 5737.40 | 0.864 | 5737.44 | 5738.47 | n/a | 5738.47 j | 7 |
| 9 | L9 | 10.00 | 54 c | 279.0 | 5737.40 | 5740.20 | 1.004 | 5738.83 | 5741.11 | n/a | 5741.11 j | 8 |
| 10 | L10 | 8.18 | 24 c | 58.7 | 5721.70 | 5723.68 | 3.373 | 5722.30 | 5724.70 | 0.00 | 5724.70 | 3 |
| 11 | L11 | 7.49 | 24 c | 52.4 | 5724.38 | 5724.94 | 1.069 | 5725.16 | 5725.92 | 0.00 | 5725.92 | 10 |
| 12 | L12 | 19.36 | 30 c | 84.4 | 5721.30 | 5723.52 | 2.629 | 5722.22 | 5725.13 | 0.00 | 5725.13 | 3 |
| 13 | L13 | 5.14 | 18 c | 214.7 | 5724.72 | 5728.81 | 1.905 | 5725.52 | 5729.68 | 0.00 | 5729.68 | 12 |
| 14 | L14 | 5.32 | 18 c | 182.2 | 5729.11 | 5734.84 | 3.145 | 5729.90 | 5735.72 | 0.00 | 5735.72 | 13 |
| 15 | L15 | 8.63 | 24 c | 31.0 | 5725.08 | 5725.61 | 1.711 | 5725.82 | 5726.92 | 0.00 | 5726.92 | 12 |
| 16 | L16 | 7.21 | 24 c | 13.1 | 5724.61 | 5725.10 | 3.742 | 5725.57 | 5726.05 | n/a | 5726.05 j | 12 |
| 17 | L17 | 38.11 | 42 c | 202.3 | 5723.10 | 5727.36 | 2.106 | 5725.10 | 5729.25 | n/a | 5729.25 j | 4 |
| 18 | L18 | 31.82 | 36 c | 30.7 | 5728.15 | 5728.46 | 1.011 | 5729.74 | 5730.27 | 0.00 | 5730.27 | 17 |
| 19 | L19 | 20.19 | 36 c | 223.4 | 5728.50 | 5730.75 | 1.007 | 5730.94 | 5732.18 | n/a | 5732.18 j | 18 |
| 20 | L20 | 20.64 | 36 c | 141.8 | 5730.95 | 5732.40 | 1.021 | 5732.62 | 5733.85 | n/a | 5733.85 j | 19 |
| 21 | L21 | 20.68 | 36 c | 11.2 | 5732.70 | 5732.79 | 0.805 | 5734.29 | 5734.25 | n/a | 5734.25 j | 20 |
| 22 | L22 | 13.55 | 30 c | 139.3 | 5733.40 | 5735.50 | 1.508 | 5734.70 | 5736.73 | n/a | 5736.73 j | 21 |
| 23 | L23 | 15.69 | 30 c | 10.8 | 5729.21 | 5729.48 | 2.506 | 5730.90 | 5730.81 | n/a | 5730.81 | 18 |
| 24 | L24 | 2.96 | 18 c | 35.8 | 5719.93 | 5720.92 | 2.768 | 5720.35 | 5721.58 | 0.00 | 5721.58 | 2 |
| 25 | L25 | 2.82 | 18 c | 41.0 | 5721.22 | 5721.63 | 0.998 | 5721.78 | 5722.27 | n/a | 5722.27 | 24 |
| 26 | L26 | 6.51 | 24 c | 13.2 | 5741.12 | 5742.52 | 10.617 | 5741.52* | 5745.41* | 0.00 | 5745.41 | 7 |
| 27 | L27 | 5.20 | 18 c | 45.8 | 5742.58 | 5743.07 | 1.070 | 5743.31 | 5743.94 | 0.00 | 5743.94 | 7 |
| 28 | L28 | 4.00 | 18 c | 264.9 | 5740.45 | 5741.80 | 0.509 | 5741.23 | 5742.58 | 0.00 | 5742.58 | 8 |
| 29 | L29 | 4.00 | 18 c | 273.9 | 5741.90 | 5743.30 | 0.511 | 5742.79 | 5744.06 | n/a | 5744.06 | 28 |
| 30 | L30 | 6.00 | 30 c | 149.2 | 5743.71 | 5744.50 | 0.529 | 5744.47 | 5745.32 | 0.00 | 5745.32 | 9 |
| 31 | L31 | 4.00 | 30 c | 116.9 | 5743.49 | 5744.10 | 0.521 | 5744.11 | 5744.77 | 0.00 | 5744.77 | 9 |
| 32 | L32 | 26.54 | 36 c | 104.3 | 5709.00 | 5709.63 | 0.604 | 5711.10 | 5711.27 | n/a | 5711.27 j | End |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Summary Report



| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns line No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | L33 | 27.33 | 36 c | 243.0 | 5709.83 | 5711.30 | 0.605 | 5711.74 | 5712.97 | n/a | 5712.97 j | 32 |
| 34 | L34 | 24.96 | 36 c | 90.4 | 5711.80 | 5712.55 | 0.829 | 5713.49 | 5714.14 | 0.00 | 5714.14 | 33 |
| 35 | L35 | 13.90 | 24 c | 142.7 | 5713.55 | 5717.40 | 2.699 | 5714.51 | 5718.72 | n/a | 5718.72 | 34 |
| 36 | L36 | 14.34 | 24 c | 220.6 | 5717.70 | 5723.60 | 2.675 | 5719.02 | 5724.94 | n/a | 5724.94 | 35 |
| 37 | L37 | 8.69 | 18 c | 7.0 | 5724.10 | 5724.18 | 1.144 | 5725.20 | 5725.31 | 0.00 | 5725.31 | 36 |
| 38 | L38 | 6.03 | 18 c | 145.3 | 5724.10 | 5727.01 | 2.003 | 5725.40 | 5727.95 | n/a | 5727.95 j | 36 |
| 39 | L39 | 3.20 | 18 c | 17.2 | 5714.35 | 5714.58 | 1.340 | 5714.88 | 5715.35 | 0.00 | 5715.35 | 33 |
| 40 | L40 | 12.59 | 24 c | 27.1 | 5713.55 | 5713.76 | 0.776 | 5714.70 | 5715.03 | 0.00 | 5715.03 | 34 |
| 41 | L41 | 1.85 | 24 c | 11.5 | 5713.55 | 5713.70 | 1.303 | 5714.79 | 5714.78 | 0.00 | 5714.78 | 34 |

| | | |
|---|---|---|
| **Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017 |

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet Ht (in) | Curb Inlet L (ft) | Grate Inlet area (sqft) | Grate Inlet L (ft) | Grate Inlet W (ft) | Gutter So (ft/ft) | Gutter W (ft) | Gutter Sw (ft/ft) | Gutter Sx (ft/ft) | Gutter n | Gutter Depth (ft) | Gutter Spread (ft) | Inlet Depth (ft) | Inlet Spread (ft) | Inlet Depr (in) | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 2 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 3 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 4 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 5 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 6 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 |
| 7 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 |
| 8 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 |
| 9 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 10 | Inlet DP-34 - 5' | 0.88 | 0.00 | 0.88 | 0.00 | Curb | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.24 | 6.23 | 0.37 | 6.23 | 3.00 | Off |
| 11 | Inlet DP-33 - 10' | 7.49 | 0.81 | 8.30 | 0.00 | Curb | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.58 | 10.38 | 0.69 | 10.38 | 2.00 | Off |
| 12 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 13 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 14 | Inlet DP-28 - 15' | 5.32 | 0.00 | 5.30 | 0.02 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.026 | 2.00 | 0.080 | 0.020 | 0.013 | 0.31 | 9.40 | 0.31 | 9.40 | 0.00 | 38 |
| 15 | Inlet DP-29 - 10' | 8.63 | 0.00 | 8.63 | 0.00 | Curb | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.54 | 21.10 | 0.67 | 21.10 | 3.00 | Off |
| 16 | Inlet DP-30 - 15' | 7.21 | 0.00 | 7.21 | 0.00 | Curb | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.49 | 18.70 | 0.62 | 18.70 | 3.00 | Off |
| 17 | Inlet DP-26, 20' | 8.49 | 0.00 | 8.49 | 0.00 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.30 | 4.80 | 0.30 | 4.80 | 0.00 | Off |
| 18 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 19 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 20 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 21 | Inlet DP-23, 15' | 8.68 | 0.00 | 8.43 | 0.25 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.011 | 2.00 | 0.080 | 0.020 | 0.013 | 0.40 | 14.05 | 0.40 | 14.05 | 0.00 | 23 |
| 22 | | 13.55 | 0.00 | 13.55 | 0.00 | Hdwl | 0.0 | 0.00 | 15.00 | 6.00 | 3.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 68.28 / (Inlet time + 13.10) ^ 0.89; Return period = 5 Yrs. ; * Indicates Known Q added

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 23 | INLET DP-25- 25' | 15.69 | 0.25 | 15.94 | 0.00 | Genr | 6.0 | 48.21 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.30 | 9.00 | 0.30 | 9.00 | 0.00 | Off |
| 24 | Inlet DP-36, 5' | 0.25 | 0.00 | 0.25 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.17 | 2.71 | 0.30 | 2.71 | 3.00 | 2 |
| 25 | Inlet DP-35, 5' | 2.82 | 0.00 | 2.82 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.39 | 13.55 | 0.52 | 13.55 | 3.00 | 24 |
| 26 | Inlet DP-19c, 10' | 6.51 | 0.00 | 5.70 | 0.81 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.37 | 12.70 | 0.37 | 12.70 | 0.00 | 11 |
| 27 | Inlet DP-20, 15' | 5.20 | 0.00 | 5.20 | 0.00 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.35 | 11.55 | 0.35 | 11.55 | 0.00 | 15 |
| 28 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 29 | | 4.00* | 0.00 | 4.00 | 0.00 | Grate | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.30 | 4.85 | 0.30 | 4.85 | 0.00 | 28 |
| 30 | | 6.00* | 0.00 | 6.00 | 0.00 | Genr | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.30 | 4.80 | 0.30 | 4.80 | 0.00 | 9 |
| 31 | | 4.00* | 0.00 | 4.00 | 0.00 | Genr | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.30 | 4.80 | 0.30 | 4.80 | 0.00 | 9 |
| 32 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 33 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32 |
| 34 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 35 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 36 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35 |
| 37 | Inlet DP-39, 15' | 8.69 | 0.00 | 8.41 | 0.28 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.038 | 2.00 | 0.080 | 0.020 | 0.013 | 0.34 | 10.80 | 0.34 | 10.80 | 0.00 | 40 |
| 38 | Inlet DP-38,  15' | 6.03 | 0.02 | 6.05 | 0.00 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.011 | 2.00 | 0.080 | 0.020 | 0.013 | 0.36 | 12.05 | 0.36 | 12.05 | 0.00 | 37 |
| 39 | Inlet DP-42, 10' | 3.20 | 0.00 | 3.20 | 0.00 | Curb | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.33 | 5.48 | 0.44 | 5.48 | 2.00 | 33 |
| 40 | Inlet DP-40, 20' | 12.59 | 0.28 | 12.87 | 0.00 | Curb | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.42 | 7.13 | 0.52 | 7.13 | 2.00 | 34 |
| 41 | Inlet DP-41, 20' | 1.85 | 0.00 | 1.85 | 0.00 | Curb | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.16 | 1.97 | 0.26 | 1.98 | 2.00 | 34 |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 68.28 / (Inlet time + 13.10) ^ 0.89; Return period = 5 Yrs. ; * Indicates Known Q added

# 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 | L1 | 298.5 | 66 c | 147.3 | 5709.50 | 5711.15 | 1.122 | 5715.80* | 5716.96* | 0.00 | 5716.96 | End |
| 2 | L2 | 300.9 | 66 c | 383.5 | 5711.45 | 5715.70 | 1.106 | 5716.96 | 5720.47 | n/a | 5720.47 | 1 |
| 3 | L3 | 298.3 | 66 c | 373.9 | 5715.90 | 5719.70 | 1.017 | 5720.95 | 5724.47 | 0.00 | 5724.47 | 2 |
| 4 | L4 | 252.9 | 66 c | 249.3 | 5719.90 | 5722.40 | 1.003 | 5725.60 | 5726.73 | n/a | 5726.73 | 3 |
| 5 | L5 | 163.4 | 54 c | 228.8 | 5723.60 | 5728.00 | 1.923 | 5727.56 | 5731.67 | n/a | 5731.67 | 4 |
| 6 | L6 | 164.2 | 54 c | 494.6 | 5728.20 | 5733.16 | 1.003 | 5732.17 | 5736.84 | 0.00 | 5736.84 | 5 |
| 7 | L7 | 164.6 | 54 c | 194.1 | 5733.26 | 5735.20 | 1.000 | 5737.34 | 5738.88 | n/a | 5738.88 | 6 |
| 8 | L8 | 131.0 | 54 c | 219.8 | 5735.30 | 5737.50 | 1.001 | 5740.00 | 5740.79 | 0.00 | 5740.79 | 7 |
| 9 | L9 | 87.00 | 54 c | 279.0 | 5737.40 | 5741.20 | 1.363 | 5742.05 | 5743.88 | 0.00 | 5743.88 | 8 |
| 10 | L10 | 28.69 | 24 c | 58.7 | 5723.20 | 5724.30 | 1.873 | 5726.06* | 5727.01* | 0.00 | 5727.01 | 3 |
| 11 | L11 | 20.03 | 24 c | 52.4 | 5724.40 | 5724.84 | 0.845 | 5727.67* | 5728.08* | 0.00 | 5728.08 | 10 |
| 12 | L12 | 42.12 | 30 c | 84.4 | 5722.70 | 5723.52 | 0.976 | 5726.21* | 5727.11* | 0.00 | 5727.11 | 3 |
| 13 | L13 | 11.36 | 18 c | 214.7 | 5724.72 | 5728.81 | 1.905 | 5727.61 | 5730.10 | n/a | 5730.10 j | 12 |
| 14 | L14 | 11.56 | 18 c | 182.2 | 5729.11 | 5734.84 | 3.145 | 5730.20 | 5736.14 | n/a | 5736.14 | 13 |
| 15 | L15 | 18.67 | 24 c | 31.0 | 5725.08 | 5725.61 | 1.711 | 5727.70* | 5727.91* | 0.00 | 5727.91 | 12 |
| 16 | L16 | 15.39 | 24 c | 13.1 | 5724.61 | 5725.10 | 3.742 | 5727.88* | 5727.94* | 0.00 | 5727.94 | 12 |
| 17 | L17 | 92.58 | 42 c | 202.3 | 5724.40 | 5727.36 | 1.465 | 5727.76 | 5730.31 | n/a | 5730.31 | 4 |
| 18 | L18 | 78.29 | 36 c | 30.7 | 5728.15 | 5728.46 | 1.011 | 5731.15* | 5731.57* | 0.00 | 5731.57 | 17 |
| 19 | L19 | 51.29 | 36 c | 223.4 | 5728.50 | 5730.75 | 1.007 | 5732.66* | 5733.98* | 0.00 | 5733.98 | 18 |
| 20 | L20 | 51.77 | 36 c | 141.8 | 5730.95 | 5732.40 | 1.022 | 5733.98 | 5734.69 | 0.00 | 5734.69 | 19 |
| 21 | L21 | 51.81 | 36 c | 11.2 | 5732.70 | 5732.79 | 0.805 | 5735.10 | 5735.11 | 0.00 | 5735.11 | 20 |
| 22 | L22 | 35.92 | 30 c | 139.3 | 5733.40 | 5735.50 | 1.508 | 5735.49 | 5737.50 | n/a | 5737.50 j | 21 |
| 23 | L23 | 33.74 | 30 c | 10.8 | 5729.21 | 5729.48 | 2.506 | 5732.75* | 5732.82* | 0.00 | 5732.82 | 18 |
| 24 | L24 | 6.37 | 18 c | 35.8 | 5719.93 | 5720.92 | 2.768 | 5723.20* | 5723.33* | 0.00 | 5723.33 | 2 |
| 25 | L25 | 6.01 | 18 c | 41.0 | 5721.22 | 5721.63 | 0.998 | 5723.36* | 5723.49* | 0.00 | 5723.49 | 24 |
| 26 | L26 | 22.01 | 24 c | 13.2 | 5741.12 | 5742.52 | 10.617 | 5741.87* | 5748.38* | 0.00 | 5748.38 | 7 |
| 27 | L27 | 13.06 | 18 c | 45.8 | 5742.58 | 5743.07 | 1.070 | 5744.08* | 5744.79* | 0.00 | 5744.79 | 7 |
| 28 | L28 | 18.00 | 18 c | 268.7 | 5740.50 | 5741.84 | 0.498 | 5742.00* | 5749.89* | 0.00 | 5749.89 | 8 |
| 29 | L29 | 18.00 | 18 c | 271.6 | 5741.94 | 5743.30 | 0.500 | 5749.89* | 5757.88* | 0.00 | 5757.88 | 28 |
| 30 | L30 | 61.00 | 48 c | 149.2 | 5741.71 | 5742.50 | 0.529 | 5744.72 | 5744.81 | 0.00 | 5744.81 | 9 |
| 31 | L31 | 52.00 | 42 c | 116.9 | 5742.20 | 5742.90 | 0.597 | 5744.63 | 5745.11 | n/a | 5745.11 j | 9 |
| 32 | L32 | 65.12 | 36 c | 104.3 | 5709.00 | 5709.63 | 0.604 | 5711.81* | 5712.81* | 0.00 | 5712.81 | End |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 12-18-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Summary Report



| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns line No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | L33 | 65.94 | 36 c | 243.0 | 5709.83 | 5711.30 | 0.605 | 5712.83* | 5715.21* | 0.00 | 5715.21 | 32 |
| 34 | L34 | 60.45 | 36 c | 90.4 | 5711.80 | 5712.55 | 0.829 | 5715.42* | 5716.17* | 0.00 | 5716.17 | 33 |
| 35 | L35 | 31.08 | 24 c | 142.7 | 5713.55 | 5717.40 | 2.699 | 5716.17 | 5719.28 | n/a | 5719.28 j | 34 |
| 36 | L36 | 31.58 | 24 c | 220.6 | 5717.70 | 5723.60 | 2.675 | 5719.31 | 5725.49 | n/a | 5725.49 | 35 |
| 37 | L37 | 19.13 | 18 c | 7.0 | 5724.10 | 5724.18 | 1.144 | 5725.60* | 5725.83* | 0.00 | 5725.83 | 36 |
| 38 | L38 | 13.06 | 18 c | 145.3 | 5724.10 | 5727.01 | 2.003 | 5726.28 | 5728.51 | 0.00 | 5728.51 | 36 |
| 39 | L39 | 7.04 | 18 c | 17.2 | 5714.35 | 5714.58 | 1.340 | 5716.31* | 5716.39* | 0.00 | 5716.39 | 33 |
| 40 | L40 | 32.43 | 24 c | 27.1 | 5713.55 | 5713.76 | 0.776 | 5716.17* | 5716.72* | 0.00 | 5716.72 | 34 |
| 41 | L41 | 5.88 | 24 c | 11.5 | 5713.55 | 5713.67 | 1.049 | 5717.25* | 5717.26* | 0.00 | 5717.26 | 34 |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 12-18-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet Ht (in) | Curb Inlet L (ft) | Grate Inlet area (sqft) | Grate Inlet L (ft) | Grate Inlet W (ft) | Gutter So (ft/ft) | Gutter W (ft) | Gutter Sw (ft/ft) | Gutter Sx (ft/ft) | Gutter n | Gutter Depth (ft) | Gutter Spread (ft) | Inlet Depth (ft) | Inlet Spread (ft) | Inlet Depr (in) | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 131.00* | 0.00 | 0.00 | 131.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 2 | | 131.00* | 0.00 | 0.00 | 131.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 3 | | 131.00* | 0.00 | 0.00 | 131.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 4 | | 131.00* | 0.00 | 0.00 | 131.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 5 | | 131.00* | 629.00 | 0.00 | 760.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 6 | | 131.00* | 498.00 | 0.00 | 629.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 |
| 7 | | 131.00* | 367.00 | 0.00 | 498.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 |
| 8 | | 131.00* | 236.00 | 0.00 | 367.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 |
| 9 | | 87.00* | 113.00 | 0.00 | 200.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 10 | Inlet DP-34 - 5' | 13.94* | 11.12 | 21.06 | 4.00 | Genr | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.30 | 9.00 | 0.30 | 9.00 | 0.00 | Off |
| 11 | Inlet DP-33 - 10' | 20.03* | 11.39 | 20.30 | 11.12 | Genr | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | 0.020 | 2.00 | 0.080 | 0.050 | 0.013 | 0.65 | 11.88 | 0.65 | 11.88 | 0.00 | 10 |
| 12 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 13 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 14 | Inlet DP-28 - 15' | 11.56 | 0.00 | 10.36 | 1.20 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.026 | 2.00 | 0.080 | 0.020 | 0.013 | 0.38 | 13.25 | 0.38 | 13.25 | 0.00 | 38 |
| 15 | Inlet DP-29 - 10' | 18.67 | 1.73 | 16.30 | 4.10 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | 0.020 | 2.00 | 0.080 | 0.020 | 0.013 | 0.47 | 17.60 | 0.47 | 17.60 | 0.00 | 16 |
| 16 | Inlet DP-30 - 15' | 15.39 | 4.10 | 19.49 | 0.00 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.30 | 9.00 | 0.30 | 9.00 | 0.00 | Off |
| 17 | Inlet DP-26, 20' | 18.18 | 6.91 | 25.10 | 0.00 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.30 | 4.80 | 0.30 | 4.80 | 0.00 | Off |
| 18 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 19 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 20 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 21 | Inlet DP-23, 15' | 18.56 | 0.00 | 13.69 | 4.87 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.011 | 2.00 | 0.080 | 0.020 | 0.013 | 0.50 | 19.10 | 0.50 | 19.10 | 0.00 | 23 |
| 22 | | 35.92 | 0.00 | 35.92 | 0.00 | Hdwl | 0.0 | 0.00 | 15.00 | 6.00 | 3.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |

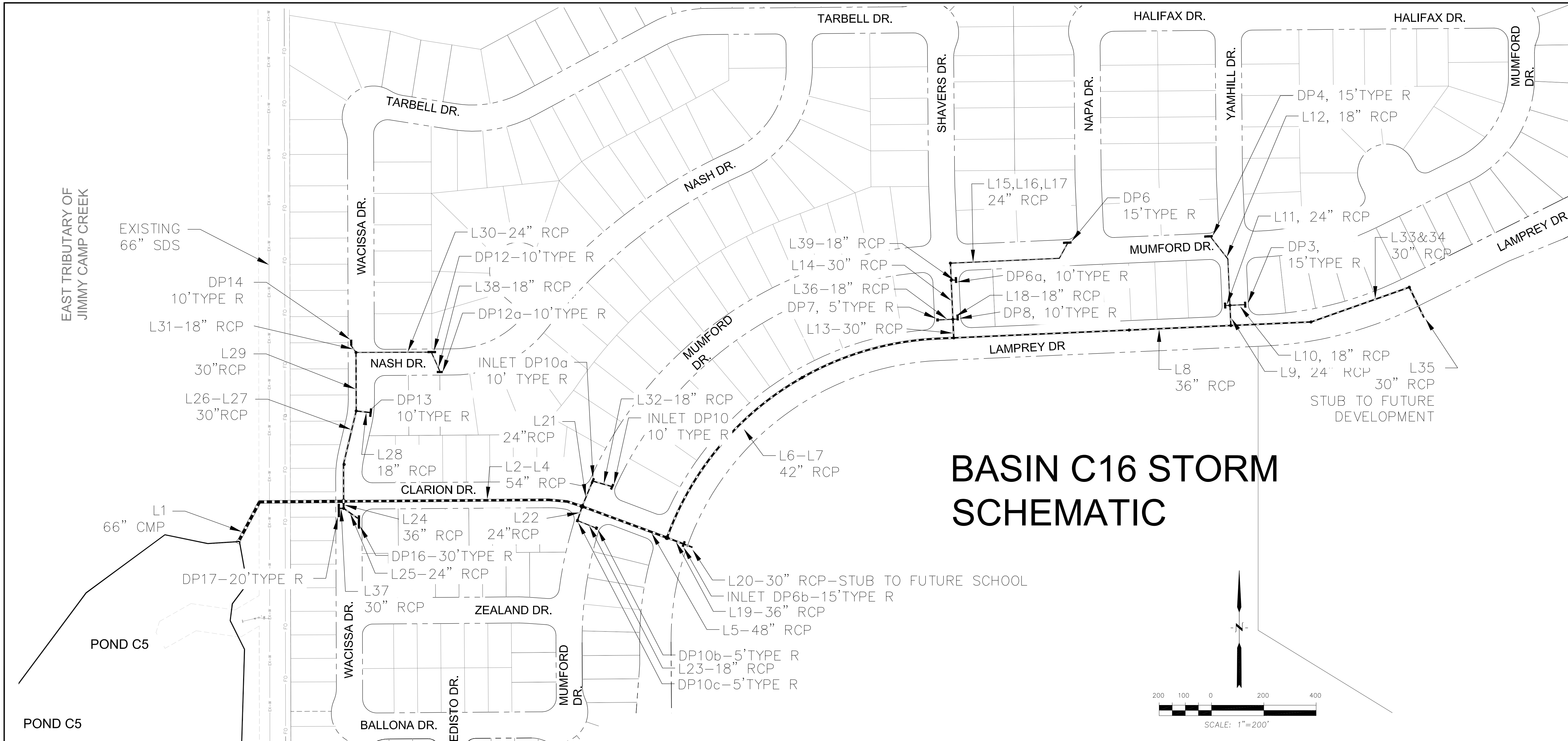
**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 12-18-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 23 | INLET DP-25- 25' | 33.74 | 4.87 | 31.70 | 6.91 | Genr | 6.0 | 48.21 | 0.00 | 0.00 | 0.00 | 0.020 | 2.00 | 0.080 | 0.020 | 0.013 | 0.57 | 22.65 | 0.57 | 22.65 | 0.00 | 17 |
| 24 | Inlet DP-36, 5' | 0.57 | 0.00 | 0.57 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.21 | 4.65 | 0.34 | 4.65 | 3.00 | 2 |
| 25 | Inlet DP-35, 5' | 6.01 | 0.00 | 6.01 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.57 | 22.50 | 0.70 | 22.50 | 3.00 | 24 |
| 26 | Inlet DP-19c, 10' | 22.01 | 0.00 | 10.62 | 11.39 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.54 | 20.80 | 0.54 | 20.80 | 0.00 | 11 |
| 27 | Inlet DP-20, 15' | 13.06 | 0.00 | 11.33 | 1.73 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.46 | 16.90 | 0.46 | 16.90 | 0.00 | 15 |
| 28 | | 18.00* | 18.00 | 0.00 | 36.00 | None | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 29 | | 18.00* | 0.00 | 0.00 | 18.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 28 |
| 30 | | 61.00* | 0.00 | 0.00 | 61.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 |
| 31 | | 52.00* | 0.00 | 0.00 | 52.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 |
| 32 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 33 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32 |
| 34 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 35 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 36 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35 |
| 37 | Inlet DP-39, 15' | 19.13 | 2.43 | 14.93 | 6.62 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.038 | 2.00 | 0.080 | 0.020 | 0.013 | 0.44 | 15.80 | 0.44 | 15.80 | 0.00 | 40 |
| 38 | Inlet DP-38,  15' | 13.06 | 1.20 | 11.83 | 2.43 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.011 | 2.00 | 0.080 | 0.020 | 0.013 | 0.46 | 17.20 | 0.46 | 17.20 | 0.00 | 37 |
| 39 | Inlet DP-42, 10' | 7.04 | 0.00 | 7.04 | 0.00 | Curb | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.52 | 9.30 | 0.63 | 9.30 | 2.00 | 33 |
| 40 | Inlet DP-40, 20' | 32.43 | 6.62 | 26.00 | 13.06 | Genr | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | 0.020 | 2.00 | 0.080 | 0.050 | 0.013 | 0.71 | 12.92 | 0.71 | 12.92 | 0.00 | 41 |
| 41 | Inlet DP-41, 20' | 5.88 | 13.06 | 18.94 | 0.00 | Curb | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.52 | 9.24 | 0.63 | 9.24 | 2.00 | 34 |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 12-18-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added




CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
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CONTACT: RICHARD L. SCHINDLER, P.E.
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| NO. | DESCRIPTION | DATE |
|---|---|---|
| | | |

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

PROJECT:
LORSON RANCH EAST
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C16
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
1

TOTAL SHEETS: 3

# 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 | 147.9 | 66 c | 249.0 | 5710.00 | 5711.25 | 0.502 | 5715.50* | 5717.15* | 0.30 | 5717.45 | End |
| 2 | 2 | 105.5 | 54 c | 380.6 | 5714.10 | 5717.91 | 1.001 | 5717.45 | 5720.86 | n/a | 5720.86 | 1 |
| 3 | 3 | 105.5 | 54 c | 42.5 | 5717.91 | 5718.34 | 1.011 | 5721.59 | 5721.29 | n/a | 5721.29 | 2 |
| 4 | 4 | 105.5 | 54 c | 37.8 | 5718.54 | 5718.92 | 1.005 | 5722.02 | 5721.87 | n/a | 5721.87 | 3 |
| 5 | 5 | 90.12 | 48 c | 174.0 | 5720.30 | 5722.04 | 1.000 | 5722.60 | 5724.85 | n/a | 5724.85 | 4 |
| 6 | 6 | 75.68 | 42 c | 397.2 | 5722.60 | 5727.37 | 1.201 | 5725.31 | 5730.03 | 0.29 | 5730.03 | 5 |
| 7 | 7 | 75.68 | 42 c | 300.0 | 5727.67 | 5731.27 | 1.200 | 5730.51 | 5733.93 | 0.72 | 5733.93 | 6 |
| 8 | 8 | 52.52 | 36 c | 531.0 | 5732.23 | 5739.66 | 1.399 | 5734.52 | 5741.97 | 0.50 | 5741.97 | 7 |
| 9 | 9 | 18.79 | 24 c | 51.8 | 5740.66 | 5741.53 | 1.680 | 5742.67 | 5743.07 | n/a | 5743.07 j | 8 |
| 10 | 10 | 8.87 | 18 c | 26.3 | 5742.03 | 5742.29 | 0.990 | 5743.49 | 5743.60 | 0.23 | 5743.83 | 9 |
| 11 | 11 | 0.25 | 18 c | 9.8 | 5742.23 | 5742.33 | 1.025 | 5743.89* | 5743.89* | 0.00 | 5743.89 | 9 |
| 12 | 12 | 9.67 | 18 c | 124.3 | 5742.63 | 5743.23 | 0.483 | 5744.13* | 5745.19* | 0.23 | 5745.42 | 9 |
| 13 | 13 | 23.16 | 30 c | 33.6 | 5732.73 | 5733.02 | 0.864 | 5734.63 | 5734.63 | n/a | 5734.63 j | 7 |
| 14 | 14 | 16.76 | 30 c | 65.0 | 5733.02 | 5733.41 | 0.600 | 5734.90 | 5734.89 | 0.05 | 5734.94 | 13 |
| 15 | 15 | 11.05 | 24 c | 43.0 | 5733.91 | 5734.17 | 0.604 | 5735.22 | 5735.35 | 0.20 | 5735.56 | 14 |
| 16 | 16 | 11.05 | 24 c | 210.8 | 5734.47 | 5738.22 | 1.779 | 5735.87 | 5739.40 | n/a | 5739.40 j | 15 |
| 17 | 17 | 11.05 | 24 c | 31.9 | 5738.25 | 5738.89 | 2.005 | 5739.72 | 5740.07 | n/a | 5740.07 | 16 |
| 18 | 18 | 6.15 | 24 c | 7.0 | 5733.52 | 5733.59 | 0.997 | 5735.30 | 5735.30 | 0.04 | 5735.33 | 13 |
| 19 | 19 | 14.44 | 36 c | 23.0 | 5723.04 | 5723.27 | 1.000 | 5726.19 | 5726.20 | 0.03 | 5726.23 | 5 |
| 20 | 20 | 7.62 | 30 c | 20.0 | 5723.77 | 5723.97 | 1.001 | 5726.24 | 5726.25 | 0.02 | 5726.27 | 19 |
| 21 | 21 | 11.62 | 24 c | 50.5 | 5721.42 | 5721.92 | 0.991 | 5723.08 | 5723.13 | n/a | 5723.13 j | 4 |
| 22 | 22 | 3.79 | 24 c | 29.2 | 5721.42 | 5721.71 | 0.992 | 5723.25 | 5723.25 | 0.02 | 5723.26 | 4 |
| 23 | 23 | 3.21 | 18 c | 35.8 | 5722.21 | 5722.57 | 1.004 | 5723.26 | 5723.26 | n/a | 5723.39 j | 22 |
| 24 | 24 | 16.68 | 36 c | 15.3 | 5715.75 | 5716.21 | 3.006 | 5717.68 | 5717.51 | 0.20 | 5717.51 | 1 |
| 25 | 25 | 12.81 | 24 c | 33.7 | 5717.21 | 5717.55 | 1.007 | 5718.29 | 5718.90 | 0.25 | 5719.15 | 24 |
| 26 | 26 | 25.69 | 30 c | 69.5 | 5716.10 | 5716.80 | 1.007 | 5717.63 | 5718.49 | n/a | 5718.49 | 1 |
| 27 | 27 | 25.69 | 30 c | 103.6 | 5717.00 | 5718.04 | 1.004 | 5718.89 | 5719.73 | n/a | 5719.73 | 26 |
| 28 | 28 | 6.55 | 18 c | 25.1 | 5719.54 | 5719.79 | 0.995 | 5720.40 | 5720.77 | 0.22 | 5721.00 | 27 |
| 29 | 29 | 19.14 | 30 c | 112.8 | 5718.04 | 5719.17 | 1.002 | 5720.32 | 5720.63 | n/a | 5720.63 j | 27 |
| 30 | 30 | 13.19 | 24 c | 135.3 | 5719.97 | 5721.19 | 0.901 | 5721.10 | 5722.48 | n/a | 5722.48 | 29 |
| 31 | 31 | 5.95 | 18 c | 16.1 | 5720.88 | 5721.04 | 0.997 | 5721.69 | 5722.05 | 0.35 | 5722.39 | 29 |
| 32 | 32 | 5.97 | 18 c | 36.2 | 5722.42 | 5722.75 | 0.911 | 5723.48 | 5723.68 | n/a | 5723.68 j | 21 |

**Lorson East PDR -C16 basins** | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Summary Report



| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns line No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 33 | 33.73 | 30 c | 152.0 | 5740.16 | 5742.14 | 1.303 | 5742.49 | 5744.08 | n/a | 5744.08 j | 8 |
| 34 | 34 | 33.73 | 30 c | 197.6 | 5742.44 | 5745.01 | 1.301 | 5744.40 | 5746.95 | n/a | 5746.95 j | 33 |
| 35 | 35 | 33.73 | 30 c | 65.3 | 5745.31 | 5746.29 | 1.500 | 5747.27 | 5748.23 | n/a | 5748.23 j | 34 |
| 36 | 36 | 0.25 | 18 c | 26.6 | 5734.20 | 5734.34 | 0.525 | 5735.37 | 5735.37 | 0.00 | 5735.37 | 13 |
| 37 | 37 | 3.87 | 30 c | 8.3 | 5717.21 | 5717.34 | 1.568 | 5718.00 | 5718.00 | n/a | 5718.00 j | 24 |
| 38 | 38 | 6.76 | 18 c | 31.4 | 5721.69 | 5722.00 | 0.989 | 5722.84 | 5722.99 | n/a | 5722.99 | 30 |
| 39 | 39 | 5.71 | 18 c | 9.3 | 5734.41 | 5734.51 | 1.068 | 5735.25 | 5735.43 | 0.20 | 5735.62 | 14 |

| | | |
|---|---|---|
| **Lorson East PDR -C16 basins** | Number of lines: 39 | Run Date: 10-13-2017 |

NOTES: c = cir; e = ellip; b = box; Return period = 5 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 1 | MH #19 | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 2 | | 0.00 | 0.00 | 0.00 | 0.00 | None | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 3 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 4 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 5 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 6 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 7 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 8 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 9 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 10 | Inlet DP-3, 15' | 8.87 | 0.00 | 8.87 | 0.00 | Curb | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.000 | 0.46 | 16.85 | 0.59 | 16.85 | 3.00 | Off |
| 11 | Inlet DP-5 (5') | 0.25 | 0.00 | 0.25 | 0.00 | Curb | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.17 | 2.70 | 0.30 | 2.70 | 3.00 | Off |
| 12 | Inlet DP-4 (15') | 10.43 | 0.00 | 9.67 | 0.76 | Genr | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.43 | 15.45 | 0.43 | 15.45 | 0.00 | 17 |
| 13 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 14 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 15 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 16 | | 0.00 | 0.00 | 0.00 | 0.00 | None | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 17 | Inlet DP-6 (15') | 12.07 | 0.76 | 11.05 | 1.78 | Genr | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.025 | 2.00 | 0.083 | 0.020 | 0.013 | 0.40 | 13.90 | 0.40 | 13.90 | 0.00 | 39 |
| 18 | Inlet DP-8 (10') | 5.28 | 0.87 | 6.15 | 0.00 | Curb | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.000 | 0.46 | 16.81 | 0.50 | 16.81 | 2.00 | Off |
| 19 | Inlet DP6b, 15' | 6.81 | 0.00 | 6.81 | 0.00 | Curb | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.40 | 14.11 | 0.53 | 14.11 | 3.00 | Off |
| 20 | C13-DP6c | 7.62 | 0.00 | 7.62 | 0.00 | Curb | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.000 | 0.55 | 9.81 | 0.55 | 9.81 | 0.00 | Off |
| 21 | Inlet DP-10a, 15' | 5.65 | 0.00 | 5.65 | 0.00 | Curb | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.44 | 15.89 | 0.57 | 15.89 | 3.00 | Off |
| 22 | Inlet DP-10c, 5' | 0.58 | 0.00 | 0.58 | 0.00 | Curb | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.000 | 0.15 | 1.93 | 0.34 | 1.97 | 3.00 | Off |

**Lorson East PDR -C16 basins** | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 503.90 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 23 | Inlet DP-10b, 5' | 3.21 | 0.00 | 3.21 | 0.00 | Curb | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.000 | 0.42 | 14.79 | 0.55 | 14.79 | 3.00 | Off |
| 24 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 25 | Inlet DP-16, 30' | 10.98 | 1.83 | 12.81 | 0.00 | Curb | 6.0 | 30.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.39 | 13.54 | 0.52 | 13.54 | 3.00 | Off |
| 26 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 27 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 28 | Inlet DP-13, 10' | 4.72 | 3.66 | 6.55 | 1.83 | Genr | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.40 | 14.10 | 0.40 | 14.10 | 0.00 | 25 |
| 29 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 30 | Inlet DP-12, 10' | 8.03 | 0.00 | 6.43 | 1.60 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | 0.012 | 2.00 | 0.080 | 0.020 | 0.013 | 0.39 | 13.35 | 0.39 | 13.35 | 0.00 | 28 |
| 31 | Inlet DP-14, 10' | 7.06 | 0.00 | 5.95 | 1.11 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.38 | 13.15 | 0.38 | 13.15 | 0.00 | 37 |
| 32 | Inlet DP10, 10' | 5.97 | 0.00 | 5.97 | 0.00 | Curb | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.000 | 0.39 | 6.59 | 0.58 | 6.59 | 3.00 | Off |
| 33 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 34 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 35 | Inlet DP-2 | 33.73 | 0.00 | 33.73 | 0.00 | Curb | 6.0 | 20.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.000 | 0.80 | 33.99 | 0.85 | 33.99 | 2.00 | Off |
| 36 | Inlet DP-7 (5') | 0.25 | 0.00 | 0.25 | 0.00 | Curb | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.11 | 1.42 | 0.22 | 1.65 | 2.00 | Off |
| 37 | Inlet DP-17, 25' | 2.76 | 1.11 | 3.87 | 0.00 | Curb | 6.0 | 25.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.26 | 6.86 | 0.39 | 6.86 | 3.00 | Off |
| 38 | Inlet DP-12a, 10' | 8.82 | 0.00 | 6.76 | 2.06 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | 0.012 | 2.00 | 0.080 | 0.020 | 0.013 | 0.40 | 13.90 | 0.40 | 13.90 | 0.00 | 28 |
| 39 | Inlet DP-6a (10') | 4.81 | 1.78 | 5.71 | 0.87 | Genr | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.37 | 12.75 | 0.37 | 12.75 | 0.00 | 18 |

**Lorson East PDR -C16 basins** | Number of lines: 39 | Run Date: 10-13-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 503.90 / (Inlet time + 28.20) ^ 1.31; Return period = 5 Yrs. ; * Indicates Known Q added

# 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 | 230.8 | 66 c | 249.0 | 5710.00 | 5711.25 | 0.502 | 5714.95* | 5718.89* | 0.73 | 5719.62 | End |
| 2 | 2 | 154.4 | 54 c | 380.6 | 5714.10 | 5717.91 | 1.001 | 5719.62 | 5721.48 | 0.30 | 5721.79 | 1 |
| 3 | 3 | 154.6 | 54 c | 42.5 | 5717.91 | 5718.34 | 1.011 | 5722.34 | 5722.45 | 0.56 | 5723.01 | 2 |
| 4 | 4 | 154.8 | 54 c | 37.8 | 5718.54 | 5718.92 | 1.005 | 5723.01 | 5723.15 | 0.62 | 5723.77 | 3 |
| 5 | 5 | 136.5 | 48 c | 174.0 | 5720.30 | 5722.04 | 1.000 | 5723.77 | 5725.52 | n/a | 5725.52 | 4 |
| 6 | 6 | 103.9 | 42 c | 397.2 | 5722.60 | 5727.37 | 1.201 | 5725.86 | 5730.49 | 0.41 | 5730.49 | 5 |
| 7 | 7 | 105.3 | 42 c | 300.0 | 5727.67 | 5731.27 | 1.200 | 5730.67 | 5734.40 | 1.05 | 5734.40 | 6 |
| 8 | 8 | 71.50 | 36 c | 531.0 | 5732.23 | 5739.66 | 1.399 | 5734.90 | 5742.34 | 0.71 | 5742.34 | 7 |
| 9 | 9 | 35.45 | 24 c | 42.8 | 5740.66 | 5741.53 | 2.029 | 5742.66* | 5743.71* | 0.79 | 5744.51 | 8 |
| 10 | 10 | 20.05 | 18 c | 26.3 | 5742.03 | 5742.29 | 0.990 | 5744.51* | 5745.47* | 1.00 | 5746.47 | 9 |
| 11 | 11 | 0.57 | 24 c | 9.8 | 5741.73 | 5741.83 | 1.025 | 5746.48* | 5746.48* | 0.00 | 5746.48 | 9 |
| 12 | 12 | 14.98 | 18 c | 131.6 | 5742.63 | 5743.33 | 0.532 | 5745.37* | 5748.05* | 0.56 | 5748.61 | 9 |
| 13 | 13 | 44.84 | 30 c | 33.6 | 5732.73 | 5733.02 | 0.864 | 5735.23* | 5735.63* | 0.52 | 5736.15 | 7 |
| 14 | 14 | 34.17 | 30 c | 65.0 | 5733.02 | 5733.41 | 0.600 | 5736.70* | 5737.15* | 0.08 | 5737.22 | 13 |
| 15 | 15 | 17.18 | 24 c | 43.0 | 5733.91 | 5734.17 | 0.604 | 5737.51* | 5737.76* | 0.19 | 5737.94 | 14 |
| 16 | 16 | 17.78 | 24 c | 210.8 | 5734.47 | 5738.22 | 1.779 | 5737.94 | 5739.71 | n/a | 5739.71 j | 15 |
| 17 | 17 | 17.87 | 24 c | 31.9 | 5738.15 | 5738.79 | 2.008 | 5739.99 | 5740.29 | 0.39 | 5740.29 | 16 |
| 18 | 18 | 16.30 | 24 c | 7.0 | 5733.52 | 5733.59 | 0.997 | 5737.03* | 5737.07* | 0.21 | 5737.28 | 13 |
| 19 | 19 | 53.54 | 36 c | 23.0 | 5723.04 | 5723.27 | 1.000 | 5726.78* | 5726.93* | 0.36 | 5727.28 | 5 |
| 20 | 20 | 38.21 | 30 c | 20.0 | 5723.77 | 5723.97 | 1.001 | 5727.28* | 5727.46* | 0.47 | 5727.93 | 19 |
| 21 | 21 | 32.25 | 24 c | 50.5 | 5721.42 | 5721.92 | 0.991 | 5723.77* | 5724.79* | 0.82 | 5725.61 | 4 |
| 22 | 22 | 7.98 | 24 c | 29.2 | 5721.42 | 5721.71 | 0.992 | 5725.21* | 5725.25* | 0.05 | 5725.30 | 4 |
| 23 | 23 | 6.92 | 18 c | 35.8 | 5722.21 | 5722.57 | 1.004 | 5725.30* | 5725.46* | 0.12 | 5725.58 | 22 |
| 24 | 24 | 54.37 | 36 c | 15.3 | 5715.75 | 5716.21 | 3.006 | 5720.17* | 5720.27* | 0.37 | 5720.64 | 1 |
| 25 | 25 | 22.80 | 24 c | 33.7 | 5717.31 | 5717.95 | 1.897 | 5720.74* | 5721.08* | 0.41 | 5721.49 | 24 |
| 26 | 26 | 38.85 | 30 c | 69.5 | 5716.10 | 5716.80 | 1.007 | 5720.11* | 5720.74* | 0.19 | 5720.93 | 1 |
| 27 | 27 | 39.15 | 30 c | 103.6 | 5717.00 | 5718.04 | 1.004 | 5720.93* | 5721.88* | 0.40 | 5722.27 | 26 |
| 28 | 28 | 9.70 | 18 c | 25.1 | 5719.54 | 5719.79 | 0.995 | 5722.79* | 5723.01* | 0.23 | 5723.24 | 27 |
| 29 | 29 | 27.87 | 30 c | 112.8 | 5718.04 | 5719.17 | 1.002 | 5722.76* | 5723.28* | 0.15 | 5723.43 | 27 |
| 30 | 30 | 19.15 | 24 c | 135.3 | 5719.97 | 5721.19 | 0.901 | 5723.43* | 5724.40* | 0.87 | 5725.27 | 29 |
| 31 | 31 | 8.74 | 18 c | 16.1 | 5720.88 | 5721.04 | 0.997 | 5723.55* | 5723.66* | 0.38 | 5724.04 | 29 |
| 32 | 32 | 12.53 | 18 c | 36.2 | 5722.62 | 5723.05 | 1.186 | 5726.47* | 5726.98* | 0.39 | 5727.38 | 21 |

**Lorson East PDR- C16 basins** | Number of lines: 39 | Run Date: 10-13-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Summary Report



| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns line No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 33 | 39.85 | 30 c | 152.0 | 5740.16 | 5742.14 | 1.303 | 5743.10 | 5744.29 | 0.25 | 5744.53 | 8 |
| 34 | 34 | 40.32 | 30 c | 197.6 | 5742.44 | 5745.01 | 1.301 | 5744.71 | 5747.13 | n/a | 5747.13 j | 33 |
| 35 | 35 | 40.47 | 30 c | 65.3 | 5745.31 | 5746.29 | 1.500 | 5747.36 | 5748.43 | n/a | 5748.43 | 34 |
| 36 | 36 | 0.57 | 18 c | 26.6 | 5734.20 | 5734.34 | 0.525 | 5737.45* | 5737.45* | 0.00 | 5737.45 | 13 |
| 37 | 37 | 31.86 | 30 c | 8.3 | 5717.21 | 5717.34 | 1.568 | 5720.90* | 5720.95* | 0.65 | 5721.61 | 24 |
| 38 | 38 | 9.82 | 18 c | 31.4 | 5721.69 | 5722.10 | 1.308 | 5725.37* | 5725.64* | 0.48 | 5726.12 | 30 |
| 39 | 39 | 10.16 | 18 c | 9.3 | 5734.41 | 5734.51 | 1.068 | 5737.46* | 5737.55* | 0.26 | 5737.81 | 14 |

| | | |
|---|---|---|
| **Lorson East PDR- C16 basins** | Number of lines: 39 | Run Date: 10-13-2017 |

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 1 | MH #19 | 29.20* | 11.55 | 0.00 | 40.75 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 2 | 2 | 9.00* | 16.17 | 0.00 | 25.17 | None | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 |
| 3 | | 9.00* | 7.17 | 0.00 | 16.17 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2 |
| 4 | | 9.00* | -1.83 | 0.00 | 7.17 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3 |
| 5 | | 9.00* | -10.83 | 0.00 | -1.83 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4 |
| 6 | | 0.00 | -10.83 | 0.00 | -10.83 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 |
| 7 | | 0.00 | -10.83 | 0.00 | -10.83 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 |
| 8 | | 0.00 | -5.70 | 0.00 | -5.70 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 |
| 9 | | -5.70 | 0.00 | 0.00 | -5.70 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 10 | Inlet DP-3, 15' | 20.05 | 0.00 | 20.05 | 0.00 | Curb | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.016 | 0.70 | 29.09 | 0.83 | 29.09 | 3.00 | 19 |
| 11 | Inlet DP-5, 5' | 0.57 | 0.00 | 0.57 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.21 | 4.65 | 0.34 | 4.65 | 3.00 | 9 |
| 12 | Inlet DP-4 , 15' | 14.98 | 0.00 | 14.98 | 0.00 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.48 | 17.85 | 0.48 | 17.85 | 0.00 | 17 |
| 13 | | 0.00 | -5.13 | 0.00 | -5.13 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 |
| 14 | | -5.13 | 0.00 | 0.00 | -5.13 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 13 |
| 15 | | -7.84 | -7.84 | 0.00 | -15.68 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 16 | | -7.84 | 0.00 | 0.00 | -7.84 | None | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15 |
| 17 | Inlet DP-6, 15' | 17.87 | 0.00 | 17.87 | 0.00 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.025 | 2.00 | 0.083 | 0.020 | 0.013 | 0.44 | 15.95 | 0.44 | 15.95 | 0.00 | 39 |
| 18 | Inlet DP-8, 10' | 16.30* | 0.00 | 16.30 | 0.00 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.015 | 2.00 | 0.080 | 0.020 | 0.013 | 0.46 | 17.05 | 0.46 | 17.05 | 0.00 | 21 |
| 19 | Inlet DP6b, 20' | 20.68* | 0.17 | 20.30 | 0.56 | Genr | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.53 | 20.40 | 0.53 | 20.40 | 0.00 | 25 |
| 20 | C13-DP6c | 38.21 | 0.00 | 38.21 | 0.00 | Curb | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 4.76 | 93.97 | 4.76 | 93.97 | 0.00 | 19 |
| 21 | Inlet DP-10a, 10' | 20.64* | 0.00 | 20.64 | 0.00 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.30 | 9.00 | 0.30 | 9.00 | 0.00 | 28 |
| 22 | Inlet DP-10c, 5' | 1.31 | 0.00 | 1.31 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.22 | 3.25 | 0.41 | 3.25 | 3.00 | 4 |

**Lorson East PDR- C16 basins** | Number of lines: 39 | Run Date: 12-18-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 23 | Inlet DP-10b, 5' | 6.92 | 0.00 | 6.92 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.61 | 24.74 | 0.74 | 24.74 | 3.00 | 24 |
| 24 | | 26.10* | 0.00 | 0.00 | 26.10 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 |
| 25 | Inlet DP-16, 25' | 22.80 | 0.56 | 23.35 | 0.00 | Genr | 6.0 | 30.00 | 2.00 | 4.00 | 2.00 | 0.020 | 2.00 | 0.080 | 0.020 | 0.013 | 0.49 | 18.60 | 0.49 | 18.60 | 0.00 | 37 |
| 26 | | -12.29 | -27.43 | 0.00 | -39.72 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1 |
| 27 | | -12.29 | -15.14 | 0.00 | -27.43 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 26 |
| 28 | DP-13, 10' | 9.70 | 0.04 | 9.73 | 0.00 | Genr | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.42 | 15.00 | 0.42 | 15.00 | 0.00 | 25 |
| 29 | | -15.14 | 0.00 | 0.00 | -15.14 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 27 |
| 30 | DP-12, 10' | 1.46 | 0.00 | 1.46 | 0.00 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.012 | 2.00 | 0.080 | 0.020 | 0.013 | 0.24 | 5.90 | 0.24 | 5.90 | 0.00 | 28 |
| 31 | Inlet DP-14, 10' | 8.74 | 0.00 | 8.74 | 0.00 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.41 | 14.35 | 0.41 | 14.35 | 0.00 | 37 |
| 32 | Inlet DP10, 10' | 12.53 | 0.00 | 12.53 | 0.00 | Curb | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.60 | 10.84 | 0.79 | 10.84 | 3.00 | 25 |
| 33 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 34 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 33 |
| 35 | Inlet DP-2 | 40.47 | 0.00 | 40.30 | 0.17 | Genr | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | 0.015 | 2.00 | 0.080 | 0.050 | 0.013 | 0.75 | 13.84 | 0.75 | 13.84 | 0.00 | 19 |
| 36 | Inlet DP-7, 5' | 0.57 | 0.00 | 0.57 | 0.00 | Curb | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.15 | 1.83 | 0.25 | 1.90 | 2.00 | 13 |
| 37 | Inlet DP-17, 25' | 31.86* | 0.00 | 31.86 | 0.00 | Genr | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.30 | 9.00 | 0.30 | 9.00 | 0.00 | 24 |
| 38 | Inlet DP-12a, 10' | 9.82 | 0.00 | 9.78 | 0.04 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.012 | 2.00 | 0.080 | 0.020 | 0.013 | 0.41 | 14.50 | 0.41 | 14.50 | 0.00 | 28 |
| 39 | Inlet DP-6a, 10' | 10.16 | 0.00 | 10.16 | 0.00 | Genr | 6.0 | 10.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.43 | 15.30 | 0.43 | 15.30 | 0.00 | 18 |

**Lorson East PDR- C16 basins** | Number of lines: 39 | Run Date: 12-18-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

## APPENDIX G–KIOWA ENGINEERING ETRIB FINAL BRIDGE AND CHANNEL DESIGN REPORT

# Final Bridge and Channel Design Report

# East Fork Jimmy Camp Creek at Fontaine Boulevard
# Lorson Ranch Development

## CDR-16-009
**El Paso County, Colorado**

Prepared for:
Lorson Development
212 North Wahsatch Suite 301
Colorado Springs, Colorado 80903

Prepared by:

Kiowa Engineering Corporation
1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342


Kiowa Project No. 16031
December 7, 2016
Revised February 13, 2017
Revised May 15, 2017
Revised July 24, 2017
Revised August 24, 2017

**List of Figures**

**Engineer's Statement:**

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the 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.

Kiowa Engineering Corporation, 1604 South 21st Street, Colorado Springs, Colorado 80904

______________________________ __________

Richard N. Wray — Date
Registered Engineer #19310
For and on Behalf of Kiowa Engineering Corporation

**Developer's Statement:**

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

BY: __________________________ __________

Date

__________________________

Printed

ADDRESS: Lorson Development, LLC
212 North Wahsatch Suite 300
Colorado Springs, Colorado 80903

**El Paso County:**

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

______________________________ __________

Jennifer Irvine, P.E. — Date
County Engineer/ECM Administrator

Include signed version.

# I. General Location and Description

This report serves to summarize the design of the East Fork Jimmy Camp Creek (EFJCC), drainageway and for the bridge at Fontaine Boulevard within the Lorson Ranch Development. It is proposed to construct four low flow rock drops, low flow channels, a grouted rock check and soil riprap bank linings at selective locations along a 3,400-lineal foot segment of the EFJCC. The work along the drainageway will begin approximately 200 feet south of the centerline for future Fontaine Boulevard and extend upstream to the northern property line of the Lorson Ranch development. To provide for a continuous design, at the northern property line a short portion of the EFJCC drainageway that lies within the Banning-Lewis Ranch property has been included in the drawings. Banning Lewis-Ranch lies within in the City of Colorado Springs. Lorson Development does not intend to complete the work that is shown within Banning-Lewis Ranch as the need for drainageway improvements would not be required until such time that development proceeds within Banning-Lewis Ranch. The location of the site is shown on Figure 1.

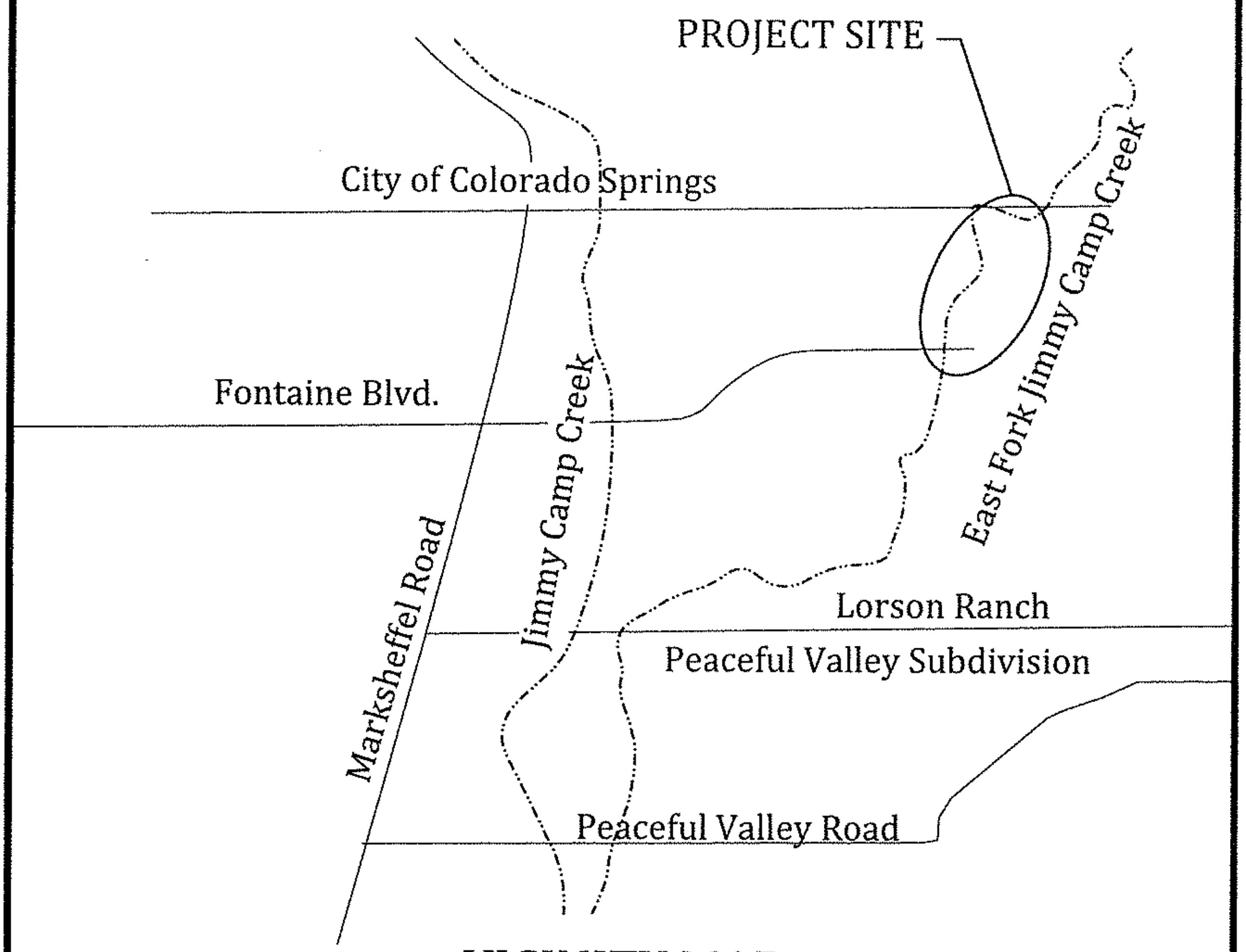
Upon the completion of the drainageway facilities and acceptance by El Paso County, easements and or tracts will be dedicated to the County for the purposes of maintenance access. Tract E, a tract of land dedicated as an area for future development was created when Pioneer Landing at Lorson Ranch Filing 2 was platted. Most of the proposed drainageway facilities shown on the plans are confined to Tract E with the exception of the portion of the drainageway that will abut a future Lorson East filing. With the platting of the first filing within Lorson East, Tract E will be re-platted and enlarged to contain the drainage facilities shown on the plans within a new tract dedicated for open space, floodplain preservation and drainage maintenance access. Upon completion of a LOMR that accounts for the channel and bridge structures subject to this design, there will be no residential lots within future Lorson East filings will be platted into the 100-year floodplain.

The bridge over EFJCC at Fontaine Boulevard is also included within the design plans. The bridge will be a clear-span precast structure that has the capacity to pass the 100-year discharge. The ultimate roadway right-of-way is proposed to be 130-feet. The structure will be 126 feet out-to-out. The roadway section shown on the design plans includes four lanes with a 16-foot median and 5-foot detached sidewalks. Protective guardrails as shown on the drawings have been designed in conformance with Colorado Department of Transportation M-standards. The use of a clear-span structure is consistent with the US Army Corps of Engineers 404 permit issued for the Lorson Ranch Development that requires that a natural invert be constructed. Once the bridge and roadway facilities are completed and accepted by El Paso County, the facilities will be owned, operated and maintained by El Paso County.

The developer intends to request reimbursement for the cost to construct the bridge and drainageway facilities, or request credit against future drainage and bridge fees. Reimbursement will be processed in accordance with sections 1.7 and 3.3 of the Drainage Criteria Manual (DCM). The drainageway facilities will be operated and maintained by El Paso County

# II. Project Background

EFJCC is a natural drainageway that was shown to be stabilized in the Lorson Ranch Master Development Drainage Plan (MDDP). The MDDP as last updated showed the EFJCC drainageway to be reconfigured into a trapezoidal channel section capable of conveying the 100-year discharge as listed in the MDDP as derived from the Jimmy Camp Creek Drainage Basin Planning Study (DBPS), that was prepared in 1988. Between future Lorson Boulevard and the downstream limits of this project, the channel has been stabilized into a trapezoidal section with buried grouted rock checks




VICINITY MAP

SCALE: N.T.S.

FIGURE 1

across the invert, and soil/riprap bank lining. The segment below the project site is presently stable and functioning as intended in the design.

In April 2015, the City of Colorado Springs adopted an update to the 1987 Jimmy Camp Creek DBPS. The primary findings and recommendations summarized in the updated 2015 DBPS was in regards to hydrology and the recommendation for implementation of full spectrum detention (FSD) within the overall Jimmy Camp Creek watershed. The long-term stable sloped estimated in the 2015 DBPS was used as the basis for the hydraulic design for the facilities shown on the design drawings. The existing basin condition hydrology summarized in the DBPS was used in combination with the hydrology summarized in the El Paso County Flood Insurance Study in the hydraulic design of the bridge and EFJCC drainageway work shown on the drawings.

Another finding of the 2015 DBPS was that with the assumption of the maintenance of existing basin condition flow rates through the implementation of FSD, the low flow channel would still need of stabilization because of the anticipation of continuous low flow once the basin develops into an urban watershed. The 2015 DBPS also called for the 100-year floodplain to be preserved for many segments of the natural drainageways within the Jimmy Camp Creek watershed, including the EFJCC drainageway subject to this design. Low flow stabilization was called for in the 2015 DBPS for the EFJCC, along with selective bank lining and the preservation of the 100-year floodplain.

Though the 2015 DBPS was never adopted by El Paso County, the County is now requiring development to provide for FSD, as is the City of Colorado Springs. The implementation of FSD is being accomplished in the County through the adoption of Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs Drainage Criteria Manual, Volume 1.

## III. Previous Reports and Jurisdictional Requirements

The basis for the development of the design has been developed from referencing the following reports:

1. ***Lorson Ranch Master Development Drainage Plan (MDDP), prepared by Core Engineering, latest version (not approved by El Paso County).***
2. ***Jimmy Camp Creek Drainage Basin Planning Study (DBPS), prepared by Kiowa Engineering, 2015 (not approved by El Paso County).***
3. ***City of Colorado Springs and El Paso County Drainage Criteria Manual, 1987.***
4. ***El Paso County Engineering Criteria Manual, most current version.***
5. ***City of Colorado Springs Drainage Criteria Manual, Chapters 6 and 12, May 2014.***
6. ***The City of Colorado Springs and El Paso County Flood Insurance Study (FIS), prepared by the Federal Emergency Management Agency, effective 1997.***
7. ***East Fork Jimmy Camp Creek Letter of Map Revision, Case Number 14-08-0543P, Lorson Ranch Development, effective date January 2015.***

Reference 7 provides for the existing condition floodplain and floodway for the segment of EFJCC subject to this design. The existing condition floodplain has been shown on the design drawings, and has been modified to shown the effect of the bridge crossing at Fontaine Boulevard. Because the bridge structure and channel stabilization measures will occur within the regulatory floodplain and floodway, a Conditional Letter of Map Revision (CLOMR), will need to be processed through FEMA as part of gaining the necessary construction approvals for the project. Reference 7 has been included in the Appendix.

Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs DCM was made part of Reference 3 by El Paso County Board of County Commissioners Resolution 15-042.

## IV. Site Description

The EFJCC floodplain within the design reach is well vegetated with native grasses that are in fair to good condition that exists on the floodplain overbanks and within the greater valley in general. There is very little evidence of active invert degradation or bank sloughing. Current longitudinal slope along the project is ranges from .2 to .5 percent. There is presently no base flow in this segment. There is at some locations a small low flow channel that has formed and has a top width of approximately 20 feet. Topography used in the design was compiled at a one-foot contour interval and is dated 2015. The topography reflects the grading within Pioneer Landing Filing 2 that lies west of the drainageway and north of Fontaine Boulevard. There are presently no encroachments into the floodplain or channel thread associated with man-made structures. There is presently no existing water, wastewater, gas or electric utilities that impact the construction of the proposed drainageway facilities. A future wastewater and water line is proposed at Fontaine Boulevard. Each of these future utilities have been shown on the design plans. Approval of the water and wastewater design plans would ultimately come from Widefield Water and Sanitation District.

## V. Hydrology

Hydrology for use in determining the typical channel sections shown on the plans were obtained from Reference 7. The 100-year discharges shown in Reference 7 (ranging from 4,400 to 4,750 cubic feet per second), have been used in the hydraulic design of the bridge at Fontaine and in determining the proposed condition floodplain shown on the design plans. The low flow channel was sized using ten percent of the peak flow rate for the 10-year recurrence interval (ranging 440 to 475 cubic feet per second), as listed in Reference 2 in accordance with Reference 3. Basin area at Fontaine Boulevard is approximately 9.6 square miles. The watershed above Fontaine Boulevard is presently undeveloped. Provided on Table 1 is a summary of the peak flows for existing watershed development conditions for References 2 and 7

The assumption that FSD will be required for all future development is reflected in the use of the FIS discharges in this design. There is a good correlation between the FIS and DBPS 100-year discharges for the segment of EFJCC subject to this design. Use of the existing basin condition flow rates is consistent with the requirements set forth in the annexation agreement between the owners of Banning-Lewis Ranch and the City of Colorado Springs. The future FSD's within Banning-Lewis Ranch will be publicly operated and maintained facilities. The plan and profile that summarize the peak discharges from Reference 2 are included in the Appendix.

## VI. Hydraulics

The hydraulic design of the drainageway and bridge as presented on the plans was carried out using the US Army Corps of Engineers HEC-RAS modeling system. The HEC-RAS model was used to determine the 100-year hydraulic grade line shown on the plan and profiles. The 100-year profile for the FIS hydrology has been determined. The location for the proposed 100-year floodplain using FIS hydrology has been presented on the plan view of the design plans and on the grading plan. Contained within the Appendix of this report are floodplain maps that show the proposed (pre-project) and regulatory (FIS LOMR) 100-year floodplains using the FIS hydrology. The location for selected HEC-RAS cross-sections are shown on the design profile. The HEC-RAS cross-sections are presented on the floodplain work maps contained in Appendix A. The summary output and cross-section plots for the HEC-RAS models have been included in the Appendix of this memorandum.

The propose drainageway design concepts put forth on the plans are 100-year selective bank lining with low flow stabilization. As described in the DBPS, even with FSD implemented throughout the watershed the low flow area of the drainageway will continue to degrade to a flatter longitudinal

TABLE 1: SUMMARY OF DESIGN DISCHARGES
PROJECT: EAST FORK JIMMY CAMP CREEK
PROJECT NO: 16031

| DESIGN POINT | LOCATION | EL PASO COUNTY FIS (1) | | JIMMY CAMP CREEK DBPS | |
|---|---|---|---|---|---|
| | | 10-YEAR (CFS) | 100-YEAR (CFS) | 10-YEAR (CFS) | 100-YEAR (CFS) |
| A | 800 FT DOWNSTREAM OF FONTAINE BOULEVARD | 2400 | 4750 | 1850 | 4260 |
| B | PROFILE STATION 20+00 | 2200 | 4400 | 1830 | 4260 |
| C | 500-FEET UPSTREAM LORSON RANCH NORTH PROPERTY LINE | 2200 | 4400 | 1830 | 4260 |

(1) FIS DISCHARGES USED FOR THE DESIGN OF BRIDGE AND DRAINAGEWAY FACILITIES
(2) ALL DISCHARGES LISTED IN TABLE 1 ARE FOR THE EXISTING WATERSHED CONDITIONS

slope. The effect of development within the watershed will be to increase the frequency and duration of base flows. Base flows will increase with the development because of discharges from future FSD's

and irrigation return flows. Natural drainageway will eventually degrade along the invert in turn causing bank sloughing to occur if grade control is not implemented. The bank full capacity as estimated in the DBPS represents rate of runoff that would form the low flow channel over time. The bank full capacity for most natural watersheds represents a flow rate usually between the 2-year to and 5-year recurrence intervals. In order to comply with County DCM criteria, the low flow channel capacity for this design was set at 10 percent of the predominant 100-year FIS discharge (445 cubic feet per second) for the reach. While considerably higher than the bank full capacity estimated in Reference 2, (100 cubic feet per second), designing the low channel at the higher discharge will stabilize the low for over a wider range of runoff events. The crest of the drops has been sized to be able to convey 475 cubic feet per second. A buried grouted rock check has been added at the downstream terminus of the project that will extend into the toe of the soil riprap channel banks. The check will limit the possibility of a head cut from developing that could migrate upstream through the bridge and the drainageway above.

A qualitative channel stability analysis was carried as part of developing the design for EFJCC. The analysis consisted of a field inspection, historic topographic mapping comparisons and the determination of existing channel slopes. Field observations revealed no indication of invert degradation along the entire length of the design reach. There is presently no base flow in the drainageway which explains the relative lack if any significant head cutting or bank erosion. The long term stable slope for this segment the East Fork Jimmy Camp Creek was estimated at .09 percent. The current slope is approximately .76 percent through the project reach. This means that if the drainageway is left unchecked with increasing base flows, the invert could fall as much as 8-feet at the north property line. The grouted low check grade controls have been designed to prevent the possibility of long-term invert degradation. The longitudinal location of the grade controls as well as the depth of the upstream cut-off wall that is integral with the crest of each structure, were determined by projecting the long-term slope of .09 percent upstream such that if a head cut was to from and move upstream along the low flow, the invert of the head cut would not reach an elevation that is below the bottom of the grouted rock sill, and/or the bottom of the cut-off wall.

The design of the channel stabilization measures using .25 percent has been based upon guidance offered in section 3.1.2 of Reference 5. The development of the watershed upstream of Loson Ranch will occur over the next 30 to 40 years. As such the sediment supply to the reach of East Fork Jimmy Camp Creek as it passes through Lorson Ranch will remain the same as present conditions. Designing the low flow and stabilized channel section at the slope called for in the Jimmy Camp Creek DBPS (.09 percent) now could cause aggradation of sediment along the low flow and floodplain benches due to extremely low flow velocities (less than 3 feet per second). As pointed out in section 3.1.2, it is in some cases better to phase the construction of the channel drops, as a phased approach better recognizes the fact that the natural sediment supply will change as the basin moves from un-developed to developed. It is this guidance that the drops shown in this design have been determined.

Based upon the field observations regarding channel stability, the EFJCC low flow channel was designed to operate at normal depths of flow, thereby eliminating channel instability associated with super-critical flow conditions. The low flow channel lining is proposed to be a combination of soil/riprap bank and turf reinforcement mats depending upon velocity. The locations where selective 100-year soil/riprap lining is proposed was based upon the velocities returned by the HEC-RAS model. Velocities for the 100-year discharge range from 4.1 to 9.9 feet per second. Calculations related to the sizing of the soil/riprap bank and channel sections are contained within the Appendix of the report. The low flow is in normal conditions for most of the reach except at the crest of the grouted boulder drops. At the outside channel bends of the floodplain soil/riprap is proposed as the bank lining material. The top of the bank where selective linings have been proposed reflect the freeboard criteria per County DCM requirements. There was also an effort to realign portions of the low flow channel away the toe of an outside bend of the drainageway. The intent of the positioning of the low flow was to minimize disturbance to the vegetation on the benches of the 100-year floodplain that could occur during construction. Finally, shear stress calculations were carried out for the 10- and 100-year flow conditions at each segment of the drainageway. Maximum 100-year shear stress on the bench was calculated at .83 pounds per square foot. Permissible shear stress for native vegetation with Class B retardance similar to what is present at the site is 2.1 pounds per square foot. Channel design calculations are included in the Appendix of this memorandum.

## VII. Design Elements

Presented on the design plans associated with this design memorandum are the proposed drainageway conditions. The drops have been designed to raise the invert anywhere from two to three feet. Design criteria for the project are summarized as follows:

| | |
|---|---|
| Channel design slope: | .25 percent |
| Maximum low flow drop height: | 3.5feet |
| Outside bend slopes- riprap | 2.5 to 1 maximum |
| Low flow channel side slopes- TRM lined | 3 to 1 maximum |
| Low flow channel side slopes- riprap lined | 3 to 1 maximum |
| Low flow channel depth | 3 feet |
| Manning's n-values: | .025-.04 |
| Froude number-(excluding crests of drops): | .25-.84 |
| Minimum channel radius | 150 feet |
| Maximum design velocity | |
| Grass-lined | 5 feet per second |
| Reinforced turf (TRM) | 7 feet per second |
| Permissible shear stress: low flow channel | |
| TRM (curled wood mat) | 1.55 psf |
| Type VL riprap | 2.5 psf |
| Permissible shear stress: floodplain benches and overbanks | |
| Class B retardance, native vegetation | 2.1 psf |
| TRM (curled wood mat) | 1.55 psf |
| Type M riprap | 5.0 psf |

The low flow drops will be constructed using grouted boulders. The selection of grouted boulders was chosen to address long-term durability of the drop knowing that they would be overtopped in a flood exceeding the low flow design discharge. Each grade control has an integral grouted boulder sill followed by a 25-foot soil/riprap transition to the low flow channel section. A concrete cut-off wall is proposed at the crest of each grade control that will extend into the adjacent floodplain section. The bottom depth of the cut-off walls and the grouted boulder sills have been determined so that the degradation to the ultimate channel slope of .09 percent would not cause the grade control to be undermined. Wherever soil riprap linings are proposed, rock sizing and freeboard criteria followed is in accordance with the DCM.

A geotechnical investigation was conducted to support the design of the foundation for the bridge at Fontaine. The geotechnical report is included within the Appendix. Two soil borings were drilled at near the location of the proposed footings for the bridge. Because of the depth to bedrock, deep foundations are proposed using driven H-piles. A precast bridge section has been chosen that has a 48-foot clear span and a 13-foot rise. The 100-year discharge can be passed through the bridge at a headwater to depth ratio of 1. Bridge velocity during a 100-year event is estimated at between 10.5 and 14.5 feet per second. The Geotechnical Report has been included in this report within Appendix C.

The construction of the improvements shown on the plans will result in a long-term stable drainageway corridor and prevent damages that could arise from bank sloughing related to the erosion of the drainageway's invert. Because the low flow channel will be stabilized both horizontally and vertically the potential for negative impacts upon the native vegetative habitat will be minimized. A stabilized floodplain corridor will result from the construction of the proposed drainageway structures and over the long–term, the environmental quality of the corridor will be enhanced and preserved.

Maintenance access to the proposed drops will be provided via platted tracts within Pioneer Land Filing 2 and from tracts or easements within the future Lorson East filings. The locations of the maintenance roads are shown on the design plans. The benches of the channel are relatively flat and will allow for access to the crest of each drop. Access to the floodplain bench will allow for maintenance of proposed storm sewer outfalls from the adjacent Pioneer Landing Filing 2B and future Lorson East filings. Access points to the 100-year floodplain will be identified in the Lorson East MDDP and subsequent subdivision plat(s). Access roadways will have an all-weather surface and be a minimum of 12-feet in width.

## VIII. Construction Permitting

The following permits are anticipated to allow for the construction of the project as shown on the design plans. A copy of the Lorson Ranch 404 Permit is included within the Appendix.

Notification of project in conformance with 404 permit - USACOE

Floodplain Development Permit – Regional Building Department

Grading and Erosion Control Permit (ESQCP) – El Paso County

Construction Stormwater Discharge Permit – CDPHE

Construction Dewatering Permit - CDPHE

Conditional Letter of Map Revision - FEMA

## IX. Drainage and Bridge Fees

The Lorson Ranch Development and specifically Lorson Ranch East lies wholly within the Jimmy Camp Creek drainage basin. Drainage and bridge fees have been established by the County for the Jimmy Camp Creek drainage basin for assessment against platted land within the watershed. The drainageway structures will be public and are considered reimbursable or creditable against drainage fees owed when land within Lorson East is platted pending approval through the DCM reimbursement process. Construction of the bridge at Fontaine Boulevard will be creditable against bridge fees owed pending approval through the DCM reimbursement process.

The current 2017 drainage and bridge fees for the Jimmy Camp Creek drainage basin are as follows:

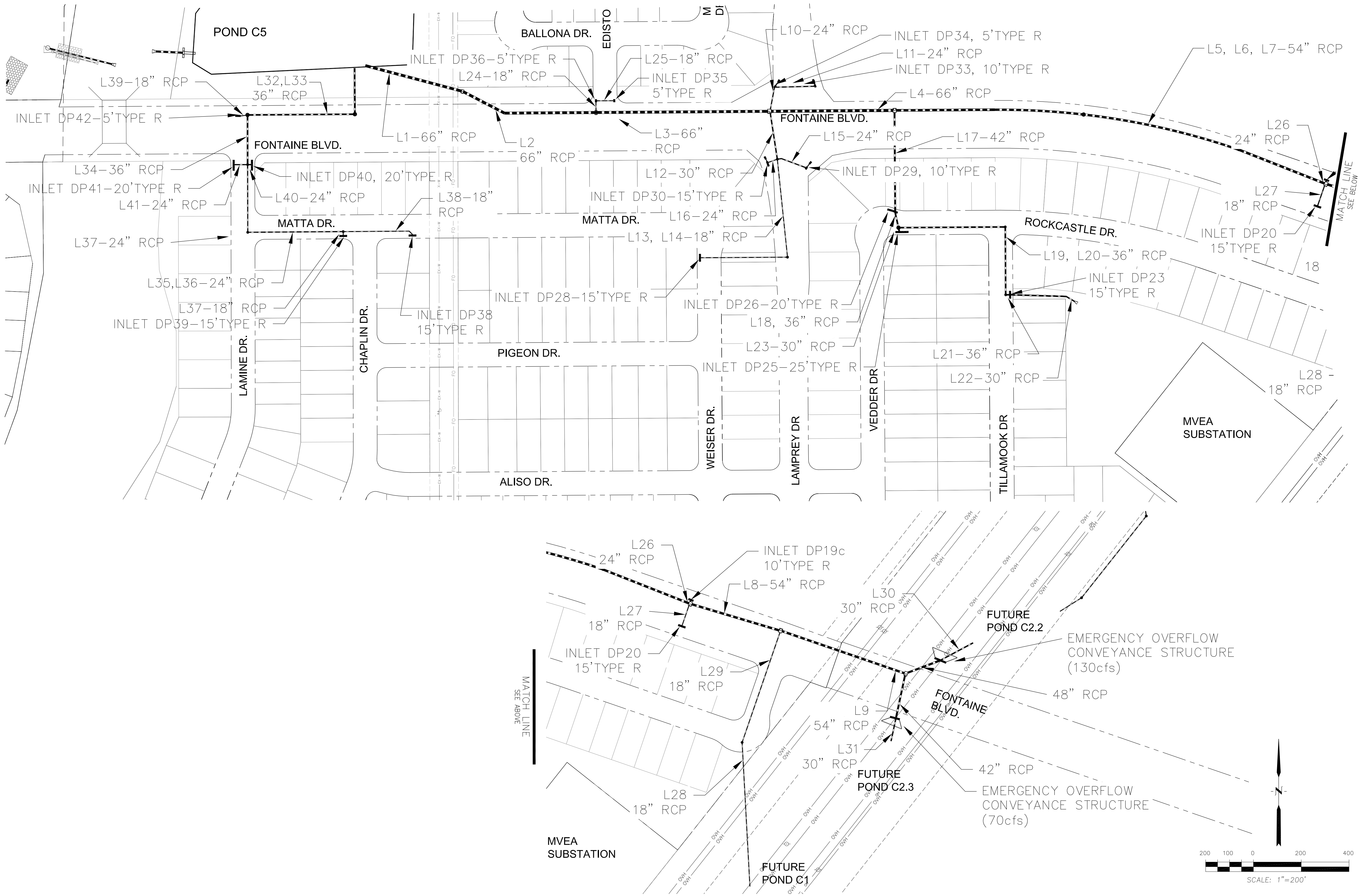
| | |
|---|---|
| Drainage Fee: | $16,270 per all impervious acres |
| Drainage Fee Escrow (BOCC Reas.16-320) | $7,285 per acre |
| Total Drainage Fee | $23,555 per acre |
| Bridge Fee: | $735 per acre |

## X. Phasing

Construction of the drainage and bridge facilities shown on the plans is to be completed all at once and no phasing of the construction is proposed. The construction will commence prior to or concurrent with the development of the first filing within Lorson East. Plans are to commence with construction in Fall 2017 with a completion in Winter 2018. Completion of the roadway may initially involve only the two westbound lanes on an interim basis until such time that traffic warrants completing the entire future east bound lanes of Fontaine Boulevard. The full bridge length will be constructed.

## APPENDIX H – EMERGENCY OVERFLOW STORM SEWER CALCULATIONS FOR C15-C17 BASINS BY HYDRAFLOW

# BASIN C15 - C17 STORM SCHEMATIC

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| NO. | DESCRIPTION | DATE |
| --- | --- | --- |
| | | |

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

PROJECT: LORSON RANCH EAST
EAST OF EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC
BASIN C15 - C17
LORSON RANCH EAST

DATE
OCTOBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
2

TOTAL SHEETS: 3

# 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 | L1 | 368.8 | 66 c | 147.3 | 5709.50 | 5711.15 | 1.120 | 5715.80* | 5717.58* | 0.00 | 5717.58 | End |
| 2 | L2 | 370.7 | 66 c | 383.5 | 5711.45 | 5715.70 | 1.108 | 5717.58* | 5722.25* | 0.00 | 5722.25 | 1 |
| 3 | L3 | 367.7 | 66 c | 373.9 | 5715.90 | 5719.70 | 1.016 | 5722.31* | 5726.80* | 0.00 | 5726.80 | 2 |
| 4 | L4 | 321.9 | 66 c | 249.3 | 5719.90 | 5722.40 | 1.003 | 5727.66* | 5729.96* | 0.00 | 5729.96 | 3 |
| 5 | L5 | 232.8 | 54 c | 228.8 | 5723.60 | 5728.00 | 1.923 | 5729.96* | 5733.16* | 0.00 | 5733.16 | 4 |
| 6 | L6 | 233.3 | 54 c | 494.6 | 5728.20 | 5733.16 | 1.003 | 5733.16* | 5740.13* | 0.00 | 5740.13 | 5 |
| 7 | L7 | 233.6 | 54 c | 194.1 | 5733.26 | 5735.20 | 1.000 | 5740.13* | 5742.87* | 0.00 | 5742.87 | 6 |
| 8 | L8 | 200.0 | 54 c | 219.8 | 5735.30 | 5737.50 | 1.001 | 5743.76* | 5746.04* | 0.00 | 5746.04 | 7 |
| 9 | L9 | 200.0 | 54 c | 279.0 | 5737.40 | 5741.20 | 1.362 | 5746.04* | 5748.92* | 0.00 | 5748.92 | 8 |
| 10 | L10 | 24.69 | 24 c | 58.7 | 5723.20 | 5724.30 | 1.862 | 5729.56* | 5730.26* | 0.00 | 5730.26 | 3 |
| 11 | L11 | 20.03 | 24 c | 52.4 | 5724.40 | 5724.84 | 0.845 | 5730.59* | 5731.00* | 0.00 | 5731.00 | 10 |
| 12 | L12 | 42.12 | 30 c | 84.4 | 5722.70 | 5723.52 | 0.976 | 5729.38* | 5730.27* | 0.00 | 5730.27 | 3 |
| 13 | L13 | 11.36 | 18 c | 214.7 | 5724.72 | 5728.81 | 1.905 | 5730.77* | 5733.28* | 0.00 | 5733.28 | 12 |
| 14 | L14 | 11.56 | 18 c | 182.2 | 5729.11 | 5734.84 | 3.145 | 5733.28 | 5736.14 | n/a | 5736.14 j | 13 |
| 15 | L15 | 18.67 | 24 c | 31.0 | 5725.08 | 5725.61 | 1.711 | 5730.86* | 5731.07* | 0.00 | 5731.07 | 12 |
| 16 | L16 | 15.39 | 24 c | 13.1 | 5724.61 | 5725.10 | 3.742 | 5731.04* | 5731.10* | 0.00 | 5731.10 | 12 |
| 17 | L17 | 92.58 | 42 c | 202.3 | 5724.40 | 5727.36 | 1.465 | 5731.37* | 5733.08* | 0.00 | 5733.08 | 4 |
| 18 | L18 | 78.29 | 36 c | 30.7 | 5728.15 | 5728.46 | 1.011 | 5733.08* | 5733.51* | 0.00 | 5733.51 | 17 |
| 19 | L19 | 51.29 | 36 c | 223.4 | 5728.50 | 5730.75 | 1.007 | 5734.60* | 5735.92* | 0.00 | 5735.92 | 18 |
| 20 | L20 | 51.77 | 36 c | 141.8 | 5730.95 | 5732.40 | 1.022 | 5735.92* | 5736.77* | 0.00 | 5736.77 | 19 |
| 21 | L21 | 51.81 | 36 c | 11.2 | 5732.70 | 5732.79 | 0.805 | 5736.77* | 5736.84* | 0.00 | 5736.84 | 20 |
| 22 | L22 | 35.92 | 30 c | 139.3 | 5733.40 | 5735.50 | 1.508 | 5736.84 | 5737.76 | 0.00 | 5737.76 | 21 |
| 23 | L23 | 33.74 | 30 c | 10.8 | 5729.21 | 5729.48 | 2.506 | 5734.68* | 5734.75* | 0.00 | 5734.75 | 18 |
| 24 | L24 | 6.37 | 18 c | 35.8 | 5719.93 | 5720.92 | 2.768 | 5725.84* | 5725.97* | 0.00 | 5725.97 | 2 |
| 25 | L25 | 6.01 | 18 c | 41.0 | 5721.22 | 5721.63 | 0.998 | 5725.99* | 5726.13* | 0.00 | 5726.13 | 24 |
| 26 | L26 | 22.01 | 24 c | 13.2 | 5741.12 | 5742.52 | 10.617 | 5745.46* | 5745.58* | 0.00 | 5745.58 | 7 |
| 27 | L27 | 13.06 | 18 c | 45.8 | 5742.58 | 5743.07 | 1.070 | 5745.37* | 5746.08* | 0.00 | 5746.08 | 7 |
| 28 | L28 | 18.00 | 18 c | 268.7 | 5740.50 | 5741.84 | 0.498 | 5746.88* | 5754.78* | 0.00 | 5754.78 | 8 |
| 29 | L29 | 18.00 | 18 c | 271.6 | 5741.94 | 5743.30 | 0.500 | 5754.78* | 5762.76* | 0.00 | 5762.76 | 28 |
| 30 | L30 | 130.0 | 48 c | 149.2 | 5741.71 | 5742.50 | 0.529 | 5749.72* | 5750.94* | 0.00 | 5750.94 | 9 |
| 31 | L31 | 70.00 | 42 c | 116.9 | 5742.20 | 5742.90 | 0.598 | 5750.56* | 5751.13* | 0.00 | 5751.13 | 9 |
| 32 | L32 | 65.12 | 36 c | 104.3 | 5709.00 | 5709.63 | 0.604 | 5711.81* | 5712.81* | 0.00 | 5712.81 | End |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Storm Sewer Summary Report



| Line No. | Line ID | Flow rate (cfs) | Line size (in) | Line length (ft) | Invert EL Dn (ft) | Invert EL Up (ft) | Line slope (%) | HGL down (ft) | HGL up (ft) | Minor loss (ft) | HGL Junct (ft) | Dns line No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | L33 | 65.94 | 36 c | 243.0 | 5709.83 | 5711.30 | 0.605 | 5712.83* | 5715.21* | 0.00 | 5715.21 | 32 |
| 34 | L34 | 60.45 | 36 c | 90.4 | 5711.80 | 5712.55 | 0.829 | 5715.42* | 5716.17* | 0.00 | 5716.17 | 33 |
| 35 | L35 | 31.08 | 24 c | 142.7 | 5713.55 | 5717.40 | 2.699 | 5716.17 | 5719.28 | n/a | 5719.28 j | 34 |
| 36 | L36 | 31.58 | 24 c | 220.6 | 5717.70 | 5723.60 | 2.675 | 5719.31 | 5725.49 | n/a | 5725.49 | 35 |
| 37 | L37 | 19.13 | 18 c | 7.0 | 5724.10 | 5724.18 | 1.144 | 5725.60* | 5725.83* | 0.00 | 5725.83 | 36 |
| 38 | L38 | 13.06 | 18 c | 145.3 | 5724.10 | 5727.01 | 2.003 | 5726.28 | 5728.51 | 0.00 | 5728.51 | 36 |
| 39 | L39 | 7.04 | 18 c | 17.2 | 5714.35 | 5714.58 | 1.340 | 5716.31* | 5716.39* | 0.00 | 5716.39 | 33 |
| 40 | L40 | 32.43 | 24 c | 27.1 | 5713.55 | 5713.76 | 0.776 | 5716.17* | 5716.72* | 0.00 | 5716.72 | 34 |
| 41 | L41 | 5.88 | 24 c | 11.5 | 5713.55 | 5713.67 | 1.049 | 5717.25* | 5717.26* | 0.00 | 5717.26 | 34 |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

# Inlet Report



| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 1 | | 200.00* | 0.00 | 0.00 | 200.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 2 | | 200.00* | 0.00 | 0.00 | 200.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 3 | | 200.00* | 0.00 | 0.00 | 200.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 4 | | 200.00* | 0.00 | 0.00 | 200.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 5 | | 200.00* | 1036.00 | 0.00 | 1236.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 6 | | 200.00* | 836.00 | 0.00 | 1036.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5 |
| 7 | | 200.00* | 636.00 | 0.00 | 836.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6 |
| 8 | | 200.00* | 436.00 | 0.00 | 636.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7 |
| 9 | | 200.00* | 200.00 | 0.00 | 400.00 | MH | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 10 | Inlet DP-34 - 5' | 9.94* | 11.12 | 21.06 | 0.00 | Curb | 6.0 | 5.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 1.34 | 60.88 | 1.47 | 60.88 | 3.00 | Off |
| 11 | Inlet DP-33 - 10' | 20.03* | 11.39 | 20.30 | 11.12 | Genr | 6.0 | 6.00 | 0.00 | 0.00 | 0.00 | 0.020 | 2.00 | 0.080 | 0.050 | 0.013 | 0.65 | 11.88 | 0.65 | 11.88 | 0.00 | 10 |
| 12 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 13 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 14 | Inlet DP-28 - 15' | 11.56 | 0.00 | 10.36 | 1.20 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.026 | 2.00 | 0.080 | 0.020 | 0.013 | 0.38 | 13.25 | 0.38 | 13.25 | 0.00 | 38 |
| 15 | Inlet DP-29 - 10' | 18.67 | 1.73 | 16.30 | 4.10 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | 0.020 | 2.00 | 0.080 | 0.020 | 0.013 | 0.47 | 17.60 | 0.47 | 17.60 | 0.00 | 16 |
| 16 | Inlet DP-30 - 15' | 15.39 | 4.10 | 19.49 | 0.00 | Genr | 6.0 | 10.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.30 | 9.00 | 0.30 | 9.00 | 0.00 | Off |
| 17 | Inlet DP-26, 20' | 18.18 | 6.91 | 25.10 | 0.00 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.30 | 4.80 | 0.30 | 4.80 | 0.00 | Off |
| 18 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 19 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 20 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 21 | Inlet DP-23, 15' | 18.56 | 0.00 | 13.69 | 4.87 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.011 | 2.00 | 0.080 | 0.020 | 0.013 | 0.50 | 19.10 | 0.50 | 19.10 | 0.00 | 23 |
| 22 | | 35.92 | 0.00 | 35.92 | 0.00 | Hdwl | 0.0 | 0.00 | 15.00 | 6.00 | 3.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

| Line No | Inlet ID | Q = CIA (cfs) | Q carry (cfs) | Q capt (cfs) | Q byp (cfs) | Junc type | Curb Inlet | | Grate Inlet | | | Gutter | | | | | | | Inlet | | | Byp line No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ht (in) | L (ft) | area (sqft) | L (ft) | W (ft) | So (ft/ft) | W (ft) | Sw (ft/ft) | Sx (ft/ft) | n | Depth (ft) | Spread (ft) | Depth (ft) | Spread (ft) | Depr (in) | |
| 23 | INLET DP-25- 25' | 33.74 | 4.87 | 31.70 | 6.91 | Genr | 6.0 | 48.21 | 0.00 | 0.00 | 0.00 | 0.020 | 2.00 | 0.080 | 0.020 | 0.013 | 0.57 | 22.65 | 0.57 | 22.65 | 0.00 | 17 |
| 24 | Inlet DP-36, 5' | 0.57 | 0.00 | 0.57 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.21 | 4.65 | 0.34 | 4.65 | 3.00 | 2 |
| 25 | Inlet DP-35, 5' | 6.01 | 0.00 | 6.01 | 0.00 | Curb | 6.0 | 5.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.57 | 22.50 | 0.70 | 22.50 | 3.00 | 24 |
| 26 | Inlet DP-19c, 10' | 22.01 | 0.00 | 10.62 | 11.39 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.54 | 20.80 | 0.54 | 20.80 | 0.00 | 11 |
| 27 | Inlet DP-20, 15' | 13.06 | 0.00 | 11.33 | 1.73 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.010 | 2.00 | 0.080 | 0.020 | 0.013 | 0.46 | 16.90 | 0.46 | 16.90 | 0.00 | 15 |
| 28 | | 18.00* | 18.00 | 0.00 | 36.00 | None | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8 |
| 29 | | 18.00* | 0.00 | 0.00 | 18.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 28 |
| 30 | | 130.00* | 0.00 | 0.00 | 130.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 |
| 31 | | 70.00* | 0.00 | 0.00 | 70.00 | MH | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9 |
| 32 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 33 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 2.00 | 0.080 | 0.020 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32 |
| 34 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 35 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | Off |
| 36 | | 0.00 | 0.00 | 0.00 | 0.00 | MH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | Sag | 0.00 | 0.000 | 0.000 | 0.013 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 35 |
| 37 | Inlet DP-39, 15' | 19.13 | 2.43 | 14.93 | 6.62 | Genr | 6.0 | 15.00 | 2.00 | 4.00 | 2.00 | 0.038 | 2.00 | 0.080 | 0.020 | 0.013 | 0.44 | 15.80 | 0.44 | 15.80 | 0.00 | 40 |
| 38 | Inlet DP-38,  15' | 13.06 | 1.20 | 11.83 | 2.43 | Genr | 6.0 | 15.00 | 0.00 | 0.00 | 0.00 | 0.011 | 2.00 | 0.080 | 0.020 | 0.013 | 0.46 | 17.20 | 0.46 | 17.20 | 0.00 | 37 |
| 39 | Inlet DP-42, 10' | 7.04 | 0.00 | 7.04 | 0.00 | Curb | 6.0 | 6.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.52 | 9.30 | 0.63 | 9.30 | 2.00 | 33 |
| 40 | Inlet DP-40, 20' | 32.43 | 6.62 | 26.00 | 13.06 | Genr | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | 0.020 | 2.00 | 0.080 | 0.050 | 0.013 | 0.71 | 12.92 | 0.71 | 12.92 | 0.00 | 41 |
| 41 | Inlet DP-41, 20' | 5.88 | 13.06 | 18.94 | 0.00 | Curb | 6.0 | 20.00 | 2.00 | 4.00 | 2.00 | Sag | 2.00 | 0.080 | 0.050 | 0.013 | 0.52 | 9.24 | 0.63 | 9.24 | 2.00 | 34 |

**Lorson East PDR - C15 basins** | Number of lines: 41 | Run Date: 10-30-2017

NOTES: Inlet N-Values = 0.016 ; Intensity = 58.48 / (Inlet time + 7.70) ^ 0.75; Return period = 100 Yrs. ; * Indicates Known Q added

# MAP POCKET

| DESIGN POINT SUMMARY TABLE | | | | |
|---|---|---|---|---|
| DESIGN POINT | BASIN | DRAINAGE AREA (AC) | RUNOFF 5 YR (CFS) | RUNOFF 100 YR (CFS) |
| 2 | EX-C | 452.97 | 141 | 458 |

FROM LORSON EAST MDDP

| | EAST TRIBUTARY FEMA FLOW DATA | | EAST TRIBUTARY DBPS FLOW DATA | |
|---|---|---|---|---|
| DESIGN POINT | RUNOFF 10 YR (CFS) | RUNOFF 100 YR (CFS) | RUNOFF 2 YR (CFS) | RUNOFF 100 YR (CFS) |
| ET1 | 2400 | 4750 | 100 | 4220 |
| ET2 | 2600 | 5200 | 110 | 4530 |
| ET3 | 2800 | 5500 | 110 | 4570 |
| ET4 | 2800 | 5500 | 120 | 4600 |



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EMAIL: Rich@ceg1.com


NO. | DESCRIPTION | DATE

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

PROJECT:
LORSON RANCH EAST
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: LJA
DESIGNED: LAB
CHECKED: RLS

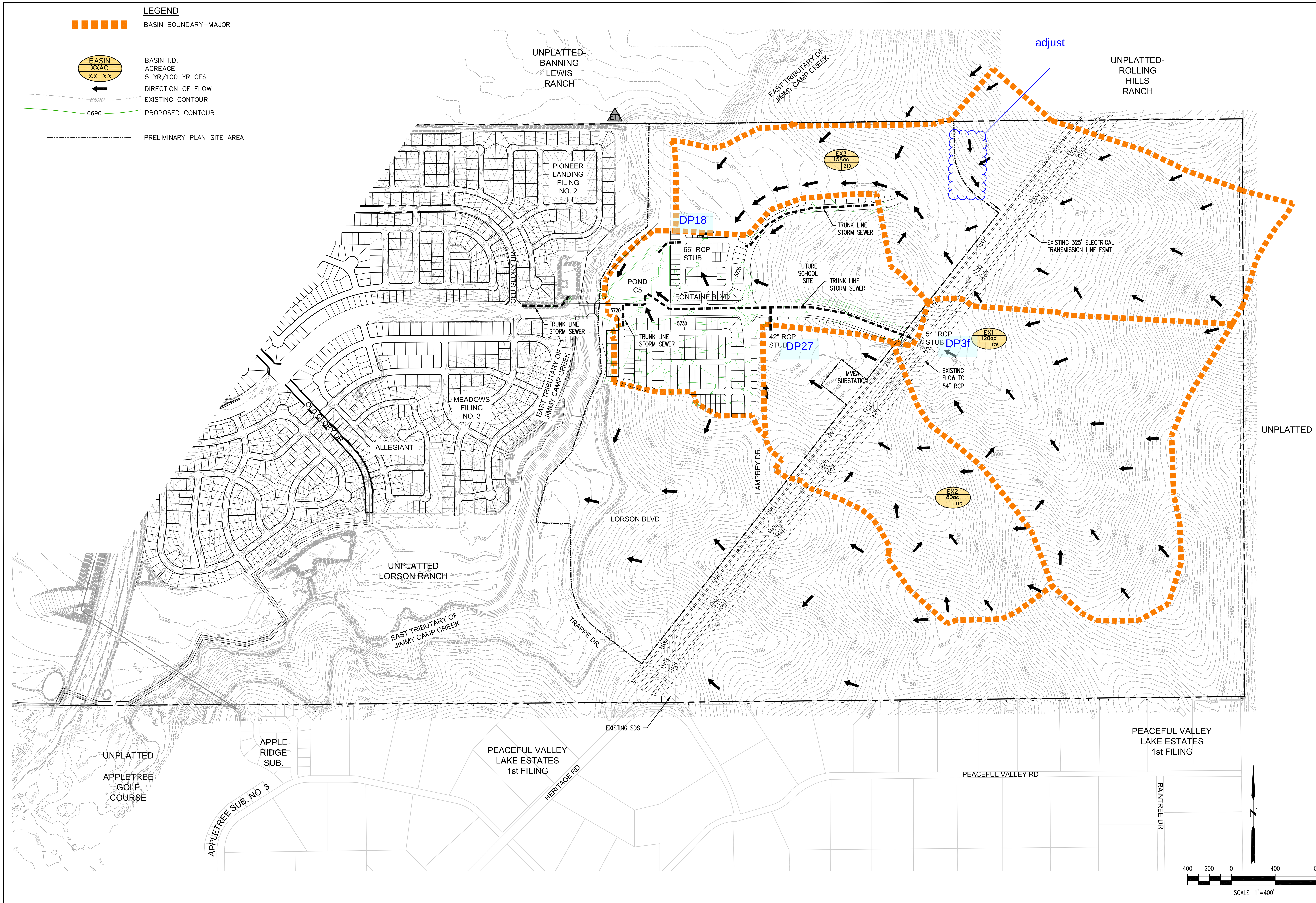
# EXISTING CONDITIONS FONTAINE BOULEVARD EAST OF ETRIB OF JIMMY CAMP CREEK

DATE: DECEMBER 20, 2017

PROJECT NO. 100.041

SHEET NUMBER 1

TOTAL SHEETS: 1

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PROJECT:
LORSON RANCH EAST
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: LJA
DESIGNED: LAB
CHECKED: RLS

# EXISTING FLOWS AT FONTAINE BLVD & LAMPREY DRIVE IN PHASE 1 OF LORSON RANCH EAST

DATE:
DECEMBER 20, 2017

PROJECT NO.
100.041

SHEET NUMBER
1

TOTAL SHEETS: 1

LEGEND

BASIN BOUNDARY–MAJOR

BASIN I.D.
ACREAGE
5 YR/100 YR CFS

DIRECTION OF FLOW

EXISTING CONTOUR

PROPOSED CONTOUR

PRELIMINARY PLAN SITE AREA

| EXISTING VERSUSES DEVELOPED FLOW AT OUTFLOWS TO ETRIB | | | | |
|---|---|---|---|---|
| DESIGN POINT | EXISTING RUNOFF 5 YR (CFS) | EXISTING RUNOFF 100 YR (CFS) | DEVELOPED RUNOFF 5 YR (CFS) | DEVELOPED RUNOFF 100 YR (CFS) |
| 46 | 141 | 458 | 121 | 443 |

## NOTE:

1. OVERALL BASIN "C" FLOWS TO FULL SPECTRUM DETENTION POND C5.

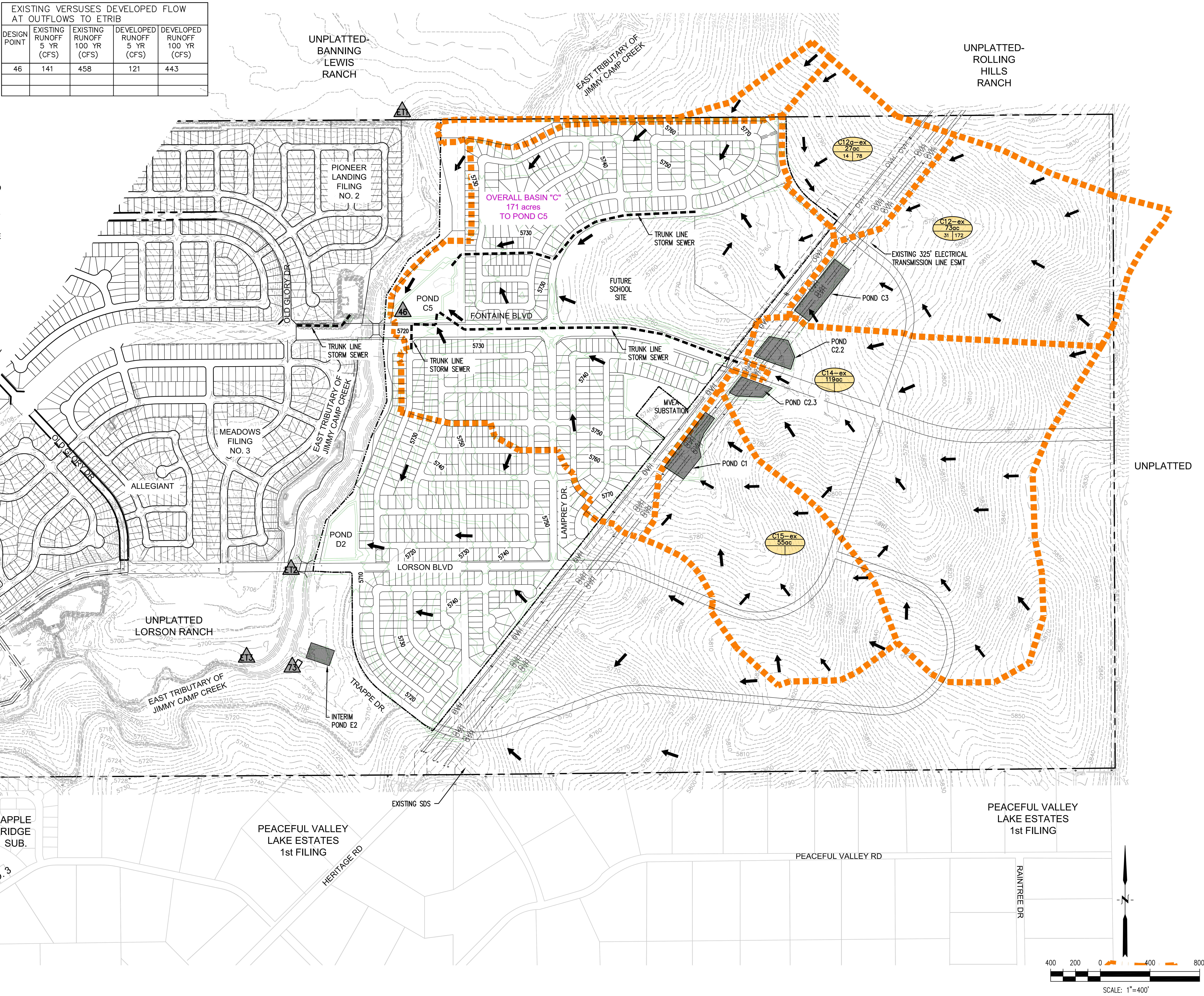
2. EXISTING DRAINAGE BASINS EAST OF THE POWERLINE EASEMENT WILL BE ROUTED TO FUTURE PONDS UNDER THE POWERLINE EASEMENT PER THE LORSON RANCH MDDP FOR AREAS EAST OF THE EAST TRIBUTARY.

3. OFFSITE PONDS ARE REQUIRED IN PHASE 2 OF LORSON RANCH EAST TO REDUCE EXISTING FLOW DRAINING WEST UNDER THE ELECTRIC EASEMENT TO RATES THAT CAN BE ACCOMODATED BY THE PROPOSED STORM SEWER/STREETS. INTERIM POND CONSTRUCTION CAN BE PHASED BASED ON DOWNSTREAM DEVELOPMENT.

4. NO OFFSITE PONDS ARE REQUIRED FOR PHASE 1 OF LORSON RANCH EAST WHICH INCLUDES FONTAINE BOULEVARD AND LAMPREY DRIVE NORTH OF FONTAINE. THE OFFSITE PONDS ARE INCLUDED IN THIS REPORT BECAUSE STORM SEWER IN FONTAINE BOULEVARD PROVIDES THE FUTURE POND OUTFALL STORM SEWER.

| DESIGN POINT | EAST TRIBUTARY FEMA FLOW DATA RUNOFF 10 YR (CFS) | RUNOFF 100 YR (CFS) | EAST TRIBUTARY DBPS FLOW DATA RUNOFF 2 YR (CFS) | RUNOFF 100 YR (CFS) |
|---|---|---|---|---|
| ET1 | 2400 | 4750 | 100 | 4220 |
| ET2 | 2600 | 5200 | 110 | 4530 |
| ET3 | 2800 | 5500 | 110 | 4570 |
| ET4 | 2800 | 5500 | 120 | 4600 |

DATA FROM KIOWA REPORT

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CONTACT: JEFF MARK

PROJECT: LORSON RANCH EAST
EAST OF THE EAST TRIBUTARY
EL PASO COUNTY, COLORADO

DRAWN: LJA
DESIGNED: LAB
CHECKED: RLS

# OVERALL DEVELOPED CONDITIONS FONTAINE BLVD & LAMPREY DRIVE EAST OF ETRIB OF JIMMY CAMP CREEK

DATE: DECEMBER 20, 2017

PROJECT NO. 100.041

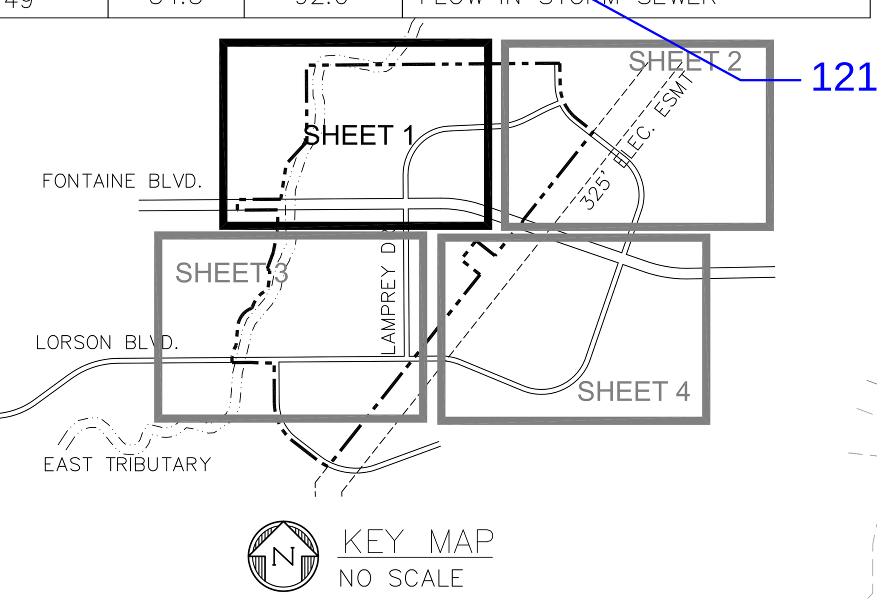
SHEET NUMBER 1

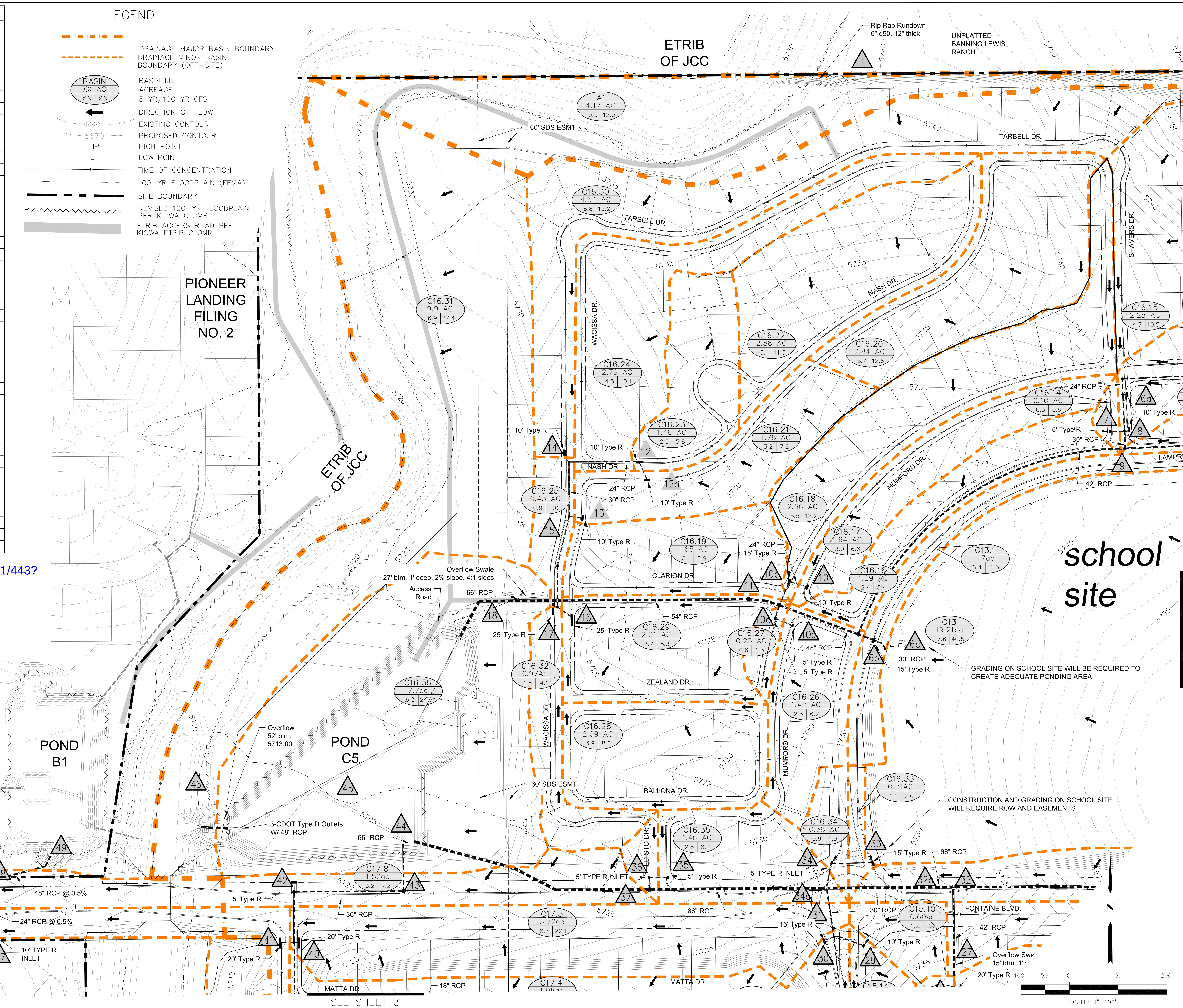
TOTAL SHEETS: 1

## RUNOFF SUMMARY

| DESIGN POINT | 5 YEAR | 100 YEAR | NOTES |
|---|---|---|---|
| 1 | 9.4 | 21.0 | FLOW IN SWALE |
| 6a | 6.61 | 24.87 | STREET FLOW |
| 6c | 7.6 | 40.5 | FLOW IN STM SWR TO SCHOOL |
| 6b | 6.8 | 20.2 | STREET FLOW |
| 7 | 0.3 | 0.6 | STREET FLOW |
| 8 | 6.2 | 25.2 | STREET FLOW |
| 9 | 75.68 | 105.3 | FLOW IN STM SWR |
| 10 | 6.0 | 12.5 | STREET FLOW |
| 10a | 5.7 | 20.7 | STREET FLOW |
| 10b | 3.2 | 6.9 | STREET FLOW |
| 10c | 0.6 | 1.3 | STREET FLOW |
| 11 | 105.5 | 154.8 | FLOW IN STM SWR |
| 12 | 8.0 | 16.65 | STREET FLOW |
| 12a | 8.78 | 18.28 | STREET FLOW |
| 13 | 8.35 | 25.48 | STREET FLOW |
| 14 | 1.1 | 14.44 | STREET FLOW |
| 15 | 25.69 | 39.15 | FLOW IN STM SWR |
| 16 | 12.8 | 57.3 | STREET FLOW |
| 17 | 3.9 | 31.6 | STREET FLOW |
| 18 | 147.9 | 230.8 | STM SWR INTO POND C5 |
| 27 | 38.11 | 92.58 | FLOW IN STM SWR |
| 29 | 8.6 | 20.8 | STREET FLOW |
| 30 | 7.2 | 20.1 | STREET FLOW |
| 31 | 19.36 | 42.12 | FLOW IN STM SWR |
| 32 | 23.2 | 163.4 | FLOW IN STM SWR |
| 32a | 56.8 | 252.9 | FLOW IN STM SWR |
| 33 | 8.2 | 26.3 | STREET FLOW |
| 34 | 0.9 | 8.0 | STREET FLOW |
| 34a | 74.7 | 298.3 | FLOW IN STM SWR |
| 35 | 2.8 | 6.1 | STREET FLOW |
| 36 | 0.3 | 0.6 | STREET FLOW |
| 37 | 74.2 | 300.0 | STM SWR INTO POND C5 |
| 40 | 12.9 | 39.4 | STREET FLOW |
| 41 | 2.0 | 19.3 | STREET FLOW |
| 42 | 3.2 | 7.2 | STREET FLOW |
| 43 | 27.33 | 65.94 | STM SWR INTO POND C5 |
| 44 | 102.5 | 365.9 | FLOW INTO POND C5 FROM SOUTH |
| 45 | 167.5 | 519.1 | TOTAL FLOW INTO POND C5 |
| 46 | 126.3 | 453.2 | FLOW INTO EAST TRIBUTARY |
| 47 | 7.8 | 13.9 | STREET FLOW |
| 48 | 8.9 | 16.0 | STREET FLOW |
| 49 | 54.3 | 92.0 | FLOW IN STORM SEWER |

121/443?

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NO. | DATE | DESCRIPTION

PREPARED FOR:
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(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
LORSON RANCH EAST
FONTAINE BLVD. - EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

# DEVELOPED CONDITIONS DRAINAGE PLAN - NORTHWEST AREA FONTAINE BLVD/LAMPREY DRIVE

DATE
DECEMBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
1

TOTAL SHEETS: 4

21.9?

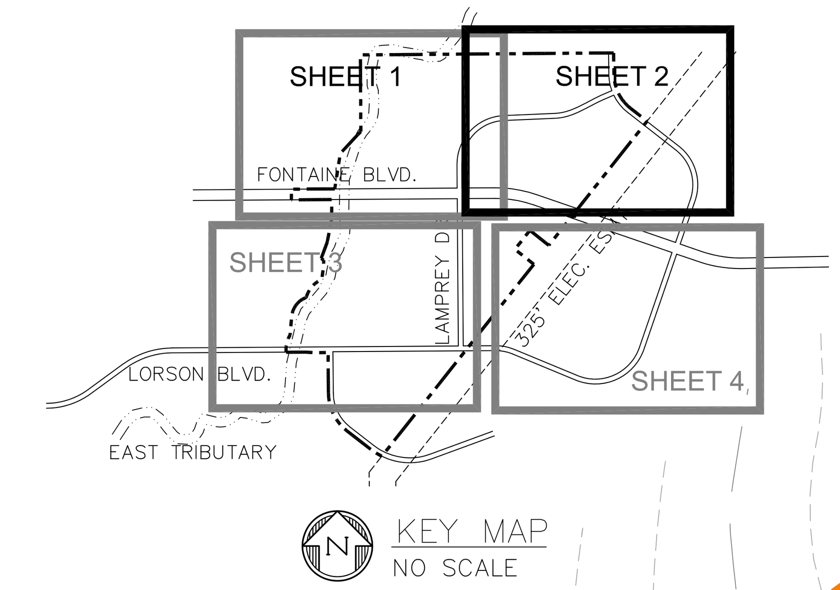
| RUNOFF SUMMARY | | | |
|---|---|---|---|
| DESIGN POINT | 5 YEAR | 100 YEAR | NOTES |
| 1 | 9.4 | 21.0 | FLOW IN SWALE |
| 2 | 33.0 | 40.5 | FUTURE FLOW IN STM SWR |
| 3 | 8.9 | 20.3 | STREET FLOW |
| 4 | 10.47 | 12.82 | STREET FLOW |
| 5 | 0.3 | 0.6 | STREET FLOW |
| 6 | 12.82 | 32.62 | STREET FLOW |
| 6a | 6.61 | 24.87 | STREET FLOW |
| 6c | 7.6 | 40.5 | FLOW IN STM SWR TO SCHOOL |
| 6b | 6.8 | 20.2 | STREET FLOW |
| 7 | 0.3 | 0.6 | STREET FLOW |
| 8 | 6.2 | 25.2 | STREET FLOW |
| 9 | 75.68 | 105.3 | FLOW IN STM SWR |

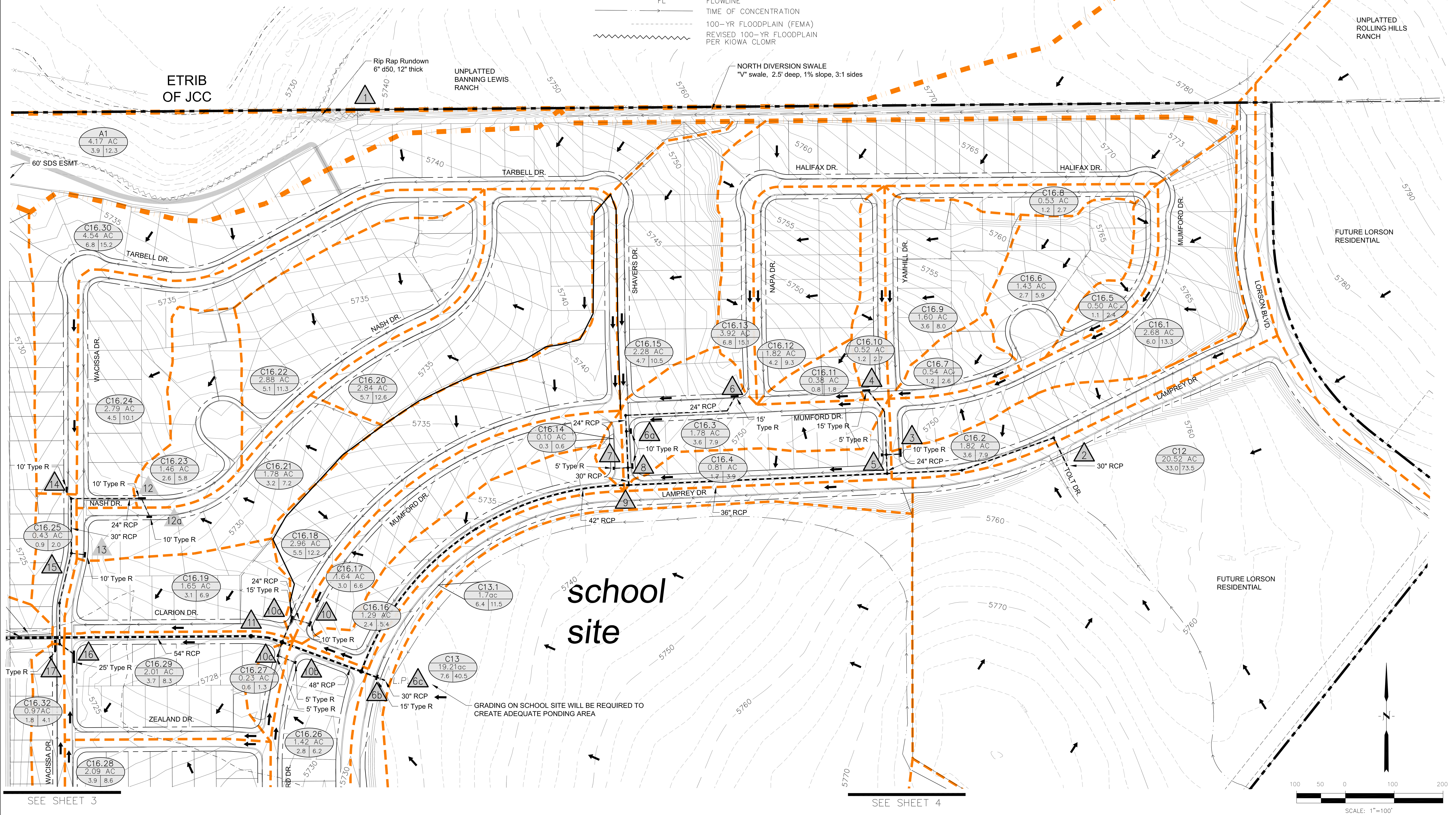
| RUNOFF SUMMARY | | | |
|---|---|---|---|
| DESIGN POINT | 5 YEAR | 100 YEAR | NOTES |
| 10 | 6.0 | 12.5 | STREET FLOW |
| 10a | 5.7 | 20.7 | STREET FLOW |
| 10b | 3.2 | 6.9 | STREET FLOW |
| 10c | 0.6 | 1.3 | STREET FLOW |
| 11 | 105.5 | 154.8 | FLOW IN STM SWR |
| 12 | 8.0 | 16.65 | STREET FLOW |
| 12a | 8.78 | 18.28 | STREET FLOW |
| 13 | 8.35 | 25.48 | STREET FLOW |
| 14 | 1.1 | 14.44 | STREET FLOW |
| 15 | 25.69 | 39.15 | FLOW IN STM SWR |
| 16 | 12.8 | 57.3 | STREET FLOW |
| 17 | 3.9 | 31.6 | STREET FLOW |

7/15?

## LEGEND

| | |
|---|---|
| | DRAINAGE MAJOR BASIN BOUNDARY |
| | DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE) |
| | SITE BOUNDARY |
| BASIN XX AC X.X X.X | BASIN I.D. ACREAGE 5 YR/100 YR CFS |
| | DIRECTION OF FLOW |
| 6690 | EXISTING CONTOUR |
| 6670 | PROPOSED CONTOUR |
| HP | HIGH POINT |
| LP | LOW POINT |
| GB | GRADE BREAK |
| TC | TOP BACK OF CURB |
| FL | FLOWLINE |
| | TIME OF CONCENTRATION |
| | 100-YR FLOODPLAIN (FEMA) |
| | REVISED 100-YR FLOODPLAIN PER KIOWA CLOMR |





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FONTAINE BLVD. - EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

# DEVELOPED CONDITIONS DRAINAGE PLAN - NORTHEAST AREA LORSON RANCH EAST

DATE: DECEMBER 20, 2017

PROJECT NO. 100.040

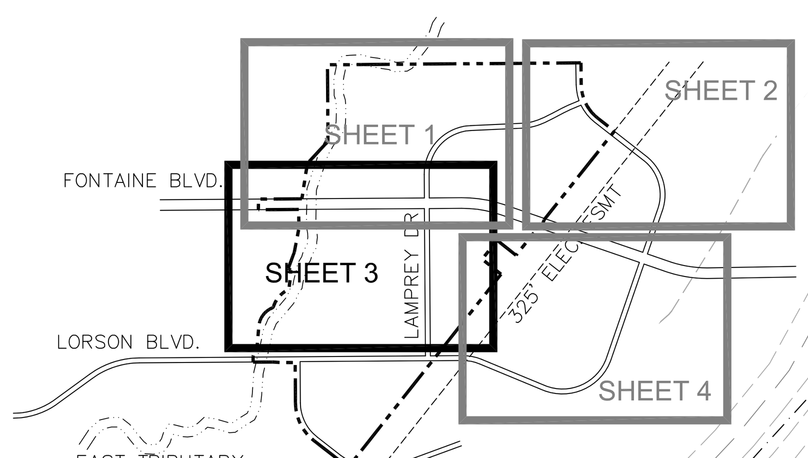
SHEET NUMBER 2

TOTAL SHEETS: 4

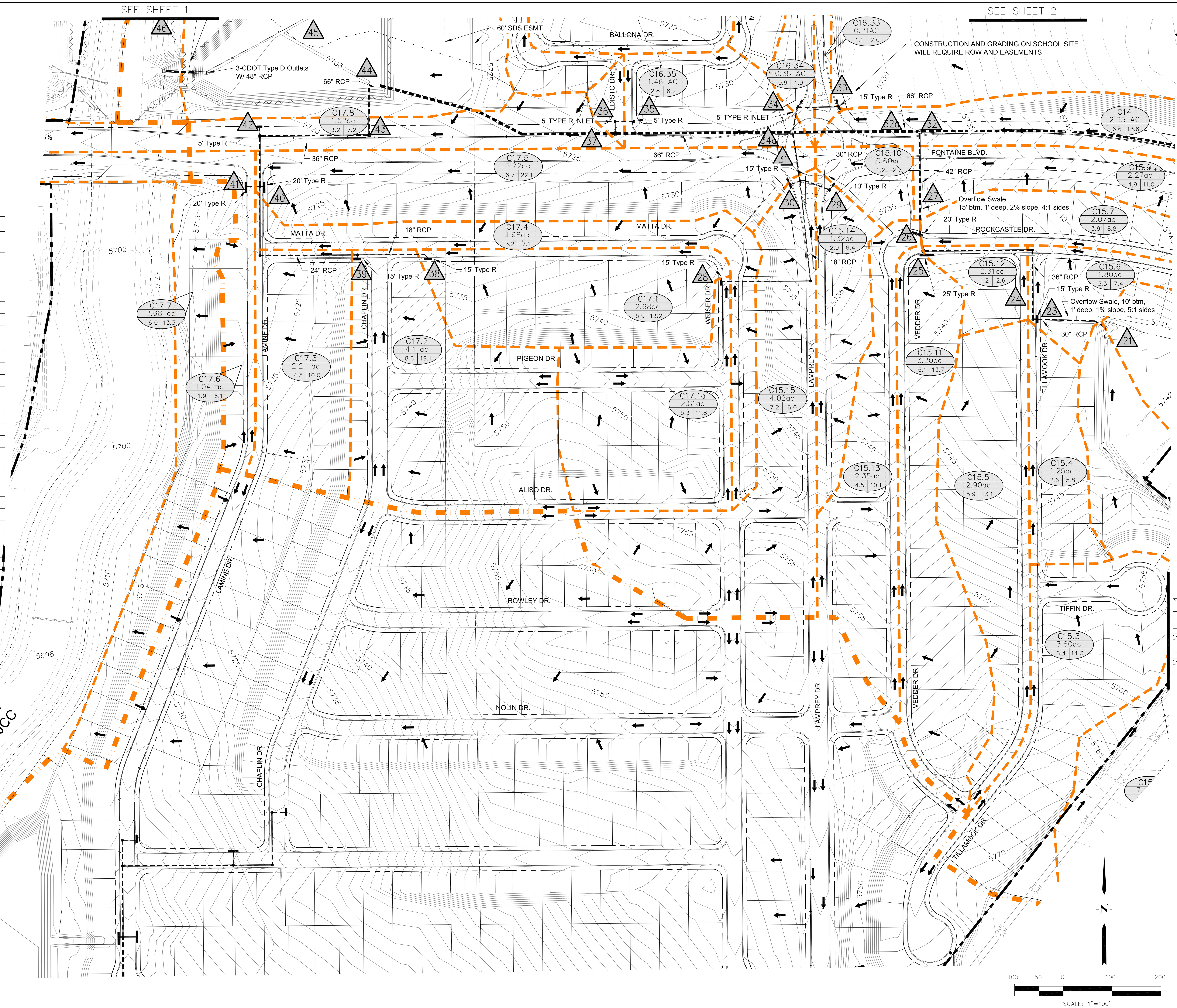
## LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF-SITE)
- SITE BOUNDARY
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (BASIN, XX AC, X.X | X.X)
- DIRECTION OF FLOW
- 6690 — EXISTING CONTOUR
- 6670 — PROPOSED CONTOUR
- HP — HIGH POINT
- LP — LOW POINT
- TIME OF CONCENTRATION
- 100-YR FLOODPLAIN (FEMA)

| RUNOFF SUMMARY | | | |
|---|---|---|---|
| DESIGN POINT | 5 YEAR | 100 YEAR | NOTES |
| 21 | 13.55 | 35.92 | FLOW IN STM SWR |
| 23 | 8.73 | 18.69 | STREET FLOW |
| 24 | 20.64 | 51.77 | FLOW IN STM SWR |
| 25 | 16.0 | 38.9 | STREET FLOW |
| 26 | 8.4 | 26.0 | STREET FLOW |
| 27 | 38.11 | 92.58 | FLOW IN STM SWR |
| 28 | 5.3 | 11.56 | STREET FLOW |
| 29 | 8.6 | 20.8 | STREET FLOW |
| 30 | 7.2 | 20.1 | STREET FLOW |
| 31 | 19.36 | 42.12 | FLOW IN STM SWR |
| 32 | 23.2 | 163.4 | FLOW IN STM SWR |
| 32a | 56.8 | 252.9 | FLOW IN STM SWR |
| 33 | 8.2 | 26.3 | STREET FLOW |
| 34 | 0.9 | 8.0 | STREET FLOW |
| 34a | 74.7 | 298.3 | FLOW IN STM SWR |
| 35 | 2.8 | 6.1 | STREET FLOW |
| 36 | 0.3 | 0.6 | STREET FLOW |
| 37 | 74.2 | 300.0 | STM SWR INTO POND C5 |
| 38 | 5.9 | 14.43 | STREET FLOW |
| 39 | 8.61 | 21.53 | STREET FLOW |
| 40 | 12.9 | 39.4 | STREET FLOW |
| 41 | 2.0 | 19.3 | STREET FLOW |
| 42 | 3.2 | 7.2 | STREET FLOW |
| 43 | 27.33 | 65.94 | STM SWR INTO POND C5 |
| 44 | 102.5 | 365.9 | FLOW INTO POND C5 FROM SOUTH |
| 45 | 157.0 | 510.0 | TOTAL FLOW INTO POND C5 |



KEY 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


| NO. | DESCRIPTION | DATE |
|---|---|---|
| | | |

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

PROJECT:
LORSON RANCH EAST
FONTAINE BLVD. - EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

# DEVELOPED CONDITIONS
# DRAINAGE PLAN - MIDDLE WEST AREA
# FONTAINE BLVD/LAMPREY DRIVE

DATE
DECEMBER 20, 2017

PROJECT NO.
100.040

SHEET NUMBER
3

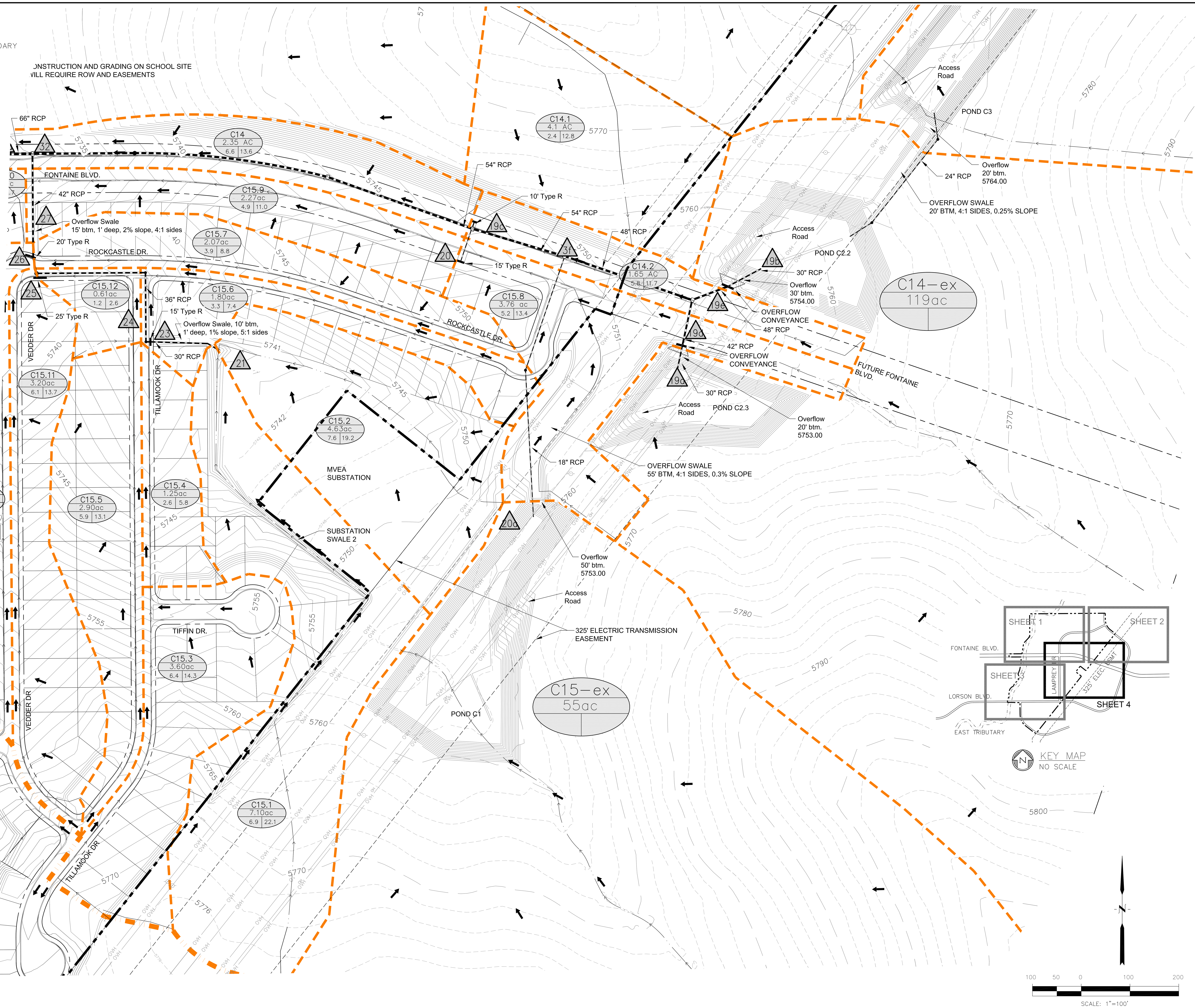
TOTAL SHEETS: 4

## LEGEND

- DRAINAGE MAJOR BASIN BOUNDARY
- DRAINAGE MINOR BASIN BOUNDARY (OFF–SITE)
- SITE BOUNDARY
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (BASIN, XX AC, X.X | X.X)
- DIRECTION OF FLOW
- 6690 EXISTING CONTOUR
- 6670 PROPOSED CONTOUR
- HP HIGH POINT
- LP LOW POINT
- TIME OF CONCENTRATION
- 100–YR FLOODPLAIN

### RUNOFF SUMMARY

| DESIGN POINT | 5 YEAR | 100 YEAR | NOTES |
|---|---|---|---|
| 19a | 4.0 | 52.0 | STM SWR FROM POND C2.3 |
| 19b | 6.0 | 61.0 | STM SWR FROM POND C2.2 |
| 19c | 5.6 | 18.7 | STREET FLOW |
| 19d | | 70 | OVERFLOW CONVEYANCE |
| 19e | | 130 | OVERFLOW CONVEYANCE |
| 20a | 4.0 | 18.0 | STM SWR FROM POND C1 |
| 3f | 14.0 | 131.0 | FLOW IN STM SWR |
| 20 | 5.2 | 13.4 | STREET FLOW |
| 21 | 13.55 | 35.92 | FLOW IN STM SWR |
| 23 | 8.73 | 18.69 | STREET FLOW |
| 24 | 20.64 | 51.77 | FLOW IN STM SWR |
| 25 | 16.0 | 38.9 | STREET FLOW |
| 26 | 8.4 | 26.0 | STREET FLOW |
| 27 | 38.11 | 92.58 | FLOW IN STM SWR |
| 32 | 23.58 | 163.4 | FLOW IN STM SWR |
| | | | |





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


| NO. | DESCRIPTION | DATE |
|---|---|---|
| | | |

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

PROJECT:
LORSON RANCH EAST
FONTAINE BLVD. – EAST TRIBUTARY OF JCC
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

# DEVELOPED CONDITIONS DRAINAGE PLAN - EAST AREA FONTAINE BLVD/LAMPREY DRIVE

DATE: DECEMBER 20, 2017

PROJECT NO. 100.041

SHEET NUMBER 4

TOTAL SHEETS: 4

# Markup Summary

## 5 (2)

**Subject:** Text Box
**Page Label:** 5
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**Status:**
**Checkmark:** Unchecked
**Author:** dsdrice
**Date:** 2/6/2018 11:43:07 AM
**Color:**

Fontaine Blvd. to be constructed after approval of detention pond design(?)

---

**Subject:** Callout
**Page Label:** 5
**Lock:** Unlocked
**Status:**
**Checkmark:** Unchecked
**Author:** dsdrice
**Date:** 2/6/2018 11:40:00 AM
**Color:**

(separate submittal)

## 7 (3)

**Subject:** Highlight
**Page Label:** 7
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**Status:**
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**Author:** dsdrice
**Date:** 2/6/2018 12:06:47 PM
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178

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**Subject:** Callout
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**Date:** 2/6/2018 12:38:33 PM
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RCP?

## 11 (5)

**Subject:** Callout
**Page Label:** 11
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**Status:**
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**Author:** dsdrice
**Date:** 2/7/2018 10:56:20 AM
**Color:**

and Clarion and Mumford

**Subject:** Text Box
**Page Label:** 11
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**Status:**
**Checkmark:** Unchecked
**Author:** dsdrice
**Date:** 2/7/2018 11:00:11 AM
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Basin C16.24?

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**Subject:** Cloud+
**Page Label:** 11
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**Status:**
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**Author:** dsdrice
**Date:** 2/7/2018 10:54:51 AM
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Shavers

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**Subject:** Cloud+
**Page Label:** 11
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**Checkmark:** Unchecked
**Author:** dsdrice
**Date:** 2/7/2018 10:56:58 AM
**Color:**

Mumford?

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**Subject:** Cloud+
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**Author:** dsdrice
**Date:** 2/7/2018 10:49:08 AM
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two proposed inlets

## 15 (1)

**Subject:** Callout
**Page Label:** 15
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**Author:** dsdrice
**Date:** 2/7/2018 4:47:50 PM
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Provide DPs (19c, 20, 42 and 47?)

## 18 (1)

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**Page Label:** 18
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**Author:** dsdrice
**Date:** 2/7/2018 3:43:37 PM
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DP10b, DP10c then DP16?

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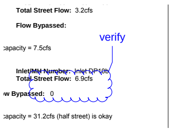


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verify

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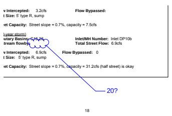


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20?

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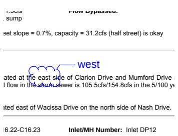


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west

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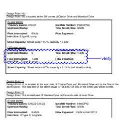

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**Date:** 2/7/2018 3:48:24 PM
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verify

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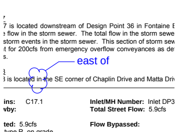


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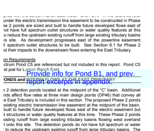
east of

## 36 (1)

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**Date:** 2/14/2018 10:43:14 AM
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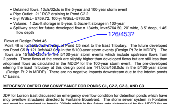
Provide info for Pond B1, and prev. report excerpts in appendix.

38 (1)



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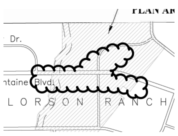
126/453?

41 (2)

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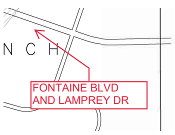


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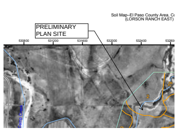
FONTAINE BLVD
AND LAMPREY DR

42 (2)

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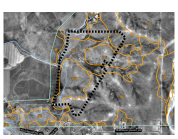
PRELIMINARY PLAN SITE



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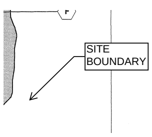
45 (3)




**Subject:** Callout
**Page Label:** 45
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**Status:**
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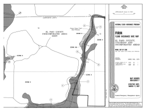
**Date:** 6/28/2017 8:49:26 AM
**Color:**

SITE
BOUNDARY



**Subject:** Polygonal Line
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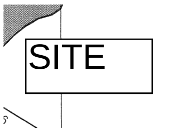
**Date:** 6/28/2017 8:48:13 AM
**Color:** ■

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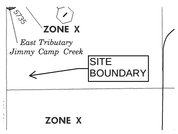
SITE

46 (2)

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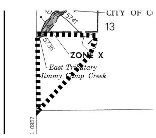
SITE
BOUNDARY



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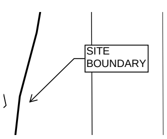
47 (5)

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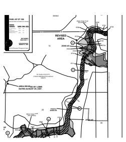
SITE
BOUNDARY



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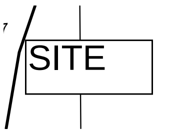


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SITE

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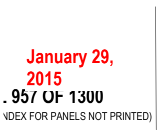


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**Date:** 9/16/2014 1:47:49 PM
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January 29, 2015

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**Subject:** LOMR Stamp
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**Date:** 9/16/2014 1:47:49 PM
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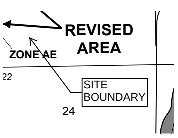
## 48 (4)

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SITE
BOUNDARY

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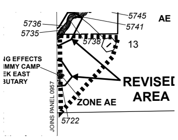


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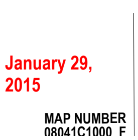


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January 29, 2015


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96 (1)

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132 (1)


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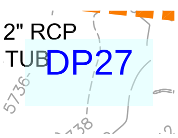
Include signed version.

150 (4)

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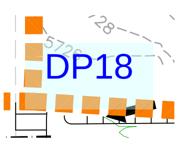
DP27

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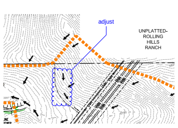
DP18

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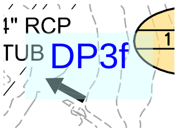
adjust

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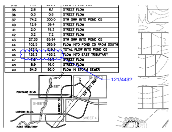
DP3f

152 (1)



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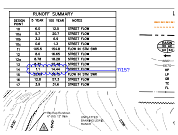
121/443?

153 (2)

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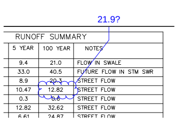


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