FINAL DRAINAGE REPORT
FOR
LOT 5 OF CLEARWAY FILING NO. 2

EL PASO COUNTY, COLORADO

JUNE 2022

Prepared for:
WIRENUT HOME SERVICES
6395 E Platte Ave.
Colorado Springs, CO 80915
(719)-227-0500

Prepared by:

CIVIL CONSULTANTS, INC.

212 N. Wahsatch, Suite 305
Colorado Springs, CO 80903
(719) 955-5485

Project #44-042

PCD Project No. SF-XX-XXX

FINAL DRAINAGE REPORT FOR
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DRAINAGE PLAN STATEMENTS

ENGINEERS STATEMENT

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

_____
Virgil A. Sanchez, P.E. #37160
For and on Behalf of M&S Civil Consultants, Inc

DEVELOPER'S STATEMENT

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

BY:_____

TITLE:_____
DATE:_____

ADDRESS: Wirenut Home Services
6395 E. Platte Ave.
Colorado Springs, CO 80915

EL PASO COUNTY'S STATEMENT

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

BY:_____ DATE:_____
Jennifer Irvine, P.E.
County Engineer

CONDITIONS:

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APPENDIX

FINAL DRAINAGE REPORT FOR
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PURPOSE

This document is intended to serve as the Final Drainage Report for the Lot 5 of Clearway Filing No. 2. The purpose of this document is to identify and analyze the on and offsite drainage patterns and to ensure that post development runoff is routed through the site safely and in a manner that satisfies the requirements set forth by the El Paso County Drainage Criteria Manual. The development plan for Lot 5 will consist of asphalt parking lots, an office/warehouse building, asphalt storage, lighting, utility infrastructure, and landscaping. A Sand Filter Basin (Pond 1) is proposed to provide on-site water quality and detention. The parcel is zoned “CS CAD-O” and the proposed use is permissible within the commercial zoning criteria.

GENERAL LOCATION AND DESCRIPTION

Lot 5 of Clearway Filing No. 2 is located in the north quarter of Section 18, Township 14 South, Range 65 West of the 6th P.M. in El Paso County, Colorado. The parcel is bound to the north by existing commercial buildings approximately 6 feet from the northern boundary, and the East Fork Sand Creek Sub-tributary to the south and to the east by Cherokee Metropolitan District property, and to the west by City of Colorado Springs property and northwest by The Wrangler Mobile Home Park. As shown on the enclosed FIRM panel, a channel known as the East Fork of Sand Creek Sub-tributary flows from north to south approximately 15 feet from the eastern boundary of the site. The site is located within the greater Sand Creek Drainage Basin and is tributary to the Sand Creek Channel via the East Fork Sand Creek Sub-Tributary. A vicinity map showing the location of the proposed development has been provided in the appendix of this report.

The proposed development and improvements will be constructed on approximately 1.00 acres of the 2.97-acre parcel. The site is currently zoned “CS CAD-O” which is associated with commercial development. In the existing condition, both the parcel and offsite contributing watershed lands are sparsely vegetated, with ground cover consisting primarily of native grasses ranging in density from moderate to good. The proposed development will consist of an asphalt parking area with an office/warehouse building, crushed asphalt storage area, lighting, landscaping, and an access road. Slopes across the development typically range between 2% to 7%. Offsite flows reaching development are contributed in part from areas of The Wrangler Mobile Home Park and the City of Colorado Springs property along the western boundary, from platted commercial property to the north and northeast. Flows produced within the development will be collected by proposed storm sewer improvements, swales, a riprap rundown, and will be routed to a proposed Sand Filter Basin (Pond 1) located at the southern boundary of the development.

SOILS

Soils for this project are delineated by the map in the appendix as Ellicott Loamy Coarse Sand (28) on the southeast corner of the property and Blakeland Loamy Sandy (8) throughout the majority of the property, both of which are characterized as Hydrologic Soil Types "A". Soils in the study area are shown as mapped by Soil Conservation Service in the "Soils Survey of El Paso County Area".

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual and where applicable the Urban Storm Drainage Criteria Manual. The Rational Method was used to estimate stormwater runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

HYDRAULIC CALCULATIONS

Hydraulic calculations were estimated using the Manning's Formula and the methods described in the El Paso County and City of Colorado Springs Storm Drainage Design Criteria manual. The relevant data sheets are included in the appendix of this report.

FLOODPLAIN STATEMENT

A portion of the site lies within the 100 year floodplain according to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel No. 08041C0543 F, effective date March 17, 1997 and the more recent FIRM Panel No. 08041C0754 G, effective date December 7, 2018. Base Flood Elevation (BFE) lines from FIRM Panel No. 08041C0754 G (NGVD29) are used for hydraulic calculations, drainage maps, and a discussion within this report. No development is anticipated to occur within the floodplain located at the northwest corner of the site. See Proposed Drainage Map and the FIRM Panels located in the appendix of this report for details. Tract A is provided on the plat for the portion of the lot encumbered by the floodplain. The Floodplain application and Floodplain permit are included in this report, in the Floodplain Map section in the appendix. No portions of the developed lots are within the 100 year flood zone. Additional work will be at the discretion of the local floodplain administrator in accordance with FEMA policy.

DRAINAGE CRITERIA

This drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual and where applicable the City of Colorado Springs DCM Volume 1 dated May 2014 effective January 2015. Hydrologic calculations were performed to determine runoff quantities for the 5-year and 100-year frequency storms for developed conditions using the Rational Method as required for basins having areas less than 130 acres (in accordance with Chapter 6 of the City of Colorado Springs DCM Volume 1). Full spectrum detention facilities have been designed in accordance with Section 3.2.1. of Chapter 13 of the City of Colorado Springs DCM Volume 1, dated May 2014, effective January 31, 2015 and Urban Drainage and Flood Control District Manuals dated January 2016.

FOUR STEP PROCESS

Step 1: Employ Runoff Reduction Practices. – Approximately 0.5 acres of the proposed, 2.97 acre development is being set aside for a Sand Filter Basin. Whenever possible, runoff produced within developed areas containing impervious surfaces will be routed through landscaped areas or earthen swales (grass-lined where slope exceeds 2%) to minimize direct connection of impervious surfaces.

Step 2: Stabilize drainage ways –The Lot 5 at Clearway Filing No. 2 site, proposes a Full Spectrum Detention (FSD) Pond to control developed runoff that is discharging to the East Fork Sand Creek

Sub-Tributary located at southeastern boundary of the subject site. The FSD outlet structure has been designed to drain the water quality event storm in 40 hours, while reducing the 100 year peak discharge to approximately 90% of the predevelopment conditions. The development of this site is not anticipated to have negative effects on downstream drainageways. The existing channel embankment has been stabilized at the FSD pond's emergency spillway and where the outlet pipe from the pond enters the channel. The existing channel is to remain, and no improvements are necessary for this reach of the channel (See "Referenced Reports" in the Appendix).

Step 3: Provide water quality capture volume. – A Full Spectrum Detention Pond is proposed to reduce peak discharge rates and provide water quality treatment. The WQCV will be released over a 40 hour period while larger event storms will be released in periods of times between 64-80 hours.

Step 4: Consider Need for Industrial and Commercial BMP's – This submittal provides a final grading and erosion control plans with BMPs in place. The proposed project will use silt fence, inlet protection, straw bales, a vehicle tracking control pad, and concrete washout area, mulching and reseeding to mitigate the potential for erosion across the site. DL Holdings, LLC shall be responsible for existing and potentially necessary the BMPs for the site including staging, storage and stockpile areas as determined by the contractor. Individual lot owners will be responsible for additional permanent BMPs if necessary because of site uses.

EXISTING DRAINAGE CONDITIONS

Lot 5 of Clearway Filing No. 2 site consists of 2.97 acres situated north and west of the East Fork Sub-tributary of Sand Creek. There are no existing structures within the site. In accordance with El Paso County's Engineering Criteria Manual (ECM) and Drainage Criteria Manual's (DCM Vol. 1 & 2), an existing conditions hydrologic analysis was performed to determine existing flow quantities entering and exiting the subject site so a comparison to post development discharge rates could be made. As shown on the enclosed Existing Drainage Map (located in the appendix of this report) the existing site terrain within the parcel generally slopes from north to south at grades that vary between 2% to 15%. An existing 6-8" concrete retaining wall lies approximately 6-12 feet from the northern boundary of the site and protects a portion of the site from erosion effects from the offsite, commercial area runoff from the north. The East Fork Sand Creek Sub-Tributary continues from north to south approximately 10 feet from the eastern boundary of the site. It was observed that existing channel banks appear to be stable with established vegetation and minimal scour. The existing channel is to remain, and no improvements have been determined to be necessary for this reach of the channel (See "Background" in the Appendix). An overlay of the 100 yr floodplain (Zone AE) is shown on the Floodplain Map in the appendix, of which 0.28 acres overlaps the southeast corner of the site. Refer to the enclosed Existing Drainage Map in the appendix for visual representation of the detailed, existing drainage patterns discussed below.

Detailed Drainage Discussion

Design Point 1 ((DP1), Q5 = 7.3 cfs, Q100 = 14.0 cfs) receives runoff produced by **Basin D** (Q5 = 7.3 cfs, Q100 = 14.0 cfs), which consists of commercial, gravel and native grass covered platted land located along the northeast parcel property boundary. Runoff produced by **Basin D** is conveyed as sheet flow and earthen swale to the east towards **Design Point 1.** These flows will be routed via a retaining wall to **Design Point 2**.

Design Point 2 (**(DP2)**, Q5 = 22.5 cfs, Q100 = 42.3 cfs) receives runoff produced by **Basin B** (Q5 = 8.9 cfs, Q100 = 16.6 cfs), **Basin C** (Q5 = 8.3 cfs, Q100 = 15.4 cfs) and **DP 1**. These basins consist of platted commercial lots and a 30 foot street for ingress/egress. Flows produced by **DP1** join with flows from **Basin C** and are conveyed by a retaining wall along the south border of **Basin C**. Runoff produced by **Basins B and Basin C** is conveyed as sheet flow towards **Design Point 2.** Runoff from **Design Point 2** continues southeast towards **Basin F**.

Design Point 3 (**(DP3)**, Q5 = 22.8 cfs, Q100 = 44.6 cfs) receives runoff produced by **DP 2** and **Basin F** (Q5 = 0.3 cfs, Q100 = 2.5 cfs), which consists of native grass covered platted land located northeastern portion of the property. Runoff from these basins is conveyed as sheet flow to the southeast and is released on the southeast boundary of **Basin F** and routed southeast towards **Design Point 3.** This runoff outfalls into the East Fork Sand Creek Sub-Tributary.

Design Point 4 (**(DP4)**, Q5 = 9.3 cfs, Q100 = 27.0 cfs) receives runoff produced by **Basin A** (Q5 = 9.3 cfs, Q100 = 27.0 cfs), which consist of developed gravel and un-developed native grass covered platted land located along the west portion of the property boundary. Runoff produced by **Basin A** is conveyed as sheet flow to the southeast towards **DP 4** on the west portion of the property boundary. Runoff from **DP 4** continues southeast towards **Basin E**.

Design Point 5 (**(DP5)**, Q5 = 9.6 cfs, Q100 = 28.9 cfs) receives runoff produced by **DP 4** and **Basin E** (Q5 = 0.3 cfs, Q100 = 2.3 cfs), which consists of native grass covered platted land located at the west portion of the property boundary. Runoff from **DP 4** and **Basin E** is conveyed as sheet flow to the south and southwest and is captured by an existing swale on the western property boundary, then routed southeast towards **DP 5.** This runoff outfalls into the existing channel shared by **Basin G**, which drains southeast to the East Fork Sand Creek Sub-Tributary.

Design Point 6 (**(DP6)**, Q5 = 31.0 cfs, Q100 = 72.3 cfs) receives runoff produced by **DP 3**, **DP 5** and **Basin G** (Q5 = 0.3 cfs, Q100 = 2.5 cfs), which consists of native grass covered platted land located at the southeast portion of the property. Runoff from **DP 3, DP 5** and **Basin G** is conveyed as sheet flow to the southeast and is captured by an existing channel along the southern portion of the property boundary, then is routed east towards **DP 6.** This runoff outfalls southeast to the East Fork Sand Creek Sub-Tributary. The cumulative runoff values are from the onsite flows and do not include the East Fork Sand Creek Sub-Tributary upstream flows. The values provided by FEMA for Sand Creek East Fork Sub-Tributary at confluence with Sand Creek East Fork is 1970 cfs for the 100 year event.

PROPOSED DRAINAGE CHARACTERISTICS

The proposed development and improvements will be constructed on approximately 3.05 acres. The majority of the site has been accounted for as a storage yard and the remaining northern portion identified as Tract C being considered as pastureland/undeveloped is shown on the Proposed Drainage Map. Refer to the Proposed Drainage Map and hydraulic calculations un the Appendix for weighted runoff coefficients of the site. Proposed drainage patterns generally remain consistent with those in the existing condition with surface runoff traveling north to south. A swale is proposed on the western boundary of the site to capture and route offsite runoff south to the Sand Creek East Fork Subtributary. Storm sewer and inlets is proposed, on the north and eastern edge of the site, to capture and route offsite runoff south to the Sand Creek East Fork Subtributary. The onsite runoff, is conveyed via storm sewer and inlets to the proposed FSD pond. The runoff reaching the pond will be detained and discharged via a staged outlet structure and

proposed 24" RCP storm system to the East Fork Sand Creek Sub-Tributary below historic rates. The outfall into the East Fork Sand Creek Sub-Tributary channel is armored with a proposed riprap pad and is grading away from main flows within the channel. Type M riprap protection is also proposed to stabilize the emergency spillway bank and all proposed grading around the outfall. Refer to the Proposed Drainage Map in the appendix for an illustration of the proposed site drainage patterns. All storm sewer, drainage structure and pond are private, and shall be maintained by owner. A detailed description of the proposed drainage characteristics follows:

Detailed Drainage Discussion

Design Point 1: ((DP1), Q5 = 6.8 cfs, Q100 = 12.7 cfs)
DP1 consists of 2.30 acres of offsite **Basin B** (Q5 = 6.8 cfs, Q100 = 12.7 cfs). Surface runoff from the existing neighboring Clearway Industrial Park (parking lot, gravel lot, building) within this basin generally flows from north to south as sheet flow and is routed via curb and gutter to a modified triple Denver Type 16 inlet with a mountable grate configuration (**INLET 1:** Q5 = 4.3 cfs, Q100 = 6.6 cfs). The intercepted flows are conveyed east through an 18" PP **Pipe Run 1** (Q5 = 4.3 cfs, Q100 = 6.6 cfs) until they combine with flows from **DP2**. Uncaptured runoff from this design point is conveyed as flow-by, **FB DP1** (Q5 = 2.5 cfs, Q100 = 6.1 cfs) towards **DP2**.

Design Point 2 ((DP2), Q5 = 7.1 cfs, Q100 = 13.2 cfs)
DP2 consists of 2.40 acres of offsite **Basin C** (Q5 = 7.1 cfs, Q100 = 13.2 cfs). Runoff from the existing neighboring Clearway Industrial Park (parking lot, gravel lot, building) within this basin travels as sheet flow north to south and is routed via curb and gutter a modified triple Denver Type 16 inlet with a mountable grate configuration (**INLET 2:** Q5 = 4.5 cfs, Q100 = 6.8 cfs) at **DP2**. The intercepted flow combines with flows from **PR1** and are conveyed south through 24" PP **Pipe Run 2** (Q5 = 5.9 cfs, Q100 = 9.7 cfs) to **DP4**. Uncaptured runoff from this design point is conveyed as flow-by, **FB DP2** (Q5 = 2.6 cfs, Q100 = 6.4 cfs) towards **DP4**.

Design Point 3 ((DP3), Q5 = 2.7 cfs, Q100 = 6.4 cfs)
DP3 consists of 0.02 acre, offsite **Basin F** (Q5 = 0.1 cfs, Q100 = 0.2 cfs) and **FB DP1** Runoff from the existing neighboring Clearway Industrial Park (parking lot, gravel lot) within offsite **Basin F** travels as sheet flow south and is routed via curb and gutter a modified triple Denver Type 16 inlet with a mountable grate configuration (**INLET 3**: Q5 = 2.2 cfs, Q100 = 4.1 cfs) at **DP3**. The intercepted flows are routed east through 15" **Pipe Run 3** (Q5 = 2.2 cfs, Q100 = 4.1 cfs) to **DP5**. Uncaptured runoff from this design point is conveyed east as flow-by, **FB DP3** (Q5 = 0.5 cfs, Q100 = 2.3 cfs) to **DP5.**

Design Point 4 ((DP4), Q5 = 1.2 cfs, Q100 = 3.4 cfs)
DP4 consists of 0.04 acre, offsite **Basin G** (Q5 = 0.2 cfs, Q100 = 0.4 cfs) and **FB DP2**. Runoff from the existing neighboring Clearway Industrial Park (parking lot, gravel lot, building) within this basin travels as sheet flow north to south and is routed via curb and gutter a modified triple Denver Type 16 inlet with a mountable grate configuration (**INLET 4**: Q5 = 1.0 cfs, Q100 = 2.6 cfs) at **DP4**. The intercepted flow combines with flow from **PR2** and **PR3** and is conveyed south through a 24" **Pipe Run 4** (Q5 = 9.1 cfs, Q100 = 16.4 cfs) to **DP5**. Uncaptured runoff from this design point is conveyed east as flow-by, **FB DP4** (Q5 = 0.2 cfs, Q100 = 0.8 cfs) towards **DP5**.

Design Point 5 ((DP5), Q5 = 4.1 cfs, Q100 = 9.7 cfs)

DP5 consists of 0.95 acre, offsite **Basin E** (Q5 = 3.3 cfs, Q100 = 6.1 cfs), **FB DP3** and **FB DP4**. All runoff from the existing neighboring Clearway Industrial Park (parking lot, gravel lot, building) within this basin travels southeast as sheet flow and is routed via curb and gutter a modified triple sump Denver Type 16 inlet with a mountable grate configuration (**INLET 5:** Q5 = 4.1 cfs, Q100 = 9.7 cfs) at **DP5**. The intercepted flows combines with flow from **PR4** and is conveyed southeast through 30" PP **Pipe Run 5** (Q5 = 12.7 cfs, Q100 = 30.5 cfs) to **DP6**.

Design Point 6 ((DP6), Q5 = 7.5 cfs, Q100 = 14.4 cfs)
DP6 consists of 3.18 acre, offsite **Basin D** (Q5 = 7.5 cfs, Q100 = 14.4 cfs). All runoff from the existing neighboring Clearway Industrial Park (parking lot, gravel lot, building) within this basin travels south as sheet flow to a natural swale and is fully captured via proposed Type D sump inlet **(INLET 6)** (Q5 = 7.5 cfs, Q100 = 14.4 cfs) at the design point. These flows are conveyed south through 24" PP **Pipe Run 6** (Q5 = 7.5 cfs, Q100 = 14.4 cfs) and combine with flows from **PR5** at a manhole. The combined flows continue south through a 36" PP **Pipe Run 7 & Pipe Run 8** (Q5 = 18.8 cfs, Q100 = 41.4 cfs) to a manhole at the end of **PR8.**

Design Point 7 ((DP7), Q5 = 0.8 cfs, Q100 = 1.5 cfs)
DP7 consists of 0.19 acre, onsite **Basin I** (Q5 = 0.8 cfs, Q100 = 1.5 cfs). Developed runoff from this basin (parking lot) is conveyed as sheet flow to a low point of the parking lot where a Nyloplast 24" grate inlet (**INLET 7**) intercepts the flows and conveys them west through 12" PP **Pipe Run 23** (Q5 = 0.8 cfs, Q100 = 1.5 cfs). Intercepted runoff is routed to **DP8**.

Design Point 8 ((DP8), Q5 = 1.3 cfs, Q100 = 2.4 cfs)
DP8 consists of 0.33 acre, onsite **Basin H** (Q5 = 1.3 cfs, Q100 = 2.4 cfs). Developed runoff from this basin, parking lot, is fully conveyed as sheet flow to a low point of the parking lot, where a proposed modified single sump Denver Type 16 inlet shall be constructed. The flows entering the inlet will combine with flows from **PR23** and will be directed southwest through 15" PP **Pipe Run 24** (Q5 = 2.0 cfs, Q100 = 3.8 cfs), until the flows combine with roof drain flows from 0.20 acre **Basin K** (Q5 = 0.7 cfs, Q100 = 1.4 cfs).

See below for detailed discussion of proportioned flow approximations from 0.20 acre **Basin K** (Q5 = 0.7 cfs, Q100 = 1.4 cfs) and how they enter the storm system main between **Pipe Runs 24 to 34**.

Roof Drain Detailed Discussion: Basin K
The area of the eastern side of the commercial building roof (**Basin K**) was divided into sections and the area of the sections with respect to the area of **Basin K**, determined the portion of runoff to each roof drain. A 6" PP **Pipe Run 25** (Q5 = 0.1 cfs, Q100 = 0.2 cfs) conveys runoff from ~14.3% of the basin to the east, until these flows merge with flows from **PR24** and are conveyed through 15" PP **Pipe Run 26** (Q5 = 2.2 cfs, Q100 = 4.1 cfs) and flow south. A 6" PP **Pipe Run 27** (Q5 = 0.2 cfs, Q100 = 0.3 cfs) conveys runoff from 21.4% of **Basin K** to the east, until these flows merge with flows from **PR26** and are conveyed through 15" PP **Pipe Run 28** (Q5 = 2.3 cfs, Q100 = 4.4 cfs). A 6" PP **Pipe Run 29** (Q5 = 0.2 cfs, Q100 = 0.3 cfs) conveys runoff from 21.4% of **Basin K** to the east, until these flows merge with flows from **PR28** and are conveyed through 18" PP **Pipe Run 30** (Q5 = 2.5 cfs, Q100 = 4.7 cfs). A 6" PP **Pipe Run 31** (Q5 = 0.2 cfs, Q100 = 0.3 cfs) conveys runoff from 21.4% of **Basin K** to the east, until these flows merge with flows from **PR30** and are conveyed through 18" PP **Pipe Run 32** (Q5 = 2.7 cfs, Q100 = 5.1 cfs). A 6" PP **Pipe Run 33** (Q5 = 0.1 cfs, Q100 = 0.2 cfs) conveys runoff from 14.3% of **Basin K** to the east, until these

flows merge with flows from **PR32** and are conveyed through 18" PP **Pipe Run 34** (Q5 = 2.8 cfs, Q100 = 5.2 cfs). Flows from **PR34** are routed to a manhole at the end of **PR34.**

Design Point 9 ((DP9), Q5 = 1.0 cfs, Q100 = 1.9 cfs)

DP9 consists of 0.25 acre, onsite **Basin O** (Q5 = 1.0 cfs, Q100 = 1.9 cfs). Developed runoff from this basin, crushed asphalt lot, is conveyed as sheet flow to a low point of the parking lot at the south boundary of the basin, where a proposed Nyloplast 24" grate inlet shall be constructed. These flows shall then travel southwest through 12" PP **Pipe Run 36** (Q5 = 1.0 cfs, Q100 = 1.9 cfs) to **DP10**.

Design Point 10 ((DP10), Q5 = 1.8 cfs, Q100 = 3.3 cfs)

DP10 consists of 0.40 acre, onsite **Basin N** (Q5 = 1.8 cfs, Q100 = 3.3 cfs). Developed runoff from this basin, crushed asphalt lot, is fully conveyed as sheet flow to a low point of the parking lot at the east boundary of the basin, where a proposed Nyloplast 2'x2' steel bar inlet shall be constructed. These flows will combine with flows from **PR36** and travel southwest through 18" PP **Pipe Run 37 &** 18" RCP **Pipe Run 38** (Q5 = 2.8 cfs, Q100 = 5.2 cfs) to a low tailwater riprap basin in the Sand Filter Basin at **DP13**.

See below for detailed discussion of proportioned flow approximations from 0.21 acre **Basin J** (Q5 = 0.8 cfs, Q100 = 1.5 cfs) and how they enter the storm system main between **Pipe Runs 9 to 20**.

Roof Drain Detailed Discussion: Basin J

The area of the western side of the roof (**Basin J**) was divided into sections and the area of the sections with respect to the area of **Basin J**, determined the portion of runoff to each roof drain. A 6" PP **Pipe Run 9** (Q5 = 0.1 cfs, Q100 = 0.2 cfs) conveys runoff from 13.3% of the basin to the west, then the flows travel south via a 6" PP **PR10** (Q5 = 0.1 cfs, Q100 = 0.2 cfs), until they combine with flow from **PR11.** A 6" PP **Pipe Run 11** (Q5 = 0.2 cfs, Q100 = 0.4 cfs) conveys runoff from 26.7% of **Basin J** to the west, until these flows merge with flows from **PR10** and are conveyed south through a 8" PP **Pipe Run 12** (Q5 = 0.3 cfs, Q100 = 0.6 cfs). Approximately 10% of **Basin J** is paved in asphalt and an area drain fully conveys the flow from this portion south through a 8" PP **PR13** (Q5 = 0.5 cfs, Q100 = 1.0 cfs). A 6" PP **Pipe Run 14** (Q5 = 0.0 cfs, Q100 = 0.1 cfs) conveys runoff from 7.7%% of **Basin J** to the west, until these flows merge with flows from **PR13** and are conveyed through a 12" PP **Pipe Run 15** (Q5 = 0.6 cfs, Q100 = 1.1 cfs). A 6" PP **Pipe Run 16** (Q5 = 0.1 cfs, Q100 = 0.3 cfs) conveys runoff from 20% of **Basin J** to the west, until these flows merge with flows from **PR15** and are conveyed through a 12" PP **Pipe Run 17** (Q5 = 0.7 cfs, Q100 = 1.3 cfs). A 6" PP **Pipe Run 18** (Q5 = 0.1 cfs, Q100 = 0.1 cfs) conveys runoff from 7.7% of **Basin J** to the west, until these flows merge with flows from **PR17** and are conveyed south through a 12" PP **Pipe Run 19 & Pipe Run 20** (Q5 = 0.8 cfs, Q100 = 1.5 cfs) to **DP 11**.

Design Point 11 ((DP11), Q5 = 0.9 cfs, Q100 = 1.5 cfs)

DP11 consists of 0.19 acre, onsite **Basin L** (Q5 = 0.9 cfs, Q100 = 1.5 cfs). Developed runoff from this basin, crushed asphalt lot, is conveyed as sheet flow to a low point of the parking lot at the southwest boundary of the basin, where a proposed Nyloplast 24" grate inlet shall be constructed. Flows conveyed by the inlet at **DP11**, will combine with flows from **Basin J** and be conveyed east through 15" PP **Pipe Run 21** (Q5 = 1.6 cfs, Q100 = 3.0 cfs) to **DP12**.

Design Point 12 ((DP12), Q5 = 0.6 cfs, Q100 = 1.1 cfs)

DP12 consists of 0.13 acre, onsite **Basin M** (Q5 = 0.6 cfs, Q100 = 1.1 cfs). Developed runoff from this basin, crushed asphalt lot, is fully conveyed as sheet flow to a low point of the parking lot at the southeast boundary of the basin, where a proposed Nyloplast 24" grate inlet shall be constructed. Flows conveyed by

the inlet at **DP12** will combine with flows from **PR 21** and be conveyed northeast through a 15" PP **Pipe Run 22** (Q5 = 2.3 cfs, Q100 = 4.1 cfs). Flows from **PR22** combine with flows from **PR34** and are routed via a 24" RCP **Pipe Run 35** (Q5 = 5.0 cfs, Q100 = 9.3 cfs) to a low tailwater riprap basin in the Sand Filter Basin at **DP13**.

Design Point 13 ((DP13), Q5 = 6.7 cfs, Q100 = 12.8 cfs)
DP13 consists of 0.23 acre, onsite **Basin Q** (Q5 = 0.1 cfs, Q100 = 0.6 cfs). Developed runoff from this basin is conveyed to an onsite sand filter basin **Pond 1**. **Pond 1** receives flows from **PR35** (Q5 = 5.0 cfs, Q100 = 9.3 cfs), **PR38** (Q5 = 2.8 cfs, Q100 = 5.2 cfs), and **Basin Q** (Q5 = 0.1 cfs, Q100 = 0.6 cfs). Release rates from **Pond 1** are routed south via an 18" RCP **Pipe Run 39** (Q5 = 0.3 cfs, Q100 = 0.3 cfs), where the flows combine with flows from **PR8** to a 36" RCP **PR40** (Q5 = 19.1 cfs, Q100 = 41.7 cfs) to a low tailwater riprap basin in East Fork Sand Creek Subtributary at **DP16.** See Water Quality Provision for **Pond 1** information.

Design Point 14 ((DP14), Q5 = 9.4 cfs, Q100 = 27.5 cfs)
DP 14 consists of 9.92 acre of offsite **Basin A** (Q5 = 9.3 cfs, Q100 = 27.0 cfs) and onsite undeveloped 0.22 acre **Basin R** (Q5 = 0.1 cfs, Q100 = 0.5 cfs). Runoff from these basins is fully conveyed to a low point on the southeast boundary of **Basin R**. These flows are captured by a proposed Type D sump inlet. These flows are conveyed via by a 30" RCP **Pipe Run 41** (Q5 = 9.4 cfs, Q100 = 27.5 cfs) to a low tailwater riprap basin in East Fork Sand Creek Subtributary at **DP16.**

Design Point 15 ((DP15), Q5 = 0.1 cfs, Q100 = 0.7 cfs)
DP16 consists of 0.26 acre, onsite **Basin P** (Q5 = 0.1 cfs, Q100 = 0.7 cfs). The runoff from this basin flows to the east boundary of the site and then south toward the East Fork Sand Creek Subtributary at **DP16**.

Design Point 16 (DP16), (Q5 = 28.8 cfs, Q100 = 71.5 cfs)
DP16 consists of 0.55 acre, onsite **Basin S** (Q5 = 0.2 cfs, Q100 = 1.6 cfs). **DP16** receives flows from **Basin S** (Q5 = 0.2 cfs, Q100 = 1.6 cfs), **PR40** (Q5 = 19.1 cfs, Q100 = 41.7 cfs), **PR41** (Q5 = 9.4 cfs, Q100 = 27.5 cfs), and **DP15** (Q5 = 0.1 cfs, Q100 = 0.7 cfs). The cumulative flows at **DP16** (Q5 = 28.8 cfs, Q100 = 71.5 cfs) are less than the flows in the existing condition **EX DP6** (Q5 = 31.0 cfs, Q100 = 72.3 cfs). The site will not adversely affect adjacent or downstream properties.

WATER QUALITY PROVISIONS AND MAINTENANCE

A Sand Filter Detention Pond is being proposed for this site to address water quality from 2.11 acres at 85.2% imperviousness. The pond has been sized utilizing MHFD-Detention v4.05 and UD-BMP v3.07 from Urban Drainage and Flood Control District (UDFCD). The pond is not expected to carry future additional flows other than from this project. The pond is being constructed with an outlet control structure which limits the release rate of the pond through the use of weirs and an 18" RCP outlet pipe. The pond has been sized to store the WCQV, EURV, and the flood control volumes for the 2, 5, 10, 25, 50 and 100 year storm events. The WQCV will be slowly released over 12 hours. The maximum WQCV storage volume is 0.051 acre-feet. An overflow emergency spillway is proposed along the northwest embankment to safely convey flows to the existing East Fork Sand Creek Subtributary in the event of outlet clogging. The emergency overflow spillway will be at an elevation of 6254.76 feet and will have a length of 22.0 feet, and a spillway design flow depth of approx. 0.23 feet across the crest (passing 12.8 cfs) should the outlet become clogged. The top of the proposed embankment will need to be constructed at approximately 6256.0 to provide one foot of freeboard. See Proposed Drainage Map in the appendix of this report. The

following table provided below summarizes the peak inflows, outflows, storage volumes and water surface elevations for the water quality, 5 year, EURV and 100 year event storms.

WQCV Pond 1	WQCV	EURV	5 Year	100 Year
Maximum Volume Stored (acre-ft)	0.051	0.242	0.170	0.323
Maximum WS Elevation	6252.28	6254.15	6253.55	6254.75
Peak Inflow (cfs)	N/A	N/A	5.4	10.7
Peak Outflow (cfs)	0.1	0.3	0.3	0.3

The proposed pond will be private and shall be maintained by the property owner. Access shall be granted to the owner and El Paso County for access and maintenance of the private WQCV facility. A private maintenance agreement document shall accompany this report on the next submittal.

EROSION CONTROL

It is the policy of the El Paso County that we submit a grading and erosion control plan with the drainage report. Proposed silt fence, vehicle traffic control, and concrete washout area are proposed as erosion control measures. The costs for these measures have been provided on the Grading and Erosion Control plan.

CONSTRUCTION COST OPINION

Private Drainage Facilities (**NON-Reimbursable**):

Item	Description	Quantity		Unit Cost		Cost
1.	6” PP	181	LF	$25	/LF	$4,525.00
2.	8” PP	17	LF	$35	/LF	$595.00
3.	12" PP	276	LF	$45	/LF	$12,420.00
4.	15" PP	312	LF	$55	/LF	$17,160.00
5.	18” PP	238	LF	$68	/LF	$16,184.00
6.	24" PP	65	LF	$81	/LF	$5,265.00
7.	30” PP	130	LF	$125	/LF	$16,250.00
8.	36” PP	357	LF	$150	/LF	$53,550.00
9.	18” RCP	55	LF	$78	/LF	$4,290.00
10.	24” RCP	27	LF	$104	/LF	$2,808.00
11.	30” RCP	70	LF	$130	/LF	$9,100.00
12.	36” RCP	32	LF	$155	/LF	$4,960.00
13.	18” FES RCP	1	EA	$923	/EA	$923.00
14.	24” FES RCP	1	EA	$1046	/EA	$1,046.00
15.	30” FES RCP	1	EA	$1292	/EA	$1292.00
16.	36” FES RCP	1	EA	$1845	/EA	$1845.00
17.	Triple Type 16 Inlet	5	EA	$11,900	/EA	$59,500.00
18.	Single Type 16 Inlet	1	EA	$5900	/EA	$5,900.00
19.	Type D Inlet	2	EA	$4800	/EA	$9,600.00

20.	24" Grate and Drain Basin	4	EA	$2930	/EA	$11,720.00
21.	2'x2' Steel Grate and Drain Basin	1	EA	$2930	/EA	$2,930.00
22.	Manhole	6	EA	$6500	/EA	$39,000.00
23.	Type M riprap, 2' deep Low Tailwater	60	CY	$65	/CY	$3,900.00
	FSD Pond (Inlcuding Outlet Struct, Spillway Cutoff Wall, Riprap, Signs, Sand Filter Media, Erosion Blanket)	1	LS	$17,408	/LS	$17,408.00
					Total $	**$302,171.00**
					5% Contingency	**$15,108.55**
					10% Engineering	**$30,217.10**
					Total$	**$347,496.65**

M & S Civil Consultants, Inc. (M & S) cannot and does not guarantee the construction cost will not vary from these opinions of probable costs. These opinions represent our best judgment as design professionals familiar with the construction industry and this development in particular. The above and below is only an estimate of the facility cost and drainage basin fee amounts in 2022.

DRAINAGE & BRIDGE FEES – CLEARWAY FILING NO. 2, LOT 5

Fees not required as this Filing was previously platted.

SUMMARY

Per this final drainage report, the proposed drainage facilities recommended within this report will adequately convey, detain and route runoff from the planned development to the East Fork Sand Creek Sub-Tributary drainage way at peak flow rates which are below existing with no negative impacts on surrounding developments. All drainage facilities described herein and shown on the included Proposed Drainage Map (See Appendix), this final Drainage Report and site construction documents are submitted for simultaneous review. Care will be taken to accommodate overland emergency flow routes on site and temporary drainage conditions. The development of the Clearway Filing No. 2, Lot 5 site will not adversely affect adjacent or downstream properties.

REFERENCES

1.) "El Paso County and City of Colorado Springs Drainage Criteria Manuals".

2.) "Urban Storm Drainage Criteria Manual"

3.) SCS Soils Map for El Paso County.

4.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency (Map No. 08041C0543F), Effective date March 17, 1997.

5.) Flood Insurance Rate Map (FIRM), Federal Emergency Management Agency (Map No. 08041C0754G), Effective date December 7, 2018.

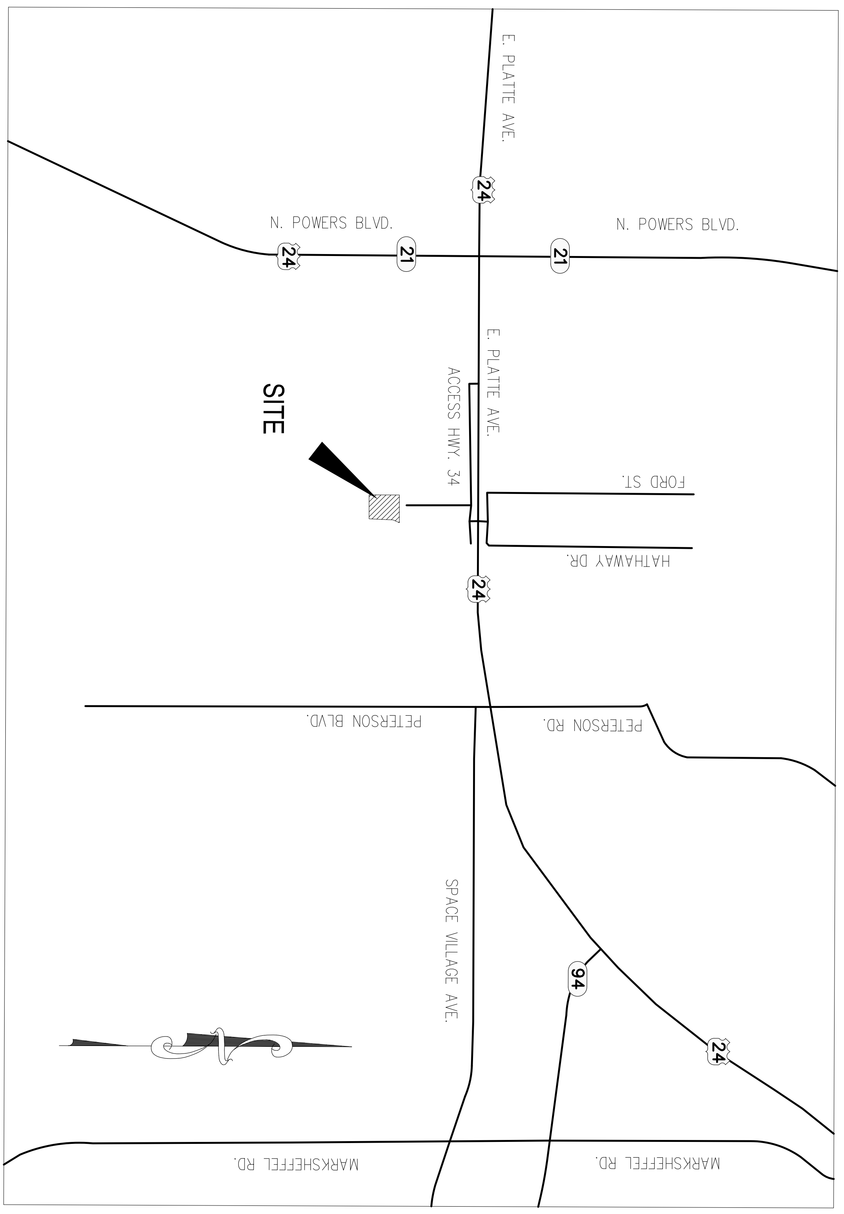
7.) "Sand Creek Drainage Basin Planning Study, Preliminary Design Report", Revised March 1996, by Kiowa Engineering Corporation.

APPENDIX

VICINITY MAP

VICINITY MAP

N.T.S.



REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APRV'D. BY:	DATE:

CAUTION: THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE, OR LIABLE FOR, UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

COLORADO REGISTERED 37160 PROFESSIONAL ENGINEER

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

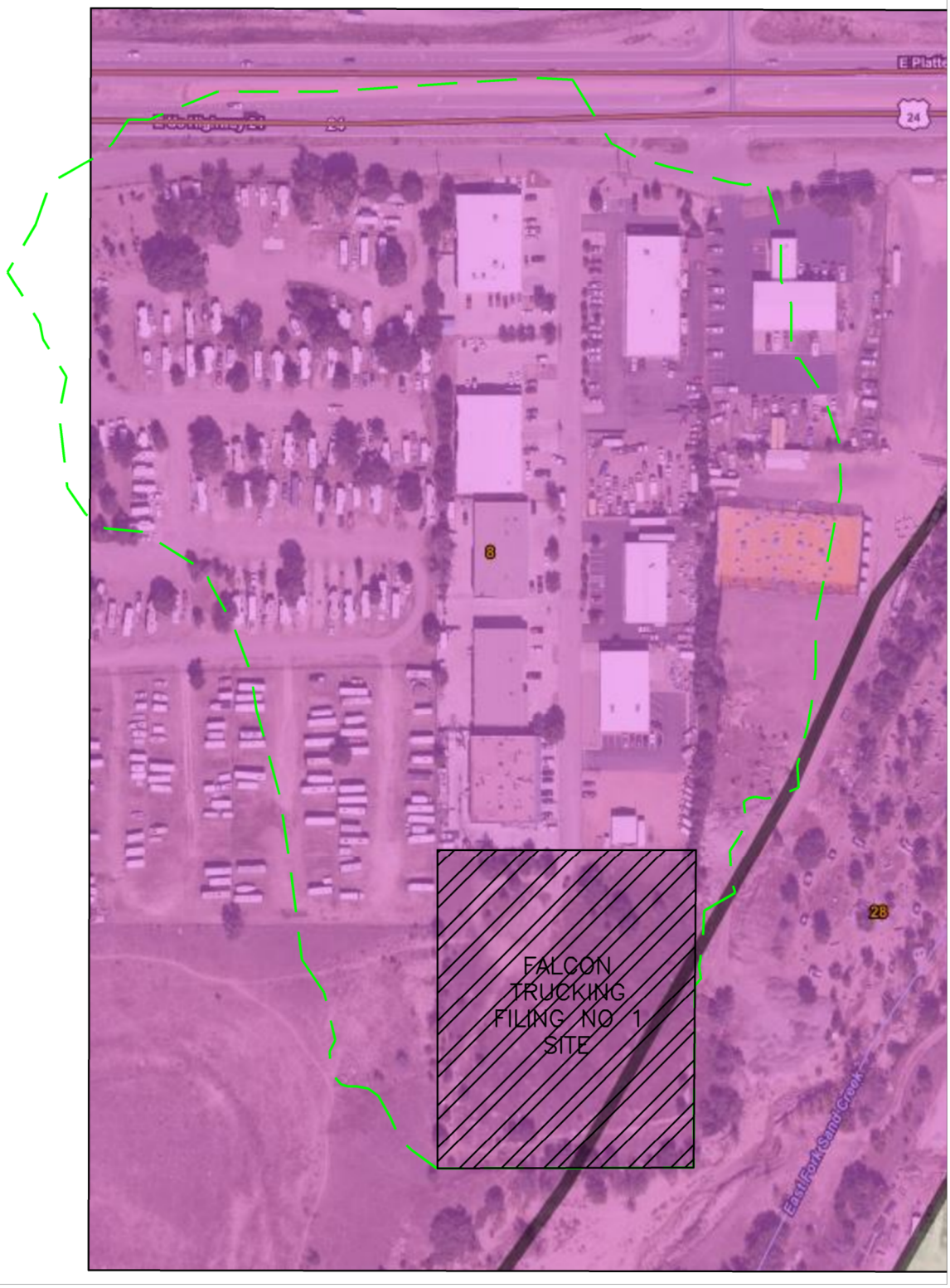
CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CLEARWAY FILING NO. 2, LOT 5

VICINITY MAP

PROJECT NO. 44-042	SCALE:	DATE: 05-20-2022	
DESIGNED BY: TAU	HORIZONTAL: N/A	SHEET 1 OF 1	VIC01
DRAWN BY: TAU	VERTICAL: N/A		
CHECKED BY: VAS			

SOILS MAP



NOT TO SCALE

Summary by Map Unit — El Paso County Area, Colorado (CO625)

Summary by Map Unit — El Paso County Area, Colorado (CO625)		
Map unit symbol	**Map unit name**	**Rating**
8	Blakeland loamy sand, 1 to 9 percent slopes	A
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A
111	Water	

FALCON TRUCKING FILING NO. 1
SOILS MAP

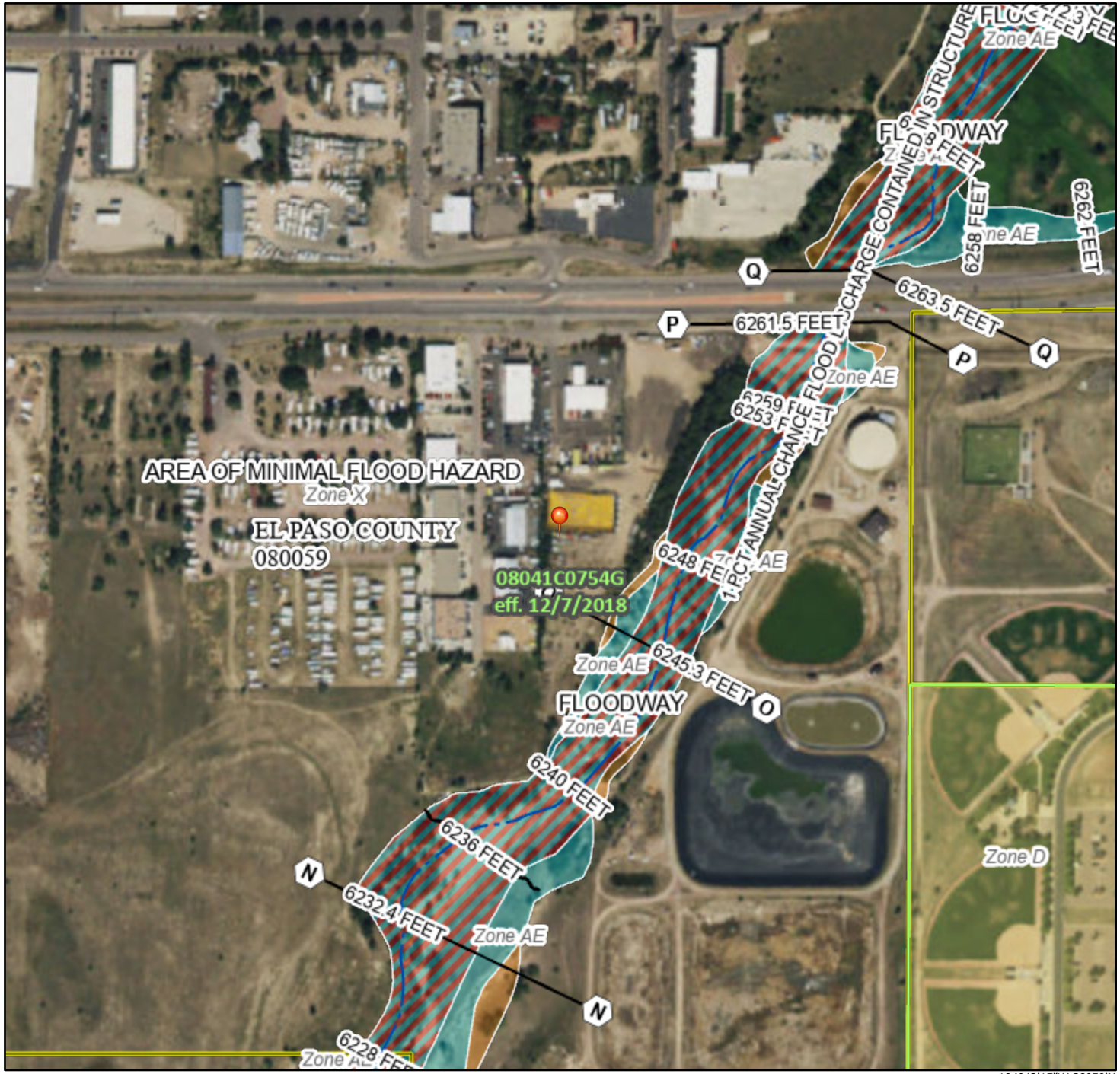
M&S CIVIL CONSULTANTS, INC.

FIRM PANEL

National Flood Hazard Layer FIRMette

FEMA

104°42'52"W 38°50'28"N



104°42'15"W 38°50'N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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 5/16/2022 at 9:02 AM 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.

HYDROLOGIC CALCULATIONS

CLEARWAY NO.2, LOT 5 (WIRENUT)
EXISTING CONDITIONS DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)

			STREETS/DEVELOPED			*DEVELOPED LOTS*			*UNDEVELOPED/LANDSCAPE*			*RUNOFF COEFFICIENT*	
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A	***431946.186***	9.92	0.00	0.90	0.96	9.13	0.30	0.50	0.78	0.08	0.35	***0.28***	***0.49***
B	***133523.312***	3.07	0.00	0.90	0.96	3.07	0.73	0.81	0.00	0.08	0.35	***0.73***	***0.81***
C	***119110.0794***	2.73	0.00	0.90	0.96	2.73	0.73	0.81	0.00	0.08	0.35	***0.73***	***0.81***
D	***134064.3175***	3.08	1.44	0.73	0.81	1.63	0.59	0.70	0.00	0.08	0.35	***0.66***	***0.75***
E	***42111.756***	0.97	0.00	0.90	0.96	0.00	0.08	0.35	0.97	0.08	0.35	***0.08***	***0.35***
F	***46802.057***	1.07	0.00	0.90	0.96	0.00	0.08	0.35	1.07	0.08	0.35	***0.08***	***0.35***
G	***47704.938***	1.10	0.00	0.90	0.96	0.00	0.08	0.35	1.10	0.08	0.35	***0.08***	***0.35***

CLEARWAY NO.2, LOT 5 (WIRENUT)
EXISTING CONDITIONS DRAINAGE CALCULATIONS
(Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	**C_5** *From DCM Table 5-1*	**C_{100}** *From DCM Table 5-1*	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**CHECK** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*
A	9.92	0.28	0.49	0.28	100	2	11.7	1174	0.5%	0.7	27.4	39.1	17.1	3.3	5.6	***9.3***	***27.0***
B	3.07	0.73	0.81	0.73	100	2	5.3	775	1.3%	2.3	5.7	11.0	14.9	4.0	6.7	***8.9***	***16.6***
C	2.73	0.73	0.81	0.73	100	2	5.3	675	1.5%	2.4	4.6	9.9	14.3	4.1	6.9	***8.3***	***15.4***
D	3.08	0.66	0.75	0.66	100	2	6.4	673	1.9%	1.4	8.1	14.5	14.3	3.6	6.0	***7.3***	***14.0***
E	0.97	0.08	0.35	0.08	50	2	8.2	298	8.4%	2.0	2.4	10.7	11.9	4.0	6.8	***0.3***	***2.3***
F	1.07	0.08	0.35	0.08	100	2	14.7	138	6.5%	1.8	1.3	15.9	11.3	3.9	6.6	***0.3***	***2.5***
G	1.10	0.08	0.35	0.08	100	1	18.4	169	14.8%	2.7	1.0	19.5	11.5	3.9	6.6	***0.3***	***2.5***

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: TAU
Date: 3/31/2022
Checked by: VAS

CLEARWAY NO.2, LOT 5 (WIRENUT)
EXISTING CONDITIONS DRAINAGE CALCULATIONS
(Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
1	**D**	2.02	2.31									14.3	3.6	6.0	***7.3***	***14.0***	conveyed by sheet flow and swale
				use D BASIN Tc													
2	**DP1, B, C**	6.25	7.01									14.3	3.6	6.0	***22.5***	***42.3***	conveyed by private street c&g
				use DP1 Tc													
3	**DP2, F**	6.34	7.39									14.3	3.6	6.0	***22.8***	***44.6***	conveyed by swale to East Fork Sand Creek
				use DP2 Tc													
4	**A**	2.80	4.84									17.1	3.3	5.6	***9.3***	***27.0***	conveyed to Lot 5
				use A BASIN Tc													
5	**DP4, E**	2.88	5.18									17.1	3.3	5.6	***9.6***	***28.9***	conveyed to East Fork Sand Creek
				use DP4 Tc													
6	**G, DP3, DP5**	9.30	12.95									17.1	3.3	5.6	***31.0***	***72.3***	conveyed to East Fork Sand Creek
				use DP5 Tc													

Weighted Percent Imperviousness of WQ Pond 1				
Contributing Basins	*Area (Acres)*	*C_5*	*Impervious % (I)*	*(Acres)*(I)*
Column1	**Column2**	**Column3**	**Column4**	**Column5**
H	0.33	0.75	91	29.71
I	0.19	0.80	94	17.73
J	0.21	0.74	91	18.70
K	0.20	0.73	90	17.56
L	0.18	0.90	100	18.43
M	0.13	0.90	100	13.32
N	0.40	0.90	100	39.72
O	0.25	0.78	93	22.90
Q	0.23	0.08	7	1.63
Totals	***2.11***			***179.70***
Imperviousness of WQ Pond 1	***85.2***			

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Area Runoff Coefficient Summary)

			STREETS/DEVELOPED			*DEVELOPED LOTS*			*UNDEVELOPED/LANDSCAPE*			*RUNOFF COEFFICIENT*	
BASIN	**TOTAL AREA** *(SF)*	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A	***431957.157***	9.92	0.00	0.90	0.96	9.13	0.30	0.50	0.78	0.08	0.35	***0.28***	***0.49***
B	***100360.697***	2.30	0.00	0.90	0.96	2.30	0.73	0.81	0.00	0.08	0.35	***0.73***	***0.81***
C	***104496.823***	2.40	0.00	0.90	0.96	2.40	0.73	0.81	0.00	0.08	0.35	***0.73***	***0.81***
D	***138334.367***	3.18	1.54	0.73	0.81	1.63	0.59	0.70	0.00	0.08	0.35	***0.66***	***0.75***
E	***41339.688***	0.95	0.00	0.90	0.96	0.95	0.73	0.81	0.00	0.08	0.35	***0.73***	***0.81***
F	***985.639***	0.02	0.02	0.90	0.96	0.00	0.73	0.81	0.00	0.08	0.35	***0.90***	***0.96***
G	***1858.029***	0.04	0.04	0.90	0.96	0.00	0.73	0.81	0.00	0.08	0.35	***0.90***	***0.96***
H	***14220.85***	0.33	0.27	0.90	0.96	0.00	0.73	0.81	0.06	0.08	0.35	***0.75***	***0.85***
I	***8213.984***	0.19	0.17	0.90	0.96	0.00	0.73	0.81	0.02	0.08	0.35	***0.80***	***0.89***
J	***8949.66***	0.21	0.01	0.90	0.96	0.20	0.73	0.81	0.00	0.08	0.35	***0.74***	***0.82***
K	***8500***	0.20	0.00	0.90	0.96	0.20	0.73	0.81	0.00	0.08	0.35	***0.73***	***0.81***
L	***8030.038***	0.18	0.18	0.90	0.96	0.00	0.73	0.81	0.00	0.08	0.35	***0.90***	***0.96***
M	***5803.105***	0.13	0.13	0.90	0.96	0.00	0.73	0.81	0.00	0.08	0.35	***0.90***	***0.96***
N	***17303.404***	0.40	0.40	0.90	0.96	0.00	0.73	0.81	0.00	0.08	0.35	***0.90***	***0.96***
O	***10726.014***	0.25	0.21	0.90	0.96	0.00	0.73	0.81	0.03	0.08	0.35	***0.78***	***0.87***
P	***11364.603***	0.26	0.00	0.90	0.96	0.00	0.12	0.39	0.26	0.12	0.39	***0.12***	***0.39***
Q	***10112.778***	0.23	0.00	0.90	0.96	0.00	0.12	0.39	0.23	0.08	0.35	***0.08***	***0.35***
R	***9732.156***	0.22	0.00	0.90	0.96	0.00	0.08	0.35	0.22	0.08	0.35	***0.08***	***0.35***
S	***23948.368***	0.55	0.00	0.90	0.96	0.00	0.08	0.35	0.55	0.08	0.35	***0.08***	***0.35***

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Area Drainage Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*STREET / CHANNEL FLOW*				*Time of Travel (T_t)*		*INTENSITY **		*TOTAL FLOWS*	
BASIN	**AREA TOTAL**	**C_5**	**C_{100}**	**C_5**	**Length**	**Height**	**T_C**	**Length**	**Slope**	**Velocity**	**T_t**	**TOTAL**	**CHECK**	**I_5**	**I_{100}**	**Q_5**	**Q_{100}**
	(Acres)	*From DCM Table 5-1*			*(ft)*	*(ft)*	*(min)*	*(ft)*	*(%)*	*(fps)*	*(min)*	*(min)*	*(min)*	*(in/hr)*	*(in/hr)*	*(c.f.s.)*	*(c.f.s.)*
A	9.92	0.28	0.49	0.28	100	2	11.7	1174	0.5%	0.7	27.4	39.1	17.1	3.3	5.6	***9.3***	***27.0***
B	2.30	0.73	0.81	0.73	100	2	5.3	674	1.2%	2.2	5.2	10.5	14.3	4.1	6.8	***6.8***	***12.7***
C	2.40	0.73	0.81	0.73	100	2	5.3	735	1.4%	2.3	5.3	10.6	14.6	4.0	6.8	***7.1***	***13.2***
D	3.18	0.66	0.75	0.66	100	2	6.3	685	1.9%	1.4	8.3	14.6	14.4	3.6	6.0	***7.5***	***14.4***
E	0.95	0.73	0.81	0.73	50	1	3.8	390	1.3%	2.3	2.9	6.6	12.4	4.7	8.0	***3.3***	***6.1***
F	0.02	0.90	0.96	0.90	25	1	1.1	17	1.5%	2.4	0.1	5.0	10.2	5.2	8.7	***0.1***	***0.2***
G	0.04	0.90	0.96	0.90	25	1	1.1	90	1.7%	2.6	0.6	5.0	10.6	5.2	8.7	***0.2***	***0.4***
H	0.33	0.75	0.85	0.75	50	1	3.6	127	0.8%	1.8	1.2	5.0	11.0	5.2	8.7	***1.3***	***2.4***
I	0.19	0.80	0.89	0.80	50	1	3.0	51	2.0%	2.8	0.3	5.0	10.6	5.2	8.7	***0.8***	***1.5***
J	0.21	0.74	0.82	0.74	50	1	3.7	86	1.2%	2.2	0.7	5.0	10.8	5.2	8.7	***0.8***	***1.5***
K	0.20	0.73	0.81	0.73	50	1	3.8	86	1.2%	2.2	0.7	5.0	10.8	5.2	8.7	***0.7***	***1.4***
L	0.18	0.90	0.96	0.90	50	1	2.0	64	2.0%	2.8	0.4	5.0	10.6	5.2	8.7	***0.9***	***1.5***
M	0.13	0.90	0.96	0.90	50	1	2.0	62	2.0%	2.8	0.4	5.0	10.6	5.2	8.7	***0.6***	***1.1***
N	0.40	0.90	0.96	0.90	50	1	2.0	123	2.4%	3.1	0.7	5.0	11.0	5.2	8.7	***1.8***	***3.3***
O	0.25	0.78	0.87	0.78	50	1	3.2	130	1.5%	2.4	0.9	5.0	11.0	5.2	8.7	***1.0***	***1.9***
P	0.26	0.12	0.39	0.12	50	2	7.9	159	5.0%	1.6	1.7	9.6	11.2	4.2	7.0	***0.1***	***0.7***
Q	0.23	0.08	0.35	0.08	50	4	6.6	140	2.9%	1.2	2.0	8.5	11.1	4.4	7.3	***0.1***	***0.6***
R	0.22	0.08	0.35	0.08	25	2	4.6	356	2.8%	1.2	5.1	9.7	12.1	4.2	7.0	***0.1***	***0.5***
S	0.55	0.08	0.35	0.08	50	8	5.2	115	15.7%	2.8	0.7	5.9	10.9	4.9	8.3	***0.2***	***1.6***

* Intensity equations assume a minimum travel time of 5 minutes.

Calculated by: TAU
Date: 4/4/2022
Checked by: VAS

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
1	**B**	1.68	1.87									10.5	4.1	6.8	***6.8***	***12.7***	Mod Triple Denver Type 16 Grate Inlet
				Basin B Tc Used													
2	**C**	1.75	1.94									10.6	4.0	6.8	***7.1***	***13.2***	Mod Triple Denver Type 16 Grate Inlet
				Basin C Tc Used													
3	**FB1, F**	0.67	0.93									10.5	4.1	6.8	***2.7***	***6.4***	Mod Triple Denver Type 16 Grate Inlet
				Basin B Tc Used													
4	**FB2, G**	0.29	0.50									10.6	4.0	6.8	***1.2***	***3.4***	Mod Triple Denver Type 16 Grate Inlet
				Basin C Tc Used													
5	**FB3, FB4, E**	0.86	1.22									6.6	4.7	8.0	***4.1***	***9.7***	Mod Triple Denver Type 16 Grate Inlet
				Basin E Tc Used													
6	**D**	2.09	2.39									14.4	3.6	6.0	***7.5***	***14.4***	CDOT Type D Grate Inlet
				Basin D Tc Used													
7	**I**	0.15	0.17									5.0	5.2	8.7	***0.8***	***1.5***	Nyloplast 24" Grate Inlet
				Basin I Tc Used													
8	**H**	0.24	0.28									5.0	5.2	8.7	***1.3***	***2.4***	Mod Single Denver Type 16 Grate Inlet
				Basin H Tc Used													
9	**O**	0.19	0.22									5.0	5.2	8.7	***1.0***	***1.9***	Nyloplast 24" Grate Inlet
				Basin O Tc Used													
10	**N**	0.36	0.38									5.0	5.2	8.7	***1.8***	***3.3***	Nyloplast 2'X2' Steel Bar Inlet
				Basin N Tc Used													
11	**L**	0.17	0.18									5.0	5.2	8.7	***0.9***	***1.5***	Nyloplast 24" Grate Inlet
				Basin L Tc Used													
12	**M**	0.12	0.13									5.0	5.2	8.7	***0.6***	***1.1***	Nyloplast 24" Grate Inlet
				Basin M Tc Used													
13	**Q, PR35, PR38**	1.54	1.75									8.5	4.4	7.3	***6.7***	***12.8***	FSD POND
				Basin Q Tc Used													
14	**A, R**	2.82	4.92									17.1	3.3	5.6	***9.4***	***27.5***	CDOT Type D Grate Inlet
				Basin A Tc Used													

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Basin Routing Summary)

From Area Runoff Coefficient Summary				*OVERLAND*				*PIPE / CHANNEL FLOW*				*Time of Travel (T_t)*	*INTENSITY **		*TOTAL FLOWS*		
DESIGN POINT	**CONTRIBUTING BASINS**	**CA_5**	**CA_{100}**	**C_5**	**Length** *(ft)*	**Height** *(ft)*	**T_C** *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	**T_t** *(min)*	**TOTAL** *(min)*	**I_5** *(in/hr)*	**I_{100}** *(in/hr)*	**Q_5** *(c.f.s.)*	**Q_{100}** *(c.f.s.)*	COMMENTS
15	**p**	0.03	0.10									9.6	4.2	7.0	***0.1***	***0.7***	SWALE CONVEYS FLOW TO EAST FORK SAND CREEK
				Basin P Tc Used													
16	**S, DP15, PR40, PR41**														***28.8***	***71.5***	EAST FORK SAND CREEK
				Basin S Tc Used													

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Storm Sewer Routing Summary)

PIPE RUN	*Contributing Pipes/Design Points*	*Equivalent CA_5*	*Equivalent CA_{100}*	*Maximum T_C*	*Intensity**		*Flow*	
					I_5	*I_{100}*	*Q_5*	*Q_{100}*
1	**DP1**	1.03	0.95	10.5	4.1	6.8	***4.3***	***6.6***
2	**PR1, DP2**	1.45	1.43	10.6	4.0	6.8	***5.9***	***9.7***
3	**DP3**	0.52	0.60	10.5	4.1	6.8	***2.1***	***4.1***
4	**PR2, PR3, DP4**	2.24	2.41	10.6	4.0	6.8	***9.1***	***16.4***
5	**PR4, DP5**	3.14	4.48	10.6	4.0	6.8	***12.7***	***30.5***
6	**DP6**	2.09	2.39	14.4	3.6	6.0	***7.5***	***14.4***
7	**PR5, PR6**	5.23	6.88	14.4	3.6	6.0	***18.8***	***41.4***
8	**PR7**	5.23	6.88	14.4	3.6	6.0	***18.8***	***41.4***
9	**.02 ACRE BASIN J**	0.02	0.02	5.0	5.2	8.7	***0.1***	***0.2***
10	**PR9**	0.02	0.02	5.0	5.2	8.7	***0.1***	***0.2***
11	**.06 ACRE BASIN J**	0.04	0.05	5.0	5.2	8.7	***0.2***	***0.4***
12	**PR10, PR11**	0.06	0.07	5.0	5.2	8.7	***0.3***	***0.6***
13	**PR12, .06 ACRE BASIN J**	0.10	0.12	5.0	5.2	8.7	***0.5***	***1.0***
14	**.01 ACRE BASIN J**	0.01	0.01	5.0	5.2	8.7	***0.0***	***0.1***
15	**PR13, PR14**	0.11	0.12	5.0	5.2	8.7	***0.6***	***1.1***
16	**.04 ACRE BASIN J**	0.03	0.03	5.0	5.2	8.7	***0.1***	***0.3***
17	**PR15, PR16**	0.14	0.15	5.0	5.2	8.7	***0.7***	***1.3***
18	**.02 ACRE BASIN J**	0.01	0.01	5.0	5.2	8.7	***0.1***	***0.1***

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Storm Sewer Routing Summary)

PIPE RUN	*Contributing Pipes/Design Points*	*Equivalent CA_5*	*Equivalent CA_{100}*	*Maximum T_C*	*Intensity**		*Flow*	
					I_5	*I_{100}*	*Q_5*	*Q_{100}*
19	**PR17, PR18**	0.15	0.17	5.0	5.2	8.7	***0.8***	***1.5***
20	**PR19**	0.15	0.17	5.0	5.2	8.7	***0.8***	***1.5***
21	**PR20, DP11**	0.32	0.34	5.0	5.2	8.7	***1.6***	***3.0***
22	**PR21, DP12**	0.44	0.47	5.0	5.2	8.7	***2.3***	***4.1***
23	**DP7**	0.15	0.17	5.0	5.2	8.7	***0.8***	***1.5***
24	**PR23, DP8**	0.40	0.44	5.0	5.2	8.7	***2.0***	***3.8***
25	**.03 ACRE BASIN K**	0.02	0.03	5.0	5.2	8.7	***0.1***	***0.2***
26	**PR24, PR25**	0.42	0.47	5.0	5.2	8.7	***2.2***	***4.1***
27	**.05 ACRE BASIN K**	0.03	0.04	5.0	5.2	8.7	***0.2***	***0.3***
28	**PR26, PR27**	0.45	0.51	5.0	5.2	8.7	***2.3***	***4.4***
29	**.05 ACRE BASIN K**	0.03	0.04	5.0	5.2	8.7	***0.2***	***0.3***
30	**PR28, PR29**	0.49	0.54	5.0	5.2	8.7	***2.5***	***4.7***
31	**.05 ACRE BASIN K**	0.04	0.04	5.0	5.2	8.7	***0.2***	***0.3***
32	**PR30, PR31**	0.52	0.58	5.0	5.2	8.7	***2.7***	***5.1***
33	**.02 ACRE BASIN K**	0.02	0.02	5.0	5.2	8.7	***0.1***	***0.2***
34	**PR32, PR33**	0.54	0.60	5.0	5.2	8.7	***2.8***	***5.2***
35	**PR22, PR34**	0.98	1.07	5.0	5.2	8.7	***5.0***	***9.3***
36	**DP9**	0.19	0.22	5.0	5.2	8.7	***1.0***	***1.9***

CLEARWAY NO.2, LOT 5
PROPOSED CONDITIONS DRAINAGE CALCULATIONS
(Storm Sewer Routing Summary)

PIPE RUN	*Contributing Pipes/Design Points*	*Equivalent CA_5*	*Equivalent CA_{100}*	*Maximum T_C*	*Intensity**		*Flow*	
					I_5	*I_{100}*	*Q_5*	*Q_{100}*
37	**PR36, DP10**	0.55	0.60	5.0	5.2	8.7	***2.8***	***5.2***
38	**PR37**	0.55	0.60	5.0	5.2	8.7	***2.8***	***5.2***
39	**FSD POND RELEASE**						***0.3***	***0.3***
40	**PR8, PR39**						***19.1***	***41.7***
41	**DP14**	2.82	4.92	17.1	3.3	5.6	***9.4***	***27.5***

* Intensity equations assume a minimum travel time of 5 minutes.

DP - Design Point
EX - Existing Design Point
FB- Flow By from Design Point
INT- Intercepted Flow from Design Point

Calculated by: TAU
Date: 4/4/2022
Checked by: VAS

HYDRAULIC CALCULATIONS / FSD POND CALCULATIONS

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

Designer: Darin Moffett
Company: M&S Civil Consultants
Date: June 3, 2022
Project: Clearway No.2, Lot 5 - WireNut
Location:

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter): I_a = 85.2 %

B) Tributary Area's Imperviousness Ratio (i = I_a/100): i = 0.852

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i): WQCV = 0.29 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 103,237 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
V_{WQCV} = WQCV / 12 * Area: V_{WQCV} = cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm: d_6 = 0.50 in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume: $V_{WQCV\ OTHER}$ = cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = 2,222 cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 0.8 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.: Z = 4.00 ft / ft

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 1099 sq ft

D) Actual Filter Area: A_{Actual} = 2331 sq ft

E) Volume Provided: V_T = cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class B or C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
- (●) YES
- ( ) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice: y = 2.4 ft

ii) Volume to Drain in 12 Hours: Vol_{12} = 2,222 cu ft

iii) Orifice Diameter, 3/8" Minimum: D_O = 1 1/16 in

Design Procedure Form: Sand Filter (SF)

Designer: Darin Moffett
Company: M&S Civil Consultants
Date: June 3, 2022
Project: Clearway No.2, Lot 5 - WireNut
Location:

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One: ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	A riprap stilling basin is provided at the inlet point Flows in excess of the WQCV are conveyed via a retangular slot in the outlet box wa box wall and enter the top of the box and discharge out via an restricted 18rcp

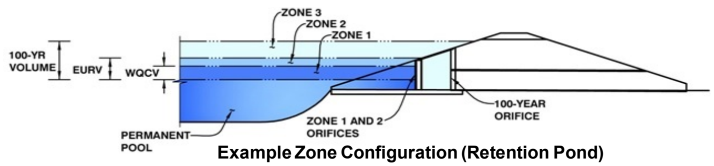
Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Clearway No. 2, Lot 5 (WireNut)

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

Watershed Information

			Optional User Overrides	
Selected BMP Type =	**SF**			
Watershed Area =	2.11	acres		
Watershed Length =	335	ft		
Watershed Length to Centroid =	165	ft		
Watershed Slope =	0.020	ft/ft		
Watershed Imperviousness =	85.20%	percent		
Percentage Hydrologic Soil Group A =	100.0%	percent		
Percentage Hydrologic Soil Group B =	0.0%	percent		
Percentage Hydrologic Soil Groups C/D =	0.0%	percent		
Target WQCV Drain Time =	12.0	hours		
Location for 1-hr Rainfall Depths =	User Input			

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.051	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.241	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.158	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.204	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.241	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.283	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.323	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.370	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.474	acre-feet		inches
Approximate 2-yr Detention Volume =	0.158	acre-feet		
Approximate 5-yr Detention Volume =	0.206	acre-feet		
Approximate 10-yr Detention Volume =	0.245	acre-feet		
Approximate 25-yr Detention Volume =	0.290	acre-feet		
Approximate 50-yr Detention Volume =	0.316	acre-feet		
Approximate 100-yr Detention Volume =	0.339	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.051	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.190	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.098	acre-feet
Total Detention Basin Volume =	0.339	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	

Depth Increment = ft

6251.5

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)
Media Surface	--	0.00	--	--	--	2,300	0.053		
	--	0.50	--	--	--	3,023	0.069	1,331	0.031
	--	1.50	--	--	--	4,171	0.096	4,928	0.113
	--	2.50	--	--	--	5,380	0.124	9,703	0.223
	--	3.50	--	--	--	6,724	0.154	15,755	0.362
	--	4.50	--	--	--	7,797	0.179	23,016	0.528
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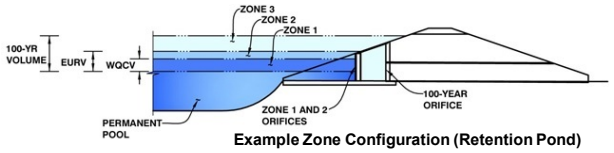
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: Clearway No. 2, Lot 5 (WireNut)

Basin ID: Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.79	0.051	Filtration Media
Zone 2 (EURV)	2.65	0.190	Circular Orifice
Zone 3 (100-year)	3.36	0.098	Weir&Pipe (Restrict)
Total (all zones)		0.339	

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

Underdrain Orifice Invert Depth =	2.40	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Diameter =	1.08	inches	Underdrain Orifice Centroid =	0.05	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)

Centroid of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	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 =	N/A	sq. inches	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 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected			Zone 2 Circular	Not Selected
Invert of Vertical Orifice =	0.79	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.04	N/A
Depth at top of Zone using Vertical Orifice =	2.65	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.11	N/A
Vertical Orifice Diameter =	2.59	N/A	inches			

Calculated Parameters for Vertical Orif

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

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	2.65	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.65	N/A
Overflow Weir Front Edge Length =	2.91	N/A	feet	Overflow Weir Slope Length =	2.91	N/A
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =		N/A
Horiz. Length of Weir Sides =	2.91	N/A	feet	Overflow Grate Open Area w/o Debris =		N/A
Overflow Grate Type =		Close Mesh Grate		Overflow Grate Open Area w/ Debris =		N/A
Debris Clogging % =	50%	N/A	%			

Calculated Parameters for Overflow W

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

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected
Depth to Invert of Outlet Pipe =	3.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.17	N/A
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.14	N/A
Restrictor Plate Height Above Pipe Invert =	2.75		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.80	N/A

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pla

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.26	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.23	feet
Spillway Crest Length =	22.00	feet	Stage at Top of Freeboard =	4.49	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.18	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.53	acre-ft

Calculated Parameters for Spillway

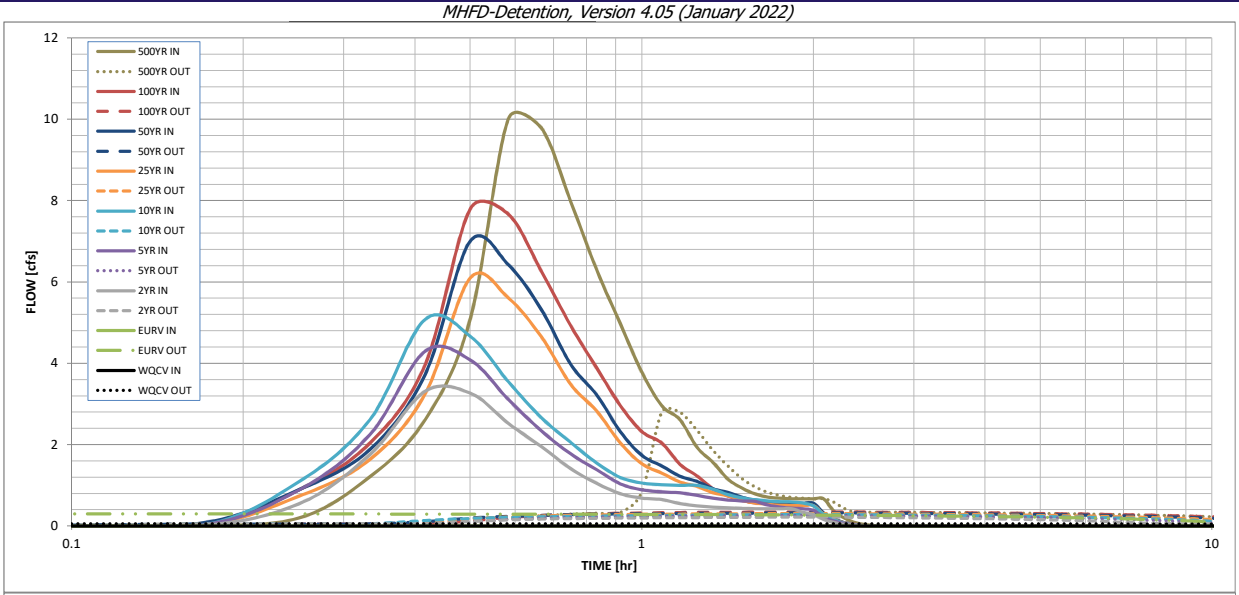
Routed Hydrograph Results

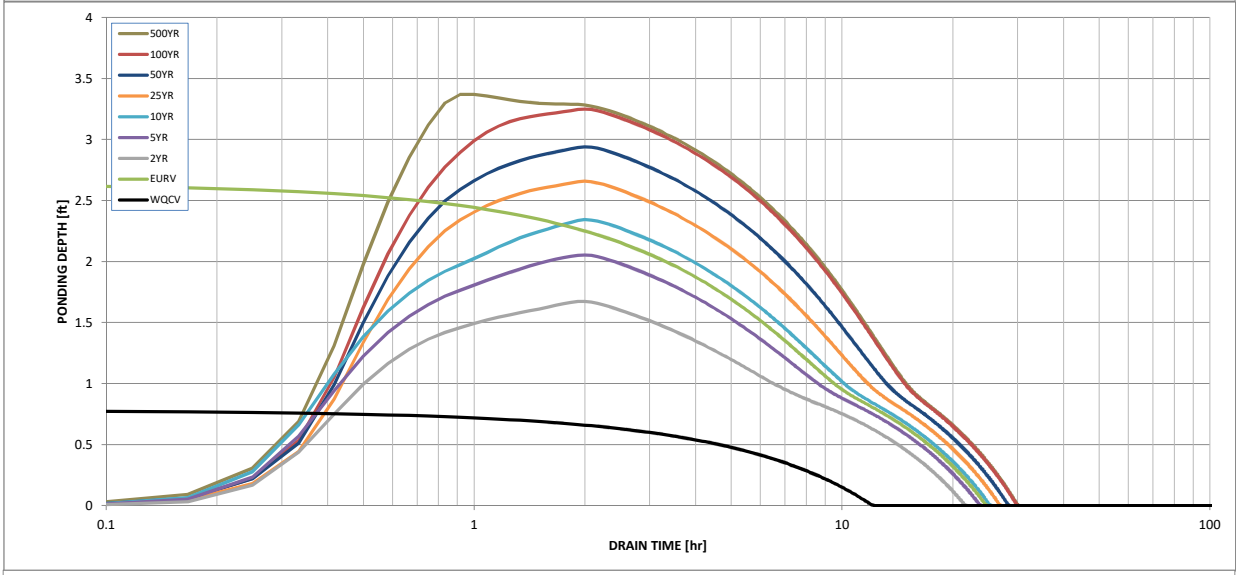
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AI

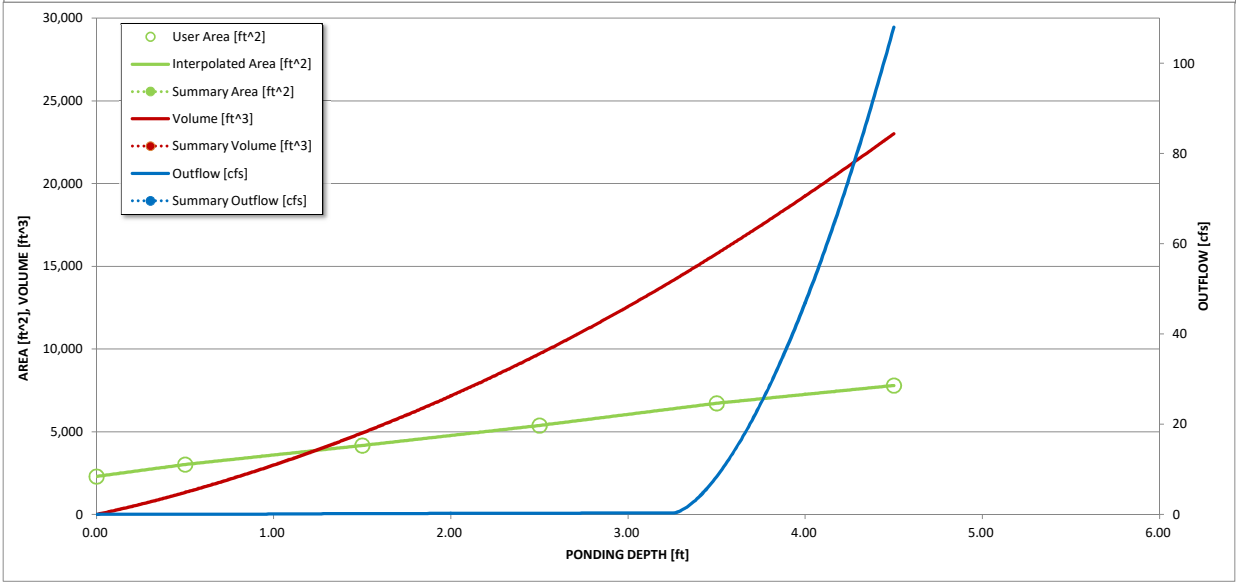
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft) =	0.051	0.241	0.158	0.204	0.241	0.283	0.323	0.370
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.158	0.204	0.241	0.283	0.323	0.370
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.1	0.5	1.0	1.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.24	0.45	0.74
Peak Inflow Q (cfs) =	N/A	N/A	3.3	4.3	5.1	6.1	7.0	7.8
Peak Outflow Q (cfs) =	0.1	0.3	0.2	0.3	0.3	0.3	0.3	0.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	6.3	5.0	0.6	0.3	0.2
Structure Controlling Flow =	Filtration Media	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	12	23	21	22	24	25	26	27
Time to Drain 99% of Inflow Volume (hours) =	**12**	24	21	23	25	26	28	29
Maximum Ponding Depth (ft) =	0.78	2.65	1.67	2.05	2.34	2.66	2.94	3.25
Area at Maximum Ponding Depth (acres) =	0.08	0.13	0.10	0.11	0.12	0.13	0.14	0.15
Maximum Volume Stored (acre-ft) =	0.051	0.242	0.130	0.170	0.203	0.242	0.280	0.323

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.01	0.19
	0:15:00	0.00	0.00	0.54	0.88	1.09	0.73	0.89	0.88	1.21
	0:20:00	0.00	0.00	1.75	2.24	2.61	1.63	1.88	2.04	2.61
	0:25:00	0.00	0.00	3.31	4.30	5.08	3.24	3.73	3.97	5.09
	0:30:00	0.00	0.00	3.27	4.08	4.67	6.09	7.00	7.80	10.01
	0:35:00	0.00	0.00	2.52	3.11	3.55	5.60	6.42	7.67	9.78
	0:40:00	0.00	0.00	1.95	2.34	2.66	4.64	5.32	6.26	7.99
	0:45:00	0.00	0.00	1.41	1.77	2.06	3.48	3.98	4.93	6.30
	0:50:00	0.00	0.00	1.05	1.38	1.55	2.82	3.22	3.89	4.98
	0:55:00	0.00	0.00	0.79	1.03	1.19	2.04	2.32	2.96	3.78
	1:00:00	0.00	0.00	0.68	0.89	1.06	1.53	1.74	2.32	2.96
	1:05:00	0.00	0.00	0.65	0.84	1.02	1.30	1.48	2.04	2.61
	1:10:00	0.00	0.00	0.55	0.82	1.00	1.08	1.22	1.52	1.93
	1:15:00	0.00	0.00	0.49	0.75	1.00	0.97	1.09	1.23	1.56
	1:20:00	0.00	0.00	0.46	0.68	0.90	0.81	0.92	0.91	1.15
	1:25:00	0.00	0.00	0.44	0.64	0.77	0.74	0.83	0.74	0.93
	1:30:00	0.00	0.00	0.43	0.61	0.69	0.63	0.70	0.63	0.79
	1:35:00	0.00	0.00	0.42	0.60	0.64	0.56	0.63	0.57	0.71
	1:40:00	0.00	0.00	0.42	0.51	0.61	0.53	0.59	0.55	0.68
	1:45:00	0.00	0.00	0.42	0.46	0.60	0.51	0.57	0.54	0.67
	1:50:00	0.00	0.00	0.42	0.43	0.59	0.50	0.56	0.54	0.67
	1:55:00	0.00	0.00	0.33	0.42	0.56	0.50	0.56	0.54	0.67
	2:00:00	0.00	0.00	0.28	0.38	0.50	0.50	0.56	0.54	0.67
	2:05:00	0.00	0.00	0.16	0.22	0.28	0.29	0.32	0.31	0.38
	2:10:00	0.00	0.00	0.09	0.12	0.16	0.16	0.18	0.18	0.22
	2:15:00	0.00	0.00	0.04	0.06	0.08	0.09	0.10	0.09	0.12
	2:20:00	0.00	0.00	0.02	0.03	0.04	0.04	0.05	0.05	0.06
	2:25:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	Inlet 1	Inlet 2	Inlet 3	Inlet 4	Inlet 5	Inlet 6	Inlet 8	Inlet 14
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET	AREA	STREET	AREA
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade	In Sump	Swale	In Sump	Swale
Inlet Type	Denver No. 16 Valley Grate	Denver No. 16 Valley Grate	Denver No. 16 Valley Grate	Denver No. 16 Valley Grate	Denver No. 16 Valley Grate	CDOT Type D (In Series & Depressed)	Denver No. 16 Valley Grate	CDOT Type D (In Series & Depressed)

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{known} (cfs)	6.8	7.1	2.7	1.2	4.1	7.5	1.3	9.4
Major Q_{known} (cfs)	12.7	13.2	6.4	3.4	9.7	14.4	2.4	27.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0		0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)								
Percent Impervious								
NRCS Soil Type								

Watershed Profile

Overland Slope (ft/ft)								
Overland Length (ft)								
Channel Slope (ft/ft)								
Channel Length (ft)								

Minor Storm Rainfall Input

Design Storm Return Period, T, (years)								
One-Hour Precipitation, P_1 (inches)								

Major Storm Rainfall Input

Design Storm Return Period, T, (years)								
One-Hour Precipitation, P_1 (inches)								

CALCULATED OUTPUT

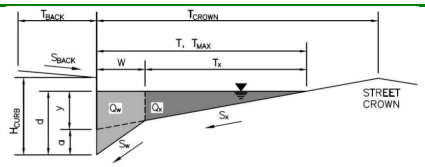
Minor Total Design Peak Flow, Q (cfs)	**6.8**	**7.1**	**2.7**	**1.2**	**4.1**	**7.5**	**1.3**	**9.4**
Major Total Design Peak Flow, Q (cfs)	**12.7**	**13.2**	**6.4**	**3.4**	**9.7**	**14.4**	**2.4**	**27.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	2.5	2.6	0.5	0.2	N/A	0.0	N/A	0.0
Major Flow Bypassed Downstream, Q_b (cfs)	6.1	6.4	2.3	0.8	N/A	0.0	N/A	0.0

MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **WireNut**
Inlet ID: **Inlet 1**



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} =	15.3	ft
Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.022	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

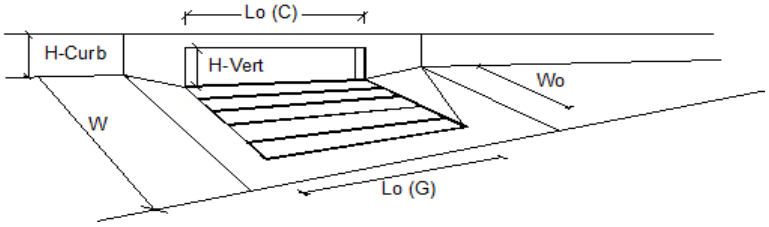
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.8	15.3	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.7	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**7.2**	**14.0**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



			MINOR	MAJOR	
	Design Information (Input)				
	Type of Inlet	Type =	Denver No. 16 Valley Grate		
	Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Warning 1	Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.92	10.92	ft
Warning 1	Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	2.50	2.50	ft
	Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	N/A	N/A	
	Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
	Design Discharge for Half of Street (from *Inlet Management*)	Q_o =	6.8	12.7	cfs
	Water Spread Width	T =	10.7	14.2	ft
	Water Depth at Flowline (outside of local depression)	d =	4.6	5.5	inches
	Water Depth at Street Crown (or at T_{MAX})	d_{CROWN} =	0.0	0.0	inches
	Ratio of Gutter Flow to Design Flow	E_o =	0.643	0.507	
	Discharge outside the Gutter Section W, carried in Section T_x	Q_x =	2.4	6.3	cfs
	Discharge within the Gutter Section W	Q_w =	4.4	6.4	cfs
	Discharge Behind the Curb Face	Q_{BACK} =	0.0	0.0	cfs
	Flow Area within the Gutter Section W	A_W =	0.71	0.89	sq ft
	Velocity within the Gutter Section W	V_W =	6.2	7.2	fps
	Water Depth for Design Condition	d_{LOCAL} =	6.6	7.5	inches
	Grate Analysis (Calculated)		MINOR	MAJOR	
	Total Length of Inlet Grate Opening	L =	10.92	10.92	ft
	Ratio of Grate Flow to Design Flow	$E_{o\text{-}GRATE}$ =	0.642	0.507	
	Under No-Clogging Condition		MINOR	MAJOR	
	Minimum Velocity Where Grate Splash-Over Begins	V_o =	3.98	3.98	fps
	Interception Rate of Frontal Flow	R_f =	0.93	0.88	
	Interception Rate of Side Flow	R_x =	0.68	0.63	
	Interception Capacity	Q_i =	5.7	9.6	cfs
	Under Clogging Condition		MINOR	MAJOR	
	Clogging Coefficient for Multiple-unit Grate Inlet	GrateCoef =	1.00	1.00	
	Clogging Factor for Multiple-unit Grate Inlet	GrateClog =	0.50	0.50	
	Effective (unclogged) Length of Multiple-unit Grate Inlet	L_e =	5.46	5.46	ft
	Minimum Velocity Where Grate Splash-Over Begins	V_o =	2.73	2.73	fps
	Interception Rate of Frontal Flow	R_f =	0.82	0.76	
	Interception Rate of Side Flow	R_x =	0.30	0.26	
	Actual Interception Capacity	**Q_a =**	**4.3**	**6.6**	**cfs**
	Carry-Over Flow = Q_o-Q_a (to be applied to curb opening or next d/s inlet)	**Q_b =**	**2.5**	**6.1**	**cfs**
	Curb or Slotted Inlet Opening Analysis (Calculated)		MINOR	MAJOR	
	Equivalent Slope S_e (based on grate carry-over)	S_e =	N/A	N/A	ft/ft
	Required Length L_T to Have 100% Interception	L_T =	N/A	N/A	ft
	Under No-Clogging Condition		MINOR	MAJOR	
	Effective Length of Curb Opening or Slotted Inlet (minimum of L, L_T)	L =	N/A	N/A	ft
	Interception Capacity	Q_i =	N/A	N/A	cfs
	Under Clogging Condition		MINOR	MAJOR	
	Clogging Coefficient	CurbCoef =	N/A	N/A	
	Clogging Factor for Multiple-unit Curb Opening or Slotted Inlet	CurbClog =	N/A	N/A	
	Effective (Unclogged) Length	L_e =	N/A	N/A	ft
	Actual Interception Capacity	**Q_a =**	**N/A**	**N/A**	**cfs**
	Carry-Over Flow = $Q_{b(GRATE)}$-Q_a	**Q_b =**	**N/A**	**N/A**	**cfs**
	Summary		MINOR	MAJOR	
	Total Inlet Interception Capacity	**Q =**	**4.3**	**6.6**	**cfs**
	Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.5**	**6.1**	**cfs**
	Capture Percentage = Q_a/Q_o =	**C% =**	**64**	**52**	**%**

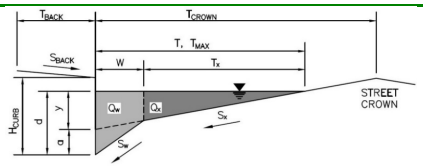
Warning 1: Dimension entered is not a typical dimension for inlet type specified.

MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **WireNut**
Inlet ID: **Inlet 2**



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} =	15.3	ft
Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.024	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

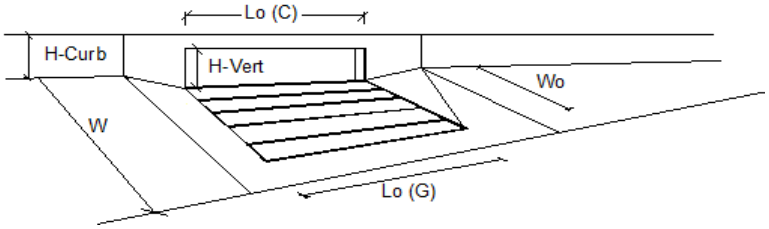
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.8	15.3	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.8	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**7.5**	**13.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



	Design Information (Input)		MINOR	MAJOR	
	Type of Inlet	Type =	Denver No. 16 Valley Grate		
	Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Warning 1	Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.92	10.92	ft
Warning 1	Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	2.50	2.50	ft
	Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	N/A	N/A	

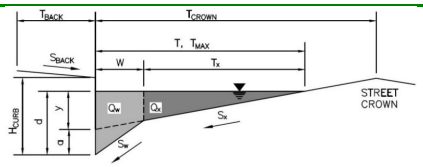
	Street Hydraulics: OK - Q < Allowable Street Capacity'	MINOR	MAJOR	
	Total Inlet Interception Capacity	**Q =**	**4.5**	**6.8**	**cfs**
	Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.6**	**6.4**	**cfs**
	Capture Percentage = Q_a/Q_o =	**C% =**	**63**	**52**	**%**

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

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

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

Project: **WireNut**
Inlet ID: **Inlet 3**



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} =	15.3	ft
Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.022	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

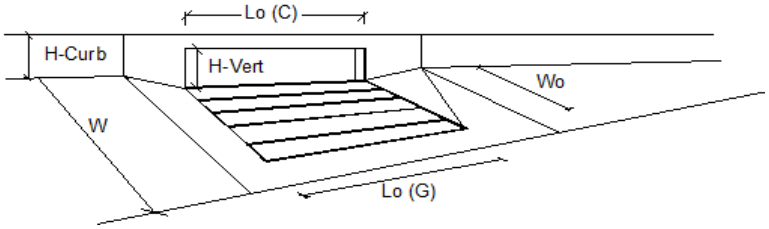
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.8	15.3	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.1	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.5**	**14.0**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



	Design Information (Input)		MINOR	MAJOR	
	Type of Inlet	Type =	Denver No. 16 Valley Grate		
	Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	2.0	2.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Warning 1	Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.92	10.92	ft
Warning 1	Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	2.50	2.50	ft
	Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	0.50	0.50	
	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	N/A	N/A	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.2**	**4.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**2.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**80**	**65**	**%**

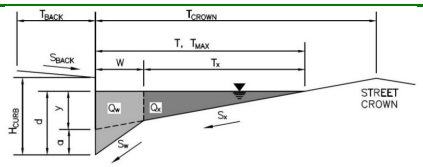
Warning 1: Dimension entered is not a typical dimension for inlet type specified.

MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **WireNut**
Inlet ID: **Inlet 4**



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} =	15.3	ft
Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.024	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.015	

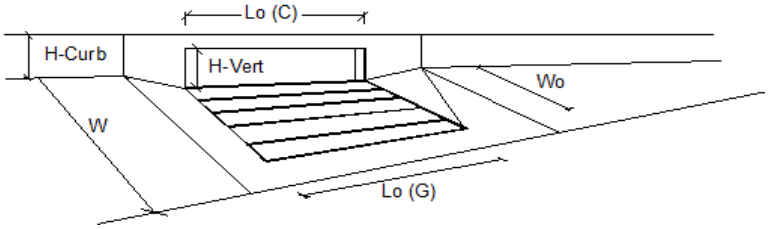
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.8	15.3	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.1	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☑	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.4**	**13.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.01 (April 2021)



	Design Information (Input)	Denver No. 16 Valley Grate		MINOR	MAJOR	
	Type of Inlet		Type =	Denver No. 16 Valley Grate		
	Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Warning 1	Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.92	10.92	ft
Warning 1	Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	2.50	2.50	ft
	Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	0.50	0.50	
	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	N/A	N/A	
	Street Hydraulics: OK - Q < Allowable Street Capacity'			MINOR	MAJOR	
	Total Inlet Interception Capacity		**Q =**	**1.0**	**2.6**	**cfs**
	Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**0.2**	**0.8**	**cfs**
	Capture Percentage = Q_a/Q_o =		**C% =**	**85**	**77**	**%**

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

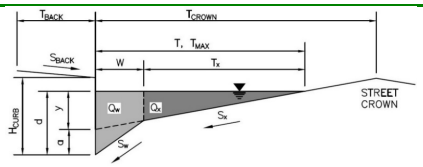
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **WireNut**

Inlet ID: **Inlet 5**



Gutter Geometry:

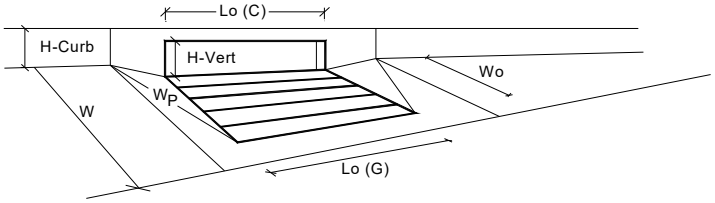
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.3	ft
Warning 1 Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.024	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} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.8	15.3	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



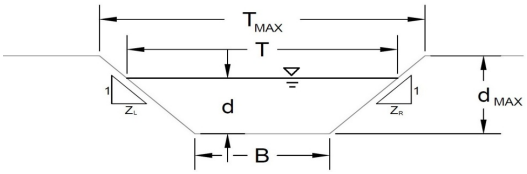
Design Information (Input)	Denver No. 16 Valley Grate		MINOR	MAJOR	
Type of Inlet		Type =	Denver No. 16 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.1	8.6	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	10.92	10.92	feet
Warning 1 Width of a Unit Grate		W_o =	2.50	2.50	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.488	0.696	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	0.58	0.81	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**4.1**	**9.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	4.1	9.7	cfs

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

AREA INLET IN A SWALE

WireNut

Inlet 6



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

	NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =	C	
	Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
	Channel Invert Slope	S_O =	0.0200	ft/ft
	Bottom Width	B =	3.00	ft
Warning 01	Left Side Slope	Z1 =	3.00	ft/ft
Warning 01	Right Side Sloe	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ○ **Non-Cohesive**
- ◉ **Cohesive**
- ○ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**13.00**	**13.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.10**	**1.30**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**20.9**	**35.8**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.10**	**1.30**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**7.5**	**14.4**	**cfs**
Water Depth	**d** =	**0.84**	**1.00**	**ft**

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

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

AREA INLET IN A SWALE

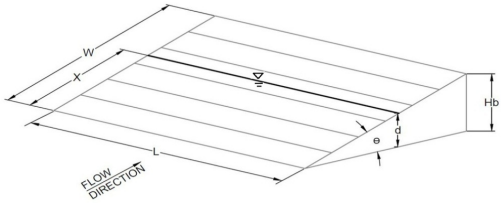
WireNut

Inlet 6

Inlet Design Information (Input)

Type of Inlet: CDOT Type D (In Series & Depressed) — Inlet Type = CDOT Type D (In Series & Depressed)

Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.72	
Orifice Coefficient	C_o =	0.48	
Weir Coefficient	C_w =	1.53	



		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.84	2.00	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**40.9**	**42.6**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

Warning 01: Sideslope steepness exceeds USDCM Volume I recommendation.

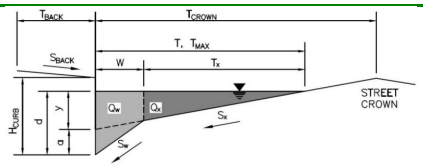
MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: **WireNut**

Inlet ID: **Inlet 8**



Gutter Geometry:

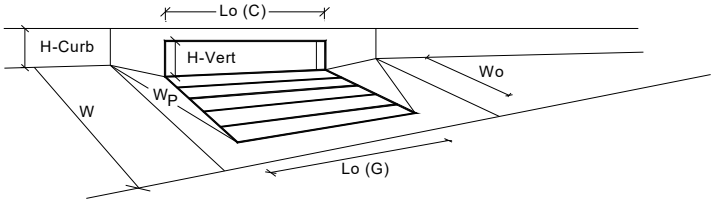
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.015	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	15.3	ft
Warning 1 Gutter Width	W =	2.50	ft
Street Transverse Slope	S_X =	0.022	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} =	0.015	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	14.8	15.3	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.2	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



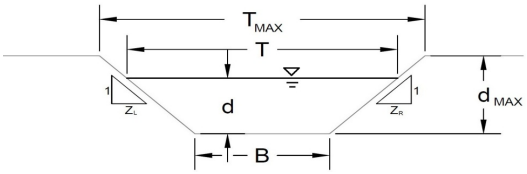
			MINOR	MAJOR	
Design Information (Input)					
Type of Inlet	Denver No. 16 Valley Grate	Type =	Denver No. 16 Valley Grate		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.2	5.9	inches
Grate Information			MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate		L_o (G) =	3.64	3.64	feet
Warning 1 Width of a Unit Grate		W_o =	2.50	2.50	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	0.60	0.60	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	0.330	0.469	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	0.61	0.86	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**1.3**	**3.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	1.3	2.4	cfs

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

AREA INLET IN A SWALE

WireNut

Inlet 14



This worksheet uses the NRCS vegetal retardance method to determine Manning's n.

For more information see Section 7.2.3 of the USDCM.

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D, or E =	C	
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	see details below	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Sloe	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Non-Cohesive	5.0 fps	0.60
Cohesive	7.0 fps	0.80
Paved	N/A	N/A

Choose One:
- ☐ **Non-Cohesive**
- ☐ **Cohesive**
- ☐ **Paved**

		Minor Storm	Major Storm	
Maximum Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**14.00**	**16.00**	**ft**
Maximum Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.30**	**1.60**	**ft**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**10.6**	**27.7**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.30**	**1.60**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**9.4**	**27.5**	**cfs**
Water Depth	**d** =	**1.27**	**1.60**	**ft**

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

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

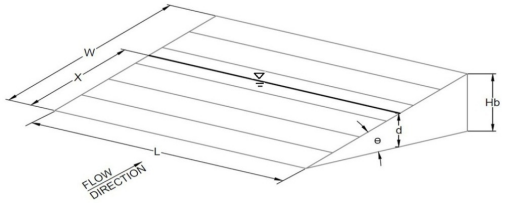
AREA INLET IN A SWALE

WireNut

Inlet 14

Inlet Design Information (Input)

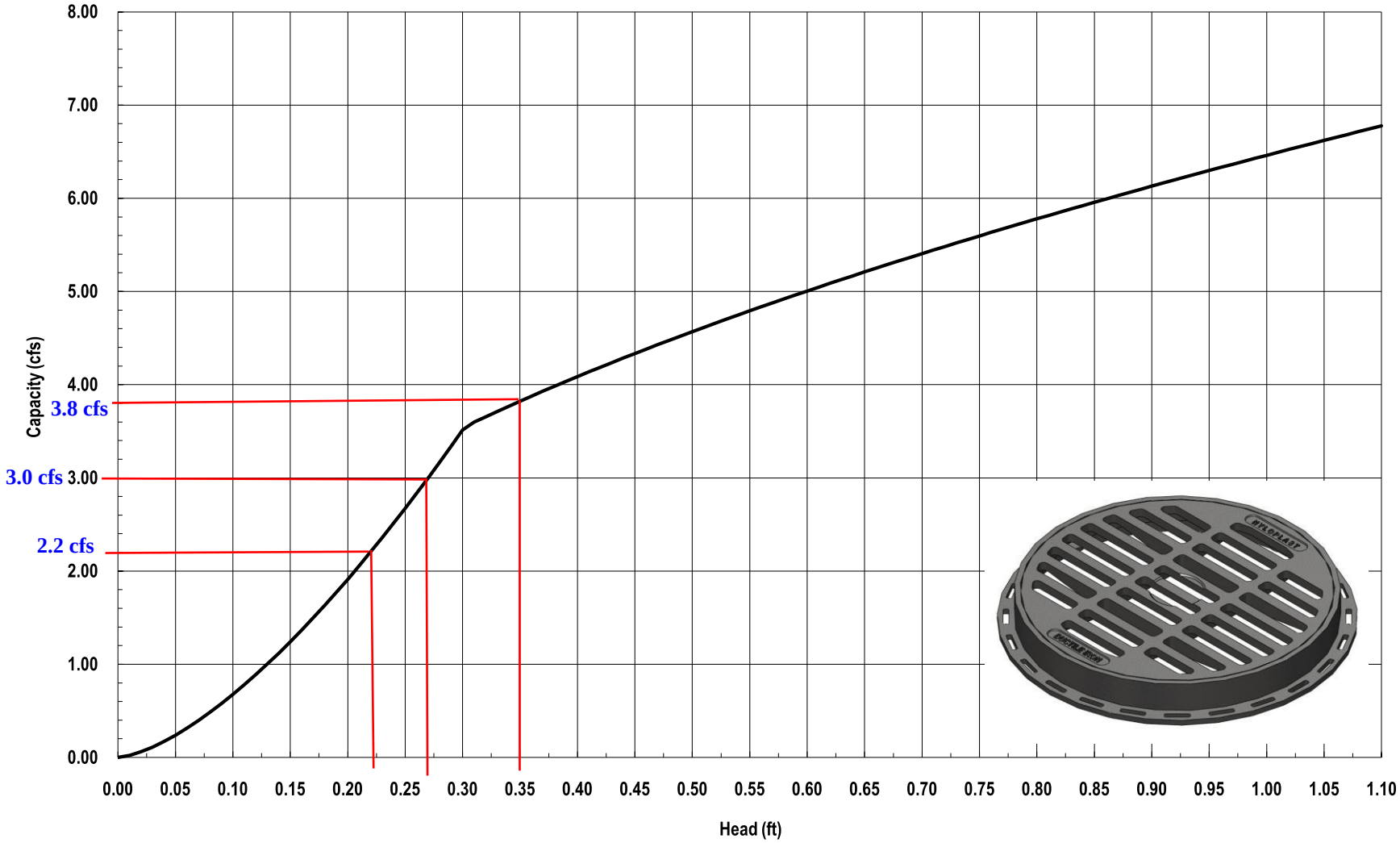
Type of Inlet: CDOT Type D (In Series & Depressed) — Inlet Type = CDOT Type D (In Series & Depressed)



Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	ft
Length of Grate	L =	6.00	ft
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	ft
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.72	
Orifice Coefficient	C_o =	0.48	
Weir Coefficient	C_w =	1.53	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	2.27	2.60	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**45.4**	**48.6**	**cfs**
Bypassed Flow	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Qa/Qo	**C% =**	**100**	**100**	**%**

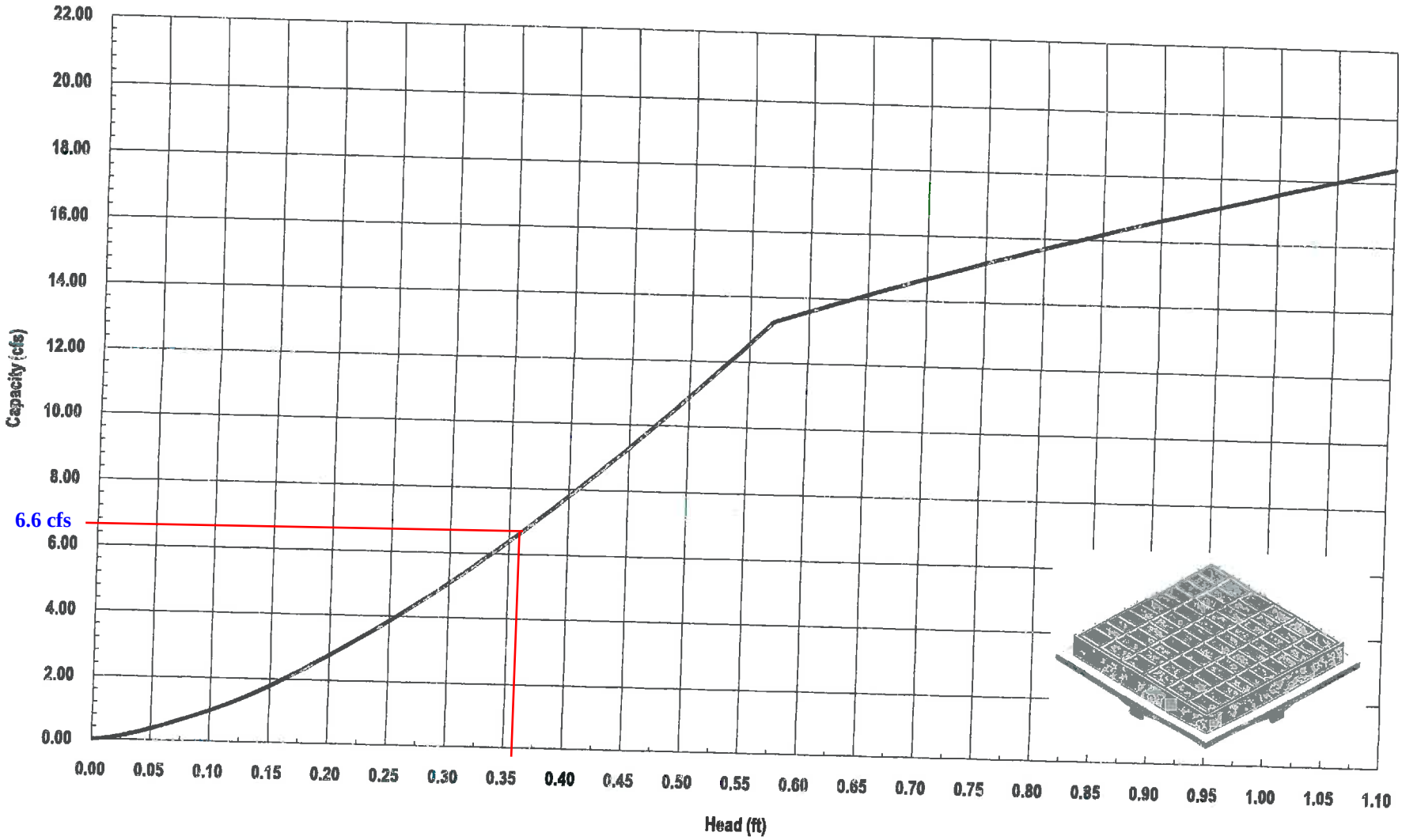
Nyloplast 24" Standard Grate Inlet Capacity Chart



DP7= Q_{100}=1.5 cfs 50% BLOCKAGE = 3.0 cfs
DP9= Q100=1.9 cfs 50% BLOCKAGE = 3.8 cfs
DP11=Q100=1.5 cfs 50% BLOCKAGE = 3.0 cfs
DP12=Q100=1.1 cfs 50% BLOCKAGE = 2.2 cfs

Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490

Nyloplast 2' x 2' Steel Bar / MAG Grate Inlet Capacity Chart



DP10= Q_{100}=3.3 cfs 50% BLOCKAGE = 6.6 cfs

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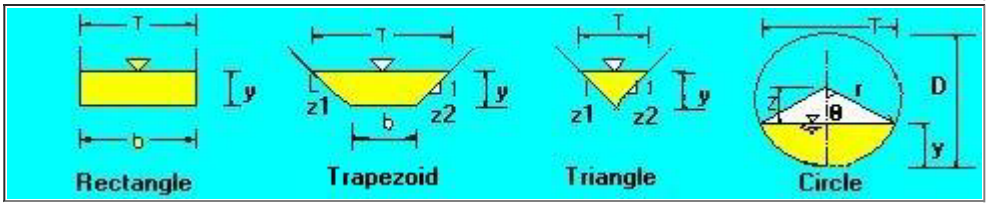
The open channel flow calculator

Select Channel Type: Triangle



Velocity(V)&Discharge(Q)

Select unit system: Feet(ft)

Channel slope: .02 ft/ft	Water depth(y): 1.25 ft	Bottom W(b) 0 ft
Flow velocity 5.9328 ft/s	LeftSlope (Z1): 3 to 1 (H:V)	RightSlope (Z2): 3 to 1 (H:V)
Flow discharge 27.8101 ft^3/s	Input n value 0.025 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 7.91 ft	Flow area 4.69 ft^2	Top width(T) 7.5 ft
Specific energy 1.8 ft	Froude number 1.32	Flow status Supercritical flow
Critical depth 1.4 ft	Critical slope 0.0109 ft/ft	Velocity head 0.55 ft

DP14~Q_{100}=27.5 cfs

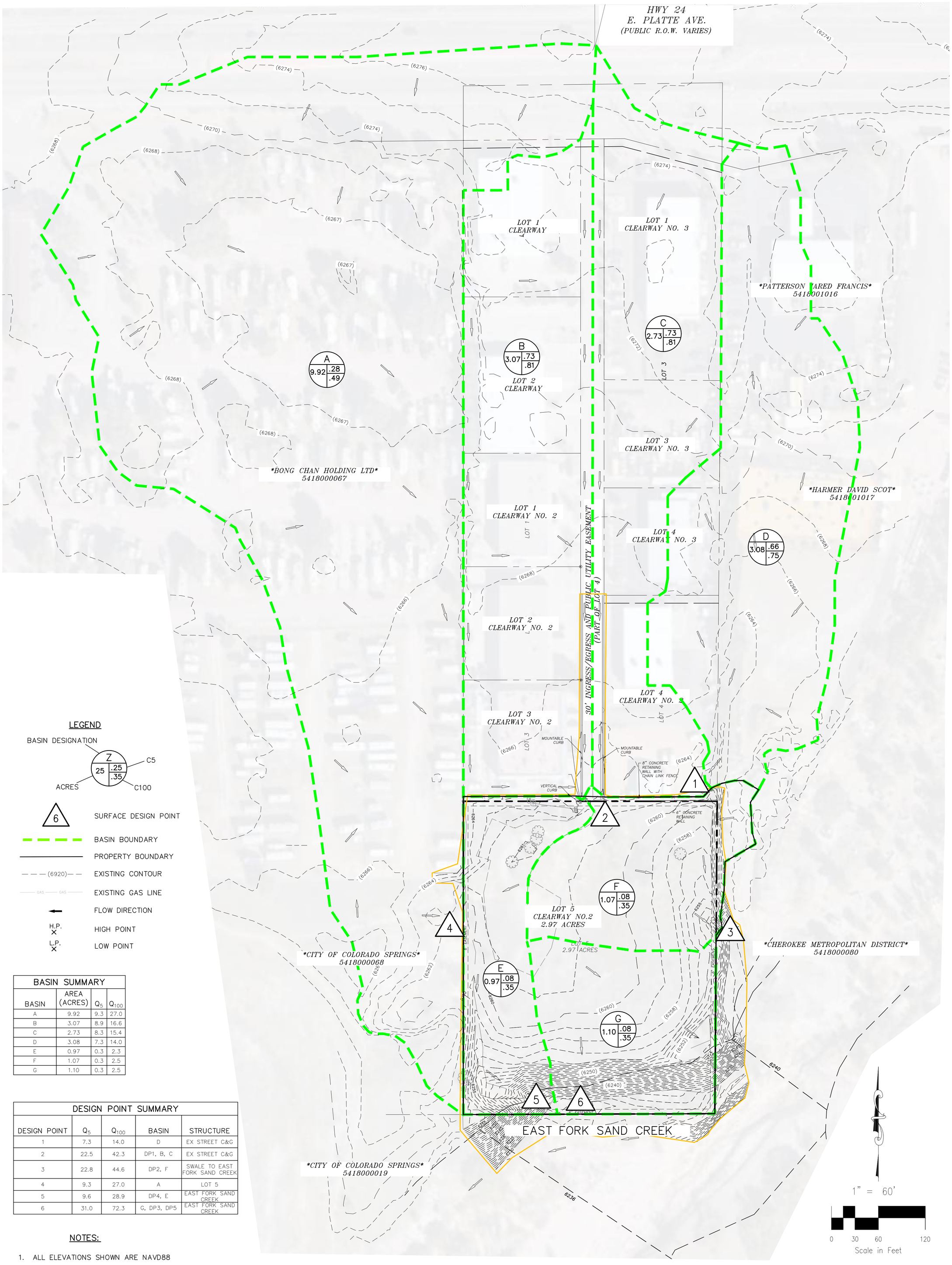
EXISTING AND PROPOSED DRAINAGE MAPS

CLEARWAY NO. 2, LOT 5 (WIRENUT)

CITY OF COLORADO SPRINGS, STATE OF COLORADO

EXISTING DRAINAGE MAP

JUNE 2022



LEGEND

BASIN DESIGNATION — Z: 25 ACRES; .25 / .35: C5 / C100

6 — SURFACE DESIGN POINT

BASIN BOUNDARY

PROPERTY BOUNDARY

(6920) — EXISTING CONTOUR

GAS — GAS — EXISTING GAS LINE

FLOW DIRECTION

H.P. — HIGH POINT

L.P. — LOW POINT

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A	9.92	9.3	27.0
B	3.07	8.9	16.6
C	2.73	8.3	15.4
D	3.08	7.3	14.0
E	0.97	0.3	2.3
F	1.07	0.3	2.5
G	1.10	0.3	2.5

DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	7.3	14.0	D	EX STREET C&G
2	22.5	42.3	DP1, B, C	EX STREET C&G
3	22.8	44.6	DP2, F	SWALE TO EAST FORK SAND CREEK
4	9.3	27.0	A	LOT 5
5	9.6	28.9	DP4, E	EAST FORK SAND CREEK
6	31.0	72.3	G, DP3, DP5	EAST FORK SAND CREEK

NOTES:

1. ALL ELEVATIONS SHOWN ARE NAVD88
2. ALL RUNOFF IS TRIBUTARY TO THE EAST FORK SAND CREEK DRAINAGE BASIN

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CLEARWAY NO. 2, LOT 5

EXISTING DRAINAGE MAP

PROJECT NO. 44-042

DESIGNED BY: TAU
DRAWN BY: DLM
CHECKED BY: VAS

SCALE: HORIZONTAL: 1"=60' VERTICAL: N/A

DATE: 06/02/2022

SHEET 1 OF 1

EDM

CLEARWAY NO. 2, LOT 5 (WIRENUT)

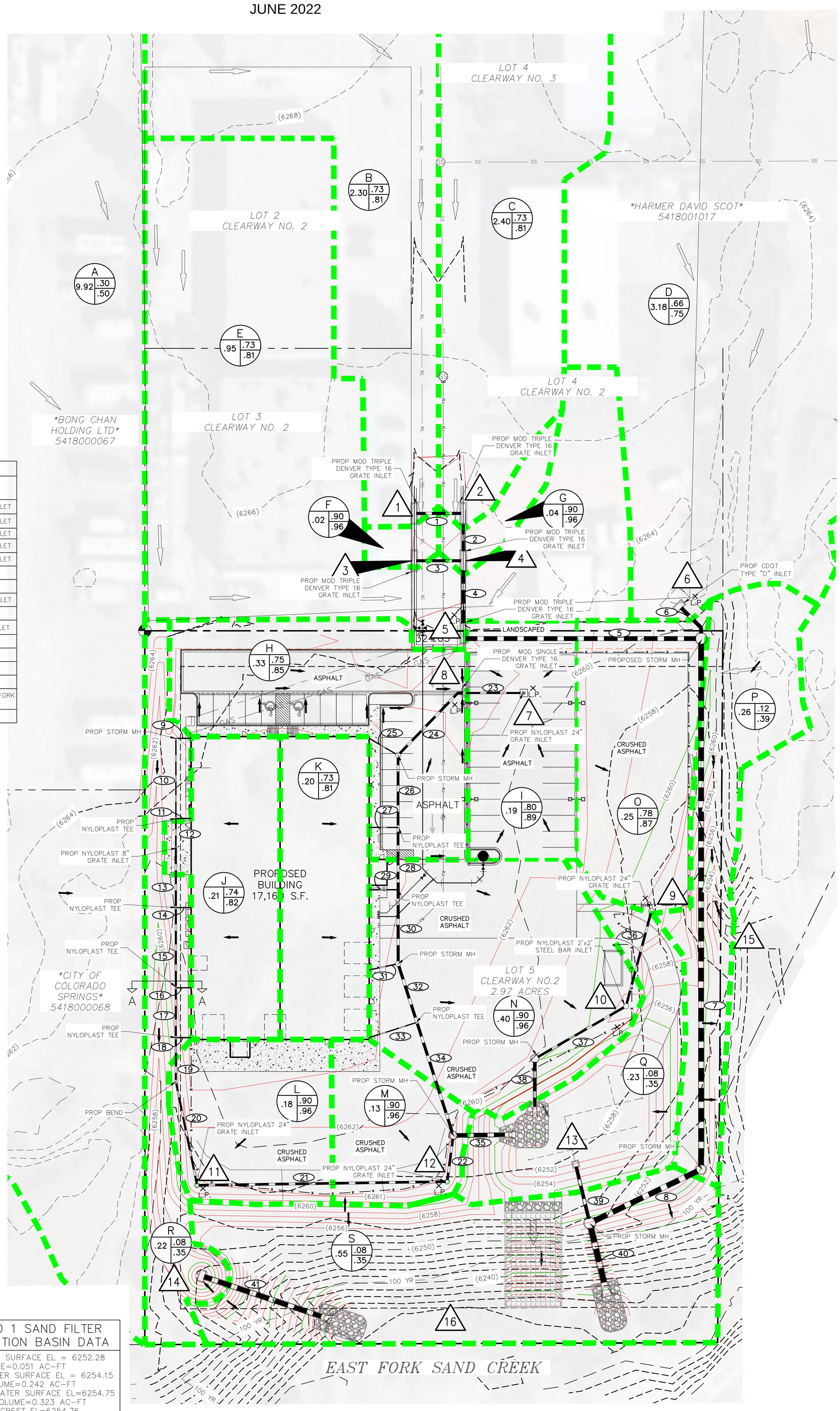
CITY OF COLORADO SPRINGS, STATE OF COLORADO

PROPOSED DRAINAGE MAP

JUNE 2022

LEGEND

- BASIN DESIGNATION (Z: 25 ACRES, .25 C5, .35 C100)
- 4 — PIPE RUN REFERENCE LABEL
- 6 — SURFACE DESIGN POINT
- BASIN BOUNDARY
- PROPERTY BOUNDARY
- 6920 — PROP CONTOUR
- (6920) — EXISTING CONTOUR
- UGE — UNDERGROUND ELECTRICAL
- GAS — EXISTING GAS LINE
- PROPOSED STORM SEWER PIPE
- EMERGENCY OVERFLOW DIRECTION
- PROPOSED INLET
- PROPOSED FLARED END SECTION
- FLOW DIRECTION
- H.P. — HIGH POINT
- L.P. — LOW POINT
- EFFECTIVE 100 YEAR FLOODPLAIN



DESIGN POINT SUMMARY				
DESIGN POINT	Q_5	Q_{100}	BASIN	STRUCTURE
1	6.8	12.7	B	MOD TRIPLE DENVER TYPE 16 INLET
2	7.1	13.2	C	MOD TRIPLE DENVER TYPE 16 INLET
3	2.7	6.4	FB1, F	MOD TRIPLE DENVER TYPE 16 INLET
4	1.2	3.4	FB2, G	MOD TRIPLE DENVER TYPE 16 INLET
5	4.1	9.7	FB3, FB4, E	MOD TRIPLE DENVER TYPE 16 INLET
6	7.5	14.4	D	CDOT TYPE D GRATE INLET
7	0.8	1.5	I	NYLOPLAST 24" GRATE INLET
8	1.3	2.4	H	MOD SINGLE DENVER TYPE 16 INLET
9	1.0	1.9	O	NYLOPLAST 24" GRATE INLET
10	1.8	3.3	N	NYLOPLAST 2'x2' STEEL BAR INLET
11	0.9	1.5	L	NYLOPLAST 24" GRATE INLET
12	0.6	1.1	M	NYLOPLAST 24" GRATE INLET
13	6.7	12.8	Q	FSD POND
14	9.4	27.5	A, R	CDOT TYPE D GRATE INLET
15	0.1	0.7	P	SWALE CONVEYS FLOW TO EAST FORK SAND CREEK
16	28.8	71.5	S,DP15,PR40,PR41	EAST FORK SAND CREEK

BASIN SUMMARY			
BASIN	AREA (ACRES)	Q_5	Q_{100}
A	9.92	9.3	27.0
B	2.30	6.8	12.7
C	2.40	7.1	13.2
D	3.18	7.5	14.4
E	0.95	3.3	6.1
F	0.02	0.1	0.2
G	0.04	0.2	0.4
H	0.33	1.3	2.4
I	0.19	0.8	1.5
J	0.21	0.8	1.5
K	0.20	0.7	1.4
L	0.18	0.9	1.5
M	0.13	0.6	1.1
N	0.40	1.8	3.3
O	0.25	1.0	1.9
P	0.26	0.1	0.7
Q	0.23	0.1	0.6
R	0.22	0.1	0.5
S	0.55	0.4	3.2

1" = 30'

0 15 30 60

Scale in Feet

STORM SEWER SUMMARY				
PIPE RUN	Q_5	Q_{100}	PIPE SIZE	CONTRIBUTING PIPES/DESIGN POINTS
1	4.2	6.6	18" PP	DP1
2	5.9	9.7	24" PP	PR1, DP2
3	2.1	4.1	15" PP	DP3
4	9.1	16.4	24" PP	PR2, PR3, DP4
5	12.7	30.5	30" PP	PR4, DP5
6	7.5	14.4	24" PP	DP6
7	18.8	41.4	36" PP	PR5, PR6
8	18.8	41.4	36" PP	PR7
9	0.1	0.2	6" PP	.02 ACRE BASIN J
10	0.1	0.2	6" PP	PR9
11	0.2	0.4	6" PP	.06 ACRE BASIN J
12	0.3	0.6	8" PP	PR10, PR11
13	0.5	1.0	12" PP	PR12, .06 ACRE BASIN J
14	0.0	0.1	6" PP	.01 ACRE BASIN J
15	0.6	1.1	12" PP	PR13, PR14
16	0.1	0.3	6" PP	.04 ACRE BASIN J
17	0.7	1.3	12" PP	PR15, PR16
18	0.1	0.1	6" PP	.02 ACRE BASIN J
19	0.8	1.5	12" PP	PR17, PR18
20	0.8	1.5	12" PP	PR19
21	1.6	3.0	15" PP	PR20, DP11
22	2.3	4.1	15" PP	PR21, DP12
23	0.8	1.5	12" PP	DP7
24	2.0	3.8	15" PP	PR23, DP8
25	0.1	0.2	6" PP	.03 ACRE BASIN K
26	2.2	4.1	15" PP	PR24, PR25
27	0.2	0.3	6" PP	.05 ACRE BASIN K
28	2.3	4.4	15" PP	PR26, PR27
29	0.2	0.3	6" PP	.05 ACRE BASIN K
30	2.5	4.7	18" PP	PR28, PR29
31	0.2	0.3	6" PP	.05 ACRE BASIN K
32	2.7	5.1	18" PP	PR30, PR31
33	0.1	0.2	6" PP	.02 ACRE BASIN K
34	2.8	5.2	18" PP	PR32, PR33
35	5.0	9.3	24" RCP	PR22, PR34
36	1.0	1.9	12" PP	DP9
37	2.8	5.2	18" PP	PR36, DP10
38	2.8	5.2	18" RCP	PR37
39	0.3	0.3	18" RCP	FSD POND RELEASE
40	19.1	41.7	36" RCP	PR8, PR39
41	9.4	27.5	30" RCP	DP14

POND 1 SAND FILTER DETENTION BASIN DATA

WQ WATER SURFACE EL = 6252.28
WQ VOLUME=0.051 AC-FT
EURV WATER SURFACE EL = 6254.15
EURV VOLUME=0.242 AC-FT
100-YR WATER SURFACE EL=6254.75
100-YR VOLUME=0.323 AC-FT
SPILLWAY CREST EL=6254.76
TOP OF EMBANKMENT EL=6256.00
RATIONAL 100-YR INFLOW=12.8 CFS
MHFD 100-YR INFLOW = 7.8 CFS
MHFD 100-YR RELEASE = 0.2 CFS

NOTES

1. REFER TO EXISTING DRAINAGE MAP FOR BASINS A, B, C, AND D.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

CIVIL CONSULTANTS, INC.
212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CLEARWAY NO. 2, LOT 5

PROPOSED DRAINAGE MAP

PROJECT NO. 44-042	SCALE: HORIZONTAL: 1"=30' VERTICAL: N/A	DATE: 06/02/2022	
DESIGNED BY: DLM DRAWN BY: TAU CHECKED BY: VAS		SHEET 1 OF 1	PDM