FINAL DRAINAGE PLAN
SF 24X

VILLAGE AT LORSON RANCH

APRIL, 2024

Prepared for:

Lorson, LLC
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Prepared by:

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Project No. 100.070

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 not located within a designated floodplain as shown on Flood Insurance Rate Map Panel No. and 08041C0957 G, dated December 7, 2018. (See Appendix A, FEMA FIRM Exhibit)

Richard L. Schindler, #33997 Date

EL PASO COUNTY

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

Date

County Engineer/ECM Administrator

Conditions: _____

1.0 LOCATION and DESCRIPTION

Village at Lorson Ranch is located west of Jimmy Camp Creek. The site is located on approximately 9.722 acres of vacant land. This project will develop this site into a commercial development. The land for the commercial lots is currently owned by Cradlan, LLC.

The site is located in the Southeast 1/4 of Section 15, Township 15 South and Range 65 West of the 6th Principal Meridian. The site is bounded on the north by Carriage Meadows North Filing No. 1, on the west by Marksheffel Road, on the east by Carriage Meadows Drive, and the south by Fontaine Boulevard. For reference, a vicinity map is included in Appendix A of this report.

Conformance with applicable Drainage Basin Planning Studies

There is an existing (unapproved) DBPS for Jimmy Camp Creek prepared by Wilson & Company in 1987, and is referenced in this report. The only major drainage improvements for this study area according to the 1987 Wilson study was the reconstruction of the main stem of Jimmy Camp Creek. In 2006 the main stem of Jimmy Camp Creek was reconstructed in accordance with the 1987 study. There are no further improvements to be made on Jimmy Camp Creek.

Conformance with Lorson Ranch MDDP1 by Pentacor Engineering (approved November 7, 2006) and Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1 (approved September 7, 2017)

Core Engineering Group has an approved MDDP for Lorson Ranch, which covers this study area for major infrastructure. The major infrastructure in the MDDP includes storm sewer in Fontaine Boulevard and relocation of the FMIC irrigation ditch which was constructed in 2006 conforming to the MDDP for Lorson Ranch. Other major infrastructure improvements constructed to serve this site include Pond G1/G2 constructed as part of Carriage Meadows South at Lorson Ranch Filing No. 1. Pond G1/G2 is an offsite full spectrum detention pond constructed in 2017 and included detention and water quality provisions that serve Village at Lorson Ranch.

The Village at Lorson Ranch is located within the ***"Jimmy Camp Creek Drainage Basin"***, which is a fee basin in El Paso County. Jimmy Camp Drainage Basin has recently been updated to be a closed basin within Lorson Ranch which is further discussed in the drainage fee section of this report.

2.0 DRAINAGE CRITERIA

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

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

Current updates to the Drainage Criteria manual for El Paso County states the if detention is necessary, Full Spectrum Detention will be included in the design, based on this criteria, Full Spectrum Detention will not be required for this development.

3.0 EXISTING HYDROLOGICAL CONDITIONS

This site is currently undeveloped with native vegetation (grass with no shrubs) and gentle slopes in a southerly direction to the north side of Fontaine Boulevard.

The Soil Conservation Service (SCS) classifies the soils within the Village at Lorson Ranch property as Manzanst clay loam and Ellicot loamy coarse sand. The clay loam is considered to be hydrologic soil group C and the sandy loams are considered hydrologic soil group A (see table 3.1 below). The clay loams are difficult to vegetate and comprise of the majority of the study area. These soils can be mitigated easily by limiting their use as topsoil since they this is a commercial site and most areas will be paved or landscaped with rock bedding.

Table 3.1: SCS Soils Survey for the Study Area

Soil No.	Soil	Hydro. Group	Shrink/Swell Potential	Permeability	Surface Runoff Potential	Erosion Hazard
28	Ellicott Loamy Coarse Sand (0.8%)	A	Low	Moderate	Medium	Moderate
52	Manzanst Clay Loam (2.2%)	C	High	Slow	Medium	Moderate

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

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

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

Basin EX1

This existing basin consists primarily of flows from the existing FMIC channel, a majority of these flows are from the offsite area west of the channel. Runoff from basin EX1 flows to the existing FMIC channel, then continues west toward Carriage Meadows Drive. The existing runoff from this 0.95 acre basin is 0.3cfs and 1.6cfs for the 5-year and 100-year events. No other runoff is directed to this basin.

The FMIC historically consisted of an open channel from Cottonwood Meadows to Jimmy Camp Creek (culvert under Marksheffel). Upon development of Lorson Ranch in 2007, a 48" pipe was installed from Cottonwood Meadows west and under Marksheffel Road. The 48" pipe carries FMIC water (50cfs) and stormwater to the east side of Marksheffel Road where a reconstructed open channel directs water east to Carriage Meadows Drive. In addition, this open channel section is designed to handle runoff from the full buildout of Marksheffel Road which is carried in a 30" RCP under Marksheffel Road. The 30" RCP is located directly north of the 48" FMIC pipe. Stormwater and FMIC water (113cfs & 214cfs in 5/100 year storm) travels east to Carriage Meadows Drive where a diversion structure and a box culvert effectively separate stormwater from FMIC water. The diversion structure is a 25' D-10-R inlet with a 1.5' opening and the box culvert is a 3x4 culvert with a gate to regulate or shut off flow. During times of FMIC operation, the gate is adjusted so that only the FMIC water is allowed to pass east in the FMIC channel. Additional runoff at this gate will pond up and flow into the 25' diversion structure. During times the FMIC is not operating, the gate is closed which forces all runoff into the 25' diversion structure. The outlet structure is drained by a 48" RCP that flows east under Carriage Meadows Drive. A 60" RCP at 0.95% slope continues east and outlets directly into Jimmy Camp Creek with a capacity of 270cfs. Just north of the 60" RCP, a 36" stub has been constructed to accept flows from a WQ basin in the Carriage

Meadows residential areas. This entire system is in place and has been fully operational since August, 2006.

Basin EX2
This existing basin consists of on-site undeveloped basin located approximately 100' east of Marksheffel Road, south of and adjacent to the existing FMIC channel, and north of Fontaine Boulevard. This basin has moderate slopes and flows overland south downstream to Fontaine Boulevard, then to an existing 34"x53" HERCP storm sewer that routes runoff southerly under Fontaine Boulevard. The total pre-developed flow from this 8.44 acre basin is 3.4cfs and 19.0cfs in the 5 and 100-year storm events.

Basin EX3
Basin EX3 is a self-contained basin and does not accept any offsite flows. Surface flows are FROM Marksheffel Road and are directed to an existing drainage swale that flows in a southerly-southwesterly direction to an existing 18" RCP, these flows are then routed within this existing 18" RCP to the aforementioned existing 34"x53" HERCP that flows southerly under Fountain Boulevard. The existing runoff from this 0.73 acre site is 0.4cfs and 2.4cfs for the 5-year and 100-year events.

Basin EX4
Basin EX4 consists of the west half of Carriage Meadows Drive, a developed north-south road. Flow is directed westerly to the existing curb and gutter, then continues southerly to an existing 5' Type "R" inlet. This inlet is located on west side of Carriage Meadows Drive, at the northwest corner of Fountaine Boulevard and Carriage Meadows Drive. Flow is routed westerly from this inlet to the aforementioned 34"x53" HERCP via an existing 30" RCP. The existing runoff from this 0.57 acre site is 2.6cfs and 4.7cfs for the 5-year and 100-year events.

4.0 DEVELOPED HYDROLOGICAL CONDITIONS

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

Soil types A/B & C/D have been assumed for the developed hydrologic conditions. See Appendix A for SCS Soils Map.

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

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

Drainage for the site was divided into 8 proposed basins and 3 existing basins. Runoff coefficients for the 5/100-year events are 0.83 and 0.90 respectively. This is a commercial site, and most areas will be paved or landscaped with rock bedding. Analysis for each of the basins are briefly discussed as follows:

Basins EX1, EX3 & EX4
These offsite basins have been discussed in the existing Hydrological Conditions portion of this report, any additional discussion is not required.

Basin PR1
This basin consists of a commercial area, surface runoff will be directed to a future 10' Type "R" inlet in a sump condition at the southwest corner of this basin. Runoff from this inlet, (design point #7) will be conveyed westerly via proposed 18" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 1.24 acre basin is 5.3cfs for the 5-year storm event and 9.7cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR2
This basin consists of a commercial area, surface runoff will be directed to a proposed 20' Type "R" inlet in a sump condition at the south-center part of this basin. Runoff from this inlet, (design point #1) will be conveyed southerly by a proposed 24" RCP, then easterly via proposed 36" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 2.41 acre basin is 9.4cfs for the 5-year storm event and 17.0cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR3
This basin consists of a commercial area and street, surface runoff will be directed to a proposed 5' Type "R" inlet in a sump condition at the south-center portion of this basin. Runoff from this inlet, (design point #1a) will be conveyed southerly by a proposed 24" RCP, then easterly via proposed 36" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 0.11 acre basin is 0.5cfs for the 5-year storm event and 0.9cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR4
This basin consists of a commercial area, surface runoff will be directed to a proposed continuous on-grade 10' Type "R" inlet at the southeast corner of this basin. Runoff from this inlet, (design point #4) will be conveyed easterly via proposed 24" and 36" RCP to the previously mentioned existing 34"x53" HERCP. Developed flow from this 1.68 acre basin is 7.2cfs for the 5-year storm event and 13.1cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR5
This basin consists of a fast-food type of commercial area, surface runoff from this basin is directed southerly, then easterly to a proposed 5' Type "R" inlet in a sump condition at the southeast corner of this basin. Runoff from this inlet, (design point #5) is routed by a proposed 24" RCP to the previously discussed proposed 36" RCP then continues easterly to the previously mentioned existing 34"x53" HERCP. Developed flow from this 0.39 acre basin is 1.7cfs for the 5-year storm event and 3.0cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR6
This basin consists of a fast-food type of commercial area, surface runoff from this basin is directed easterly and southerly to a proposed 10' Type "R" inlet in a sump condition at the southeast corner of this basin. Runoff from this inlet, (design point #3) is routed southeasterly by a proposed 24" RCP to the previously discussed proposed 36" RCP then continues easterly to the existing 34"x53" HERCP. Developed flow from this 0.72 acre basin is 3.1cfs for the 5-year storm event and 5.6cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR7
This basin consists of a fast-food type of commercial area, surface runoff from this basin is directed southerly to a future 10' Type "R" inlet in a sump condition at the south-center portion of this basin. Runoff from this inlet, (design point #8a) is routed by proposed 24" RCP's southwesterly and westerly to the existing 34"x53" HERCP. Developed flow from this 1.41 acre basin is 6.0cfs for the 5-year storm event and 11.0cfs for the 100-year storm event. See the appendix for detailed calculations.

Basin PR8

This basin consists of parking for a fast-food type of commercial area, surface flow from this basin is directed northerly to a proposed 5' Type "R" inlet in a sump condition at the north-center portion of this basin. Runoff from this inlet, (design point #8) is routed westerly by proposed 24" RCP to the existing 34"x53" HERCP. Developed flow from this 0.22 acre basin is 0.9cfs for the 5-year storm event and 1.7cfs for the 100-year storm event. See the appendix for detailed calculations.

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

5.0 HYDRAULIC SUMMARY

The sizing of the hydraulic structures was prepared by using the *StormSewers* 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 parking area curb/gutter and storm sewer to convey runoff to an existing storm sewer system, then to the existing detention and water quality pond, this pond has been adequately sized to accept the developed flow from this development. Flows will then outlet to the East Tributary of Jimmy Camp Creek. Inlet size and location are shown on the storm sewer layout in the appendix. See the appendix for detailed 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
2.7%	14.7	40.6	18.4	45.0	18.4	45.0
3.0%	15.5	39.0	17.7	43.2	17.8	43.2
3.5%	16.7	37.2	16.9	41.3	17.0	41.3
4.0%	17.9	35.7	16.2	39.7	16.3	39.7
4.5%	19.0	34.5	15.7	38.3	15.7	38.3
5.0%	19.9	33.4	15.2	37.1	15.2	37.1

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

Design Point 1

Design Point 1 is located on the north side of Street B and accepts developed flows from Basin PR2. The runoff will be conveyed to Design Point 1 via curb/gutter. The street capacity of Street B (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR2 **Inlet/MH Number:** Inlet DP1
Upstream flowby: **Total Street Flow:** 9.4cfs

Flow Intercepted: 9.4cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 20' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay half flow from each side

(100-year storm)

Tributary Basins: PR2 **Inlet/MH Number:** Inlet DP1
Upstream flowby: **Total Street Flow:** 17.0cfs

Flow Intercepted: 17.0cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 20' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 1a

Design Point 1a is located on the south side of Street B and accepts developed flows from Basin PR3. The runoff will be conveyed to Design Point 1a via curb/gutter. The street capacity of Street B (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR3 **Inlet/MH Number:** Inlet DP1a
Upstream flowby: **Total Street Flow:** 0.5cfs

Flow Intercepted: 0.5cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay half flow from each side

(100-year storm)

Tributary Basins: PR3 **Inlet/MH Number:** Inlet DP1a
Upstream flowby: **Total Street Flow:** 0.9cfs

Flow Intercepted: 0.9cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 2

Design Point 2 is located on the south side of Street B and is the total pipe flow from Des. Pts 1 & 1a. The runoff will be conveyed to Design Point 3 via a 24" storm sewer. The total pipe flow is 9.8cfs/17.8cfs in the 5/100-year storm events.

Design Point 3

Design Point 3 is located on the north side of an access street and accepts developed flows from Basin PR6. The runoff will be conveyed to Design Point 3 via curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR6 **Inlet/MH Number:** Inlet DP3
Upstream flowby: **Total Street Flow:** 3.1cfs

Flow Intercepted: 3.1cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 10' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR6 **Inlet/MH Number:** Inlet DP3
Upstream flowby: **Total Street Flow:** 5.6cfs

Flow Intercepted: 5.6cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 10' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 3a

Design Point 3a is located on the north side of an access street and is the total pipe flow from Des. Pts 2 & 3. The runoff will be conveyed to Design Point 6 via a 24" storm sewer. The total pipe flow is 12.5cfs/22.8cfs in the 5/100-year storm events.

Design Point 4

Design Point 4 is located on the south side of an access street and accepts developed flows from Basin PR4. The runoff will be conveyed to Design Point 4 via curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR4 **Inlet/MH Number:** Inlet DP4
Upstream flowby: **Total Street Flow:** 7.2cfs

Flow Intercepted: 5.9cfs **Flow Bypassed:** 1.3cfs
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR4 **Inlet/MH Number:** Inlet DP4
Upstream flowby: **Total Street Flow:** 13.1cfs

Flow Intercepted: 8.1cfs **Flow Bypassed:** 5.0cfs
Inlet Size: 10' type R, on-grade

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 5

Design Point 5 is located on the south side of an access street and accepts developed flows from Basin PR5. The runoff will be conveyed to Design Point 5 via curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR5 **Inlet/MH Number:** Inlet DP5
Upstream flowby: 1.3cfs from DP4 **Total Street Flow:** 1.7+1.3=3.0cfs

Flow Intercepted: 3.0cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR5 **Inlet/MH Number:** Inlet DP5
Upstream flowby: 5.0cfs from DP4 **Total Street Flow:** 5.0+3.0=8.0cfs

Flow Intercepted: 8.0cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 5a

Design Point 5a is located on the south side of an access street and is the total pipe flow from Des. Pts 4 & 5. The runoff will be conveyed to Design Point 6 via a 24" storm sewer. The total pipe flow is 8.9cfs/16.1cfs in the 5/100-year storm events.

Design Point 6

Design Point 6 is located on the south side of an access street and is the total pipe flow from Des. Pts 3a & 5a. The runoff will be conveyed to Design Point 6 via a 24" storm sewer. The total pipe flow is 20.5cfs/37.3cfs in the 5/100-year storm events.

Design Point 7

Design Point 7 is located on the east end of an access street and accepts developed flows from Basin PR1 which will be developed in the future. The runoff will be conveyed to Design Point 7 via future curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded. A future inlet will be constructed at this design point when the adjacent lot is developed.

(5-year storm)

Tributary Basins: PR1 **Inlet/MH Number:** future Inlet DP7
Upstream flowby: **Total Street Flow:** 5.3cfs

Flow Intercepted: 5.3cfs **Flow Bypassed:** 0.0cfs
Inlet Size: future 10' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR1 **Inlet/MH Number:** future Inlet DP7
Upstream flowby: **Total Street Flow:** 9.7cfs

Flow Intercepted: 9.7cfs **Flow Bypassed:** 0.0cfs
Inlet Size: future 10' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 8

Design Point 8 is located on the east end of an access street and accepts developed flows from Basin PR8 which will be developed in the future. The runoff will be conveyed to Design Point 8 via future curb/gutter. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded.

(5-year storm)

Tributary Basins: PR8 **Inlet/MH Number:** Inlet DP8
Upstream flowby: **Total Street Flow:** 0.9cfs

Flow Intercepted: 0.9cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, sump

Street Capacity: Street slope = 0.9%, capacity = 8.0cfs, okay

(100-year storm)

Tributary Basins: PR8 **Inlet/MH Number:** Inlet DP8
Upstream flowby: **Total Street Flow:** 1.7cfs

Flow Intercepted: 1.7cfs **Flow Bypassed:** 0.0cfs
Inlet Size: 5' type R, SUMP

Street Capacity: Street slope = 0.9%, capacity = 35.4cfs (half street) is okay

Design Point 8a
Design Point 8a is located on the east end of an access street and accepts developed flows from Basin PR7 which will be developed in the future. The runoff will be conveyed to Design Point 8a via future curb/gutter. The total surface flow is 6.0cfs/11.0cfs in the 5/100-year storm events. The street capacity of the access street (Res. Local, 8.5/35.4cfs at 0.9% slope) is not exceeded. A future inlet will be constructed at this design point when the adjacent lot is developed.

Design Point 9
Design Point 9 is located on the south side of an access street and is the total pipe flow from Des. Pts 7, 8 & 8a. The runoff will be conveyed to Design Point 10 via a 24" storm sewer. The total pipe flow is 12.2cfs/22.4cfs in the 5/100-year storm events.

Design Point 10
Design Point 10 is located on the south side of an access street and is the total pipe flow from Des. Pts 6 & 9. The runoff will be conveyed to an existing 34"x53" HERCP. The total pipe flow is 31.5cfs/57.3cfs in the 5/100-year storm events. The allowable flow into the existing HERCP is 32.2cfs/59.0cfs per the Carriage Meadows North FDR and the Fontaine Blvd. Phase 1 FDR.

6.0 DETENTION AND WATER QUALITY PONDS

Detention and Storm Water Quality for Village at Lorson Ranch will be provided for in existing Pond G1/G2 located south of Fontaine Boulevard. Pond G1/G2 is an existing full spectrum detention pond constructed in 2017 as part of the Carriage Meadows South at Lorson Ranch Filing No. 1 subdivision (SF 1711) per El Paso County criteria. Pond G1/G2 was as-builted and certified on June 27, 2023 by Core Engineering Group. A copy of the certification letter, as-builts, and a pond drainage area map are located in the appendix of this report.

For additional information, see the approved Final Drainage Report and Plan for "Carriage Meadows South at Lorson Ranch Filing No. 1, SF 1711, dated 08/10/2017.

The following text was taken from the Carriage Meadows South final drainage report:

Detention Pond G1/G2 (Full Spectrum Design), (District Facility, SF1711)
This is an on-site permanent full spectrum detention pond that includes water quality. Pond G1/G2 is designed as a single pond in the UDCF Full Spectrum spreadsheets. The full spectrum print outs are in the appendix of this report. See map in appendix for watershed areas. This pond is sized to provide full spectrum and water quality for the Brownsville Subdivision No. 2 should it become a part of Lorson Ranch.

- Watershed Ares: 96 acres
- Watershed Imperviousness: 79%
- Hydrologic Soils Group A, B, C/D
- Zone 1 WQCV: 2.301 ac-ft, WSEL: 5683.93
- Zone 2 EURV: 8.104 ac-ft, WSEL: 5686.29
- Zone 3 (100-yr): 12.881ac-ft, WSEL: 5687.93
- Pipe Outlet: 36" RCP at 0.4%
- 5-yr outflow = 4.2cfs, 100-yr outflow = 55.6cfs

7.0 DRAINAGE AND BRIDGE FEES

Village at Lorson Ranch is located within the Jimmy Camp Creek drainage basin which is currently a fee basin in El Paso County. Current El Paso County regulations require drainage and bridge fees to be paid for platting of land as part of the plat recordation process. Lorson Ranch initiated the closure of Jimmy Camp Creek drainage basin for drainage/bridge fees a few years ago and was recently approved by El Paso County and the Pikes Peak Drainage Board. Therefore, no drainage fees or bridge fees are required to be paid at this time. A copy of the drainage board meeting minutes is in the appendix of this report.

Table 7.1: Private Drainage Facility Costs (non-reimbursable)

Item	Quantity	Unit	Unit Cost	Item Total
5' Inlet	3	EA	$5,000/EA	$15,000
10' Inlet	4	EA	$8,000/EA	$32,000
20' Inlet	1	EA	$12,000/EA	$12,000
18" Storm	206	LF	$180	$37,080
24" Storm	351	LF	$240	$84,240
36" Storm	73	LF	$360	$26,280
Manholes	2	EA	$10,000	$20,000
			Subtotal	$226,600
			Eng/Cont (10%)	$22,660
			Total Est. Cost	$249,260

8.0 FOUR STEP PROCESS

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

Step 1: Employ Runoff Reduction Practices

Village at Lorson Ranch has employed several methods of reducing runoff.

- The street configuration was laid out to minimize the length of streets. Many streets are straight and perpendicular resulting in lots with less wasted space. Landscape buffers are provided for adjacent residential development
- Construct one Full Spectrum Detention Outlet Structure (Pond G1/G2). The full spectrum detention mimics existing storm discharges and includes water quality.

Step 2: Stabilize Drainageways

Jimmy Camp Creek is a major drainageway located east of this site. In 2006 Jimmy Camp Creek was reconstructed and stabilized per county criteria. The design included a natural sand bottom and armored sides.

Step 3: Provide Water Quality Capture Volume

Treatment of the water quality capture volume (WQCV) is required for all new developments. Village at Lorson Ranch utilizes an existing full spectrum stormwater extended detention basin outlet structure within existing Pond G1/G2 which include Water Quality Volumes and WQ outlet structures.

Step 4: Consider Need for Industrial and Commercial BMP's

There are no industrial areas within this site. This site is commercial but will be mostly light use commercial areas such as restaurants, gas station, mini storage, etc which does not need specific BMP's.

9.0 CONCLUSIONS

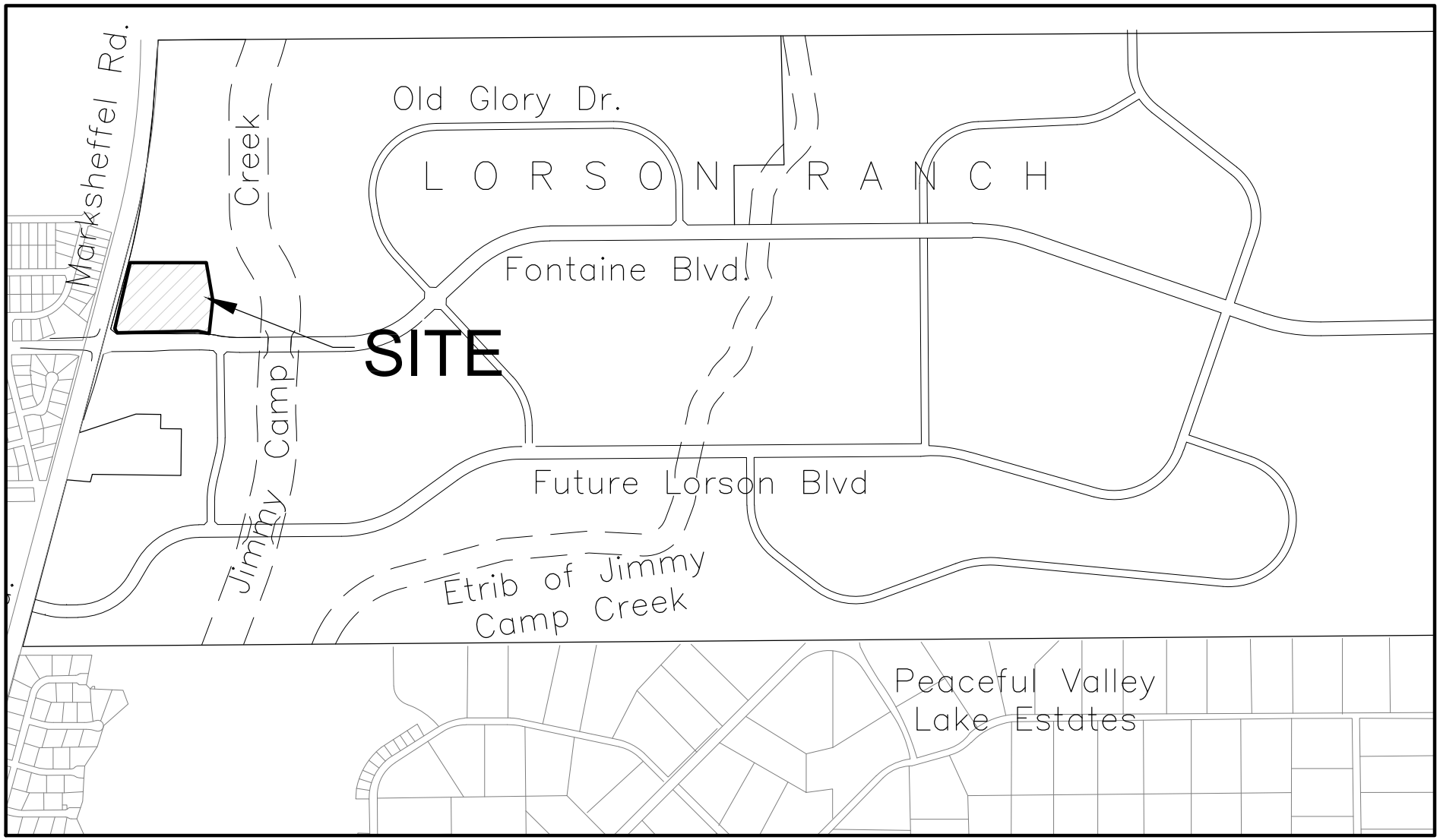
This drainage report has been prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. The proposed development and drainage infrastructure will not cause adverse impacts to adjacent properties or properties located downstream. Several key aspects of the development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

- Developed runoff will be conveyed via curb/gutter and storm sewer facilities
- Jimmy Camp Creek has been reconstructed east of this study area
- Detention and water quality for this site will be provided.

10.0 REFERENCES

1. City of Colorado Springs/El Paso County Drainage Criteria Manual DCM, dated November, 1991
2. Soil Survey of El Paso County Area, Colorado by USDA, SCS
3. Jimmy Camp Creek Drainage Basin Planning Study, Dated March 9, 2015, by Kiowa Engineering Corporation
4. City of Colorado Springs "Drainage Criteria Manual, Volume 2
5. El Paso County "Engineering Criteria Manual"
6. Lorson Ranch MDDP 1, November 7, 2006 by Pentacor.
7. El Paso County Resolution #15-042, El Paso County adoption of Chapter 6 and Section 3.2.1 of the City of Colorado Springs Drainage Criteria Manual dated May, 2014.
8. Final Drainage Report for Fontaine Boulevard Phase 1 Improvements prepared by Pentacor, dated November, 2006
9. Final Drainage Report for Carriage Meadows South at Lorson Ranch Filing No. 1 prepared by Core Engineering Group, Reference SF1711, approved September 7, 2017
10. Final Drainage Report for Carriage Meadows North prepared by Core Engineering Group, Reference SF1723, approved April 12, 2018

APPENDIX A – VICINTIY MAP, SOILS MAP, FEMA MAP



VICINITY MAP
NO SCALE

CORE
ENGINEERING GROUP

15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.659-7800

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

VILLAGE AT LORSON RANCH FIL. NO. 1
VICINITY MAP

SCALE:	DATE:	FIGURE NO.
NTS	APRIL, 2024	--

National Flood Hazard Layer FIRMette

FEMA

104°39'11"W 38°44'32"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

104°38'34"W 38°44'4"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/16/2024 at 2:56 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Soil Map—El Paso County Area, Colorado
(Villages at Lorson Ranch)

Map Scale: 1:1,370 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

El Paso County Area, Colorado

28—Ellicott loamy coarse sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 3680
Elevation: 5,500 to 6,500 feet
Mean annual precipitation: 13 to 15 inches
Mean annual air temperature: 47 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Ellicott and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ellicott

Setting

Landform: Stream terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium

Typical profile

A - 0 to 4 inches: loamy coarse sand
C - 4 to 60 inches: stratified coarse sand to sandy loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A
Ecological site: R069XY031CO - Sandy Bottomland
Other vegetative classification: SANDY BOTTOMLAND (069AY031CO)
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquoll
Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

Other soils
Percent of map unit: 1 percent
Hydric soil rating: No

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

El Paso County Area, Colorado

52—Manzanst clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w4nr
Elevation: 4,060 to 6,660 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 130 to 170 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Manzanst and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manzanst

Setting

Landform: Drainageways, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave, linear
Parent material: Clayey alluvium derived from shale

Typical profile

A - 0 to 3 inches: clay loam
Bt - 3 to 12 inches: clay
Btk - 12 to 37 inches: clay
Bk1 - 37 to 52 inches: clay
Bk2 - 52 to 79 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Gypsum, maximum content: 3 percent
Maximum salinity: Slightly saline (4.0 to 7.0 mmhos/cm)
Sodium adsorption ratio, maximum: 10.0
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 4c

Hydrologic Soil Group: C
Ecological site: R067BY037CO - Saline Overflow
Hydric soil rating: No

Minor Components

Ritoazul
Percent of map unit: 7 percent
Landform: Interfluves, drainageways
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY042CO - Clayey Plains
Hydric soil rating: No

Arvada
Percent of map unit: 6 percent
Landform: Interfluves, drainageways
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY033CO - Salt Flat
Hydric soil rating: No

Wiley
Percent of map unit: 2 percent
Landform: Interfluves
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R067BY002CO - Loamy Plains
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 20, Sep 2, 2022

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- 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

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 2018

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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	0.1	1.2%
52	Manzanst clay loam, 0 to 3 percent slopes	8.5	98.8%
Totals for Area of Interest		**8.6**	**100.0%**

APPENDIX B – HYDROLOGY CALCULATIONS

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR
Design Storm: **5 - Year Event (Current)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
EX1			0.95	0.15	40.3	0.14	2.04	0.3													
EX2			8.44	0.15	26.4	1.27	2.68	3.4													
EX3			0.73	0.15	11.1	0.11	3.98	0.4													
EX4			0.57	0.90	5.0	0.51	5.17	2.6													

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR
Design Storm: **100-Year Event (Current)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street		Pipe			Travel Time			Remarks
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope	Street Flow	Design Flow	Slope	Pipe Size	Length	Velocity	t_t	
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	%	in	ft	ft/sec	min	
EX1			0.95	0.50	40.3	0.48	3.42	1.6													
EX2			8.44	0.50	26.4	4.22	4.49	19.0													
EX3			0.73	0.50	11.1	0.37	6.68	2.4													
EX4			0.57	0.96	5.0	0.55	8.68	4.7													

2 10 10 15 15 15 15 15 15 28

CORE ENGINEERING GROUP

15004 1st Avenue South
Burnsville, MN 55306

PROJECT NAME: *Village at Lorson Ranch FDR*
PROJECT NUMBER: *100.070*
ENGINEER: *LAB*
DATE: *April, 2024*

Master Development Drainage Plan
CURRENT CONDITIONS COEFFICIENT "C" CALCULATIONS

BASIN	Soil No.	Hydro Group	Area	Cover (%)	C5	Wtd. C5	C100	Wtd. C100	CN	Wtd. CN	Impervious	Type of Cover
EX1	52	C	0.95	100.00%	0.15		0.50		51		0%	Pasture/Meadow
EX2	52	C	8.44	100.00%	0.15		0.50		51		0%	Pasture/Meadow
EX3	52	C	0.76	100.00%	0.15		0.50		51		0%	Pasture/Meadow
EX4	52	C	0.66	100.00%	0.90		0.96		51		100%	Paved Road

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Current

Calculated By: Leonard Beasley
Date: Feb. 15, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR

Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_t minutes	Computed t_c Minutes	USDCM Recommended $t_c=t_i+t_t$ (min)
EX1	0.15	0.95	15.0	51.00	10.78%	0.15	5.59	1398.00	0.20%	0.67	34.73	40.32	40.32
EX2	0.15	8.44	7.0	226.00	3.10%	0.21	17.81	229.00	1.31%	0.80	4.76		
			15.0					284.00	0.70%	1.25	3.77	26.35	26.35
EX3	0.15	0.73	15.0	37.00	4.05%	0.09	6.58	442.00	1.20%	1.64	4.48	11.06	11.06
EX4	0.90	0.66	20.0	22.00	2.00%	0.27	1.35	462.00	1.75%	2.65	2.91	4.26	4.26

CORE ENGINEERING GROUP

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

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR
Design Storm: **5 - Year Event (Developed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street				Pipe				
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	$\sum$ (CA)	i	Q	Slope / Pipe Slope	Full Street Max Flow	Max Allow street flow	Street Velocity	Design Pipe Flow	Slope	Pipe Size	Min Pipe Flow	Pipe Velocity
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	min	cfs	%	in	cfs	fps
EX1			0.95	0.15	40.3	0.14	2.04	0.3													
EX3			0.73	0.15	11.1	0.11	3.98	0.4													
EX4			0.57	0.90	5.0	0.51	5.17	2.6													
PR1	**7**		1.24	0.83	5.0	1.03	5.17	5.3													
PR2	**1**		2.41	0.83	6.9	2.00	4.68	9.4													
PR3	**1a**		0.11	0.83	5.0	0.09	5.17	0.5													
(PR2-PR3)	**2**	2.52		0.83					6.9	2.09	4.68	9.8									
PR4	**4**		1.68	0.83	5.0	1.39	5.17	7.2													
PR5			0.39	0.83	5.0	0.32	5.17	1.7													
(PR4-PR5)	**5a**	2.07		0.83					5.0	1.72	5.17	8.9									
PR6 (PR2,PR3&PR6)	**3a**		0.72	0.83	5.0	0.60	5.17	3.1	7.0	2.69	4.66	12.5									
(PR2-PR6)	**6**	5.31		0.83					7.1	4.41	4.65	20.5									
PR7	**8a**		1.41	0.83	5.0	1.17	5.17	6.0													
PR8	**8**		0.22	0.83	5.0	0.18	5.17	0.9													
(PR1,PR7&PR8)	**9**	2.87							5.1	2.38	5.14	12.2									
(PR1-PR8)	**10**	8.18							7.1	6.79	4.64	31.5									

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

CORE ENGINEERING GROUP

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch FDR Design
Storm: **100 - Year Event (Developed)**

Street or Basin	Design Point	Direct Runoff							Total Runoff				Street				Pipe				
		Area Design	Area (A)	Runoff Coeff. (C)	t_c	CA	i	Q	t_c	Σ (CA)	i	Q	Slope / Pipe Slope	Full Street Max Flow	Max Allow street flow	Street Velocity	Design Pipe Flow	Slope	Pipe Size	Min Pipe Flow	Pipe Velocity
			ac.		min.		in/hr	cfs	min		in/hr	cfs	%	cfs	cfs	min	cfs	%	ft	cfs	fps
EX1			0.95	0.50	40.3	0.48	3.42	1.6													
EX3			0.73	0.50	11.1	0.37	6.68	2.4													
EX4			0.57	0.96	5.0	0.55	8.68	4.7													
PR1	**7**		1.24	0.90	5.0	1.12	8.68	9.7													
PR2	**1**		2.41	0.90	6.9	2.17	7.85	17.0													
PR3	**1a**		0.11	0.90	5.0	0.10	8.68	0.9													
(PR2-PR3)	**2**	2.52		0.90					7.0	2.27	7.83	17.8									
PR4	**4**		1.68	0.90	5.0	1.51	8.68	13.1													
PR5			0.39	0.90	5.0	0.35	8.68	3.0													
(PR4-PR5)	**5a**	2.07		0.90					5.0	1.86	8.66	16.1									
PR6 (PR2,PR3&PR6)	**3a**		0.72	0.90	5.0	0.65	8.68	5.6	7.0	2.92	7.83	22.8									
(PR2-PR6)	**6**	5.31		0.90					7.1	4.78	7.81	37.3									
PR7	**8a**		1.41	0.90	5.0	1.27	8.68	11.0													
PR8	**8**		0.22	0.90	5.0	0.20	8.68	1.7													
(PR1,PR7&PR8)	**9**	2.87							5.0	2.58	8.68	22.4									
(PR1-PR8)	**10**	8.18	8.18	0.90	7.1	7.36	7.79	57.3	7.1	7.36	7.79	57.3									

CORE ENGINEERING GROUP

Standard Form SF-1. Time of Concentration-Proposed

Calculated By: Leonard Beasley
Date: April, 2024
Checked By: Leonard Beasley

Job No: 100.070
Project: Village at Lorson Ranch

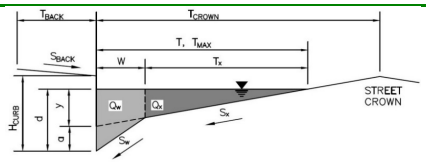
Sub-Basin Data				Initial Overland Time (t_i)				Travel Time (t_t)					t_c Check (urbanized Basins)		Final t_c
BASIN or DESIGN	C_5	AREA (A) acres	NRCS Convey.	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_i minutes	LENGTH (L) feet	SLOPE (S) %	VELOCITY (V) ft/sec	τ_t minutes	Computed t_c Minutes	TOTAL LENGTH (L) feet	Regional tc tc=(L/180)+10 minutes	USDCM Recommended $\tau_c=\tau_i+\tau_t$ (min)
EX1	0.15	0.95	15.0	51.00	10.78%	0.15	5.59	1398.00	0.20%	0.67	34.73	40.32			40.32
EX3	0.15	0.73	15.0	37.00	4.05%	0.09	6.58	442.00	1.20%	1.64	4.48	11.06			11.06
EX4	0.90	0.66	20.0	22.00	2.00%	0.27	1.35	462.00	1.75%	2.65	2.91	4.26			4.26
PR1	0.90	1.24	20.0	15.00	2.00%	0.22	1.12	410.00	1.22%	2.21	3.09	4.21	425.00	12.36	4.21
PR2	0.90	2.41	7.0	36.00	2.00%	0.35	1.73	114.00	1.00%	0.70	2.71				
			20.0					300.00	1.00%	2.00	2.50	6.94	450.00	12.50	6.94
PR3	0.90	0.11	20.0	22.00	2.00%	0.27	1.35	128.00	1.00%	2.00	1.07	2.42	150.00	10.83	2.42
PR4	0.90	1.68	20.0	10.00	2.00%	0.18	0.91	597.00	1.60%	2.53	3.93	4.85	607.00	13.37	4.85
PR5	0.90	0.39	20.0	10.00	1.96%	0.18	0.92	353.00	1.60%	2.53	2.33	3.24	363.00	12.02	3.24
PR6	0.90	0.72	20.0	10.00	2.00%	0.18	0.91	368.00	1.34%	2.32	2.65	3.56	378.00	12.10	3.56
PR7	0.90	1.41	20.0	15.00	2.20%	0.23	1.08	320.00	1.56%	2.50	2.14	3.22	335.00	11.86	3.22
PR8	0.90	0.22	20.0	25.00	2.00%	0.29	1.44	108.00	1.56%	2.50	0.72	2.16	133.00	10.74	2.16

APPENDIX C – HYDRAULIC CALCULATIONS

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP1**



Gutter Geometry:

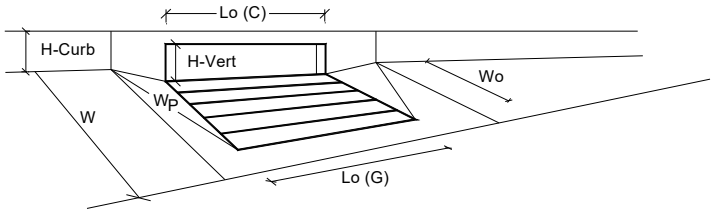
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.018	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	6.9	inches

Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

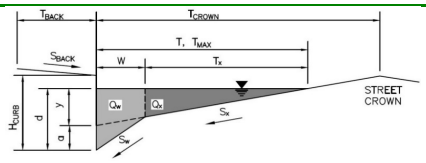
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.41	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.75	0.84	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.8**	**18.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	9.4	17.0	cfs

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP1a**



Gutter Geometry:

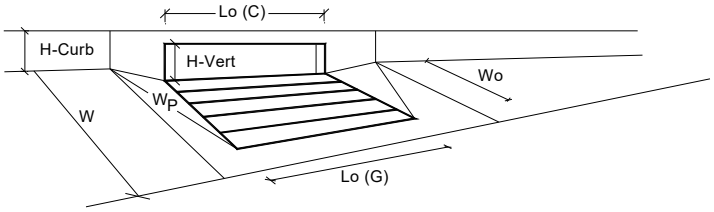
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	34.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	5.6	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
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.5	0.9	cfs

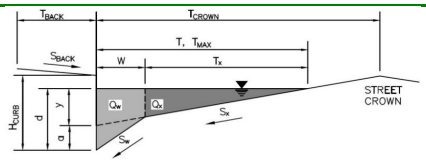
MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Village at Lorson Ranch**

Inlet ID: **Inlet DP3**



Gutter Geometry:

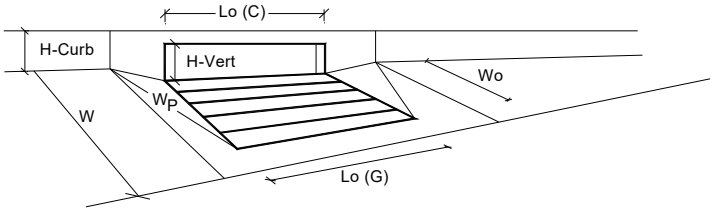
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



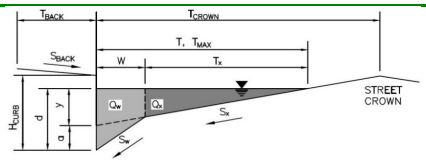
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	5.6	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
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.90	0.91	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**6.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	3.1	5.6	cfs

MHFD-Inlet, Version 5.03 (August 2023)

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP4**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	19.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

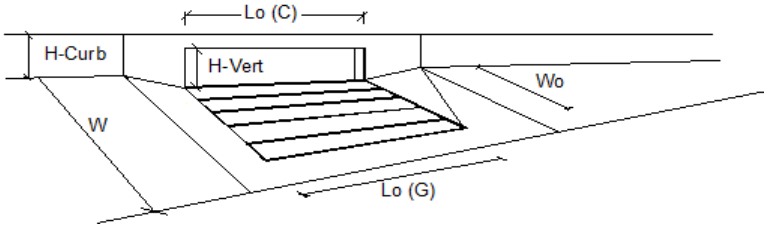
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	19.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**9.7**	**13.1**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 7.20 cfs on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 13.10 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



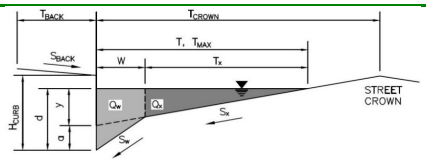
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10	10.10	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f (G) =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f (C) =	0.10	0.10	

Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.9**	**8.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.3**	**5.0**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**81**	**61**	**%**

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP5**



Gutter Geometry:

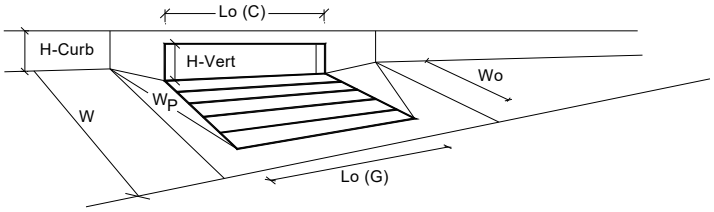
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	5.5	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

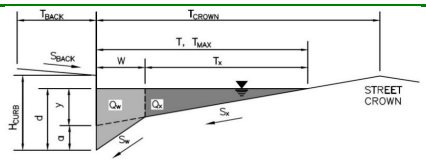


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	7.2	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.43	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**8.0**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	3.0	8.0	cfs

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP7**



Gutter Geometry:

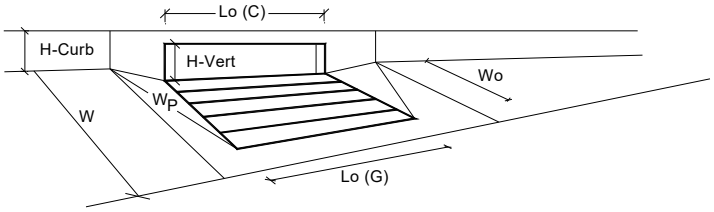
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

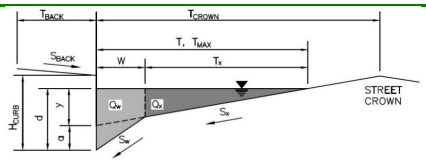


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	6.5	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.38	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.90	0.96	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.6**	**10.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	5.3	9.7	cfs

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

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

Project: **Village at Lorson Ranch**
Inlet ID: **Inlet DP8**



Gutter Geometry:

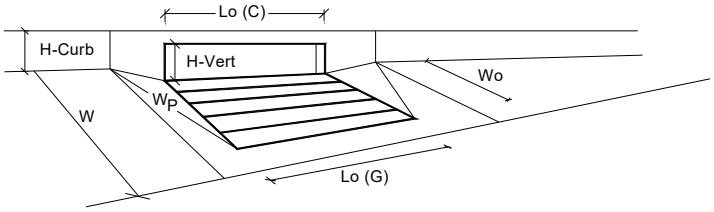
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	10.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	5.5	7.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

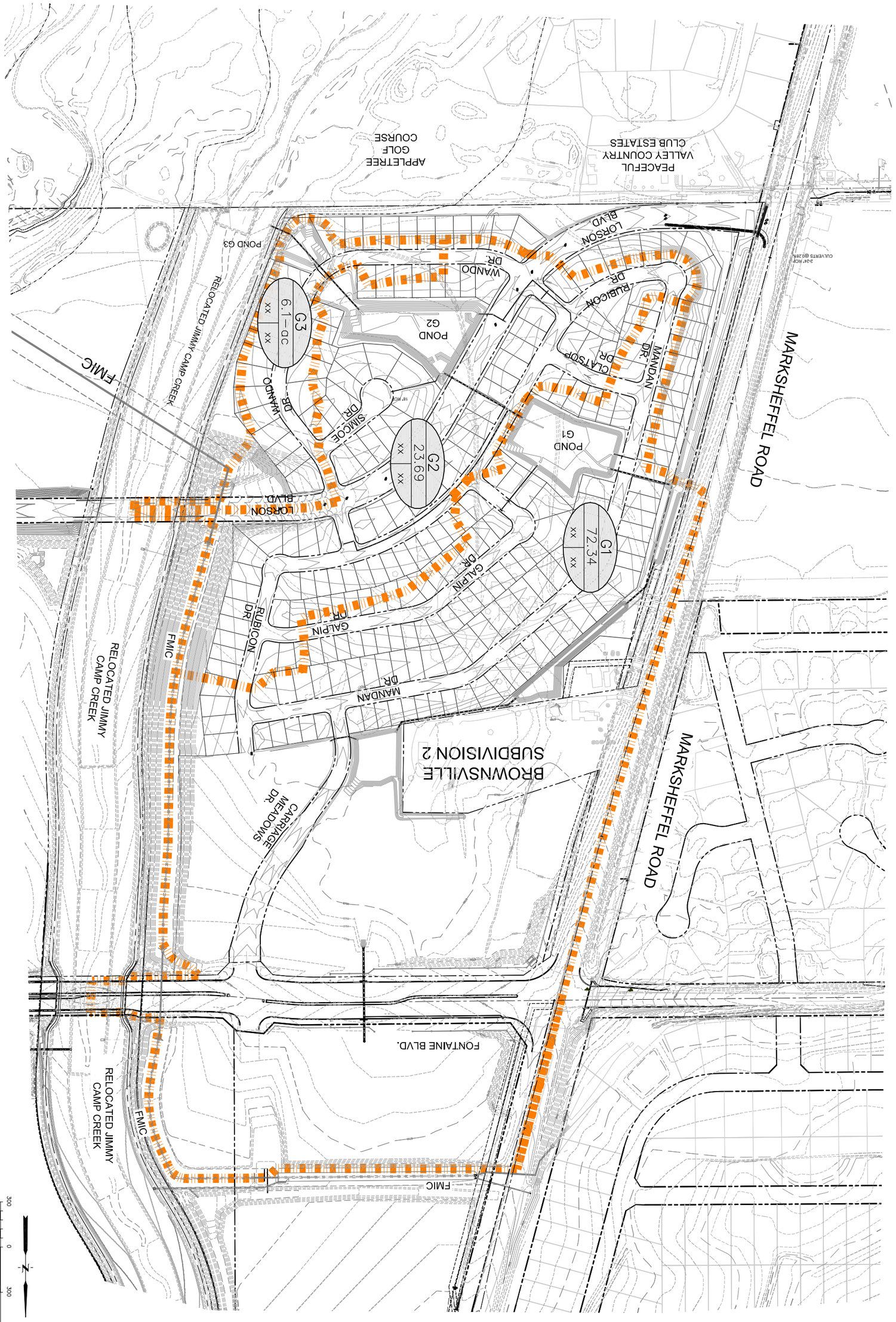
INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.5	5.6	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
Open Area 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	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.29	0.30	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.4**	**4.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	0.9	1.7	cfs

APPENDIX D – POND G1/G2



DETENTION POND WATERSHEDS
DRAINAGE PLAN
CARRIAGE MEADOWS SOUTH

DATE	JANUARY, 2017
PROJECT NO.	100.030
SHEET NUMBER	1
TOTAL SHEETS:	1

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

NO.	DESCRIPTION	DATE

PROJECT:
CARRIAGE MEADOWS SOUTH
FILING NO. 1
FONTAINE BLVD. – OLD GLORY DRIVE
EL PASO COUNTY, COLORADO

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

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

CORE
ENGINEERING GROUP

June 27, 2023

El Paso County Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

RE: Carriage Meadows South Filing No. 1 (SF 17-011)
Certification Letter

Dear El Paso County PCD,

Based upon information gathered from as-built surveys and periodic visits to the project, Core Engineering Group is of the opinion that the subdivision improvements have been constructed in general conformance with the approved design plans as filed with El Paso County.

The site and adjacent properties (as affected by work performed under the County permit) appear to be stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and the improvements (public improvements, common development improvements, site grading and paving) visually appear to meet or exceed the minimum design requirements. There have been some service line utility trench settlements but that is currently being addressed as part of the punchlist process.

The sanitary and watermain located in the public ROW has also been completed in accordance with Widefield Water and Sanitation Districts criteria.

In addition, Core Engineering Group has verified that the Extended Detention Basin/WQ Pond G1, G2, and G3 have been constructed and certified and meet the volume and elevation requirements and have been constructed in general compliance with the approved construction plans. The outlet structure for Pond G3 did change slightly from the design so the full spectrum spreadsheet was updated for this pond and it meets the design output as shown in the approved final drainage report.

Based on information gathered during construction and post-construction, Core Engineering Group is of the opinion that the public streets and storm sewer have been constructed in general accordance with the approved construction documents.

Sincerely,
Core Engineering Group, LLC

COLORADO REGISTERED RICHARD L. SCHINDLER 33997 PROFESSIONAL ENGINEER
7-3-2023

Richard L. Schindler, P.E. 33997

Pond G1/G2, G3 As-builts
Street/storm As-builts

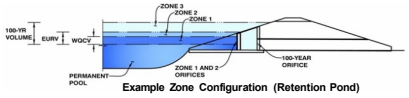
15004 1st Avenue S. • Burnsville, MN 55306
719.659.7800 (ph)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Carriage Meadows South at Lorson Ranch

Basin ID: Full Spectrum Pond G3 - asbuilt



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	6.02	acres
Watershed Length =	790	ft
Watershed Slope =	0.016	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.111	acre-feet
Excess Urban Runoff Volume (EURV) =	0.357	acre-feet
2-yr Runoff Volume (P1 = 1.16 in.) =	0.283	acre-feet
5-yr Runoff Volume (P1 = 1.44 in.) =	0.378	acre-feet
10-yr Runoff Volume (P1 = 1.68 in.) =	0.501	acre-feet
25-yr Runoff Volume (P1 = 1.92 in.) =	0.678	acre-feet
50-yr Runoff Volume (P1 = 2.16 in.) =	0.802	acre-feet
100-yr Runoff Volume (P1 = 2.42 in.) =	0.966	acre-feet
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet
Approximate 2-yr Detention Volume =	0.265	acre-feet
Approximate 5-yr Detention Volume =	0.355	acre-feet
Approximate 10-yr Detention Volume =	0.463	acre-feet
Approximate 25-yr Detention Volume =	0.503	acre-feet
Approximate 50-yr Detention Volume =	0.525	acre-feet
Approximate 100-yr Detention Volume =	0.580	acre-feet

Optional User Override 1-hr Precipitation

1.16	inches
1.44	inches
1.68	inches
1.92	inches
2.16	inches
2.42	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.111	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.246	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.223	acre-feet
Total Detention Basin Volume =	0.580	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{TOTAL}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{MAIN}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{TOTAL}) =	user	acre-feet

asblt orifice=82.94

Depth Increment = 0.1 ft

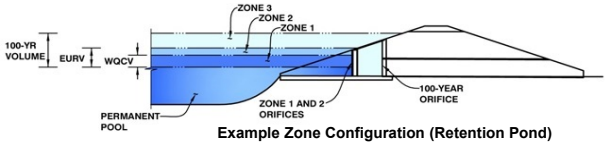
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	50	0.001		
5684	--	1.06	--	--	--	1,284	0.029	694	0.016
5685	--	2.06	--	--	--	5,841	0.134	4,269	0.098
5686	--	3.06	--	--	--	8,575	0.197	11,477	0.263
5687	--	4.06	--	--	--	10,539	0.242	21,034	0.483
5yr=5687.22	--	4.28	--	--	--	10,921	0.251	23,395	0.537
100yr=5687.81	--	4.87	--	--	--	11,948	0.274	30,141	0.692
5688	--	5.06	--	--	--	12,279	0.282	32,443	0.745
5689	--	6.06	--	--	--	14,100	0.324	45,632	1.048

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Carriage Meadows South at Lorson Ranch

Basin ID: Full Spectrum Pond G3 - asbuilt



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.16	0.111	Orifice Plate
Zone 2 (EURV)	3.52	0.246	Rectangular Orifice
Zone 3 (100-year)	4.45	0.223	Weir&Pipe (Restrict)
		0.580	Total

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

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

Calculated Parameters for Underdrain

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	4.236E-03	ft^2
Depth at top of Zone using Orifice Plate =	2.16	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.61	sq. inches (diameter = 7/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.45					
Orifice Area (sq. inches)	0.61	0.61	0.61					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	2.16	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.80	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	2.00	N/A	inches
Vertical Orifice Width =	2.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	0.03	N/A	ft^2
Vertical Orifice Centroid =	0.08	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	5.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.50	N/A	feet
Over Flow Weir Slope Length =	5.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.92	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	14.00	N/A	ft^2
Overflow Grate Open Area w/ Debris =	7.00	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	18.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.77	N/A	ft^2
Outlet Orifice Centroid =	0.75	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.56	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

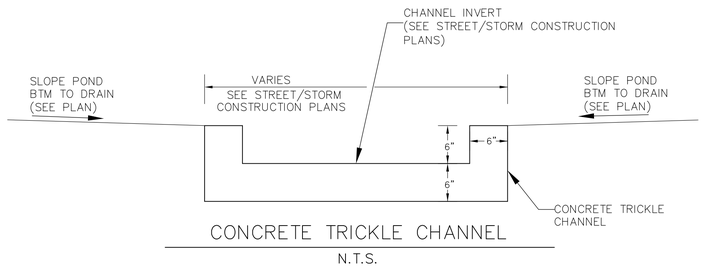
Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.30	feet
Stage at Top of Freeboard =	5.86	feet
Basin Area at Top of Freeboard =	0.32	acres

asblt orifice-82.94

Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.16	1.44	1.68	1.92	2.16	2.42	0.00
Calculated Runoff Volume (acre-ft) =	0.111	0.357	0.283	0.378	0.501	0.678	0.802	0.966	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.110	0.356	0.283	0.377	0.501	0.678	0.802	0.966	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.17	0.57	0.80	1.08	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.1	0.1	1.0	3.5	4.8	6.5	0.0
Peak Inflow Q (cfs) =	1.7	5.4	4.3	5.8	7.6	10.3	12.1	14.6	#N/A
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	2.4	5.5	7.4	10.2	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.3	2.3	1.6	1.5	1.6	#N/A
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.4	0.5	0.7	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	29	42	39	42	42	40	39	37	#N/A
Time to Drain 99% of Inflow Volume (hours) =	31	46	43	47	47	46	45	44	#N/A
Maximum Ponding Depth (ft) =	2.07	3.35	3.01	3.44	3.64	3.76	3.82	3.90	#N/A
Area at Maximum Ponding Depth (acres) =	0.13	0.21	0.19	0.21	0.22	0.23	0.23	0.23	#N/A
Maximum Volume Stored (acre-ft) =	0.098	0.320	0.254	0.342	0.385	0.412	0.426	0.445	#N/A

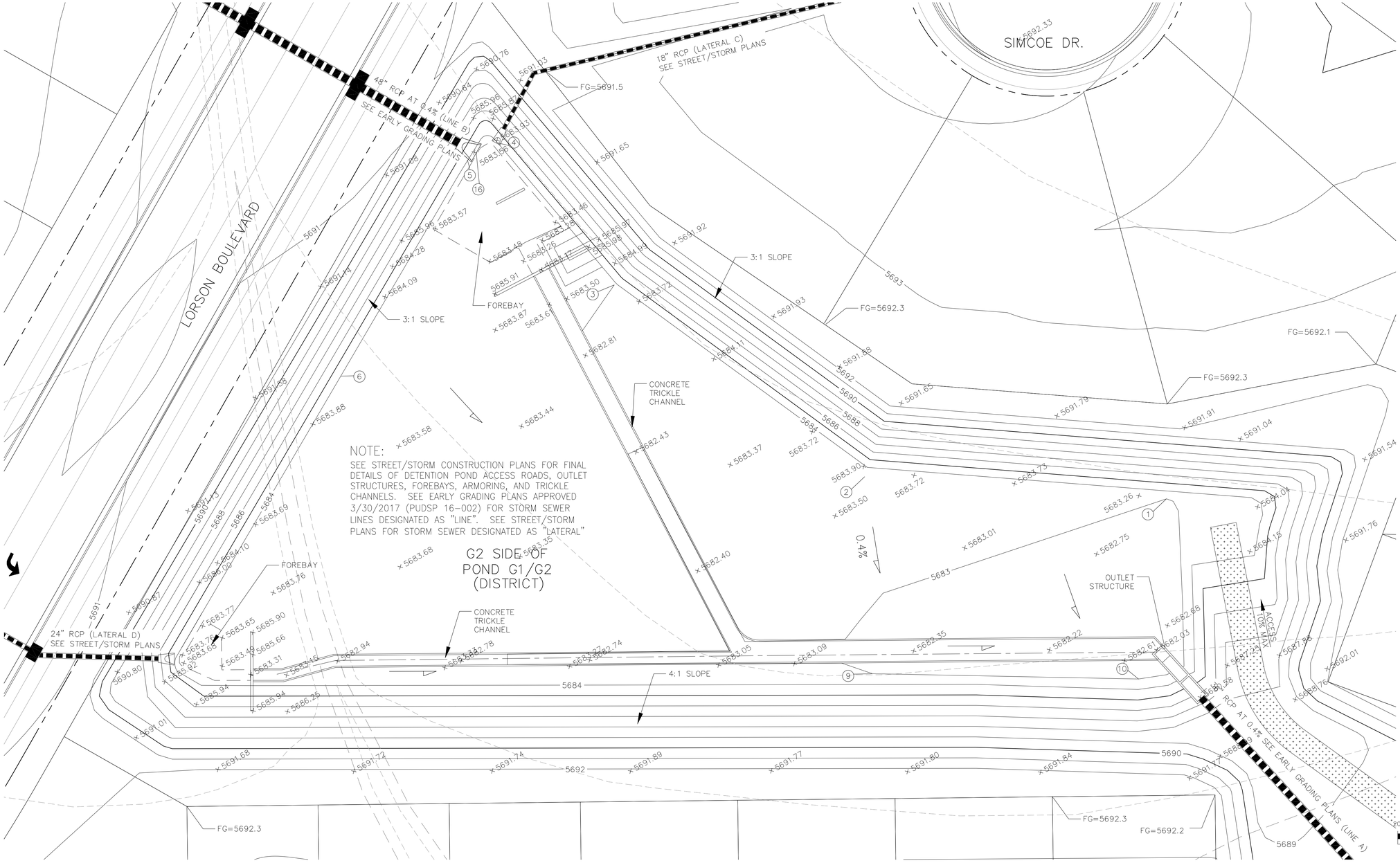


CONCRETE TRICKLE CHANNEL

N.T.S.

POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20426.91	20695.07	5683.00	POND BOTTOM
2	20435.42	20580.07	5683.19	POND BOTTOM
3	20508.55	20484.61	5683.80	POND BOTTOM
4	20562.75	20440.18	5684.00	POND BOTTOM
5	20556.24	20428.64	5684.00	POND BOTTOM
6	20473.78	20380.35	5684.00	POND BOTTOM
9	20360.30	20583.01	5683.00	POND BOTTOM

POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
10	20358.26	20684.49	5683.00	POND BOTTOM
16	20558.92	20432.02	5683.55	INVERT 48" RCP



AS-BUILT

DATE: APRIL 6, 2018

N

20 10 0 20 40

SCALE: 1"=20'

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:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

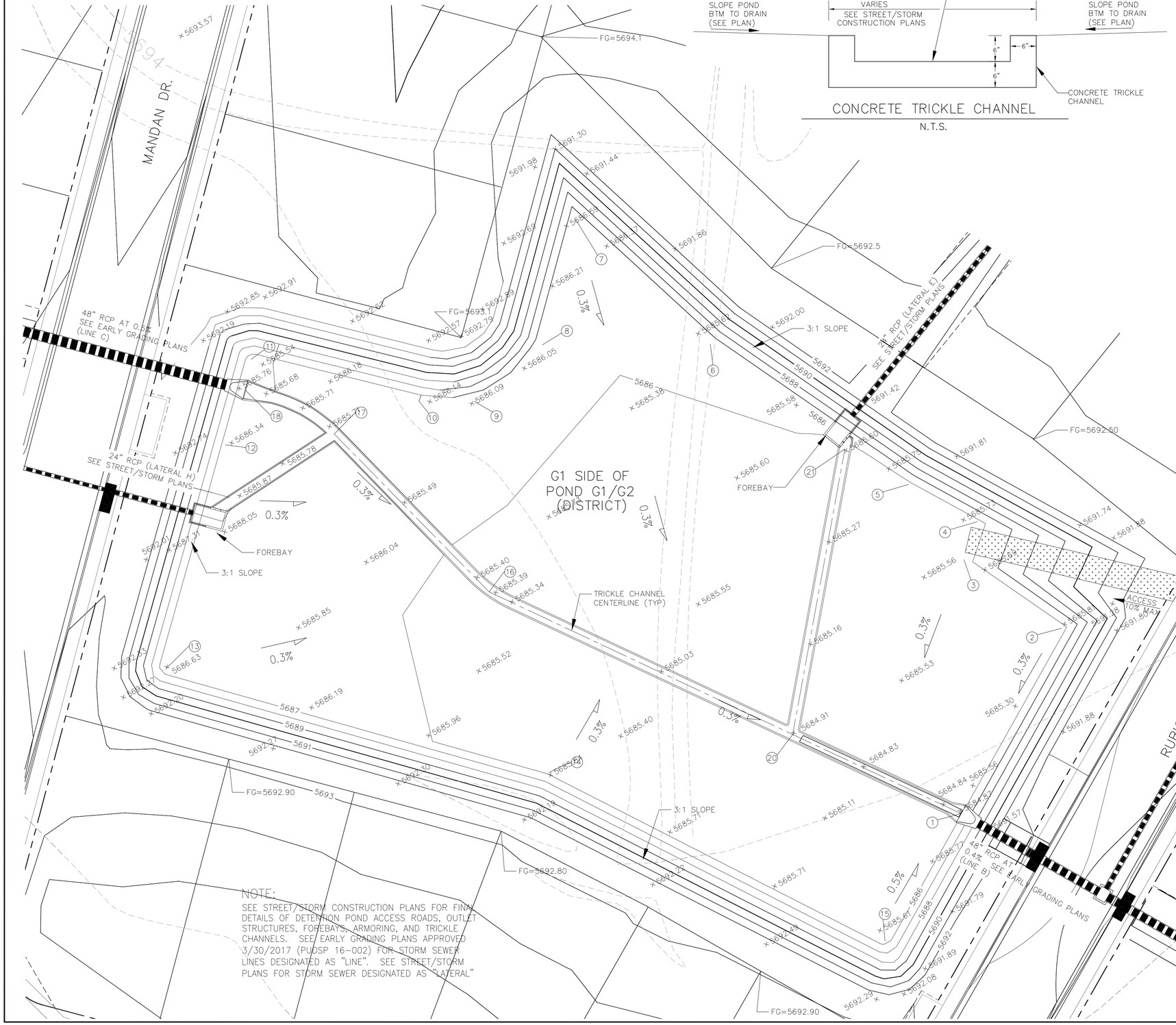
G2 SIDE OF DETENTION POND G1/G2 (DISTRICT) CARRIAGE MEADOWS SOUTH

DATE
AUGUST 10, 2017

PROJECT NO.
100.030

SHEET NUMBER
C4.4

TOTAL SHEETS: 12



CONCRETE TRICKLE CHANNEL

N.T.S.

POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20714.71	20158.47	5684.80	INV 48" RCP (LINE B)
2	20786.15	20197.19	5685.54	POND BOTTOM
3	20812.62	20159.51	5685.65	POND BOTTOM
4	20827.21	20164.67	5685.70	POND BOTTOM
5	20841.64	20138.20	5685.74	POND BOTTOM
6	20895.71	20061.76	5686.10	POND BOTTOM
7	20943.87	20009.80	5686.20	POND BOTTOM
8	20895.38	19997.02	5686.11	POND BOTTOM
9	20873.70	19970.67	5686.17	POND BOTTOM
10	20873.69	19949.53	5686.21	POND BOTTOM
11	20889.83	19884.81	5686.30	POND BOTTOM
12	20856.85	19874.86	5686.55	POND BOTTOM
13	20770.85	19852.26	5686.28	POND BOTTOM
14	20730.51	19999.53	5685.88	POND BOTTOM
15	20665.63	20129.13	5685.60	POND BOTTOM
16	20800.21	19976.50	5685.40	TRICKLE CHANNEL INVERT
17	20861.06	19916.81	5685.66	TRICKLE CHANNEL INVERT
18	20878.04	19882.51	5685.80	INV 48" RCP (LINE C)
20	20745.23	20093.52	5685..01	TRICKLE CHANNEL INVERT
21	20855.30	20113.66	5685.45	TRICKLE CHANNEL INVERT

NOTE:
SEE STREET/STORM CONSTRUCTION PLANS FOR FINAL DETAILS OF DETENTION POND ACCESS ROADS, OUTLET STRUCTURES, FOREBAYS, ARMORING, AND TRICKLE CHANNELS. SEE EARLY GRADING PLANS APPROVED 3/30/2017 (PUDSP 16-002) FOR STORM SEWER LINES DESIGNATED AS "LINE". SEE STREET/STORM PLANS FOR STORM SEWER DESIGNATED AS "LATERAL"

AS-BUILT
DATE: APRIL 6, 2018

-N-

20 10 0 20 40
SCALE: 1"=20'

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

DESCRIPTION | DATE | NO.

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

PROJECT:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

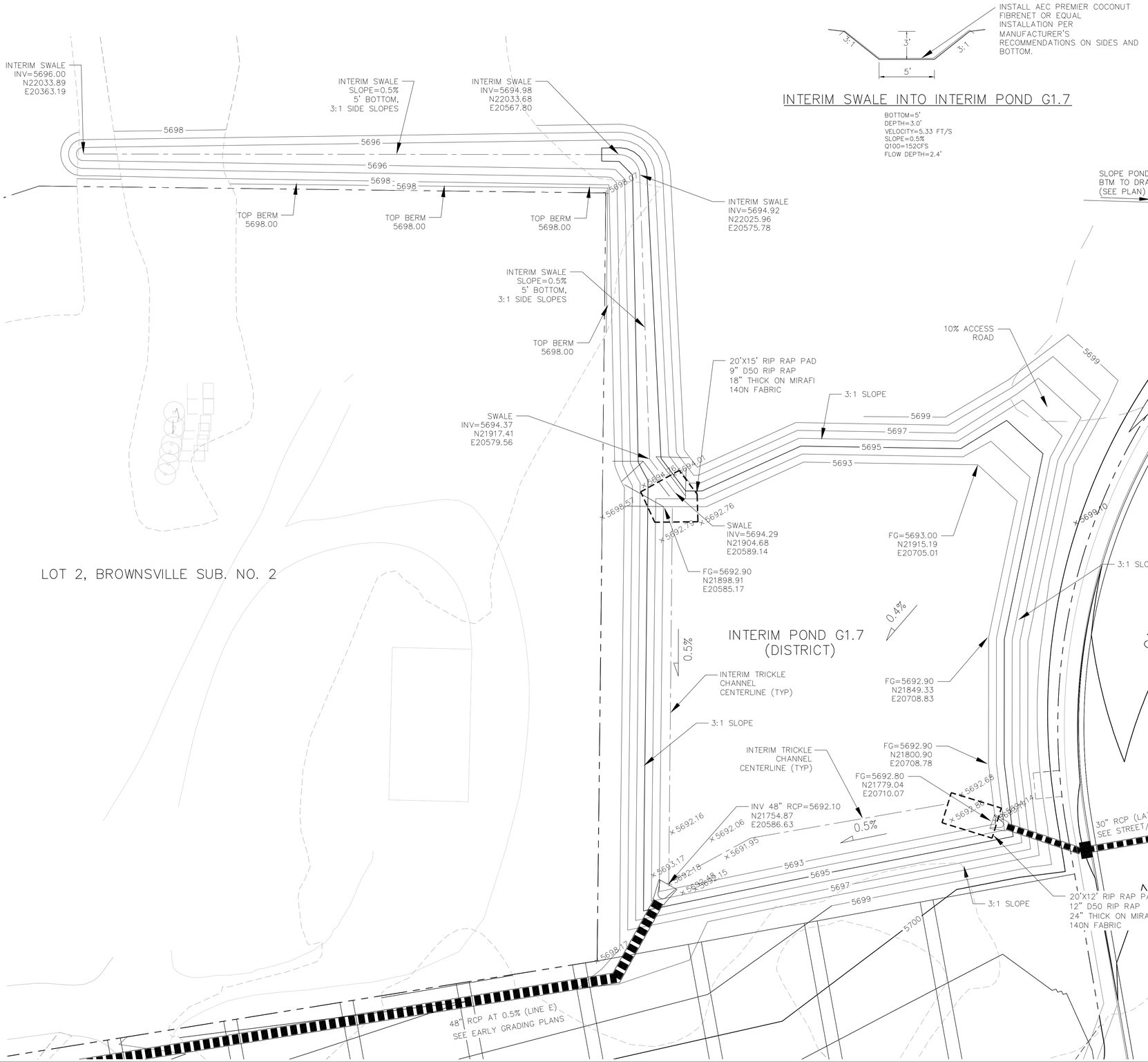
G1 SIDE OF DETENTION POND G1/G2 (DISTRICT) CARRIAGE MEADOWS SOUTH

DATE
AUGUST 10, 2017

PROJECT NO.
100.030

SHEET NUMBER
C4.5

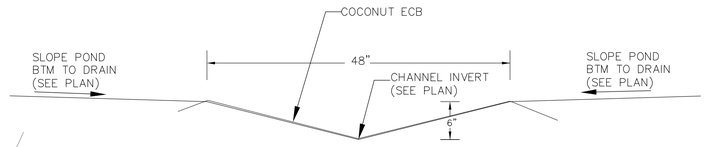
TOTAL SHEETS: 12



INSTALL AEC PREMIER COCONUT FIBRENET OR EQUAL INSTALLATION PER MANUFACTURER'S RECOMMENDATIONS ON SIDES AND BOTTOM.

INTERIM SWALE INTO INTERIM POND G1.7

BOTTOM=5'
DEPTH=3.0'
VELOCITY=5.33 FT/S
SLOPE=0.5%
Q100=152CFS
FLOW DEPTH=2.4'

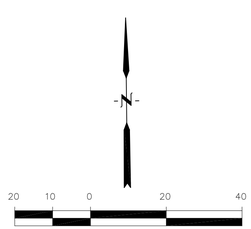


INTERIM TRICKLE CHANNEL

N.T.S.

NOTE:
SEE STREET/STORM CONSTRUCTION PLANS FOR FINAL DETAILS OF DETENTION POND ACCESS ROADS, OUTLET STRUCTURES, FOREBAYS, ARMORING, AND TRICKLE CHANNELS. SEE EARLY GRADING PLANS APPROVED 3/30/2017 (PUDSP 16-002) FOR STORM SEWER LINES DESIGNATED AS "LINE". SEE STREET/STORM PLANS FOR STORM SEWER DESIGNATED AS "LATERAL"

AS-BUILT
DATE: APRIL 6, 2018



CORE ENGINEERING GROUP
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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:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

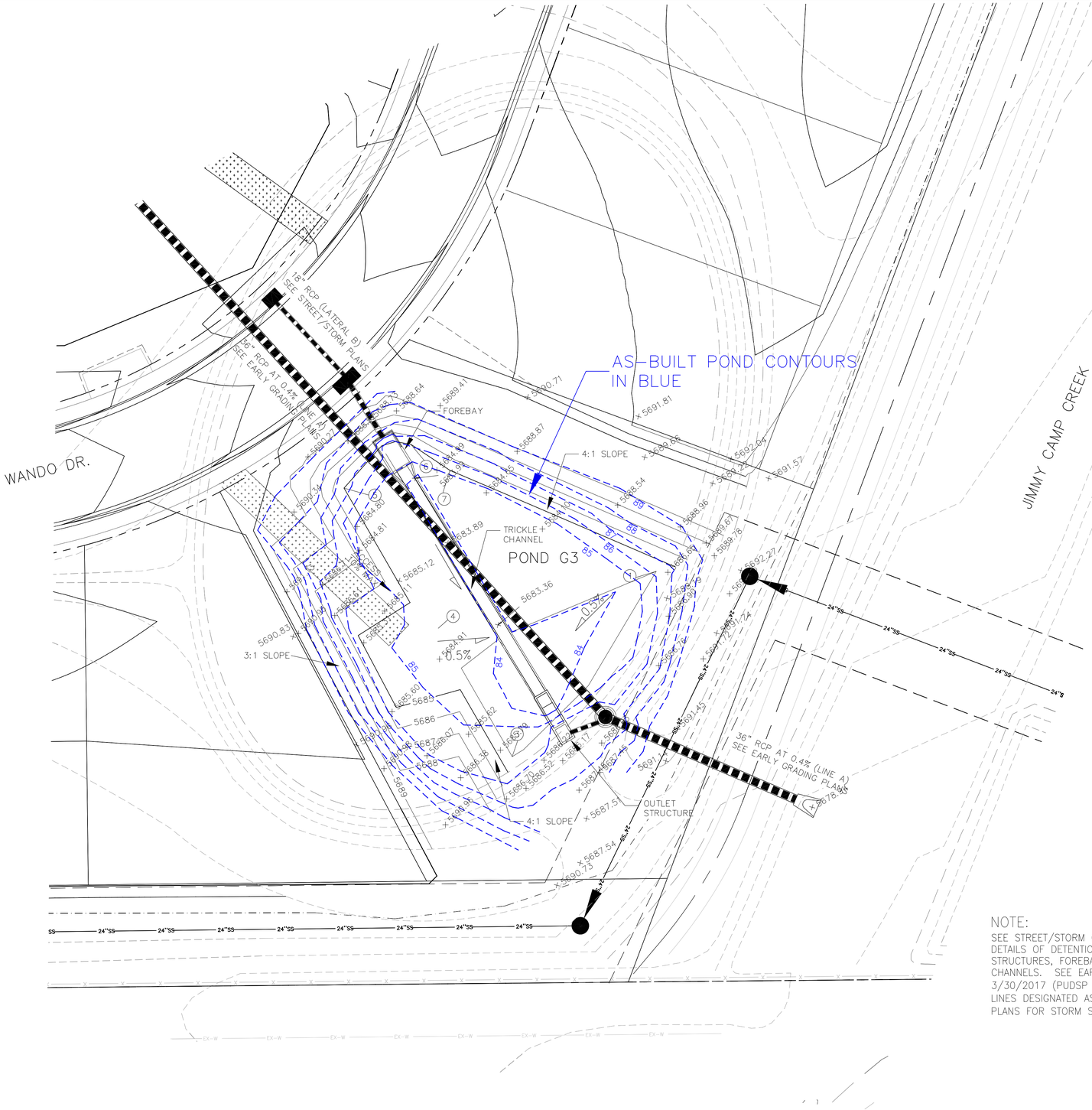
(DISTRICT) INTERIM DETENTION POND G1.7 CARRIAGE MEADOWS SOUTH

DATE
AUGUST 10, 2017

PROJECT NO.
100.030

SHEET NUMBER
C4.6

TOTAL SHEETS: 12



POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20152.70	20951.65	5684	POND BOTTOM
3	20088.79	20901.93	5684	POND BOTTOM
4	20133.08	20876.39	5684.20	POND BOTTOM
5	20181.43	20843.88	5685	POND BOTTOM
6	20196.53	20866.94	5685	POND BOTTOM
7	20187.57	20880.42	5685	POND BOTTOM

NOTE:
SEE STREET/STORM CONSTRUCTION PLANS FOR FINAL DETAILS OF DETENTION POND ACCESS ROADS, OUTLET STRUCTURES, FOREBAYS, ARMORING, AND TRICKLE CHANNELS. SEE EARLY GRADING PLANS APPROVED 3/30/2017 (PUDSP 16-002) FOR STORM SEWER LINES DESIGNATED AS "LINE". SEE STREET/STORM PLANS FOR STORM SEWER DESIGNATED AS "LATERAL"

AS-BUILT
DATE: APRIL 6, 2018

20 10 0 20 40
SCALE: 1"=20'

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

PREPARED FOR:
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COLORADO SPRINGS, COLORADO 80903
(719) 635-3200
CONTACT: JEFF MARK

PROJECT:
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AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

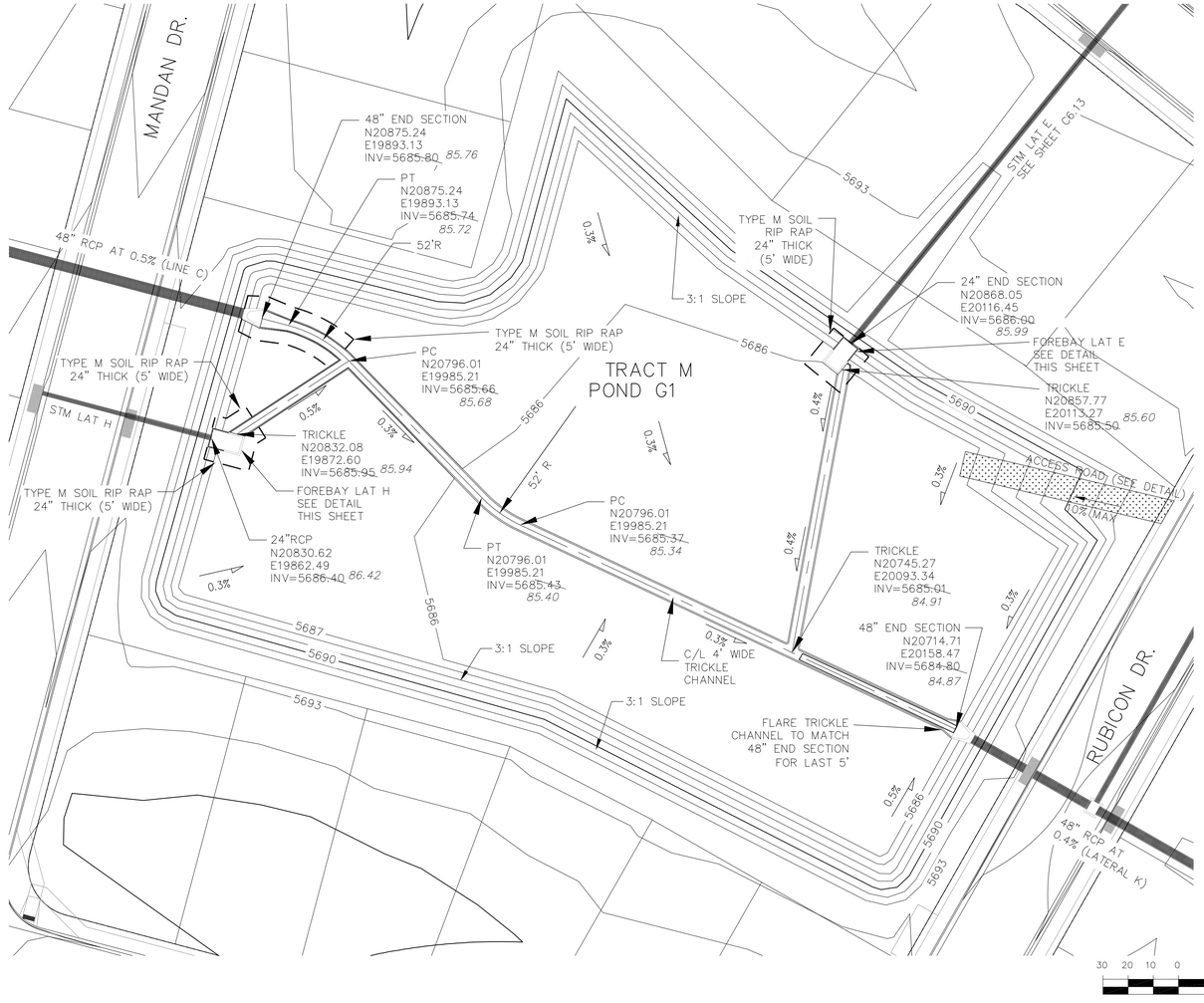
DETENTION POND G3 (DISTRICT)
CARRIAGE MEADOWS SOUTH

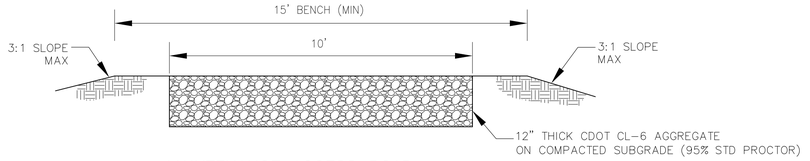
DATE
AUGUST 10, 2017

PROJECT NO.
100.030

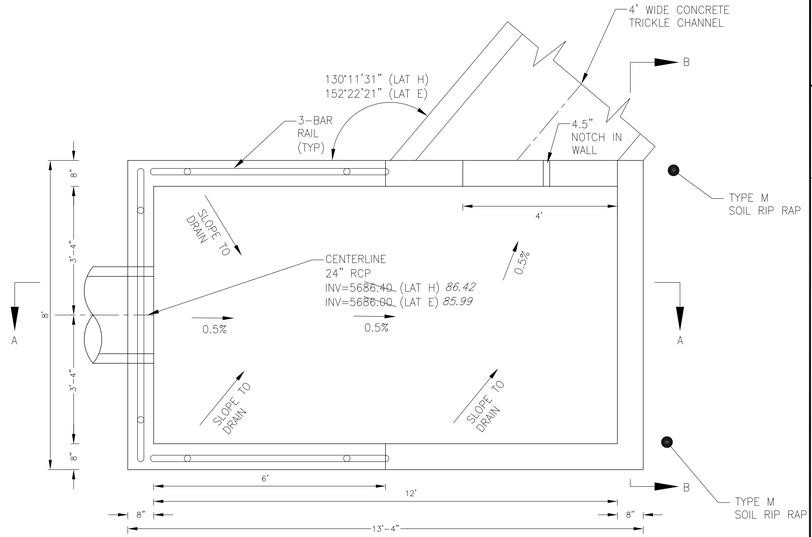
SHEET NUMBER
C4.8

TOTAL SHEETS: 12

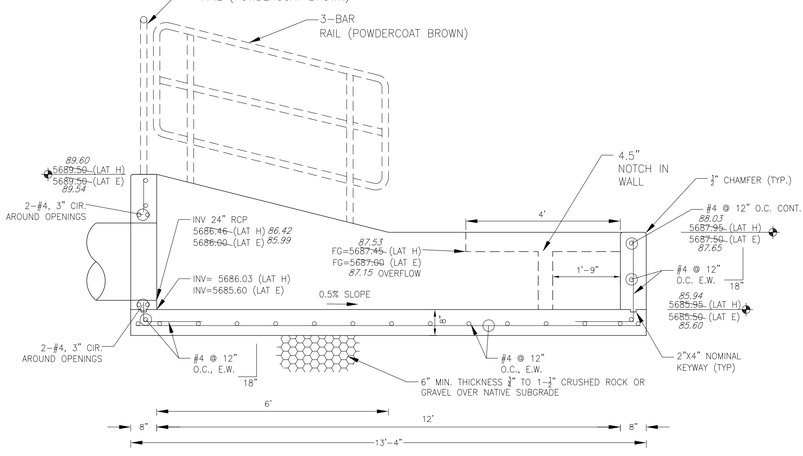




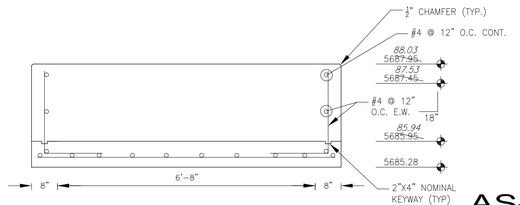
MAINTENANCE ACCESS ROAD
NO SCALE



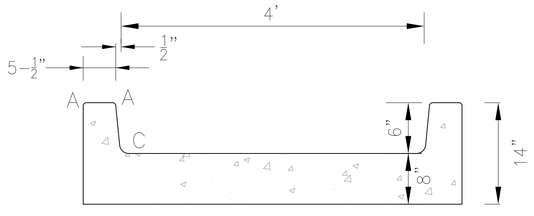
FOREBAY DETAIL
NO SCALE



FOREBAY SECTION A–A
NO SCALE

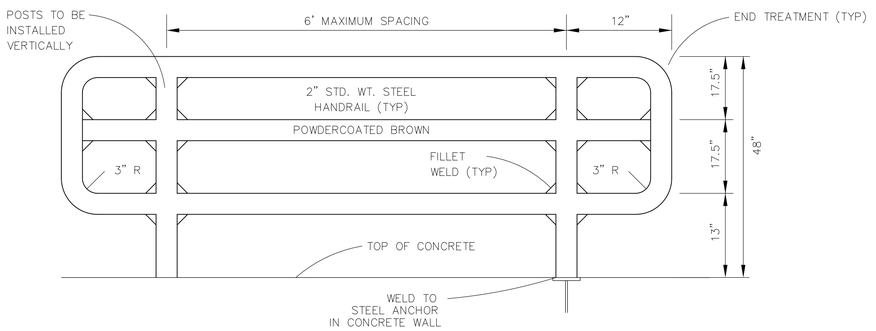


FOREBAY SECTION B–B
NO SCALE



TRICKLE CHANNEL DETAIL
NO SCALE

LENGTH FOR RADII
A = 1/2"
C = 1-1/2"



3–BAR RAIL DETAIL
NO SCALE

AS-BUILT
DATE: APRIL 6, 2018

CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlschindler@ceg-i.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:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

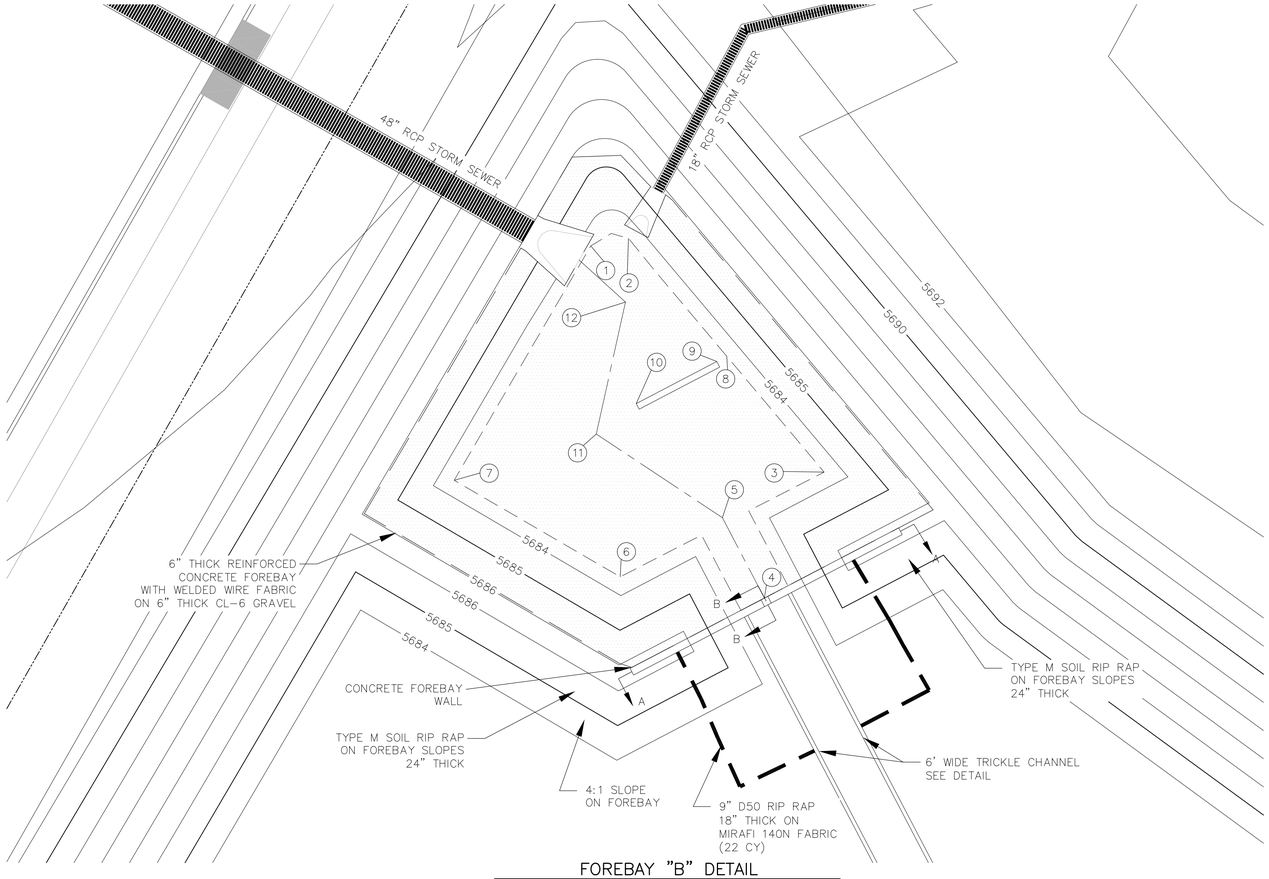
POND G1/G2 (DISTRICT)
G1 SIDE OF POND
TRICKLE AND FOREBAY DETAILS

DATE
AUGUST 28, 2017

PROJECT NO.
100.030

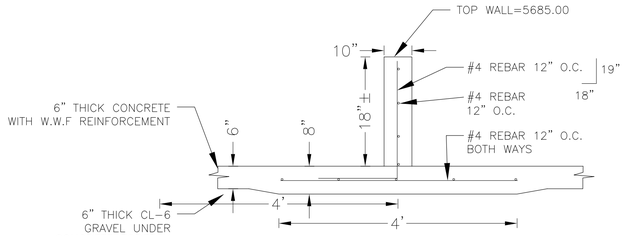
SHEET NUMBER
C9.1

TOTAL SHEETS: 39



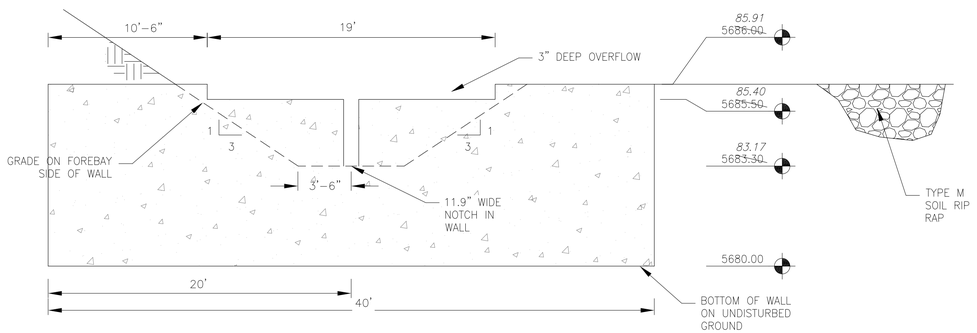
FOREBAY "B" DETAIL
1"=10'

POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20560.79	20433.55	5683.54	FOREBAY BOTTOM
2	20561.80	20438.53	5683.54	FOREBAY BOTTOM
3	20530.94	20464.35	5683.54	FOREBAY BOTTOM
4	20514.32	20456.47	5683.30	FOREBAY BOTTOM
5	20524.93	20450.92	5683.35	FOREBAY BOTTOM
6	20517.12	20437.44	5683.54	FOREBAY BOTTOM
7	20529.87	20415.52	5683.54	FOREBAY BOTTOM
8	20546.23	20451.50	5683.54	FOREBAY BOTTOM
9	20545.54	20450.19	5683.53	ENERGY DISSIPATER WALL
10	20539.98	20439.55	5683.48	ENERGY DISSIPATER WALL
11	20535.97	20434.28	5683.43	FOREBAY BOTTOM
12	20553.38	20438.13	5683.50	FOREBAY BOTTOM

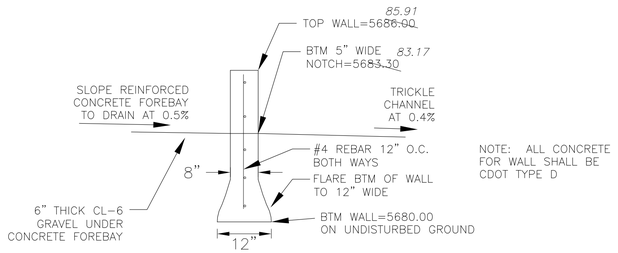


ENERGY DISSIPATER WALL
NO SCALE

NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D



WALL SECTION A-A
1"=10'



WALL SECTION B-B
NO SCALE

NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D

AS-BUILT
DATE: APRIL 6, 2018

CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
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CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlcs@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:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

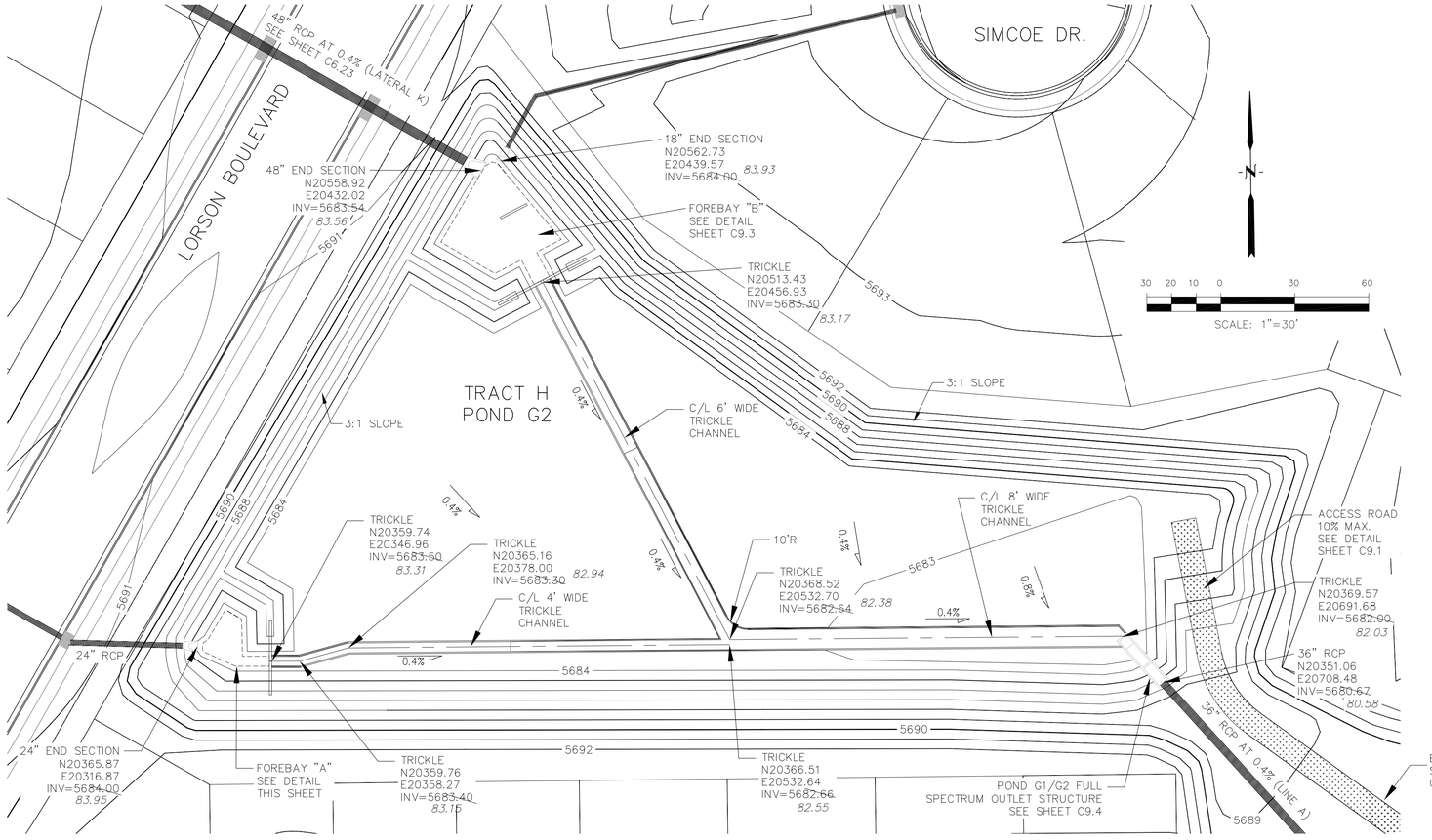
POND G1/G2 (DISTRICT)
G2 SIDE OF POND - FOREBAY "B"
TRICKLE AND FOREBAY DETAILS

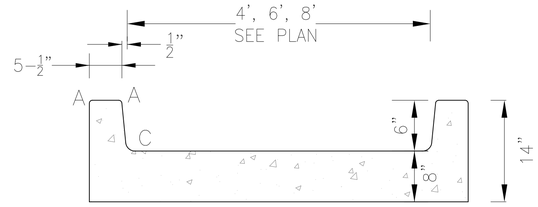
DATE
AUGUST 28, 2017

PROJECT NO.
100.030

SHEET NUMBER
C9.3

TOTAL SHEETS: 39

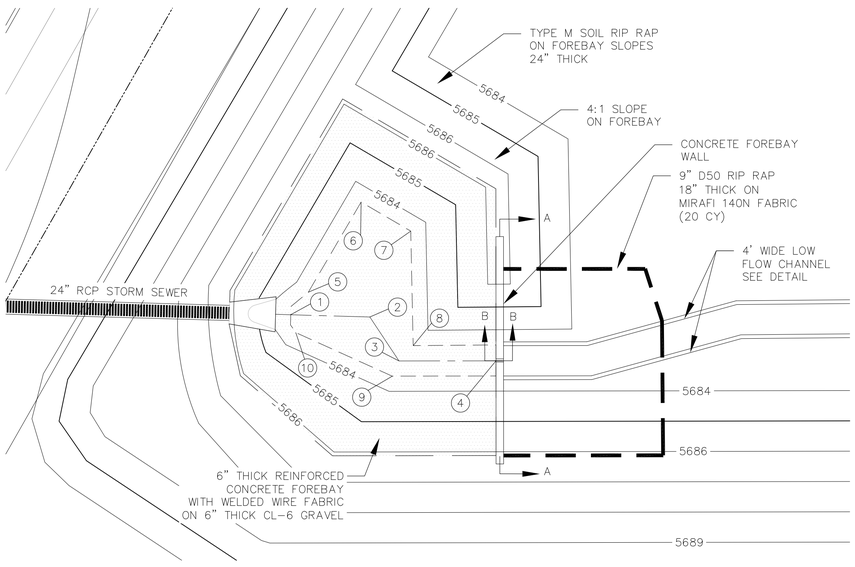




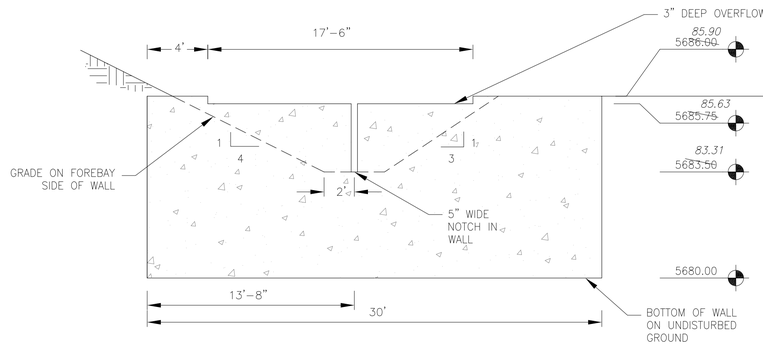
TRICKLE CHANNEL DETAIL
NO SCALE

LENGTH FOR RADII
A = 1/2"
C = 1-1/2"

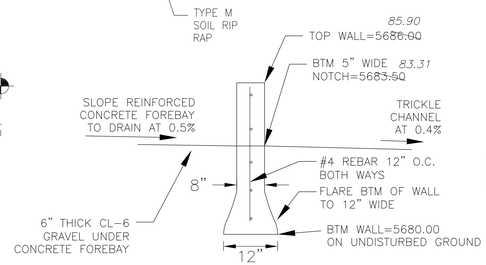
POINT TABLE				
NUMBER	NORTHING	EASTING	ELEVATION	NOTES
1	20365.82	20318.86	5683.65	FOREBAY BOTTOM
2	20365.52	20329.30	5683.60	FOREBAY BOTTOM
3	20359.71	20333.16	5683.57	FOREBAY BOTTOM
4	20359.74	20345.96	5683.50	FOREBAY BOTTOM
5	20368.80	20321.19	5683.67	FOREBAY BOTTOM
6	20380.69	20328.16	5683.67	FOREBAY BOTTOM
7	20376.85	20334.70	5683.66	FOREBAY BOTTOM
8	20361.75	20335.03	5683.58	FOREBAY BOTTOM
9	20357.71	20332.26	5683.58	FOREBAY BOTTOM
10	20363.46	20319.53	5683.67	FOREBAY BOTTOM



FOREBAY "A" DETAIL
1"=10'



WALL SECTION A-A
1"=10'



WALL SECTION B-B
NO SCALE

NOTE: ALL CONCRETE FOR WALL SHALL BE CDOT TYPE D

AS-BUILT
DATE: APRIL 6, 2018

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

PREPARED FOR:
LORSON, LLC
212 N. WAHSATCH AVE., SUITE 301
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CONTACT: JEFF MARK

PROJECT:
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AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

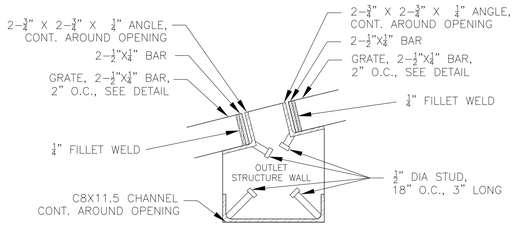
POND G1/G2 (DISTRICT)
G2 SIDE OF POND
TRICKLE AND FOREBAY DETAILS

DATE
AUGUST 28, 2017

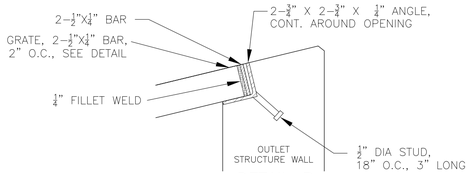
PROJECT NO.
100.030

SHEET NUMBER
C9.2

TOTAL SHEETS: 39



DETAIL A
NO SCALE



DETAIL B
NO SCALE

NOTE:
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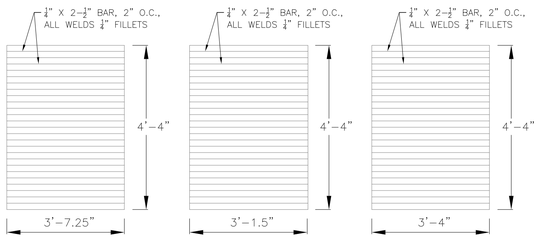
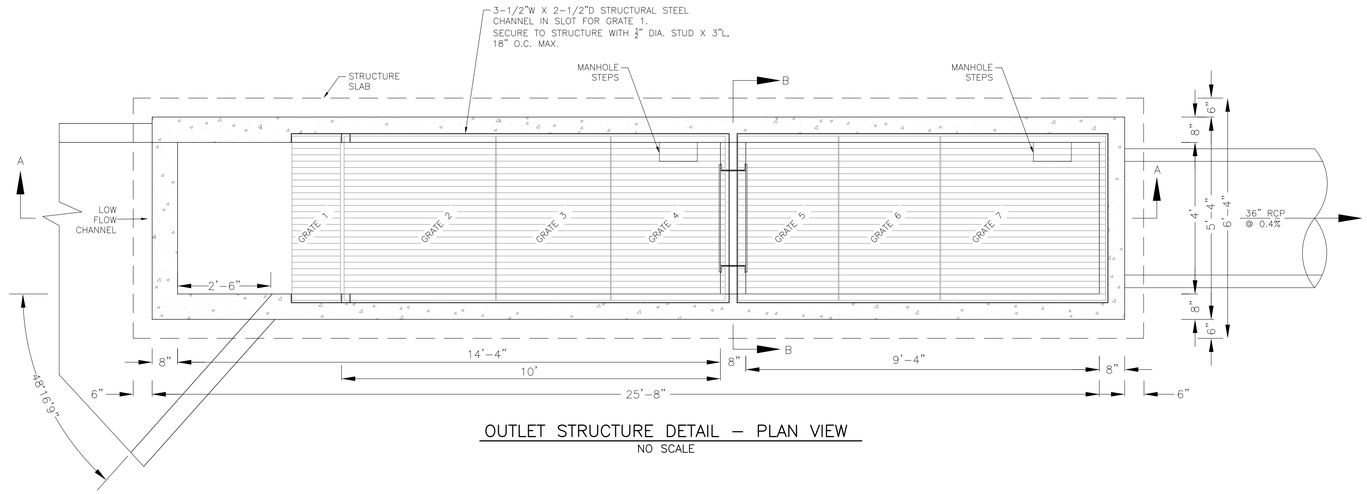


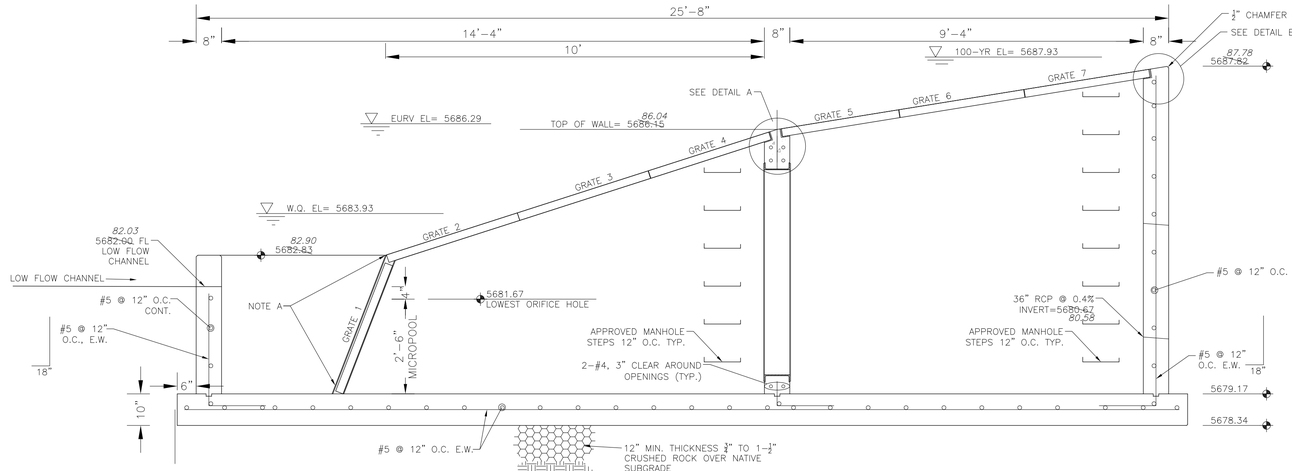
GRATE 1,2,3
NO SCALE

GRATE 5
NO SCALE

GRATE 4, 6, 7
NO SCALE

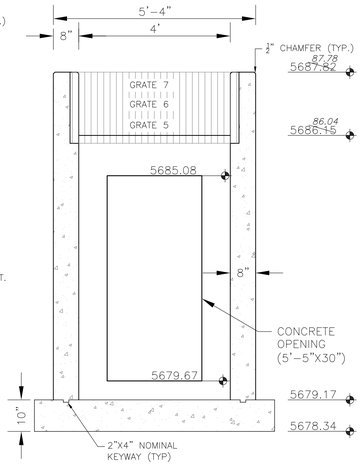


OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE

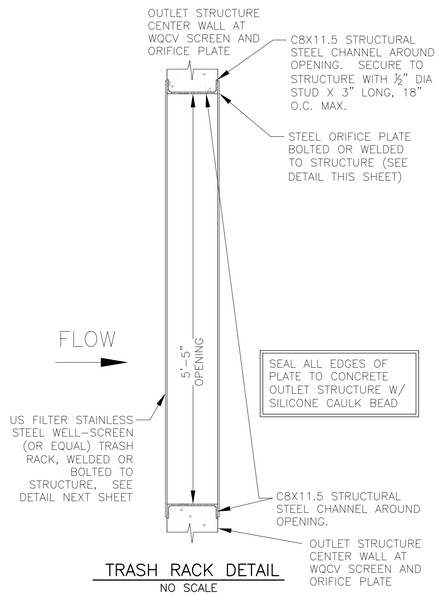


NOTE A:
3–1/2"W X 2–1/2"D STRUCTURAL STEEL CHANNEL IN SLOT FOR GRATE 1. SECURE TO STRUCTURE WITH ½" DIA. STUD X 3"L, 18" O.C. MAX.

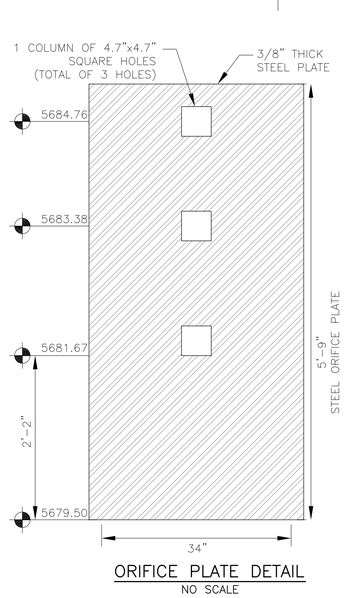
OUTLET STRUCTURE DETAIL – SECTION A–A
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



ORIFICE PLATE DETAIL
NO SCALE

OUTLET STRUCTURE, FOREBAY, AND DRAIN CHANNEL NOTES:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PROVIDE SHOP DRAWINGS FOR ALL COMPONENTS OF THE OUTLET STRUCTURE.
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BAR SIZE	#4	#5	#6
MIN. SPLICE LENGTH	1'–3"	1'–7"	2'–0"

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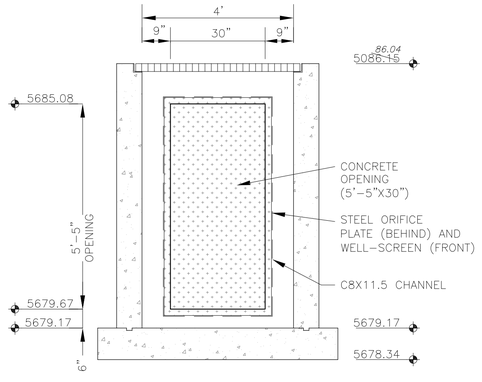
4. CONCRETE FOR DRAIN CHANNELS SHALL BE CDOT CLASS B CONCRETE
5. EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M–213. EXPANSION JOINT MATERIAL SHALL BE ½" THICK, SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE AND THE JOINT SHALL BE SEALED, REFER TO DETAILS.
6. ALL EXPOSED CONCRETE CORNERS SHALL HAVE A ⅜" CHAMFER UNLESS OTHERWISE NOTED.
7. SUBGRADE TO BE 12" THICK CLEAN FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY PER ASTM M698 UNDER STRUCTURE.
8. REFER TO SHEET XX FOR PRESEDIMENTATION/FOREBAY DESIGN.
9. ENGINEER SHALL BE NOTIFIED PRIOR TO BEGINNING CONSTRUCITON OF OUTLET STRUCTURE TO SCHEDULE OBSERVATION VISITS FOR STRUCTURES.

AS-BUILT
DATE: APRIL 6, 2018



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

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

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

NO.	DESCRIPTION	DATE

PROJECT:
CARRIAGE MEADOWS SOUTH
FONTAINE BLVD.–MARKSHEFFEL RD
COLORADO SPRINGS, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

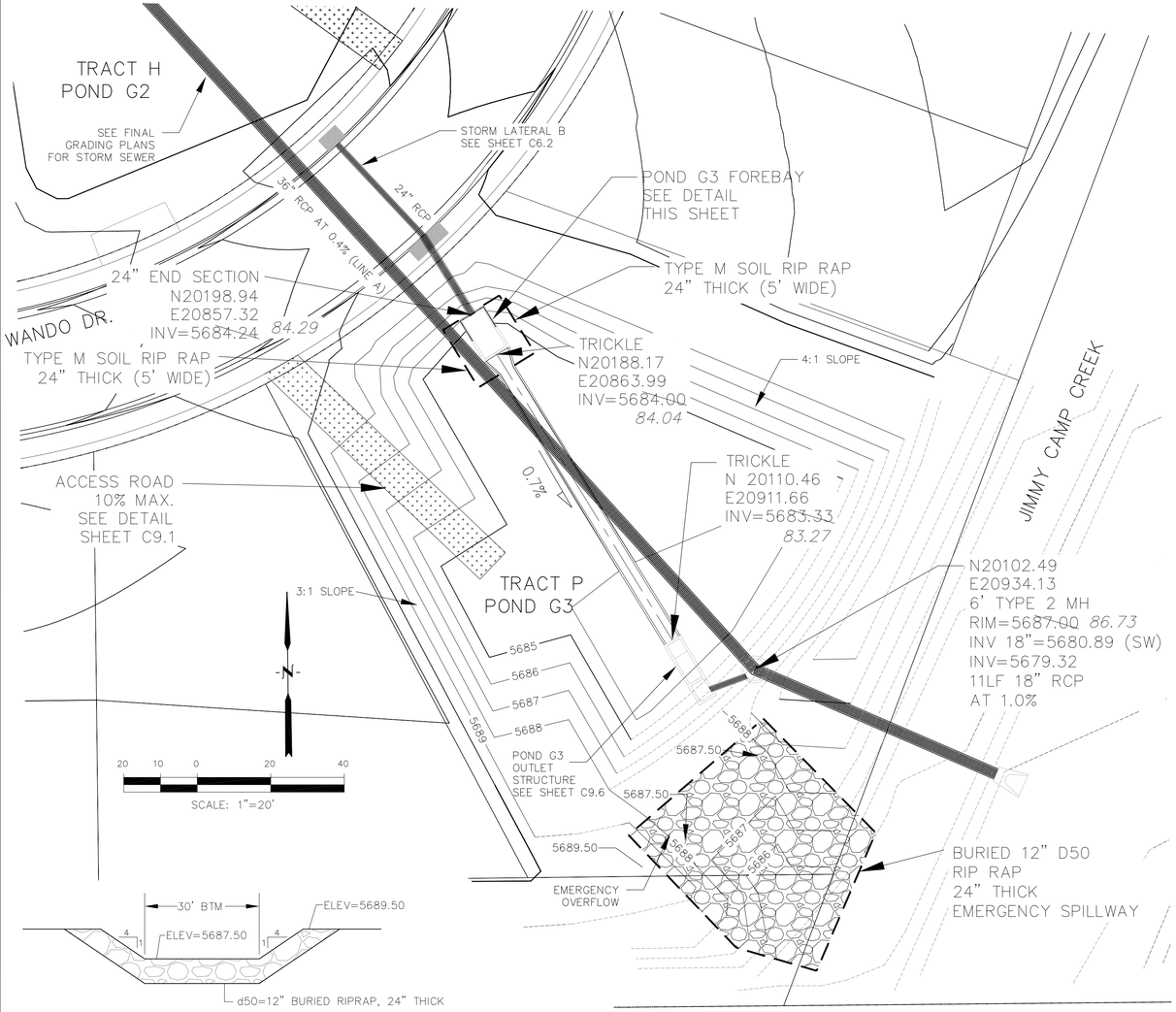
POND G1/G2
FULL SPECTRUM
OUTLET STRUCTURE DETAILS

DATE:
AUGUST 28, 2017

PROJECT NO.
100.030

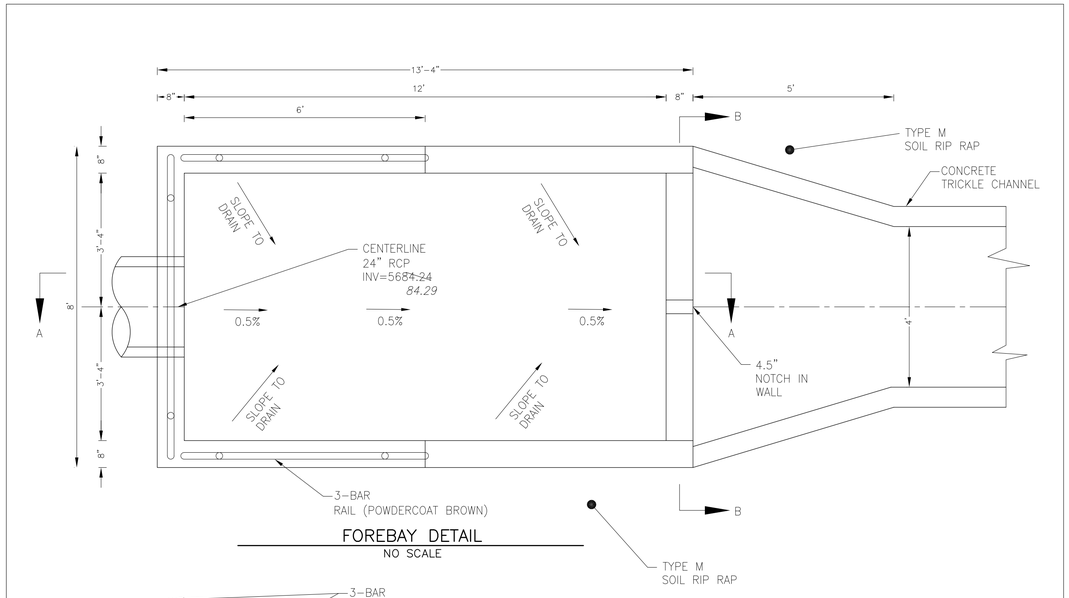
SHEET NUMBER
C9.4

TOTAL SHEETS: 39



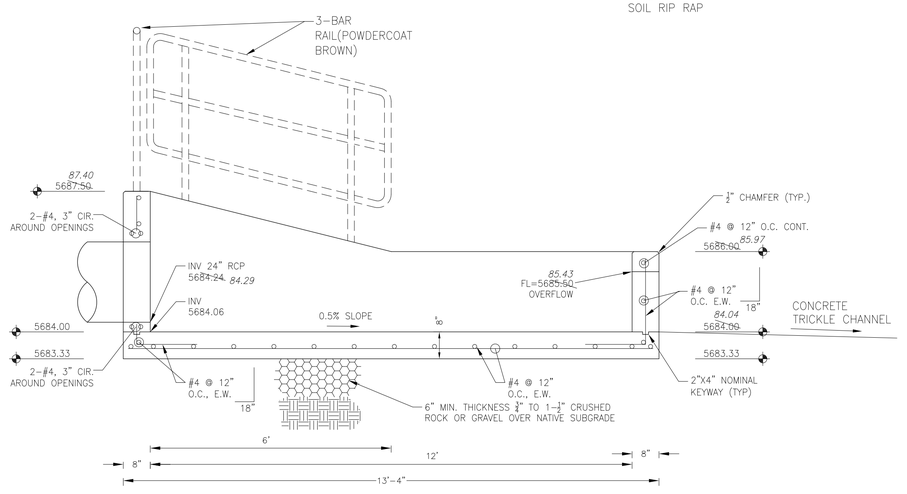
EMERGENCY SPILLWAY DETAIL

SCALE: NTS



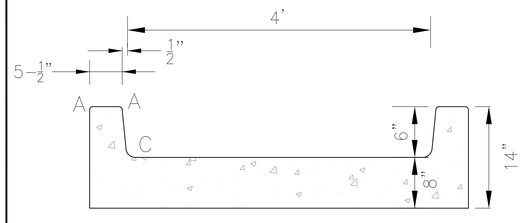
FOREBAY DETAIL

NO SCALE



FOREBAY SECTION A-A

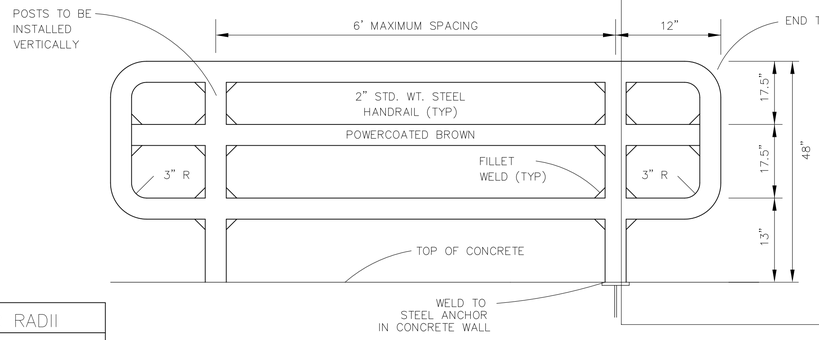
NO SCALE



TRICKLE CHANNEL DETAIL

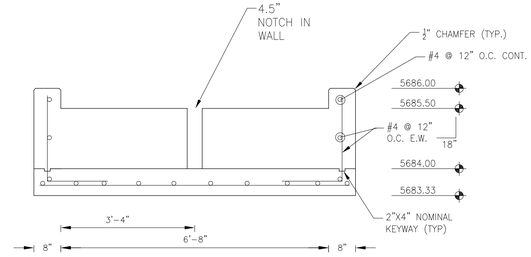
NO SCALE

LENGTH FOR RADII
A = 1/2"
C = 1-1/2"



3-BAR RAIL DETAIL

NO SCALE



FOREBAY SECTION B-B

NO SCALE

AS-BUILT

DATE: APRIL 6, 2018

CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 719.570.1100
CONTACT: RICHARD L. SCHINDLER, P.E.
EMAIL: rlcs@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:
CARRIAGE MEADOWS SOUTH
AT LORSON RANCH FIL. NO. 1
FONTAINE BLVD. - CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

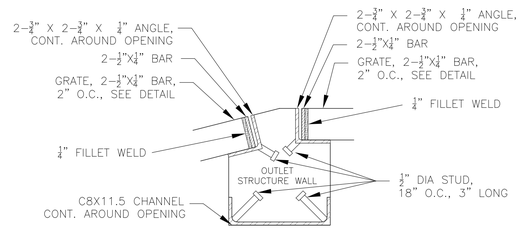
POND G3 (DISTRICT)
TRICKLE AND FOREBAY DETAILS

DATE
AUGUST 28, 2017

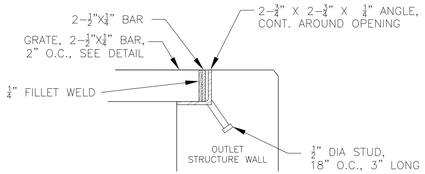
PROJECT NO.
100.030

SHEET NUMBER
C9.5

TOTAL SHEETS: 39



DETAIL A
NO SCALE



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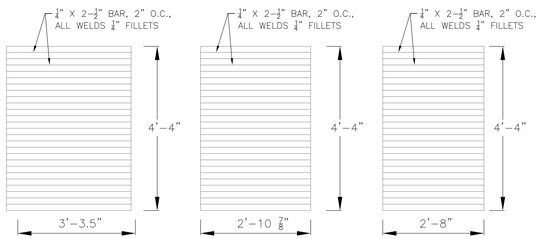
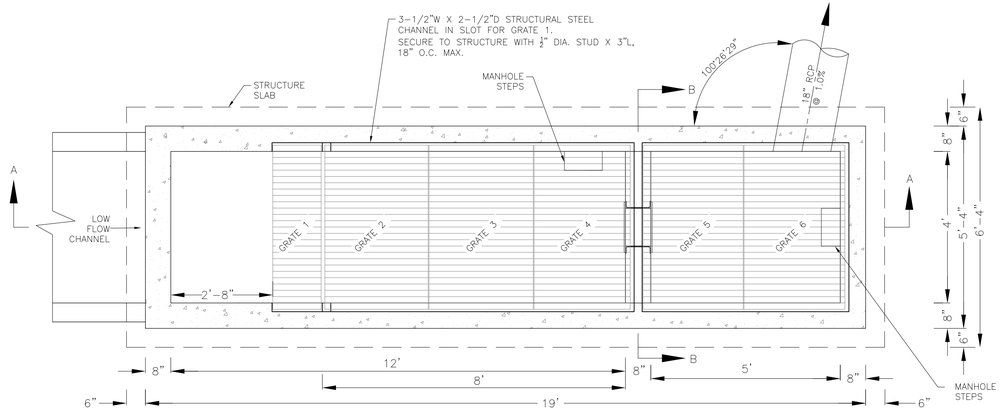


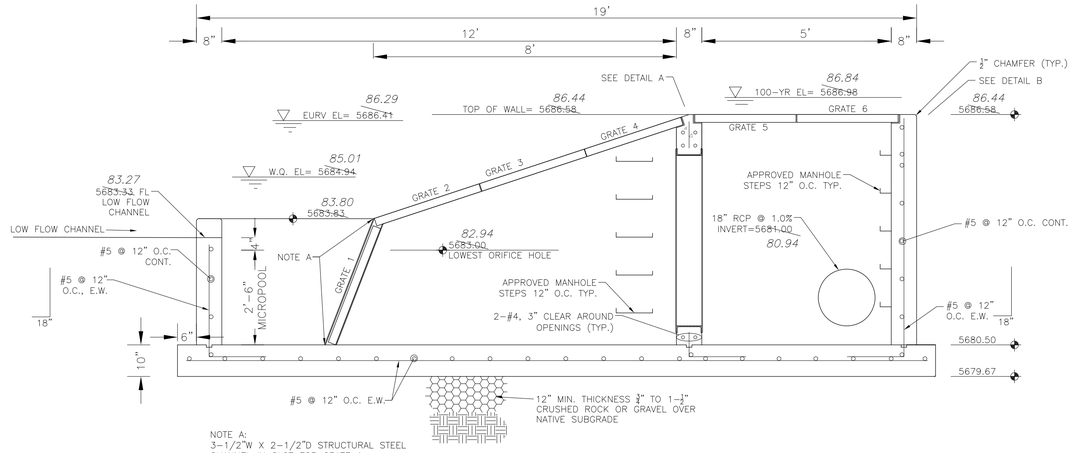
GRATE 1
NO SCALE

GRATE 2,3
NO SCALE

GRATE 4, 5, 6
NO SCALE



OUTLET STRUCTURE DETAIL – PLAN VIEW
NO SCALE



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SECURE TO STRUCTURE WITH ½" DIA. STUD X 3"L, 18" O.C. MAX.

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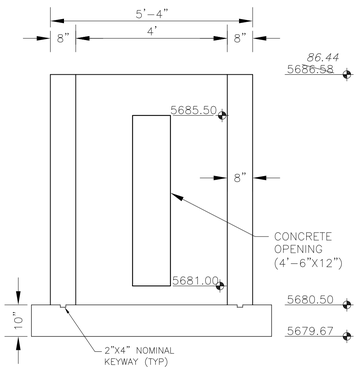
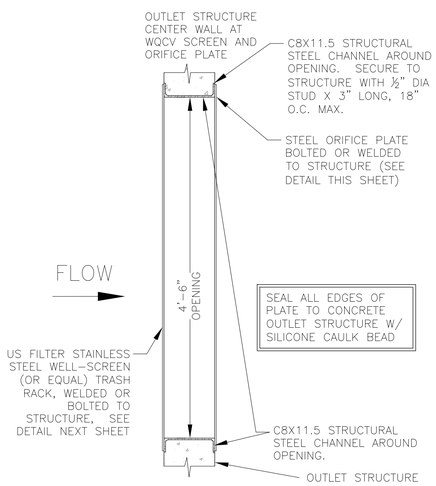
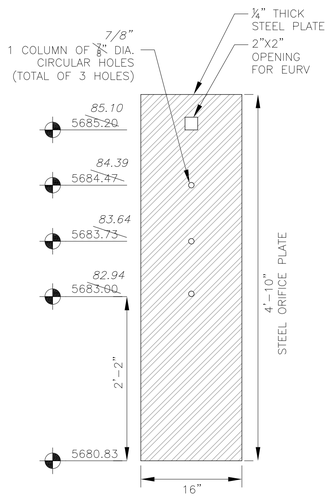
NO SCALE



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE



TRASH RACK DETAIL
NO SCALE



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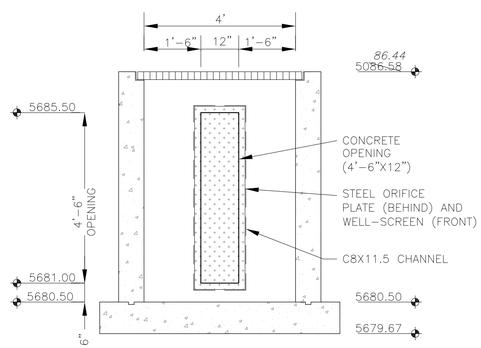
AS-BUILT
DATE: APRIL 6, 2018



OUTLET STRUCTURE DETAIL – SECTION B–B
NO SCALE

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

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

PROJECT:
CARRIAGE MEADOWS SOUTH
FONTAINE BLVD.–MARKSHEFFEL RD
COLORADO SPRINGS, COLORADO

NO.	DESCRIPTION	DATE

DRAWN: RLS
DESIGNED: RLS
CHECKED: RLS

POND G3
FULL SPECTRUM
OUTLET STRUCTURE DETAILS

DATE:
AUGUST 28, 2017

PROJECT NO.
100.030

SHEET NUMBER
C9.6

TOTAL SHEETS: 39

APPENDIX E– DRAINAGE BOARD MINUTES, STORM SEWER SCHEMATIC AND HYDRAFLOW STORM SEWER CALCS

Minutes
City of Colorado Springs/ El Paso County
Drainage Board Meeting Summary
January 23, 2024

The City of Colorado Springs/ El Paso County Drainage Board held its meeting at 1:30 PM, Tuesday, January 23, 2024, at Pikes Peak Regional Building in the Pikes Peak Hearing Room.

MEMBERS PRESENT: Tim McConnell (Chair), Marc Whorton (Vice Chair), Grant Petik, Brett Louk, Mark Sherwood, Scott Smith

OTHERS PRESENT: Christina Aragon (City), Erin Powers (City), Erica Schmitz (City), Amy Tuten (City), Rebecca Greenberg (City), Daniel Torres (El Paso County), Carlos Hernandez (El Paso County), Jeff Rice (El Paso County), Greg Shaner (Matrix), Jesse Sullivan (Matrix), Tina Buschar (View Homes), JM Turley (View Homes), Jeff Mark (Landhuis), Rich Wray (Kiowa), Dave Gorman (MVE)

Item 1: Meeting called to order by ***Tim McConnell*** at 1:31 PM.

Item 2:

a) Approval of the November 14, 2023, Drainage Board minutes

Approval of the minutes from the November 14, 2023, Drainage Board Meeting. Motion was made by ***Scott Smith*** to approve the minutes of November 14, 2023, ***with the amendment to remove Marc Whorton's duplicate naming in the "Members Present"***. Motion was seconded by ***Mark Sherwood***.

Motion Passed 6-0

Item 3: Old Business – None.

Item 4: New Business

a) Partial Closure of Jimmy Camp Creek for Bull Hill/Rolling Meadows (County) – presented by ***Jeff Rice (County)***, ***Jeff Mark (Landhuis),*** and ***Rich Wray (Kiowa)***

Jeff Rice introduces the request for the closure of a portion of Jimmy Camp Creek Basin for Bull Hill, Rolling Meadows, and the remaining unplatted portions of Lorson Ranch development in unincorporated El Paso County. El Paso County supports the approval of the partial closure, but they are still reviewing to ensure this action will not significantly increase the drainage fee for the remaining parcels in the basin. *Tim McConnell* asks if this item will need to come back to Drainage Board once the determinations are made, or will it be approved administratively. *Jeff Rice* responds that could be decided by the Board whether or not they would like to have the item come back to the Board. *Jeff Mark* then states it would be preferred if the Item could be settled administratively, but agrees it is the Board's decision. *Jeff Rice* displays the map of Lorson Ranch to show the area of concern for this Item. *Jeff Mark* continues to describe the area in question and explain the background of the improvements already installed and future installments. Jeff explains this request is being brought to the Board

because the cost of the improvements is anticipated to far exceed what the basin fees would be based on the analysis. Mark Sherwood asks if they are fairly confident about the required improvements to be installed in the area. Jeff Rice answers that they are confident about the final design and associated fees. Rich Wray arrives and offers further details on the calculations of the drainage fees for the area. He then continues to explain justifications to support this request. Scott Smith asks Jeff Mark about the current status of this portion of Lorson Ranch in terms of the fees and reimbursable cost and if it's in balance. Jeff Rice responds by explaining the current status of this portion of Lorson Ranch discussing the fees and credits for the basin. Marc Whorton asks if the channel improvements have been accepted by the County. Jeff Rice confirms that the channels have been completed and accepted, and the metro district maintains it. Marc Whorton then asks when the updated DBPS will be completed, and Jeff Rice responds that it is anticipated to be completed within the year.

Marc Whorton asks if Jeff Mark would be ok with splitting up the request to close the portion of the basin with completed improvements while the County finishes their review and completes the updated DBPS. Jeff agrees the would be acceptable if the Board agrees.

Marc Whorton moves to approve the partial closure of Jimmy Camp Creek just for the remaining Lorson developments, pending confirmation that this action will not significantly raise the resulting drainage fees for the remaining parcels in the basin with the expectation that the applicant will bring the same request back to the Board for Rolling Meadows/ Bull Hill. ***Scott Smith*** seconds the motion.

Motion Passed 6-0

b) Sand Creek Channel Stabilization Reimbursement Request (City) – presented by ***Erica Schmitz (City)*** and ***Gregory Shaner (Matrix)***

Erica Schmitz introduces the request for reimbursement for Sand Creek channel improvements. Erica continues providing a bit of background for the request and states that City staff is remaining neutral on this request because the reimbursement request is greater than the 10% allotted by code. *Gregory Shaner* is introduced and continues to provide background on the project and history of the site. Gregory describes the difficulties and obstacles with the project, which helps to justify why they are requesting a larger reimbursement. Grant Petik asks for clarification on some of the additional costs shown in their analysis. Gregory explains the costs depicted and discusses more details about the project. Board members and applicant discuss the cost breakdown, and Tim McConnell mentions an analysis to determine whether a fee increase is warranted. There is further discussion amongst the Board.

Tim McConnell moves to approve the $553,188.31 channel improvements reimbursement request. ***Mark Sherwood*** seconds the motion.

Motion Passed 6-0

c) Sand Creek Request to Designate Reimbursable Infrastructure (City) – presented by ***Erica Schmitz (City)***

Erica Schmitz introduces the request for channel improvements associated with the Final Plat for The Crossing at Palmer Park Filing No. 5 be designated as reimbursable. Erica adds that City staff is remaining neutral on this request but offers options for possible motions. Erica introduces *Dave Gorman*, who takes the stand to explain the background of their improvements and the reason for their request. Dave explains there has been no improved or stabilization of the channel in this area previously. *Mike Turley* asks about drainage fees in association with platting the area. *Erin Powers*

addresses Mike's question with City policy. *Scott Smith* then asks if these improvements are installed already, and Dave responds that they have not. Dave explains that plans have been reviewed by the City and this is just an estimated cost for the improvements. *Scott Smith* confirms that this is a request to improvement costs to be considered reimbursable and Dave confirms. There is further discussion between the Board and applicant describing the project and development for The Crossing at Palmer Park Filing No. 5.

Scott Smith moves to approve the request to add this reimbursable amount to the Sand Creek Drainage Basin with a request for a fee analysis of the Sand Creek Basin upon request for reimbursement. ***Marc Whorton*** seconds the motion.

Motion Passed 6-0

e) Housekeeping

a. **February meeting cancellation**

Mark Sherwood moves to approve the cancellation of the schedule meeting in February 2024. ***Marc Whorton*** seconds the motion.

Motion Passed 6-0

f) Open Discussion

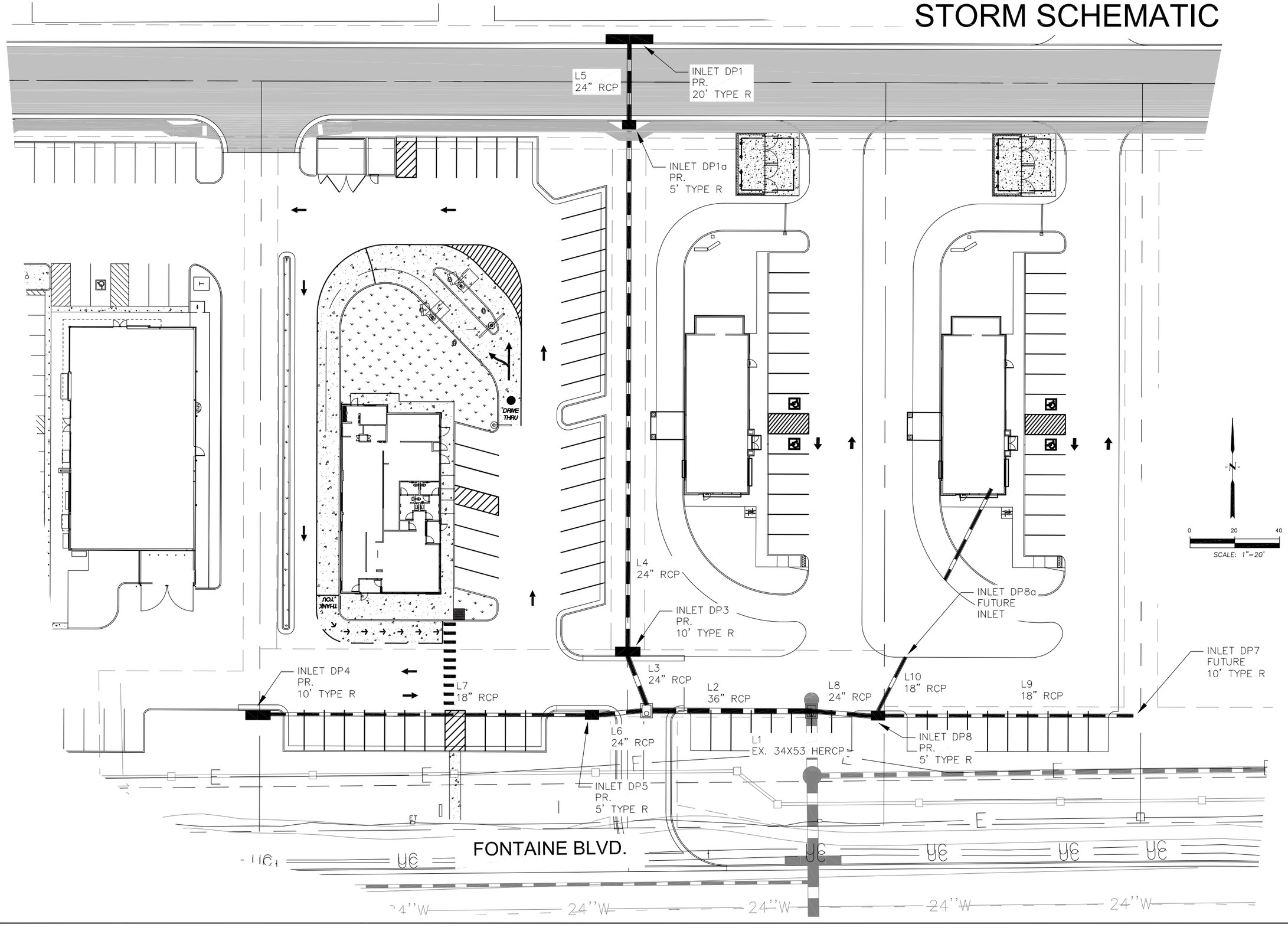
Tim McConnell asks about Gary's vacancy and the upcoming vacancies when his and Marc's terms expire in May 2024. *Erin Powers* responds explaining that the vacancies are posted and reviews the process for hiring.

Tim McConnell then asks about the financial update from the County and requests they could provide an update at the next meeting.

Tim McConnell asked about Amy's financial update and the unclaimed reimbursements, wanting more details on where the additional unclaimed funds were reallocated to. *Erin Powers* responds that she will speak with Amy to find out if the unclaimed funds will be reallocated to each individual basin versus the Interest fund.

Item 5: ***Tim McConnell*** **-** Meeting adjourned at 3:43 PM.

STORM SCHEMATIC



CORE ENGINEERING GROUP
15004 1ST AVE. S.
BURNSVILLE, MN 55306
PH: 763.210.1100
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:
VILLAGES AT LORSON RANCH
FONTAINE BLVD – CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: LAB

STORM SEWER SCHEMATIC

VILLAGE AT LORSON RANCH

DATE
APRIL, 2024

PROJECT NO.
100.070

SHEET NUMBER
1

TOTAL SHEETS: 1

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	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.	Junction Type
1	1	31.50	34x53	Ell	28.90	5701.86	5702.05	0.657	5704.47	5703.75	0.38	5703.75	End	Manhole
2	2	20.50	36	Cir	72.76	5702.15	5702.51	0.495	5703.75	5703.96	n/a	5703.96	1	Manhole
3	3	12.50	24	Cir	26.00	5703.26	5703.52	1.001	5704.32	5704.79	0.23	5704.79	2	Manhole
4	4	9.80	24	Cir	239.29	5703.62	5706.01	0.999	5704.79	5707.13	n/a	5707.13 j	3	Manhole
5	5	9.40	24	Cir	35.00	5706.11	5706.46	1.000	5707.13	5707.56	0.44	5707.56	4	Manhole
6	6	8.90	24	Cir	22.46	5703.26	5703.38	0.535	5704.31	5704.44	n/a	5704.44	2	Manhole
7	7	5.90	18	Cir	151.60	5703.88	5704.63	0.495	5704.89	5705.64	0.34	5705.98	6	Manhole
8	8	12.20	24	Cir	28.65	5702.90	5703.19	1.012	5703.94	5704.44	0.51	5704.44	1	Manhole
9	9	5.30	18	Cir	125.20	5703.69	5704.94	0.998	5704.44	5705.83	n/a	5705.83	8	None
10	10	6.00	18	Cir	29.57	5703.69	5703.99	1.016	5704.50	5704.94	0.41	5704.94	8	None

Village 5yr | Number of lines: 10 | Run Date: 3/28/2024

NOTES: Return period = 5 Yrs. ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	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.	Junction Type
1	1	57.30	34x53	Ell	29.00	5701.86	5702.05	0.655	5704.41	5704.32	n/a	5704.32	End	Manhole
2	2	37.30	36	Cir	72.76	5702.15	5702.51	0.495	5704.32	5704.52	0.81	5705.32	1	Manhole
3	3	22.80	24	Cir	26.00	5703.26	5703.52	1.001	5705.32*	5705.59*	0.34	5705.93	2	Manhole
4	4	17.80	24	Cir	239.29	5703.62	5706.01	0.999	5705.93	5707.53	n/a	5707.53 j	3	Manhole
5	5	17.00	24	Cir	35.00	5706.11	5706.46	1.000	5707.53	5707.95	0.72	5707.95	4	Manhole
6	6	16.10	24	Cir	22.46	5703.26	5703.38	0.535	5705.32*	5705.44*	0.06	5705.50	2	Manhole
7	7	8.10	18	Cir	151.60	5703.88	5704.63	0.495	5705.50*	5706.40*	0.33	5706.73	6	Manhole
8	8	22.40	24	Cir	29.00	5702.90	5703.19	1.000	5704.52	5704.88	0.92	5704.88	1	Manhole
9	9	9.70	18	Cir	125.20	5703.69	5704.94	0.998	5704.88	5706.14	0.64	5706.14	8	None
10	10	11.00	18	Cir	29.57	5703.69	5703.99	1.016	5704.98	5705.28	0.72	5706.00	8	None

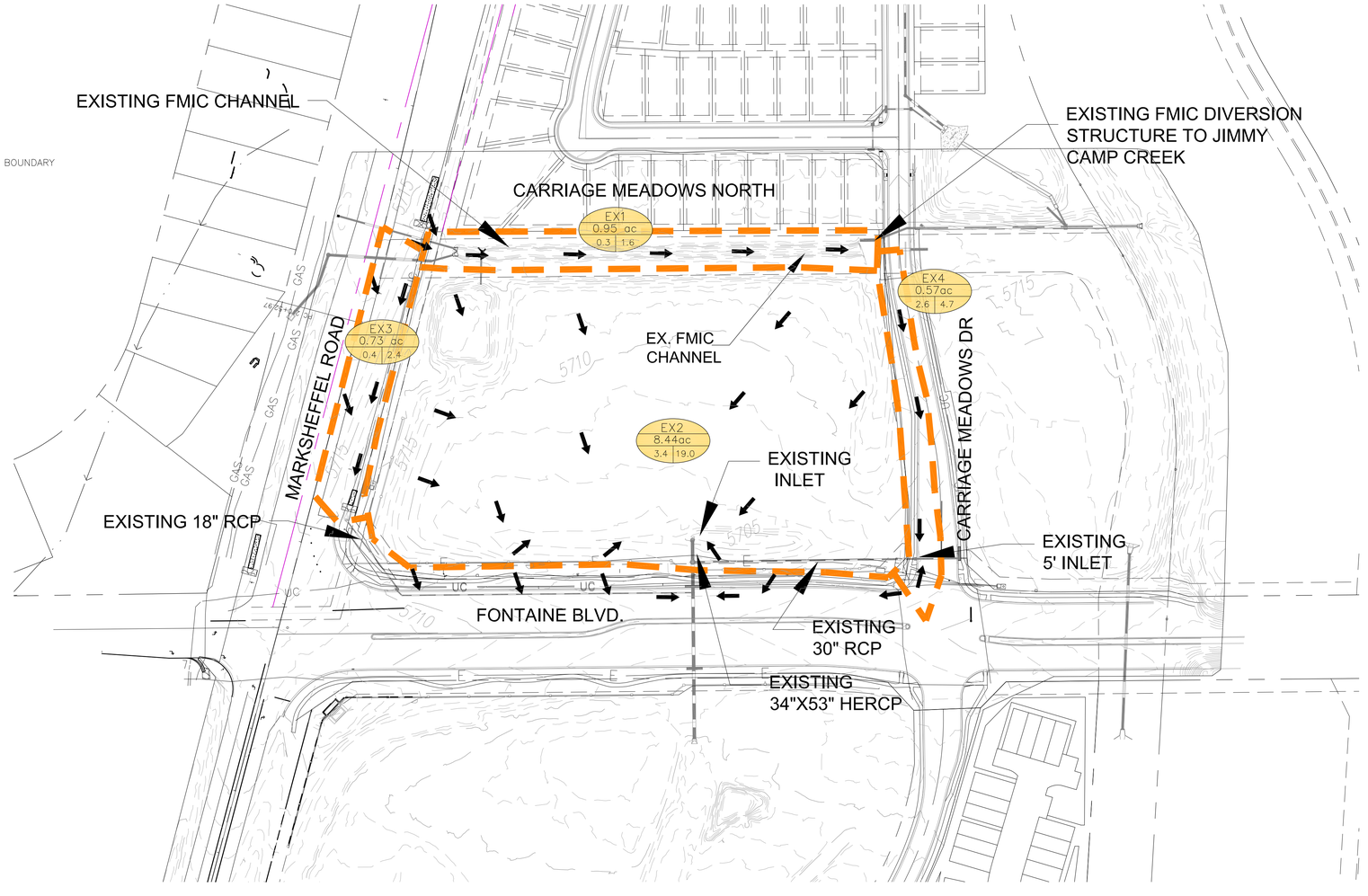
Village 100yr | Number of lines: 10 | Run Date: 3/28/2024

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

MAP POCKET

LEGEND

- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (BASIN XXAC X.X | X.X)
- DIRECTION OF FLOW
- EXISTING CONTOUR (6690)
- EXISTING ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- TIME OF CONCENTRATION



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NO. | DESCRIPTION

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

PROJECT:
VILLAGES AT LORSON RANCH
FONTAINE BLVD/CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: RLS

EXISTING CONDITIONS
FINAL PLAT
VILLAGE AT LORSON RANCH

DATE: APRIL, 2024

PROJECT NO. 100.070

SHEET NUMBER 1

TOTAL SHEETS: 1

DESIGN POINT SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
1		9.4	17.0	STREET FLOW
1a		0.5	0.9	STREET FLOW
2		9.8	17.8	PIPE FLOW
3		3.1	5.6	STREET FLOW
3a		12.5	22.8	PIPE FLOW
4		7.2	13.1	STREET FLOW
5		3.0	8.0	STREET FLOW
5a		8.9	16.1	PIPE FLOW
6		20.5	37.3	PIPE FLOW
7		5.3	9.7	STREET FLOW

DESIGN POINT SUMMARY				
D.P.		5 YEAR cfs	100 YEAR cfs	NOTES
8		0.9	1.7	STREET FLOW
8a		6.0	11.0	STREET FLOW
9		12.2	22.4	PIPE FLOW
10		31.5	57.3	PIPE FLOW

DETENTION POND AREAS:

1. ALL BASINS DRAIN TO POND G1/G2 LOCATED IN CARRIAGE MEADOWS SOUTH AT LORSON RANCH

2. POND G1/G2 PROVIDES DETENTION AND WQ FOR THIS DEVELOPMENT

3. DETENTION POND G1/G2 WAS CONSTRUCTED PER SF 17-011 (CARRIAGE MEADOWS SOUTH AT LORSON RANCH FDR, APPROVED ON SEPTEMBER 7, 2017)

NOTES:

1. ALL PROPOSED STORM SEWER IS RCP ROUND PIPE AND IS A PRIVATE STORM SEWER SYSTEM UNLESS NOTED OTHERWISE.
2. CURB/GUTTER IS TYPE A EXCEPT AS NOTED

LEGEND

- PLAT BOUNDARY
- BASIN BOUNDARY
- BASIN DESIGN POINT
- BASIN I.D. / ACREAGE / 5 YR/100 YR CFS (DENOTES OVERALL BASIN)
- DIRECTION OF FLOW
- EXISTING CONTOUR
- PROPOSED CONTOUR
- ROW/LORSON RANCH BOUNDARY
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- TIME OF CONCENTRATION
- HP HIGH POINT
- LP LOW POINT
- CROSSPAN (6' OR 8')

CARRIAGE MEADOWS NORTH AT LORSON RANCH FIL. NO. 1 (SF17-023)

TRACT E
CARRIAGE MEADOWS NORTH AT LORSON RANCH FIL. NO. 1
(SF17-023)

EX. FMIC CHANNEL

EX. TYPE C INLET

EX. 30" RCP

EX. 48" FMIC

EX. FMIC OVERFLOW STRUCTURE

EX. 48" RCP

EX. 3'X4' FMIC RCBC

EX. FMIC PIPE SYSTEM

EX1 0.95ac 0.3 1.6

PR2 2.41ac 9.4 17.0

PR3 0.11ac 0.5 0.9

PR1 1.24ac 5.3 9.7

PR4 1.68ac 7.2 13.1

PR5 0.39ac 1.7 3.1

PR6 0.72ac 3.1 5.6

PR7 1.41ac 6.0 11.0

PR8 0.22ac 0.9 1.7

EX3 0.73ac 0.4 2.4

EX4 0.57ac 2.6 4.7

PR. 20' TYPE "R" INLET #1

PR. 24" RCP @1.00%

PR. 5' TYPE "R" INLET #1a

PR. 10' TYPE "R" INLET #3

PR. 24" RCP @1.0%

PR. 36" RCP @0.5%

FUTURE INLET #8a

PR. 18" RCP @1.0%

PR. 10' TYPE "R" INLET #4

PR. 24" RCP @0.5%

PR. 5' TYPE "R" INLET #5

PR. 24" RCP @0.5%

PR. 5' TYPE "R" INLET #8

FUTURE 10' TYPE "R" INLET #7

EX. 30" RCP

EX. 5' TYPE R INLET

EX. 34"X53" HERCP

EX. 25' TYPE R INLET

EX. SWALE TO REMAIN

RE 18" RCP @1.42%

PC STA 12+97.97

MARKSHEFFEL ROAD

FONTAINE BLVD.

CARRIAGE MEADOWS DRIVE

SCALE: 1"=50'

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(719) 635-3200
CONTACT: JEFF MARK

NO. DESCRIPTION

PROJECT: VILLAGES AT LORSON RANCH
FONTAINE BLVD/CARRIAGE MEADOWS DR
EL PASO COUNTY, COLORADO

DRAWN: RLS
DESIGNED: LAB
CHECKED: RLS

DEVELOPED CONDITIONS FINAL PLAT VILLAGE AT LORSON RANCH

DATE: APRIL, 2024

PROJECT NO. 100.070

SHEET NUMBER 1

TOTAL SHEETS: 1

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