January 9, 2023

El Paso County Planning and Community Development Department
2880 International Circle, Suite 110
Colorado Springs, CO 80190

RE: EPC SF2219 – Mayberry Filing 3 Drainage Report Comment Response

The intent of this letter is to give a broad overview of changes between the last Filing 3 Drainage Report submission and the 3rd submission. Responses to individual comments can be found on the marked up PDF following this letter. A broad overview of the changes are as follows:

- Previously listed industrial areas have been revised to commercial which in turn altered the C-value and increased runoff. This has created larger pipes downstream.
- Additional inlets and storm pipes have been added to the overall storm drain network to help with roadway capacity and future Mayberry Filing 2 improvements.
- Detention Pond D was analyzed to support the interim condition where only Filing 2 and Filing 3 will be developed, leaving the remainder of the tributary basin as undeveloped. This altered the orifice plate which will be replaced after the full build out.
- To ensure no downstream negative impacts, a plunge pool has been added to slow release rates before entering the roadside ditch along South Log Road.

Clif Dayton, PE
R&R Engineers-Surveyors, Inc.
Department Manager
(303) 753-6730
cdayton@rrengineers.com

FINAL DRAINAGE REPORT

FOR

MAYBERRY, COLORADO SPRINGS – FILING NO. 3

PREPARED FOR:

COLORADO SPRINGS MAYBERRY, LLC
3296 DEVINE HEIGHTS #208
COLORADO SPRINGS, CO 80922

PREPARED BY:

R & R ENGINEERS - SURVEYORS, INC.
1635 W. 13TH AVE, SUITE 310
DENVER, CO 80204
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(303) 753-6730

R&R JOB #MC22110
EPC PROJECT NO. SF2219

ORIGINAL SUBMITTAL: MAY 2022
2ND SUBMITTAL: SEPTEMBER 2022

ENGINEER'S STATEMENT:

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

SIGNATURE: ______________________________

Clif Dayton, P.E.
Registered Professional Engineer
State of Colorado No. 51674

DEVELOPER'S STATEMENT:

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

SIGNATURE: ______________________________

John Mick
Colorado Springs Mayberry, LLC
3296 Devine Heights #208
Colorado Springs, CO 80922

EL PASO COUNTY'S STATEMENT:

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

SIGNATURE: ______________________________

Joshua Palmer, P.E.
County Engineer/ECM Administrator

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I. GENERAL LOCATION AND DESCRIPTION

A. Background

Mayberry, Colorado Springs (formerly known as "Ellicott Town Center") is a proposed subdivision located west of Ellicott, Colorado in El Paso County. The development is located on the south side of State Highway 94, approximately 1-1/2 miles west of Ellicott Highway, as shown in Figure A1 (Appendix F). The approved Ellicott Town Center Sketch Plan and Overall PUD includes a total of 1,048 single-family dwelling units and 32 acres of commercial space. The Amended Mayberry, Colorado Springs Phase 1 PUD was approved by BOCC in April, 2022, which maintained the originally approved 240 Phase 1 lots, but revised various street and lot configurations based on current market conditions. Filing No. 3 comprises the easterly 142 residential lots within the Amended Phase 1 PUD.

B. Scope

This report has been prepared in support of the Final Plat application for Mayberry, Colorado Springs Filing No. 3. The report is intended to fulfill the El Paso County requirements for a Final Drainage Report (FDR).

The report will provide a summary of site drainage issues impacting the proposed development, including analysis of impacts from upstream drainage patterns, site-specific developed drainage patterns, and impacts on downstream facilities. This drainage report was prepared based on the guidelines and criteria presented in the El Paso County Drainage Criteria Manual, providing preliminary design of required drainage facilities for this phase of the project.

C. Site Location and Description

The Mayberry, Colorado Springs (Ellicott Town Center) parcel comprises the west half of Section 14 along with the contiguous east quarter of Section 15, as well the west half of the northeast quarter of Section 14, Township 14 South, Range 63 West of the 6th Principal Meridian. The site is located at an elevation of approximately 6,060 feet above mean sea level. Filing No. 3 comprises 105.8-acres in the northeast area of the Mayberry development.

State Highway 94 borders Filing 3 to the north along with Filing 2, and unplatted agricultural properties (zoned A35) border Filing 3 on the east and south sides. Unplatted property zoned PUD and Filing 1 border Filing 3 to the west.

The primary access to Filing 3 will be provided by construction of Springs Road, which will run through the site from north to south as a minor collector roadway (65' right-of-way). Additionally, Filing 3 will be accessed by New Log Road via Village Main Street (60' right-of-way). Both roads intersect SH94 to the north.

The intermittent streams throughout this area drain into the Black Squirrel Creek Basin which ultimately outfalls into the Arkansas River. Filing 3 is located within the Ellicott Consolidated Drainage Basin (CHBS1200). This basin conveys surface drainage to the West Fork of Black Squirrel Creek, which is located east of this parcel between the site and Ellicott Highway.

The terrain is generally flat with gentle northwest to southeast slopes ranging from one to two percent. Historic drainage patterns from the site are conveyed overland to the south and east boundaries of the site. The entire site is covered with native grasses.

D. General Soil Conditions

According to the Soil Survey of El Paso County prepared by the Soil Conservation Service, on-site soils are comprised primarily of "Blakeland series (type 8)" soils (see Figure A2). The Blakeland soils are characterized as well-drained loamy sand with rapid permeability, slow surface runoff rates, and moderate hazard of erosion. These soils are classified as hydrologic soils group "A" for drainage analysis purposes.

E. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual," revised October 12, 1994.

City of Colorado Springs "Drainage Criteria Manual, Volumes 1 and 2," revised May, 2014.

CDOT, "CDOT Drainage Design Manual," 2004.

David R. Sellon & Associates Inc., "Antelope Park Ranchettes Interior Drainage Plan," March, 1972.

El Paso County Planning Department, "Ellicott Valley Comprehensive Plan," March, 1989.

El Paso County "Engineering Criteria Manual," January 9, 2006.

El Paso County Resolution No. 15-042 (El Paso County adoption of "Chapter 6: Hydrology" and "Chapter 13, Section 3.2.1: Full Spectrum Detention" of the City of Colorado Springs Drainage Criteria Manual dated May 2014).

JPS Engineering, "Master Development Drainage Plan for Ellicott Town Center," November 22, 2005 (approved by El Paso County 12/02/05).

JPS Engineering, "Master Development Drainage Plan and Preliminary Drainage Report for Springs East Village," March 21, 2002 (approved by El Paso County 10/23/02).

JPS Engineering, "Master Development Drainage Plan and Preliminary Drainage Report for Viewpoint Village," January 28, 2002 (approved by El Paso County 9/11/02).

JPS Engineering, "Preliminary Drainage Report for Ellicott Town Center - Phase 1," January 15, 2007.

JPS Engineering, "Preliminary & Final Drainage Report for Mayberry, Colorado Springs - Filing No. 1," revised October 27, 2020 (approved by El Paso County November 5, 2020).

JPS Engineering, "Preliminary Drainage Report Amendment for Mayberry, Colorado Springs – Phase 1 PUD," revised February 2022

Leigh Whitehead & Associates, Inc., "Master Development Drainage Plan for Sunset Village," May, 2000 (approved by El Paso County 8/31/00).

Pacific Summits Engineering, "Final Drainage Report for Viewpoint Estates," January 6, 1998 (approved by El Paso County 10/6/99).

United Planning and Engineering, "Preliminary Drainage Plan & Report for Springs East," November 19, 1999.

United Planning and Engineering, "Drainage Plan & Report for Viewpoint Subdivision," May, 2000.

USDA/NRCS, "Soil Survey of El Paso County Area, Colorado," June, 1981.

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Drainage Basins

The proposed development lies primarily within the Ellicott Consolidated Drainage Basin (CHBS1200) as classified by El Paso County. This basin is comprised of the area tributary to the West Fork of Black Squirrel Creek, with the majority of the basin bounded by SH94 to the north and Ellicott Highway to the east. No drainage planning study has been completed for the Ellicott Consolidated Drainage Basin or any adjacent drainage basins.

The major drainage basins lying in and around the proposed development are depicted in Figure EX1 and is sourced from the Phase 1 PUD Amended Drainage Report. Mayberry, Colorado Springs is located primarily within the Ellicott Consolidated Drainage Basin, which comprises a tributary area of about 13 square miles, or 8,320 acres. The proposed subdivision represents a total of 551 acres of development, or 7 percent of the total basin area. An "on-site" drainage planning approach has been proposed based on the relatively small developed area in comparison to the remaining undeveloped basin area, which is primarily agricultural land.

The existing site topography has one off-site drainage basin (EC-10) that enters the northeast corner of Filing 3. Triple 30-inch CMP culverts cross SH94 at this location combines with on-site flows, following existing grass-lined swales southeasterly through the site. Filing 3 historically consists of one major basin conveying flows towards the south and eastern boundaries of the site, as shown in Figure EX2. Flows from Filing 3 combine with the tributary areas from Filing 1 and surrounding offsite areas downstream of the site, flowing southeasterly to an existing natural channel towards Black Squirrel Creek.

B. Floodplain Impacts

Mayberry – Filing 3, Colorado Springs is located approximately one mile southwest of the 100-year floodplain limits for the West Fork of Black Squirrel Creek, as delineated by the Federal Emergency Management Agency (FEMA). The floodplain limits in the vicinity of the site are shown in Flood Insurance Rate Map (FIRM) Number 08041C0810G, dated December 7, 2018 (see Figure A3).

C. Sub-Basin Description

The developed drainage basins lying within Filing 3 are depicted in Figure D1. The interior site layout has been delineated into several drainage basins (C-E) based on the proposed interior road layout and grading scheme. The natural drainage patterns will be impacted through development by site grading and concentration of runoff in subdivision street gutters, storm drains, and channels. Most sub-basins drain to the southeast, collecting in the interior roads and drainage channels. On-site flows will be diverted to a proposed extended detention basin (EDB) located at the southeast boundary of the site, and detained runoff flows will discharge to the east, following historic drainage paths.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference

The Ellicott Consolidated Drainage Basin has not had a Drainage Basin Planning Study performed for the basin. Most areas within the basin are comprised of agricultural lands and rural residential uses.

A "Master Development Drainage Plan (MDDP) for Ellicott Town Center" was approved concurrent with the original Overall PUD, and a Preliminary Drainage Report for Ellicott Town Center Phase One was approved with the original Phase One PUD and Preliminary Plan.

JPS Engineering prepared the "Preliminary & Final Drainage Report for Mayberry, Colorado Springs - Filing No. 1," revised October 27, 2020 (approved by El Paso County November 5, 2020) in support of the final approval and recording of Filing No. 1.

This "Final Drainage Report for Mayberry, Colorado Springs – Filing No. 3" fully conforms to the previously approved MDDP and Preliminary/Final Drainage Reports, along with the "Preliminary Drainage Report Amendment for Mayberry, Colorado Springs Phase 1 PUD" dated February, 2022 prepared in support of the Phase 1 PUD Amendment.

B. Hydrologic Criteria

SCS procedures were utilized for analysis of major basin flows impacting the site. In accordance with El Paso County drainage criteria, SCS hydrologic calculations were based on the following assumptions:

• Design storm (minor)	5-year
• Design storm (major)	100-year
• Storm distribution	SCS Type IIA (eastern Colorado)
• 100-year, 24-hour rainfall	4.4 inches per hour (NOAA isopluvial map)
• 5-year, 24-hour rainfall	2.6 inches per hour (NOAA isopluvial map)
• Hydrologic soil type	B

- SCS curve number - undeveloped conditions 61 (pasture / range)
- SCS curve number - developed conditions 80 (1/8-1/4 acre lots)
- SCS curve number - developed conditions 92 (commercial areas)

Hydraflow Hydrographs was utilized for the modeling of these storms.

Rational method procedures were utilized for calculation of peak flows within the on-site drainage basins. Rational method hydrologic calculations were based on the following assumptions:

Shouldn't this be A as indicated in page 2 and the sheet below? Please revise as necessary

revised

•	Design storm (minor)	5-year	
•	Design storm (major)	100-year	
•	Rainfall Intensities	El Paso County I-D-F Curve	
•	Hydrologic soil type	A	
		C5	C100
•	Runoff Coefficients - undeveloped:		
	Existing pasture/range areas	0.25	0.35
•	Runoff Coefficients - developed:		
	Proposed Residential (1/8-1/4 acre lots)	0.375	0.545
	Proposed Neighborhood Commercial	0.49	0.62

Composite runoff coefficients for the developed residential areas have been calculated based on average lot sizes between 1/8-acre and 1/4-acre. A rational method spreadsheet was utilized for modeling these flows.

C. Hydraulic Criteria

Street and inlet capacities were calculated using the UD_Inlet utilizing the street geometries at each inlet. The criteria used for street and inlet capacities was that for the 5 year storm, flow depths would not exceed 6 inches or overtop the street crown while for the 100 year storm, the depth of water at the flow line would not exceed 12 inches.

Three pipe systems are proposed as part of the Filing 3 development. Pipes are sized so that the 100 year HGLs are a minimum of 1 foot below finished grades. HGLs are derived using Bentley StormCAD software. Velocities in pipes do not exceed 18 fps as stated in the EPC DCM. All peak flows for pipes were derived via the Rational Method.

Four grass lined channels are proposed as part of the Filing 3 development: C2, D, E, and F. Channels are sized so that there is a minimum of 1 foot of freeboard between the 100 year water surface elevation and the top of channels. Channel linings are chosen based on the calculated velocities/slopes and conform to Table 10-4 of the EPC DCM. Channel E utilized the SCS method to determine the peak flow from the upstream offsite basin. Peak flows for Channels C2 and D were derived via the Rational Method while peak flows for Channel F were obtained from the release rates from upstream extended detention basin D combined with offsite flows routed by Channel E.

Rip-Rap was sized for the 100 year storm per UDFCD Section 3.2.1. Rip-rap is placed where all pipes discharge into channels across the site.

Two temporary culverts are proposed beneath temporary cul-de-sacs east of the proposed development. The culverts are designed so that during the 100 year storm event, water levels do not exceed 12 inches above finished grade when overtopping the roadway above.

D. Detention and Water Quality Criteria

Detention volumes and required release rates will be calculated using the UD_Detention Spreadsheet from UDFCD. An extended detention basin will be utilized to provide water quality and detention for Filing 3. The facility is designed to pass and release the water quality captured volume (WQCV), excess urban runoff volume (EURV), and 100 year storm to meet all local and state regulations by means of a multi-stage outlet structure.

The WQCV will be routed through an orifice plate installed within the outlet structure and sized to have a 40 hour draw down time. The orifice plate will also drain 97% the EURV within 72 hours. Finally, a restrictor plate and weir combination will pass the 100 year flow at 90% of the pre-developed rate.

Per El Paso County Engineering Criteria Manual Section 1.7.1.C.1, up to one acre of development may be exempt from stormwater treatment. Due to the requirement that temporary cul-de-sacs be provided for fire department access to Union Pacific and El Reno Way, these developed areas are unable to drain to the proposed detention pond. These areas will drain to Channel E and flow offsite undetained. These cul-de-sac areas total to 0.3 acres, so well below the 1 acre requirement.

IV. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

As stated in DCM Volume 2, the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

<u>Step 1: Employ Runoff Reduction Practices</u>

- Minimize Impacts: The approved Planned Unit Development includes significant open space, play areas, and parks, resulting in a moderate level of impervious site development.
- Minimize Directly Connected Impervious Areas (MDCIA): The proposed development will include landscaped areas adjoining the proposed building and parking lots, providing for impervious areas to drain across pervious areas where feasible.
- Grass Swales: The proposed drainage plan incorporates grass-lined swales in

selected locations to encourage stormwater infiltration while providing positive drainage through the site.

Step 2: Stabilize Drainageways

- Proper erosion control measures will be implemented along the grass-lined drainage channels to provide stabilized drainageways within the site.

Step 3: Provide Water Quality Capture Volume (WQCV)

- EDB: The developed areas of the site will drain through proposed Full-Spectrum Extended Detention Basins (EDB) southeast of the developed areas. Site drainage will be routed through the extended detention basins, which will capture and slowly release the WQCV over an extended release period.
- Stormwater detention and WQCV for Filing as well as future Filings 2 and 4 will be provided by EDB-D.

Step 4: Consider Need for Industrial and Commercial BMPs

- No industrial or commercial land uses are proposed as part of the Filing No. 3 residential development.

V. GENERAL DRAINAGE RECOMMENDATIONS

The developed drainage plan for the site is to provide and maintain positive drainage away from structures and conform to the established drainage patterns for the overall site. Positive drainage shall be established and maintained away from all structures within the site in conformance with applicable building codes and geotechnical engineering recommendations.

Site grading and drainage improvements performed as a part of subdivision infrastructure development includes overlot grading and subdivision drainage improvements depicted on the subdivision construction drawings. Individual lot grading is the sole responsibility of the individual builders and property owners. Final grading of each home site should establish proper protective slopes and positive drainage in accordance with HUD guidelines and building codes. In general, main floor elevations for each home should be established approximately 2 feet above the top of curb of the adjoining street.

In general, we recommend a minimum of 6 inches clearance from the top of concrete foundation walls to adjacent finished site grades. Positive drainage slopes should be maintained away from all structures, with a minimum recommended slope of 5 percent for the first 10 feet away from buildings in landscaped areas, a minimum recommended slope of 2 percent for the first 10 feet away from buildings in paved areas, and a minimum slope of 1 percent for paved areas beyond buildings.

VI. DRAINAGE FACILITY DESIGN

A. General Concept

Consistent with generally accepted practices in eastern El Paso County, the general concept for management of stormwater from development of Mayberry – Filing 3 will be to construct an extended detention basin along the southeast boundary of the site to mitigate the impacts of developed runoff flows from the site.

Development of the Mayberry – Filing 3 project will require site grading and paving, resulting in additional impervious areas across the site. The general drainage pattern will consist of grading away from home sites to drainage swales and gutters along the internal roads within the subdivision, conveying runoff flows through the site. The Amended PUD includes 4-foot minimum side-lot drainage easements, and the proposed easements are adequate for the required side-lot drainage swales to accommodate proper grading of the individual home sites.

Runoff from the site will flow by street gutters to curb inlets at low points and road intersections, thence by storm drains and drainage channels to the proposed detention ponds. The storm inlets and storm sewer system within the development will be designed as the “minor” drainage system, sized for 5-year developed peak flows. The internal road system, drainage channels, and detention ponds will be designed as the “major” drainage system, sized for 100-year peak flows. Street flows within subdivision streets will be maintained below allowable levels in accordance with El Paso County drainage criteria.

Due to an offsite basin north of SH94 flowing onto the subject property, the site has been designed to convey this flow through the site via a series of temporary swales and culverts. The offsite flow will be routed around the proposed development and will combine with the pond discharge via a swale that conveys flow east of the site.

B. Specific Details

Existing Basins

Historic drainage conditions for Filing 3 are depicted in Figure EX2. The site has been divided into one major basin (EX-D). The undeveloped site currently has no drainage facilities within the area. The existing off-site drainage basins north of Filing 3 generally combine with on-site basins as shown on Figure EX2, flowing southeasterly through the site within existing grass-lined drainage swales and channels.

Off-site flows from Basin EC10 north of this property cross State Highway 94 in the writeup has been revised, there is only one set of triple culverts that interacts with filing 3

? what are the other culverts. I believe previously the report may have discussed culverts for basin EC11. Revise accordingly.

Please identify in the narrative how the flow is conveyed from DPEX5 to the Old Log Road Ditch i.e. a swale/channel at the south property line of the Gillespie property

another triple 30-inch CMP culvert crossing near the northeast corner of this site. These flows drain through an existing grass-lined swale across the east side of Basin EX-D to Design Point #EX-5, with historic peak flows of Q_5 = 15.25 cfs and Q_{100} = 110.9 cfs (SCS Method). As shown on Sheet EX2, two existing driveway culverts on the south side of SH94 convey flows from the roadside ditch on the south side of SH94 easterly to converge with the existing swale on the downstream side of the triple 30-inch CMP culverts, combining with Basin EC10.

the writeup has been revised to include information on what the flows do when leaving the site

The downstream drainage continues southeast to a more defined natural channel, forming the West Tributary to the Middle Fork of Black Squirrel Creek. Historic drainage from Basin EX-D flows southeast to the westerly ditch along "Old" Log Road, then turns east and follows the southerly ditch of Handle Road to its confluence with the main channel of the Middle Fork of Black Squirrel Creek.

Developed Drainage Basins

The developed drainage basins and projected flows are shown in Figures D1, D1.1-D1.5. The developed Filing 3 site has been divided into three major basins (C2-E) and one major design point (DP25), as shown on the enclosed Drainage Plan. Hydrologic flow schematics and calculations are enclosed in Appendix B.

Major Basin C2 (Sub-basins C2.1-C2.4, C3.0) will be routed to the extended detention basin via Channel C2 where it will combine with major basin D (Sub-basins D1.1-D1.11, C2.0-D2.1). Channels C2 and D are also sized to convey future flows from the area south of Filing 3 which is currently undeveloped. Offsite basin EC-10 will combine with onsite major Basin E (Sub-basin E1.0) reviseddevelop at Channel E. Basin EC-10 will be routed around Filing 3 and will combine with Pond D's discharge downstream of the pond at Channel F.

revised

FYI: it is shown as E1 on the drainage map

All onsite basin peak flows were derived via the Rational Method while the offsite basin EC-10 was analyzed by the SCS Method due to the tributary area. Detailed breakdowns of each sub-basin are listed below:

Sub-basin C2.1 is a 0.77 acre onsite area that is collected by a curb inlet. This basin consists of single family lots and a portion of Solaire Loop. Runoff from this basin drains to the street curb and gutter and enters the public storm sewer system. The 5 year and 100 year developed peak flows are 1.1 and 2.7 cfs respectively

Sub-basin C2.2 is a 0.33 acre onsite area that is collected by a curb inlet. This basin consists of single family lots and a portion of Solaire Loop. Runoff from this basin drains to the street curb and gutter and enters the public storm sewer system. The 5 year and 100 year developed peak flows are 0.6 and 1.4 cfs respectively

Sub-basin C2.3 is a 11.41 acre onsite area that is collected by a curb inlet in Mayberry Drive. This basin consists of single family lots and a portions of Solaire Loop, Galveston please make clear that the developed flows entering this basin will be conveyed to the Pond.

the writeup has been revised to reflect this

Terrace, Cattlemen Run, Achison Way, and Village Main Street. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 13.2 and 32.2 cfs respectively.

Sub-basin C2.4 is a 1.16 acre onsite area that is collected by a curb inlet on the south side of Mayberry Drive. This basin consists of south section of the Mayberry Drive ROW. Runoff from this basin is routed via curb/gutter, enters a double Type R curb inlet, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 4.1 and 7.8 cfs respectively.

Sub-basin C3.0 is a 35.40 acre basin south of the Filing 3 development. The basin was analyzed for future development and assumed to comprise both single family lots and park area. The basin will ultimately drain to Pond D via future storm sewer improvements. During the interim condition the basin will be undeveloped with part of the basin bypassing Pond D. The 5 year and 100 year developed peak flows are 22 and 72.7 cfs respectively.

identify that this is a commercial development.

the writeup has been revised to reflect this

Please identify that your are discussing a future condition and that this inlet would not be installed at this stage (or will it?).

a stub will be installed but not the inlet. the writeup has been revised to reflect this

Sub-basin D1.1 is a 10.45 acre basin comprising single family lots and portions of Cattlemen Run, Solaire Loop, Besseyi Way and Filing 2. The basin was analyzed for future development of Filing 2 and comprised totally of single family lots. The basin drain via curb and gutter to a Type R inlet on the north side of Besseyi Way. The 5 year and 100 year developed peak flows are 11.6 and 28.4 cfs respectively.

Sub-basin D1.2 is a 2.57 acre basin comprising single family lots and portions of Solaire Loop and Besseyi Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the south side of Besseyi Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.4 and 8.3 cfs respectively.

Sub-basin D1.3 is a 2.02 acre basin comprising single family lots and portions of Union Pacific Way and El Reno Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the north side of El Reno Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.1 and 7.5 cfs respectively.

Sub-basin D1.4 is a 3.55 acre basin comprising single family lots and portions of Besseyi Way, Union Pacific Way, Springs Road and El Reno Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the south side of El Reno Way, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 4.7 and 11.5 cfs respectively.

Sub-basin D1.5 is a 9.37 acre basin comprising the future Filing 4 area and is assumed to be Commercial/Industrial in nature. Runoff from this basin will be routed via curb/gutter and crosspans and enter inlets within the future development. The inlets will be piped to the east to the proposed piping that will convey Basin EC-10's offsite flow through the development. The 5 year and 100 year developed peak flows are 19.8 and 39.4 cfs respectively.

The offsite flow from EC-10 will not be treated but the future developed flow from basin D1.5 must be treated. Please clarify your intent for this future flow as it appears to state that it will be combined with EC-10 flow that will not be treated. Please also discuss this flow in terms of the filing 3 stage when it is not developed. Is the flow conveyed to Channel E at this stage or the DP12 stub? The CD's identify this as stub as being capped. please clarify.

Sub-basin D1.6 is a 1.94 acre basin comprising single family lots and portions of Union Pacific Way. Runoff from this basin is routed via curb/gutter and crosspans, enters a Type R curb inlet on the north side of Union Pacific Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 2.6 and 6.3 cfs respectively.

the writeup has been revised to explain both the developed and pre-developed conditions for this basin.

Sub-basin D1.7 is a 1.56 acre basin comprising single family lots and portions of Union Pacific Way. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the south side of Union Pacific Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 2.1 and 5.0 cfs respectively.

Sub-basin D1.8 is a 1.30 acre basin comprising single family lots and portions of El Reno Way. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the north side of El Reno Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 1.8 and 4.4 cfs respectively.

Sub-basin D1.9 is a 0.54 acre basin comprising single family lots and portions of El Reno Way. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the south side of El Reno Way, and is discharged into the piped storm sewer system to the east. The 5 year and 100 year developed peak flows are 0.9 and 2.1 cfs respectively.

a stub will be installed but not the inlet. the writeup has been revised to reflect this

Sub-basin D1.10 is a 2.12 acre basin comprising single family lots and portions of Mayberry Drive. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the north side of Mayberry Drive, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 3.3 and 8.0 cfs respectively.

Please also clarify whether the inlet at DP17 that collects this basins flow will be installed at this stage as it appears that this section of Mayberry Drive will not be constructed. If not, then please identify how the developed flow will be conveyed to Pond D in the interim condition.

Sub-basin D1.11 is a 1.23 acre basin comprising a portion of Mayberry Drive. Runoff from this basin is routed via curb/gutter, enters a Type R curb inlet on the south side of Mayberry Drive, and is discharged into the piped storm sewer system. The 5 year and 100 year developed peak flows are 4 and 7.7 cfs respectively.

Sub-basin D2.0 is a 11.90 acre basin south of the Filing 3 development. The basin was analyzed for future development and assumed to comprise both single family lots and park area. The basin will ultimately drain to Pond D via future storm sewer improvements. The 5 year and 100 year developed peak flows are 10.3 and 27.7 cfs

a stub will be installed but not the inlet. the writeup has been revised to reflect this

Similar to the comment above on basin D1.10, please also discuss how the flow will be conveyed to the south in the interim condition.

basin has been added

Please label basin EC10 on the proposed conditions drainage plans. Currently it is only shown on the historic conditions plan

respectively.

Sub-basin D2.1 is a 3.15 acre basin south of the Filing 3 development. The basin comprises the area around Detention Pond D. The basin will ultimately surface flow. The 5 year and 100 year developed peak flows are 0.9 and 6.6 cfs respectively.

Sub-basin E1.0 is a 4.63 acre basin east/northeast of the Filing 3 development. The basin comprises Channel E south of SH94 and bypasses the site to the east, ultimately discharging into Channel F to the east of Pond D. The basin also comprises the temporary cul-de-sacs required at the ends of El Reno Way and Union Pacific Drive. The 5 year and 100 year developed peak flows are 0.4 and 3.3 cfs respectively.

Sub-basin EC-10 is a 317 acre agricultural basin north of SH94 and drains into Channel E via culverts beneath SH94. The basin combines with flows generated by Basin E1.0 and bypasses the site to the east, ultimately discharging into Channel F to the east of Pond D. Due to the size of the basin, the generated peak flows were derived via the SCS Method. The 5 year and 100 year peak flows are 15.3 and 110.9 cfs respectively.

C. Emergency Conditions Analysis

In the event of clogging, the storm inlets within the Filing 3 development area will overflow to the adjoining public streets, which all generally flow southeasterly. Emergency overflows would sheet flow southeasterly along the public streets, flowing into Channels C2, D, and Detention Pond D.

Pond D also has measures in place to mitigate an emergency condition. A buried riprap emergency spillway will route emergency flows over the embankment and into a swale that will carry flows east of the site.

D. Comparison of Developed to Historic Discharges

Based on the hydrologic calculations in the Appendix, the total developed flows from the site will exceed historic flows from the parcel. Due to the increased impervious areas in the developed site, the total undetained flow from the site would be significantly higher than the historic flow. The increase in developed flows will be mitigated by an on-site extended detention basin.

a table comparing pre and post flows has been added to the report

Please provide the runoff values comparing the historic flows to the developed flows after detention.

Detention Design

The total developed storm runoff downstream of the Filing No. 3 development along with the future developments of Filings 2, 2A, 4, and the area south of Filing 3 area will be maintained at historic levels by routing flows through the proposed Detention Pond D located at the southeast corner of the subdivision. The proposed detention facility has

both scenarios have been studied and writeups added to the report.

It appears that Pond D is designed for the total build-out (filings 1 -4 and basins C3.0, D2.0) and is shown to meet the required drain times. As filing 4 and basins C3.0 & D2.0 have yet to be submitted please also run a scenario with these areas as undeveloped to show that Pond D will still meet the required drain times.

been sized to attenuate onsite peak flows through the pond, mitigating developed drainage impacts.

The total volume requiring storage is equivalent to the 100 Year + ½ WQCV produced by the onsite developed area. The calculated volume to be stored is 8.3 ac-ft and was calculated by means of the UD_Detention spreadsheet. The detention volume will be routed through the extended detention basin by means of a modified CDOT Type C structure. The WQCV and EURV will be controlled by a multi-stage orifice plate within the Type C structure. The 100-year volume will be routed through a 36" pipe with restrictor plate within the Type C structure.

The proposed detention pond will be privately owned and maintained by the Metropolitan District, under the terms of a "Private Detention Basin Maintenance Agreement" recorded during final platting. Gravel maintenance access roads will be provided around the perimeter of the detention ponds to facilitate maintenance access.

The pond outlet structures have been designed to release historic flows southeast of the site towards the existing natural swales downstream. Based on the proposed approach of reducing developed flows to historic levels at the site boundaries, no significant downstream drainage impacts are anticipated, and no downstream drainage improvements are proposed.

F. Onsite Drainage Facility Design

Storm Sewer System Layout

Generally, streets are designed with cross slopes of 2%, pushing water from the centerlines to curb and gutter systems. The systems convey flows to low points at various points around the site where Type R curb inlets are proposed to convey street flows to an underground storm sewer system. The storm sewer system contains reinforced concrete pipes (RCP) with minimum sizes of 18 inches and minimum slopes of 0.5%.

Basins C2.1-C2.4 drains to a dedicated storm sewer system that discharged to channel C2. Basins D1.1-D1.4 and D1.10-D1.11 drain to another dedicated storm sewer system that discharges into Channel D at DP19. Basins D1.5-D1.9 drain into a third dedicated storm sewer system on the eastern edge of the Filing 3 boundary. This system also discharges into Channel D at DP19. Both channels ultimately drain to Detention Pond D.

Open Channel System Layout

Four open channels are proposed as part of this development: C2, D, E, and F. These channels will generally be designed as stable grass-lined channels with subcritical flow regimes. Drainage channels will be designed to convey 100-year flows, with trapezoidal cross-sections, side slopes of 4:1, and minimum freeboard of 1-foot.

this scenario has been studied and is now included in the report

It appears that the undeveloped flows from basin D1.5 will enter Channel E. Please be sure that Channel E accounts for these flows in this interim condition.

Channel C2 conveys flows from DP4 along with flows from future basin C3.0. The channel is trapezoidal with a bottom width of 8 feet and a depth of 3 feet. The channel will be lined with a grass-legume mixture.

Channel D conveys flows from DP19 along with flows from future basin D2.0. The channel is trapezoidal with a bottom width of 8 feet and a depth of 4 feet. The channel will be seeded with Kentucky bluegrass, tall fescue, or reed canarygrass.

Channel E conveys flows from offsite basin EC-10 along with flows from onsite basin E1.0. The channel is trapezoidal with a bottom width of 8 feet and a depth of 3 feet. The channel will be seeded with sodded grass.

Channel F conveys flows from the outfalls of Detention Pond D and combines with Channel E downstream of the pond. The channel will convey flows to the eastern ditch adjacent to Log Road. The channel is trapezoidal with a bottom width of 8 feet and a depth of 4 feet. The channel will be seeded with Kentucky bluegrass, tall fescue, or reed canarygrass.

G. Analysis of Existing and Proposed Downstream Facilities

Provide calculations for the 90 degree bend where Channel F meets the existing roadside ditch. Provide existing and proposed flows and capacities for the roadside ditch.

The general concept of the proposed drainage plan is to attenuate peak flows from the developed site by routing flows through the proposed on-site detention ponds. Combined flows from the Mayberry site flow southeasterly towards the existing Middle Fork of Black Squirrel Creek. The existing channels downstream of the site consist of broad grass-lined swales with no signs of active erosion. As previously discussed, there is an existing drainage crossing of Ellicott Highway approximately 2-1/2 miles downstream of this site where a future culvert should be installed. Recognizing that this historically deficient crossing is miles downstream of the site, no cost contribution to this off-site drainage improvement was requested during previous approval of the Ellicott Town Center MDDP, and no contribution is proposed at this time. An on-site stormwater detention pond will be provided to mitigate developed drainage impacts, so no off-site or downstream drainage improvements are proposed.

H. Anticipated Drainage Problems and Solutions

the roadside ditch along Log Road has been studied as part of this resubmittal and has been included in the report. flows into this ditch will be below historic rates

The proposed stormwater detention pond is designed to mitigate the impacts of developed drainage from this project. The overall drainage plan for the subdivision includes a system of improved public streets with curb and gutter, storm inlets, and storm sewers conveying developed flows to improved drainage channels running through the site. The primary drainage problems anticipated within this development will consist of maintenance of these storm sewer systems, culverts, drainage channels, and detention pond facilities. Care will need to be taken to implement proper erosion control measures in the proposed channels and swales, which will be designed to meet allowable velocity criteria.

A trail system will be constructed along the major drainage channels to provide maintenance access to the drainage facilities throughout the development. Proper construction and maintenance of the proposed detention facilities will minimize downstream drainage impacts. The proposed public streets will be owned and maintained by El Paso County. The proposed detention ponds and channels running through open space tracts and storm drains through private alleys will be privately owned and maintained by the homeowners association or metropolitan district.

VII. EROSION CONTROL

The Contractor will be required to implement best management practices (BMP's) for erosion control during construction. The proposed erosion control plan is included in the Grading & Erosion Control (GEC) Plans submitted with the subdivision construction drawings. Erosion control measures will include installation of silt fence at the toe of disturbed slopes and hay bales protecting drainage ditches. Cut and fill slopes will be stabilized during excavation if necessary and vegetation will be established for stabilization of the disturbed areas. All ditches have been designed to meet El Paso County criteria for slope and velocity. Additionally, gravel vehicle tracking pads will be installed at construction access points and inlet protection will be provided to minimize conveyance of sediment into storm inlets.

VIII. COST ESTIMATE AND DRAINAGE FEES

The developer will pay all capital costs for roadway and drainage improvements. As detailed in Appendix C, the engineer's estimate for Filing 3 drainage improvements is approximately $1,088,557.80. Filing 3 is located entirely within the Ellicott Consolidated Drainage Basin, which currently does not have a drainage or bridge fee requirement. As such, no drainage basin fees are applicable.

IX. MAINTENANCE

All proposed road and drainage construction within the Mayberry – Filing 3, Colorado Springs project will be performed to El Paso County Standards. Interior roads will be dedicated as public right-of-way. Roads and drainage facilities within the public right-of-way will be maintained by El Paso County upon final acceptance of these facilities after the warranty period. The Metropolitan District will maintain drainage channels and stormwater detention pond within the proposed open space areas.

X. SUMMARY

The Mayberry – Filing 3, Colorado Springs consists of 142 residential lots in the northeast part of the master development, with access connections to State Highway 94 at Springs Road. The residential lots are platted within Filing 3. The development will generate an increase in developed runoff from the site, which will be mitigated through on-site stormwater detention and water quality facility.

The proposed drainage patterns will remain consistent with historic conditions, and new drainage facilities constructed to El Paso County standards will safely convey runoff to adequate outfalls. Construction of the proposed Detention Pond D southeast of the development areas will ensure that developed flows remain below historic levels. Construction and proper maintenance of the proposed drainage and erosion control facilities will ensure that this subdivision has no significant adverse drainage impacts on downstream or surrounding areas.

XI. APPENDICES

Appendix A - Hydrologic Computations

1. Hydrologic References
2. Pre Developed Flow Rates
3. Post Developed Flow Rates

Appendix B – Hydraulic Computations

1. Detention and Water Quality Facility Design
2. Storm Sewer Capacity
3. Inlet and Street Capacity
4. Rip Rap Calculations
5. Channel Design

Appendix C – Reference Information

1. Cost Estimate
2. NRCS Soils Report
3. FEMA Flood Insurance Maps
4. Drainage Maps

APPENDIX A - HYDROLOGIC COMPUTATIONS

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
⅛ Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
¼ Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
⅓ Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
½ Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55

Lots are 1/6 acre, used 0.375

Lots are 1/6 acre, used 0.545

Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis—Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

I know we've talked about a possible deviation to expand the footprint of the driveway at some homes. Has this additional area been added to the percent imperviousness for the individual lots?

yes this has been analyzed and the values used from the impervious/c factor tables are more conservative

TABLE 6-10. NRCS CURVE NUMBERS FOR FRONTAL STORMS & THUNDERSTORMS FOR DEVELOPED CONDITIONS (ARCII)

EXPAND

Fully Developed Urban Areas (vegetation established)[1]	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	——	——	—	68	79	86	89
Fair condition (grass cover 50% to 75%)	——	——	—	49	69	79	84
Good condition (grass cover > 75%)	——	——	—	39	61	74	80
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way	——	——	—	98	98	98	98
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	——	——	—	98	98	98	98
Paved; open ditches (including right-of-way)	——	——	—	83	89	92	93
Gravel (including right-of-way)	——	——	—	76	85	89	91
Dirt (including right-of-way)	——	——	—	72	82	87	89
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	——	——	—	63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	——	——	—	96	96	96	96
Urban districts:							

Commercial and business	——	——	85	89	92	94	95
Industrial	——	——	72	81	88	91	93
Residential districts by average lot size:							
⅛ acre or less (town houses)	——	——	65	77	85	90	92
¼ acre	——	——	38	61	75	83	87
⅓ acre	——	——	30	57	72	81	86
½ acre	——	——	25	54	70	80	85
1 acre	——	——	20	51	68	79	84
2 acres	——	——	12	46	65	77	82
Developing Urban Areas[1]	**Treatment[2]**	**Hydrologic Condition[3]**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Newly graded areas (pervious areas only, no vegetation)	——	——	—	77	86	91	94
Cultivated Agricultural Lands[1]	**Treatment**	**Hydrologic Condition**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Fallow	Bare soil	——	—	77	86	91	94
	Crop residue cover (CR)	Poor	—	76	85	90	93
		Good	—	74	83	88	90
Row crops	Straight row (SR)	Poor	—	72	81	88	91
		Good	—	67	78	85	89
	SR + CR	Poor	—	71	80	87	90
		Good	—	64	75	82	85
	Contoured (C)	Poor	—	70	79	84	88
		Good	—	65	75	82	86
	C + CR	Poor	—	69	78	83	87
		Good	—	64	74	81	85
	Contoured & terraced (C&T)	Poor	—	66	74	80	82
		Good	—	62	71	78	81
	C&T+ CR	Poor	—	65	73	79	81
		Good	—	61	70	77	80

1/6 AC - USE 80

Small grain	SR	Poor	—	65	76	84	88
		Good	—	63	75	83	87
	SR + CR	Poor	—	64	75	83	86
		Good	—	60	72	80	84
	C	Poor	—	63	74	82	85
		Good	—	61	73	81	84
	C + CR Poor	Poor	—	62	73	81	84
		Good	—	60	72	80	83
	C&T	Poor	—	61	72	79	82
		Good	—	59	70	78	81
	C&T+ CR	Poor	—	60	71	78	81
		Good	—	58	69	77	80
Pasture, grassland, or range—continuous forage for grazing [4]	——	Poor	—	68	79	86	89
	—	Fair	—	49	69	79	84
	—	Good	—	39	61	74	80
Meadow-continuous grass, protected from grazing and generally mowed for hay	——	——	—	30	58	71	78
Brush-brush-weed-grass mixture with brush the major element [5]	——	Poor	—	48	67	77	83
	—	Fair	—	35	56	70	77
	—	Good	—	30	48	65	73
Woods-grass combination (orchard or tree farm) [6]	——	Poor	—	57	73	82	86
	—	Fair	—	43	65	76	82
	—	Good	—	32	58	72	79
Woods [7]	——	Poor	—	45	66	77	83
	—	Fair	—	36	60	73	79
	—	Good	—	30	55	70	77
Farmsteads-buildings, lanes, driveways, and surrounding lots	——	——	—	59	74	82	86
Arid and Semi-arid Rangelands[1]	**Treatment**	**Hydrologic Condition[8]**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Herbaceous-mixture of grass, weeds, and low-	——	Poor	—	——	80	87	93

growing brush, with brush the minor element	—	Fair	—	——	71	81	89
	—	Good	—	——	62	74	85
Oak-aspen-mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	——	Poor	—	——	66	74	79
	—	Fair	—	——	48	57	63
	—	Good	—	——	30	41	48
Pinyon-juniper-pinyon, juniper, or both; grass understory	——	Poor	—	——	75	85	89
	—	Fair	—	——	58	73	80
	—	Good	—	——	41	61	71
Sagebrush with grass understory	——	Poor	—	——	67	80	85
	—	Fair	—	——	51	63	70
	—	Good	—	——	35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	——	Poor	—	63	77	85	88
	—	Fair	—	55	72	81	86
	—	Good	—	49	68	79	84

[1] Ia = 0.1 S

[2.] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3.] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness. Poor: Factors impair infiltration and tend to increase runoff. Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

[4.] Poor: <50%) ground cover or heavily grazed with no mulch. Fair: 50 to 75% ground cover and not heavily grazed. Good: > 75% ground cover and lightly or only occasional

[5.] Poor: <50% ground cover. Fair: 50 to 75% ground cover. Good: >75% ground cover.

[6.] CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods

[7.] Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. Fair: Woods are grazed but not burned, and some forest litter covers the soil. Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

[8.] Poor: <30% ground cover (litter, grass, and brush overstory). Fair: 30 to 70% ground cover. Good: > 70% ground cover.

Table 6-9. NRCS Curve Numbers for Pre-Development Thunderstorms Conditions (ARC I)

EXPAND

Fully Developed Urban Areas (vegetation established)[1]	Treatment	Hydrologic Condition	% I	Pre-Development CN			
				HSG A	HSG B	HSG C	HSG D
Open space (lawns, parks, golf courses, cemeteries, etc.):							
Poor condition (grass cover < 50%)	—	—	—	47	61	72	77
Fair condition (grass cover 50% to 75%)	—	—	—	29	48	61	69
Good condition (grass cover > 75%)	—	—	—	21	40	54	63
Impervious areas:							
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	—	—	—	95	95	95	95
Streets and roads:							
Paved; curbs and storm sewers (excluding right-of-way)	—	—	—	95	95	95	95
Paved; open ditches (including right-of-way)	—	—	—	67	77	83	85
Gravel (including right-of-way)	—	—	—	57	70	77	81
Dirt (including right-of-way)	—	—	—	52	66	74	77
Western desert urban areas:							
Natural desert landscaping (pervious areas only)	—	—	—	42	58	70	75
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)	—	—	—	91	91	91	91
Developing Urban Areas[1]	**Treatment[2]**	**Hydrologic Condition[3]**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**

Newly graded areas (pervious areas only, no vegetation)	—	—	—	58	72	81	87
Cultivated Agricultural Lands[1]	**Treatment**	**Hydrologic Condition**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Fallow	Bare soil	—	—	58	72	81	87
	Crop residue cover (CR)	Poor	—	57	70	79	85
		Good	—	54	67	75	79
Row crops	Straight row (SR)	Poor	—	52	64	75	81
		Good	—	46	60	70	77
	SR + CR	Poor	—	51	63	74	79
		Good	—	43	56	66	70
	Contoured (C)	Poor	—	49	61	69	75
		Good	—	44	56	66	72
	C + CR	Poor	—	48	60	67	74
		Good	—	43	54	64	70
	Contoured & terraced (C&T)	Poor	—	45	54	63	66
		Good	—	41	51	60	64
	C&T+ CR	Poor	—	44	53	61	64
		Good	—	40	49	58	63
Small grain	SR	Poor	—	44	57	69	75
		Good	—	42	56	67	74
	SR + CR	Poor	—	43	56	67	72
		Good	—	39	52	63	69
	C	Poor	—	42	54	66	70
		Good	—	40	53	64	69
	C + CR Poor	Poor	—	41	53	64	69
		Good	—	39	52	63	67
	C&T	Poor	—	40	52	61	66
		Good	—	38	49	60	64
	C&T+ CR	Poor	—	39	51	60	64
		Good	—	37	48	58	63

Close-seeded or broadcast legumes or rotation meadow	SR	Poor	—	45	58	70	77
		Good	—	37	52	64	70
	C	Poor	—	43	56	67	70
		Good	—	34	48	60	67
	C&T	Poor	—	42	53	63	67
		Good	—	30	46	57	63
Pasture, grassland, or range-continuous forage for grazing [4]	—	Poor	—	47	61	72	77
	—	Fair	—	29	48	61	69
	—	Good	—	21	40	54	63
Meadow-continuous grass, protected from grazing and generally mowed for hay	—	—	—	15	37	51	60
Brush-brush-weed-grass mixture with brush the major element [5]	—	Poor	—	28	46	58	67
	—	Fair	—	18	35	49	58
	—	Good	—	15	28	44	53
Woods-grass combination (orchard or tree farm) [6]	—	Poor	—	36	53	66	72
	—	Fair	—	24	44	57	66
	—	Good	—	17	37	52	61
Woods [7]	—	Poor	—	26	45	58	67
	—	Fair	—	19	39	53	61
	—	Good	—	15	34	49	58
Farmsteads-buildings, lanes, driveways, and surrounding lots	—	—	—	38	54	66	72
Arid and Semi-arid Rangelands[1]	**Treatment**	**Hydrologic Condition[8]**	**% I**	**HSG A**	**HSG B**	**HSG C**	**HSG D**
Herbaceous-mixture of grass, weeds, and low-growing brush, with brush the minor element	—	Poor	—	—	63	74	85
	—	Fair	—	—	51	64	77
	—	Good	—	—	41	54	70
Oak-aspen-mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush	—	Poor	—	—	45	54	61
	—	Fair	—	—	28	36	42
	—	Good	—	—	15	23	28
Pinyon-juniper-pinyon,	—	Poor	—	—	56	70	77

juniper, or both; grass understory	—	Fair	—	—	37	53	63
	—	Good	—	—	23	40	51
Sagebrush with grass understory	—	Poor	—	—	46	63	70
	—	Fair	—	—	30	42	49
	—	Good	—	—	18	27	34
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus	—	Poor	—	42	58	70	75
	—	Fair	—	34	52	64	72
	—	Good	—	29	47	61	69

[1] Average runoff condition, and Ia = 0.1S.

[2] Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

[3] Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥ 20%), and (e) degree of surface roughness. Poor: Factors impair infiltration and tend to increase runoff. Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

[4] Poor: <50%) ground cover or heavily grazed with no mulch. Fair: 50 to 75% ground cover and not heavily grazed. Good: > 75% ground cover and lightly or only occasionally grazed.

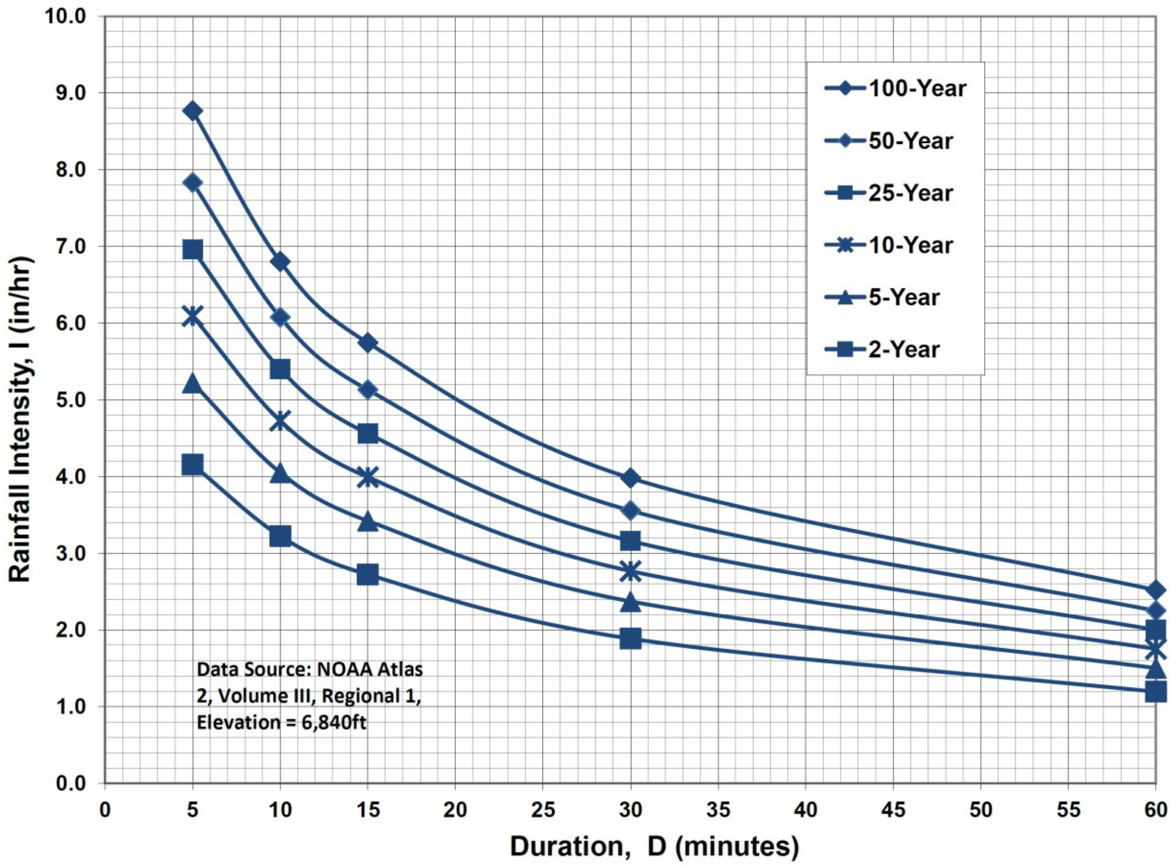
[5] Poor: <50% ground cover. Fair: 50 to 75% ground cover. Good: >75% ground cover.

[6] CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[7] Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning. Fair: Woods are grazed but not burned, and some forest litter covers the soil. Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

[8] Poor: <30% ground cover (litter, grass, and brush overstory). Fair: 30 to 70% ground cover. Good: > 70% ground cover.

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

EXISTING C VALUES

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 8/5/2022
Project: Mayberry Filing 3
Location: El Paso County

R&R ENGINEERS SURVEYORS INC

Global Parameters[1]			
Land Use	% Imp.	C_5	C_{100}
Agriculture	2	0.09	0.36
Hardscape	100	0.9	0.96
Commercial/Industrial	80	0.59	0.7
Landscape/Park	2	0.08	0.35

Summary	
Total Area (ac)	102.00
Composite Impervious	2.0%
Cells of this color are for required user-input	
Cells of this color are for optional user-input	

[1] From Table 6-6 in El Paso County DCM
[2] From Table 6-6 in El Paso County DCM

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	Agriculture		Hardscape		Commercial/Industrial		Landscape/Park		% Check	Percent Imperviousness	Runoff Coefficient, C[2]				
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	25-yr	100-yr
EX-D1	90.50	A	90.50	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%		0.09			0.36
EX-D2	11.50	A	11.50	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	2.0%		0.09			0.36

a single basin is shown on the drainage plan. Please revise so that they are consistent with each other.

these calculations and the map have been coordinated for this submittal

EX DEVELOPMENT CN VALUES

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 8/5/2022
Project: Mayberry Filing 3
Location: El Paso County

Global Parameters[1]	
Land Use	CN
PASTURE - GOOD	61

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	PASTURE - GOOD		% Check	SCS CN
			Area (ac)	%		CN
EC10	317.30	A	317.30	100.0%		61.00
EX-D1	93.50	A	93.50	100.0%		61.00
EX-D2	11.50	A	11.50	100.0%		61.00

TIME OF CONCENTRATION

Designer:	ESJ
Company:	R&R Engineers-Surveyors
Date:	8/5/2022
Project:	Aspen Distillers
Location:	El Paso County

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$\text{Computed } t_c = t_i + t_t$$

$t_{minimum}$ = 5 (urban)
$t_{minimum}$ = 10 (non-urban)

Non Urban Li max = 300'
Urban Li Max = 100'

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

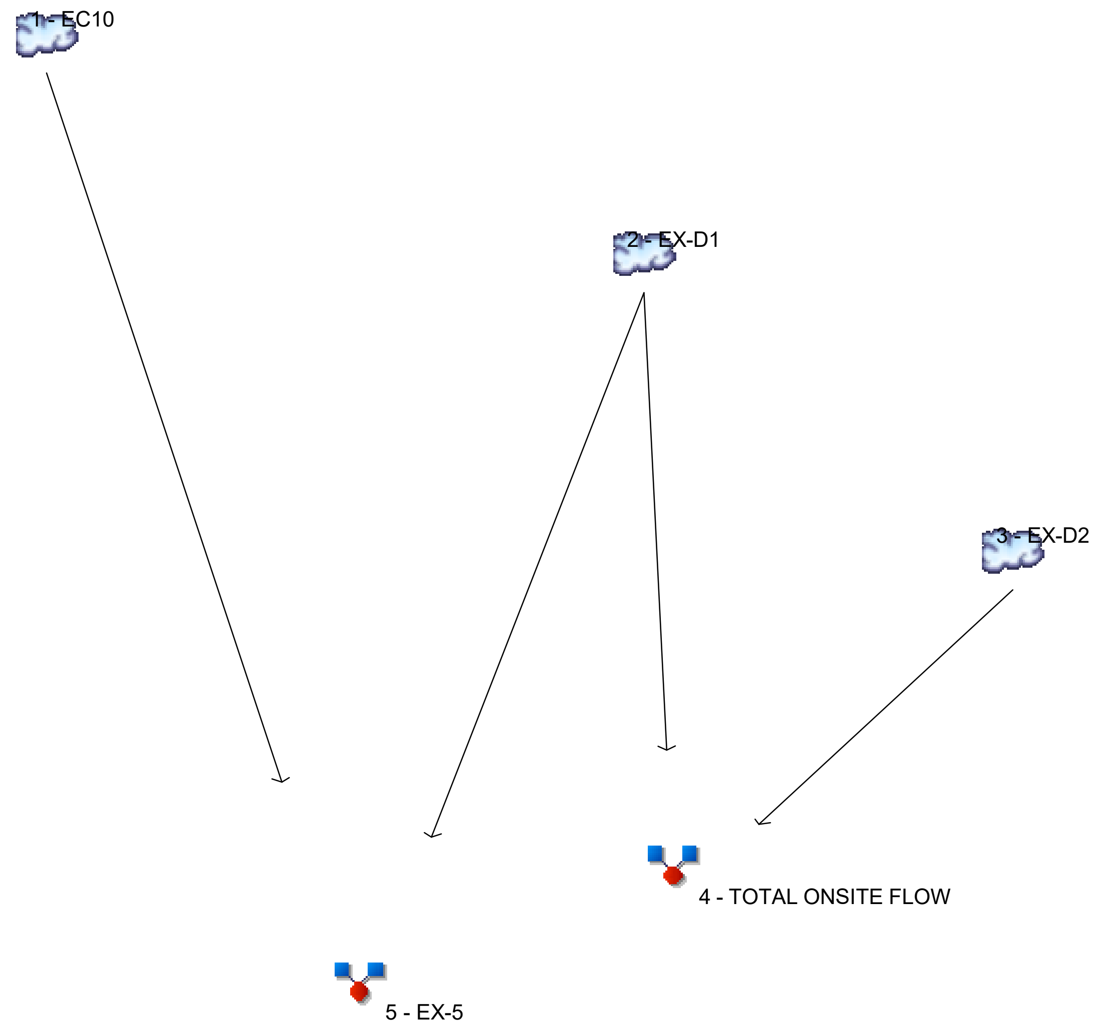
$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Cells of this color are for required user-input

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			
Basin	Area	% Impervious	C5	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	Remarks
EX-D1	90.50	2.0%	0.09	300.00	0.020	25.13	2845.00	0.020	10	1.41	33.53	58.66	61.79	58.66	
EX-D2	11.50	2.0%	0.09	300.00	0.020	25.13	1395.00	0.020	10	1.41	16.44	41.57	43.38	41.57	

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021



Legend

Hyd.	Origin	Description
1	SCS Runoff	EC10
2	SCS Runoff	EX-D1
3	SCS Runoff	EX-D2
4	Combine	TOTAL ONSITE FLOW
5	Combine	EX-5

Project: SCS ROUTING - EX.gpw

Friday, 08 / 5 / 2022

Hydraflow Table of Contents

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	15.25	-------	-------	-------	110.89	EC10
2	SCS Runoff	------	-------	-------	-------	5.630	-------	-------	-------	44.96	EX-D1
3	SCS Runoff	------	-------	-------	-------	0.834	-------	-------	-------	7.112	EX-D2
4	Combine	2, 3	-------	-------	-------	6.383	-------	-------	-------	51.31	TOTAL ONSITE FLOW
5	Combine	1, 2,	-------	-------	-------	20.08	-------	-------	-------	149.38	EX-5

Proj. file: SCS ROUTING - EX.gpw

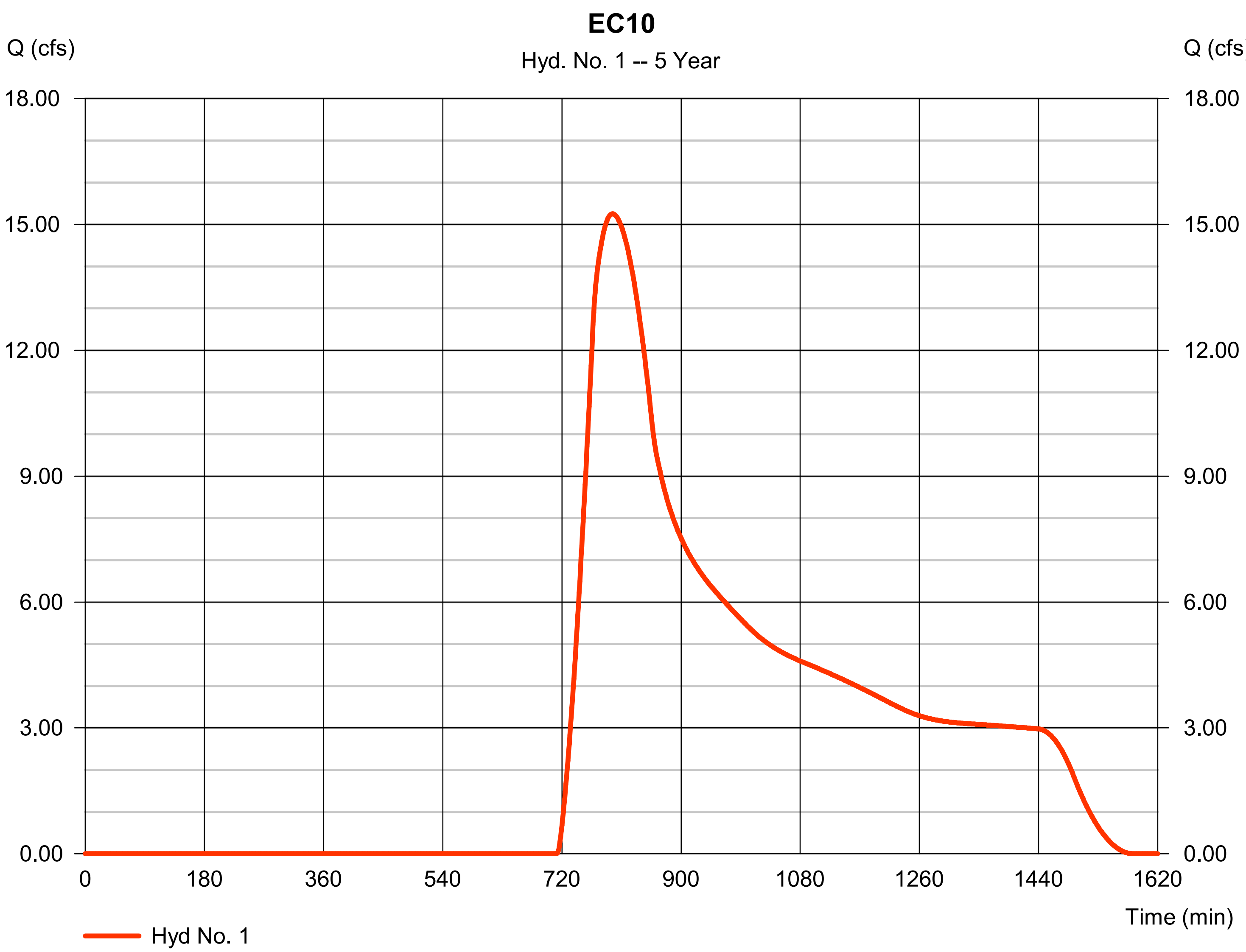
Friday, 08 / 5 / 2022

Hydrograph Report

Hyd. No. 1

EC10

Hydrograph type	= SCS Runoff	Peak discharge	= 15.25 cfs
Storm frequency	= 5 yrs	Time to peak	= 797 min
Time interval	= 1 min	Hyd. volume	= 262,872 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 90.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



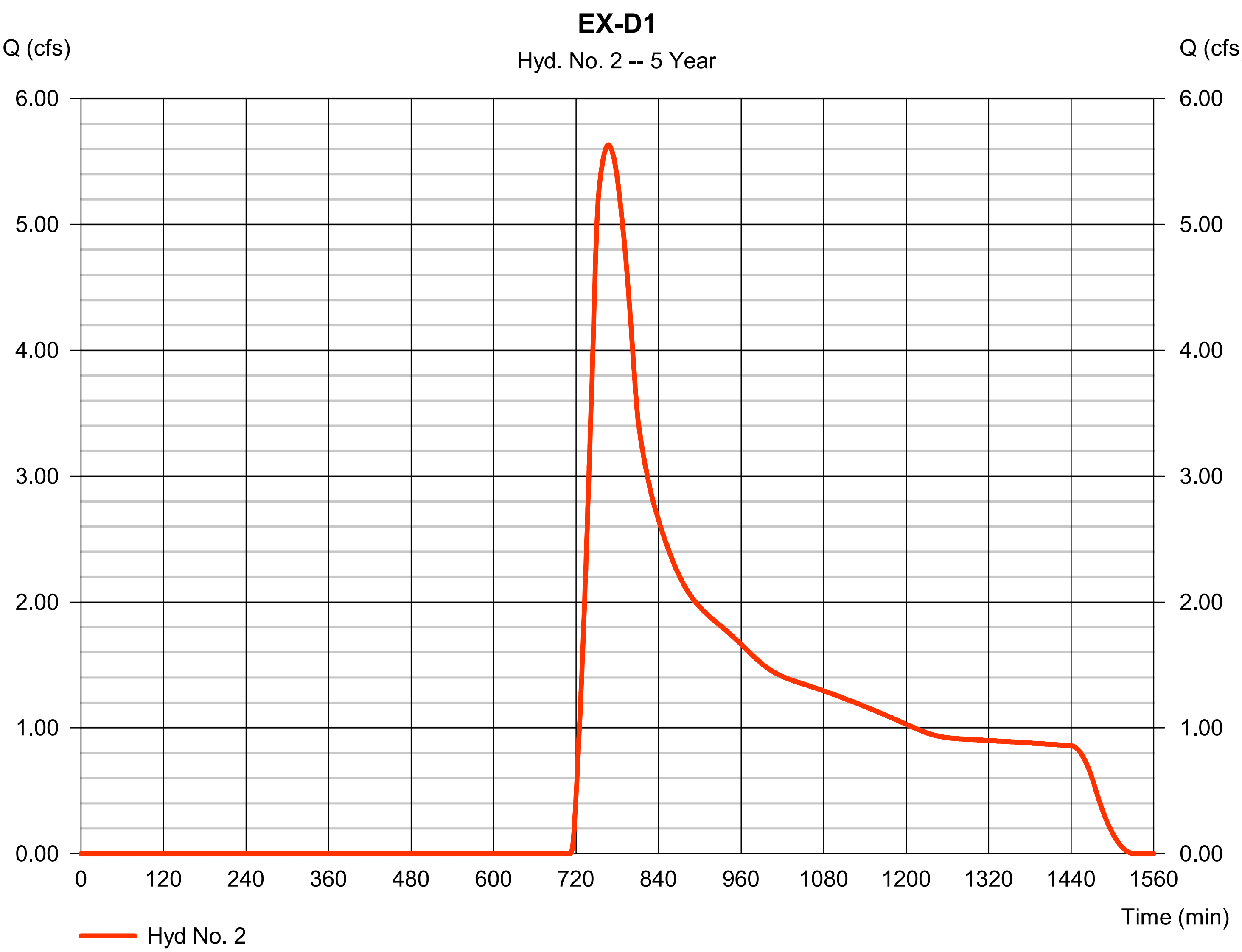
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Friday, 08 / 5 / 2022

Hyd. No. 2

EX-D1

Hydrograph type	= SCS Runoff	Peak discharge	= 5.630 cfs
Storm frequency	= 5 yrs	Time to peak	= 767 min
Time interval	= 1 min	Hyd. volume	= 76,534 cuft
Drainage area	= 93.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 58.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



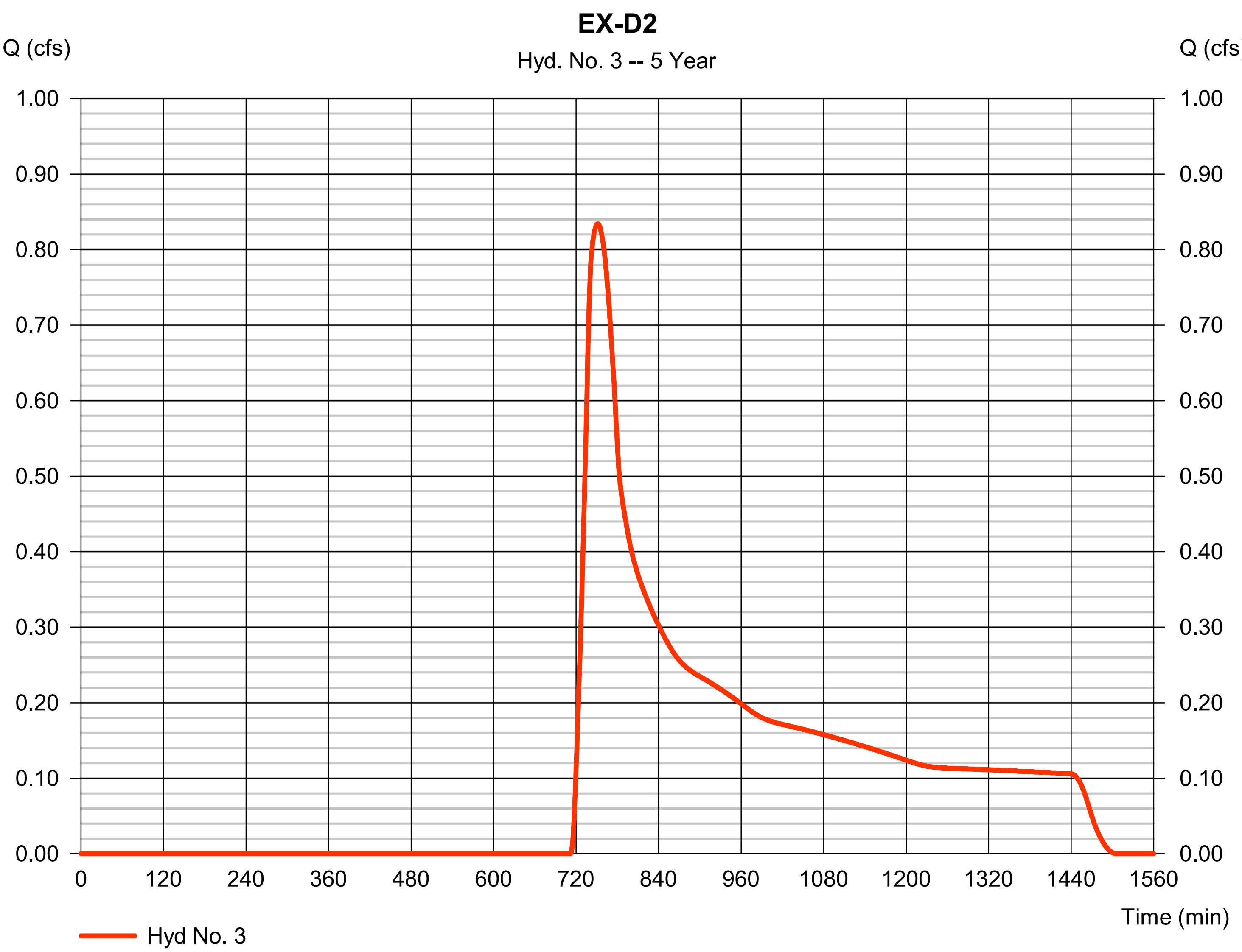
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 — Friday, 08 / 5 / 2022

Hyd. No. 3

EX-D2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.834 cfs
Storm frequency	= 5 yrs	Time to peak	= 751 min
Time interval	= 1 min	Hyd. volume	= 9,494 cuft
Drainage area	= 11.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 41.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



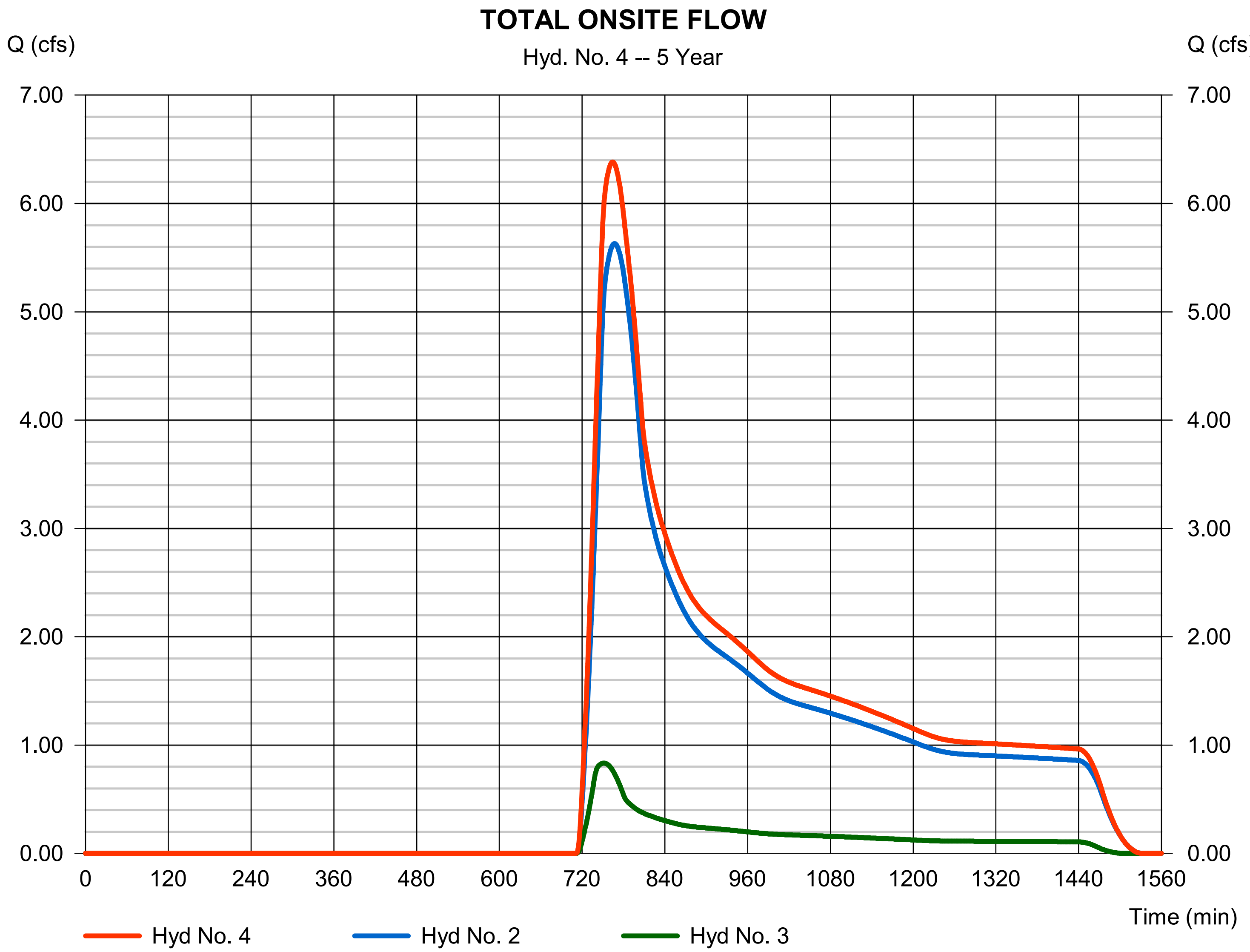
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Friday, 08 / 5 / 2022

Hyd. No. 4

TOTAL ONSITE FLOW

Hydrograph type	= Combine	Peak discharge	= 6.383 cfs
Storm frequency	= 5 yrs	Time to peak	= 764 min
Time interval	= 1 min	Hyd. volume	= 86,028 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 105.000 ac



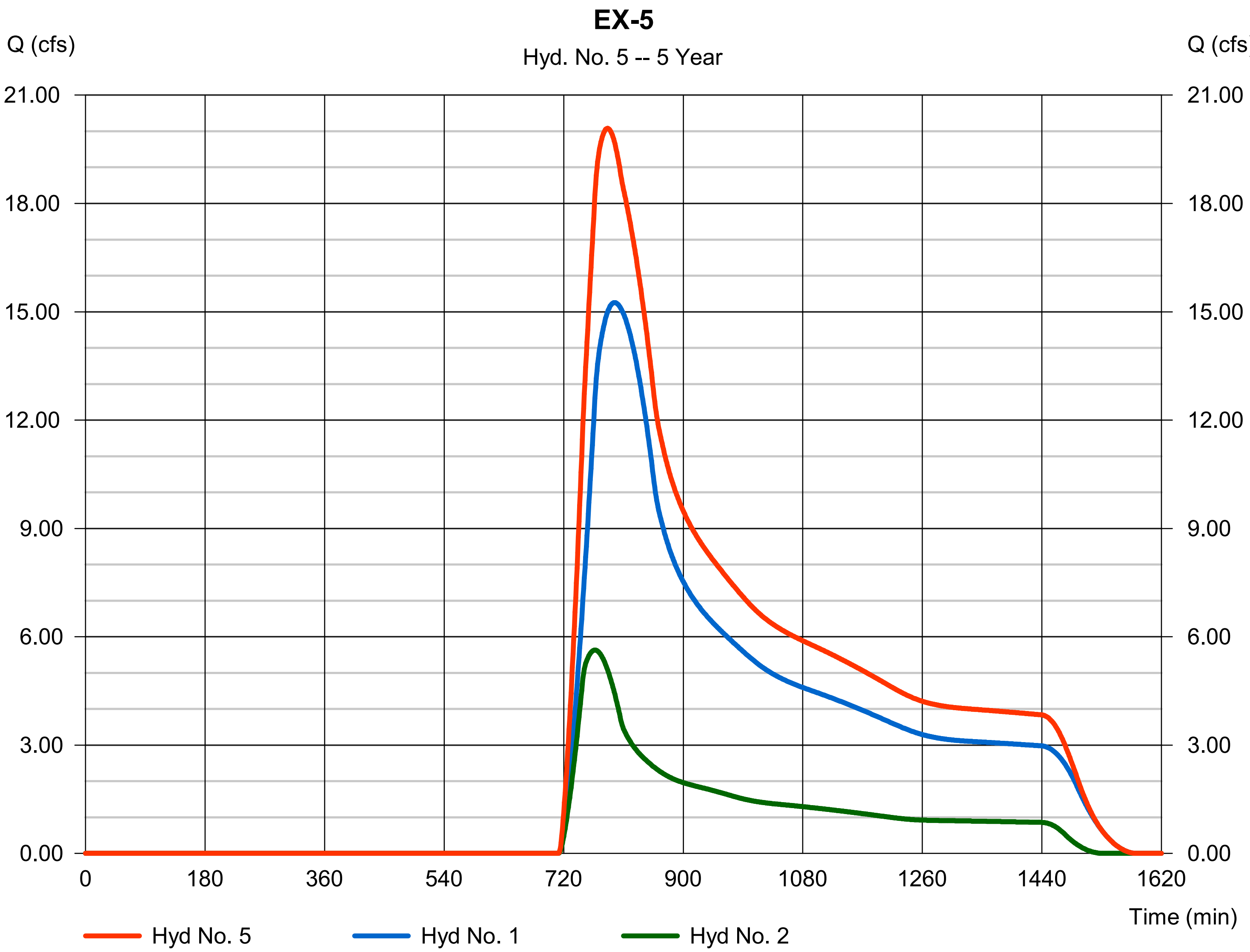
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Friday, 08 / 5 / 2022

Hyd. No. 5

EX-5

Hydrograph type	= Combine	Peak discharge	= 20.08 cfs
Storm frequency	= 5 yrs	Time to peak	= 786 min
Time interval	= 1 min	Hyd. volume	= 339,405 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 413.500 ac



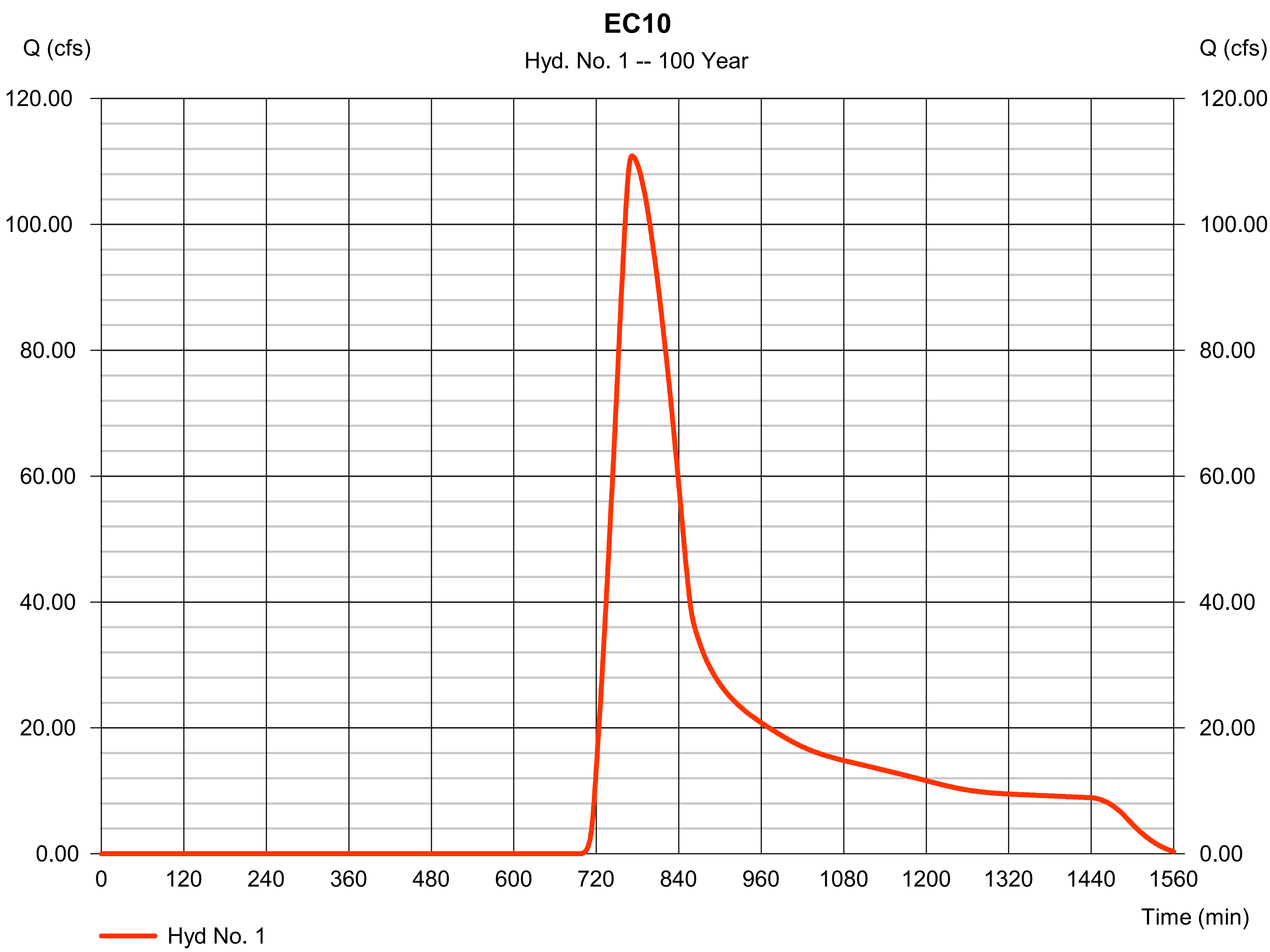
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Friday, 08 / 5 / 2022

Hyd. No. 1

EC10

Hydrograph type	= SCS Runoff	Peak discharge	= 110.89 cfs
Storm frequency	= 100 yrs	Time to peak	= 772 min
Time interval	= 1 min	Hyd. volume	= 1,189,408 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 90.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



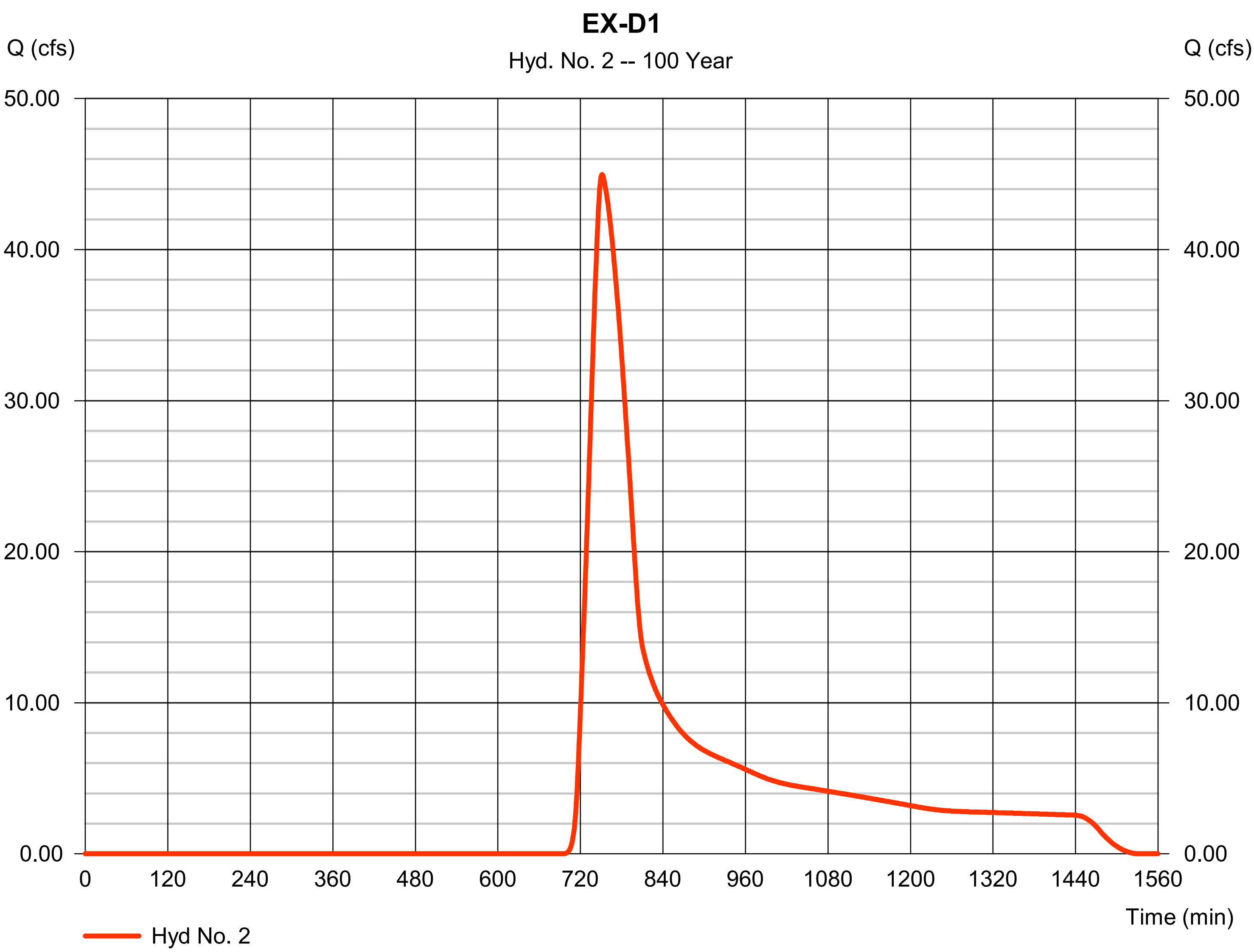
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Friday, 08 / 5 / 2022

Hyd. No. 2

EX-D1

Hydrograph type	= SCS Runoff	Peak discharge	= 44.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 1 min	Hyd. volume	= 346,289 cuft
Drainage area	= 93.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 58.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

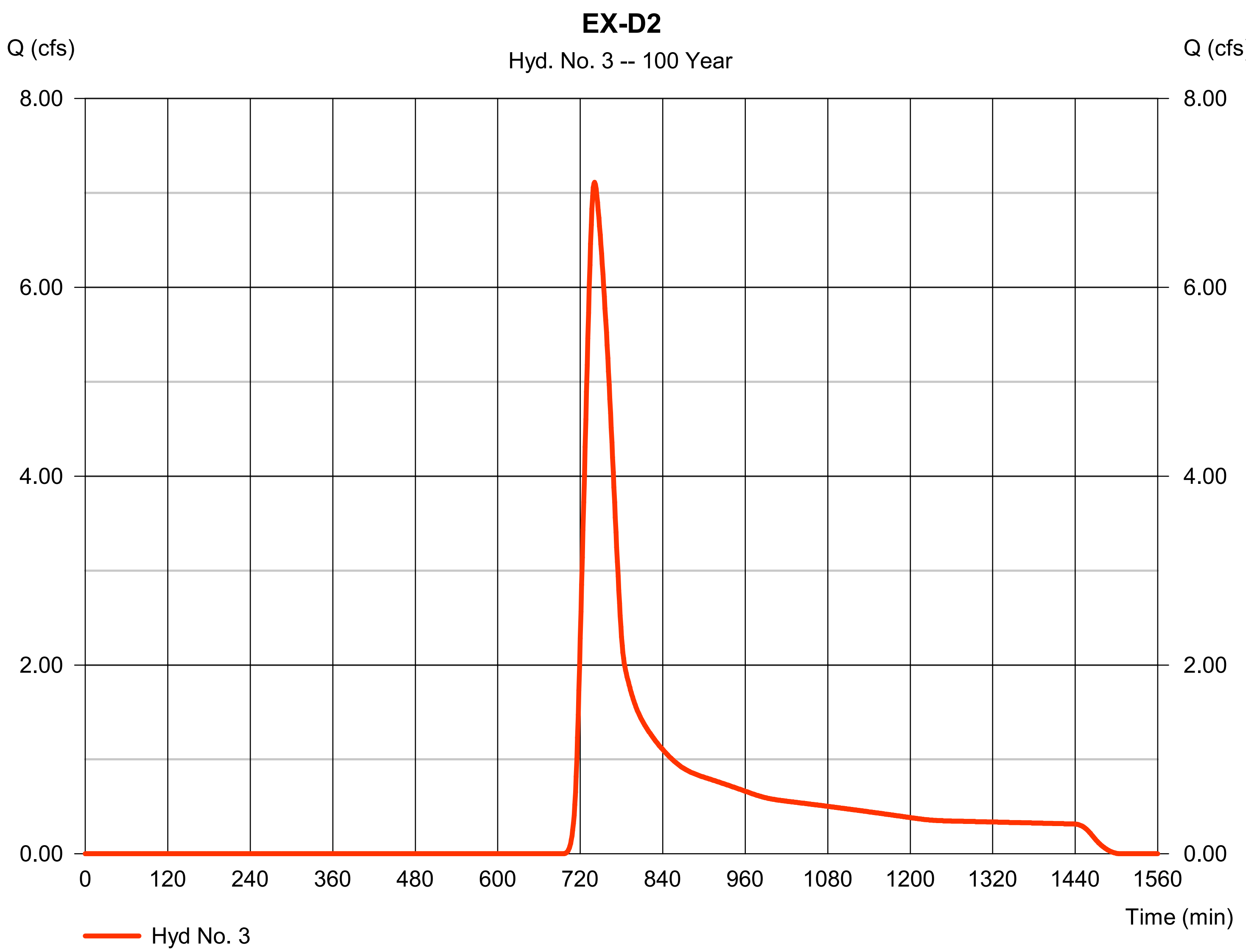


Hydrograph Report

Hyd. No. 3

EX-D2

Hydrograph type	= SCS Runoff	Peak discharge	= 7.112 cfs
Storm frequency	= 100 yrs	Time to peak	= 741 min
Time interval	= 1 min	Hyd. volume	= 42,958 cuft
Drainage area	= 11.500 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 41.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

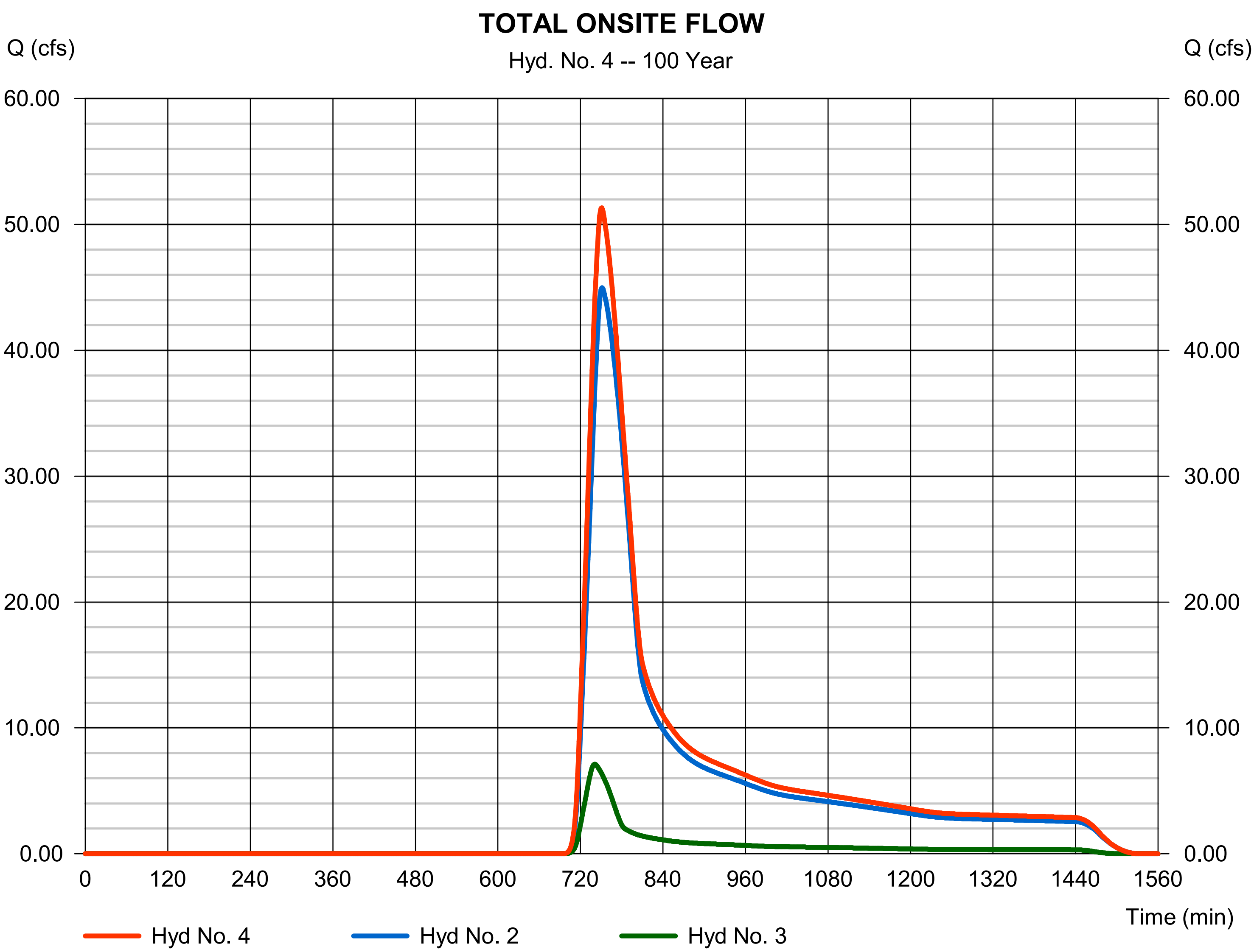


Hydrograph Report

Hyd. No. 4

TOTAL ONSITE FLOW

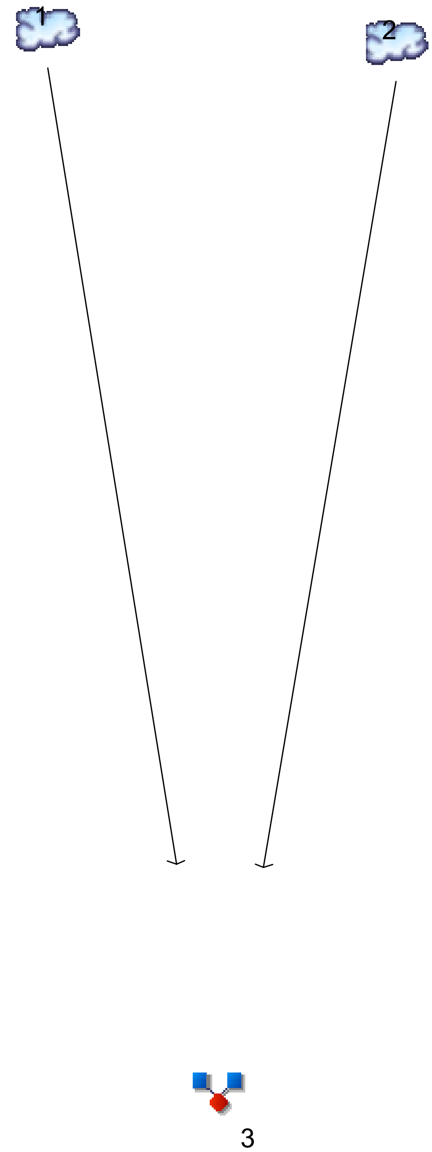
Hydrograph type	= Combine	Peak discharge	= 51.31 cfs
Storm frequency	= 100 yrs	Time to peak	= 751 min
Time interval	= 1 min	Hyd. volume	= 389,247 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 105.000 ac



Hydraflow Table of Contents

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023



Legend

Hyd.	Origin	Description
1	SCS Runoff	EC10 - PRESENT
2	SCS Runoff	E1
3	Combine	DP24

Project: SCS ROUTING.gpw	Friday, 08 / 26 / 2022

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	15.25	-------	-------	-------	110.89	EC10 - PRESENT
2	SCS Runoff	------	-------	-------	-------	0.369	-------	-------	-------	3.248	E1
3	Combine	1, 2	-------	-------	-------	15.41	-------	-------	-------	111.80	DP24

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	15.25	1	797	262,872	------	------	------	EC10 - PRESENT
2	SCS Runoff	0.369	1	745	3,803	------	------	------	E1
3	Combine	15.41	1	796	266,675	1, 2	------	------	DP24

SCS ROUTING.gpw	Return Period: 5 Year	Friday, 08 / 26 / 2022

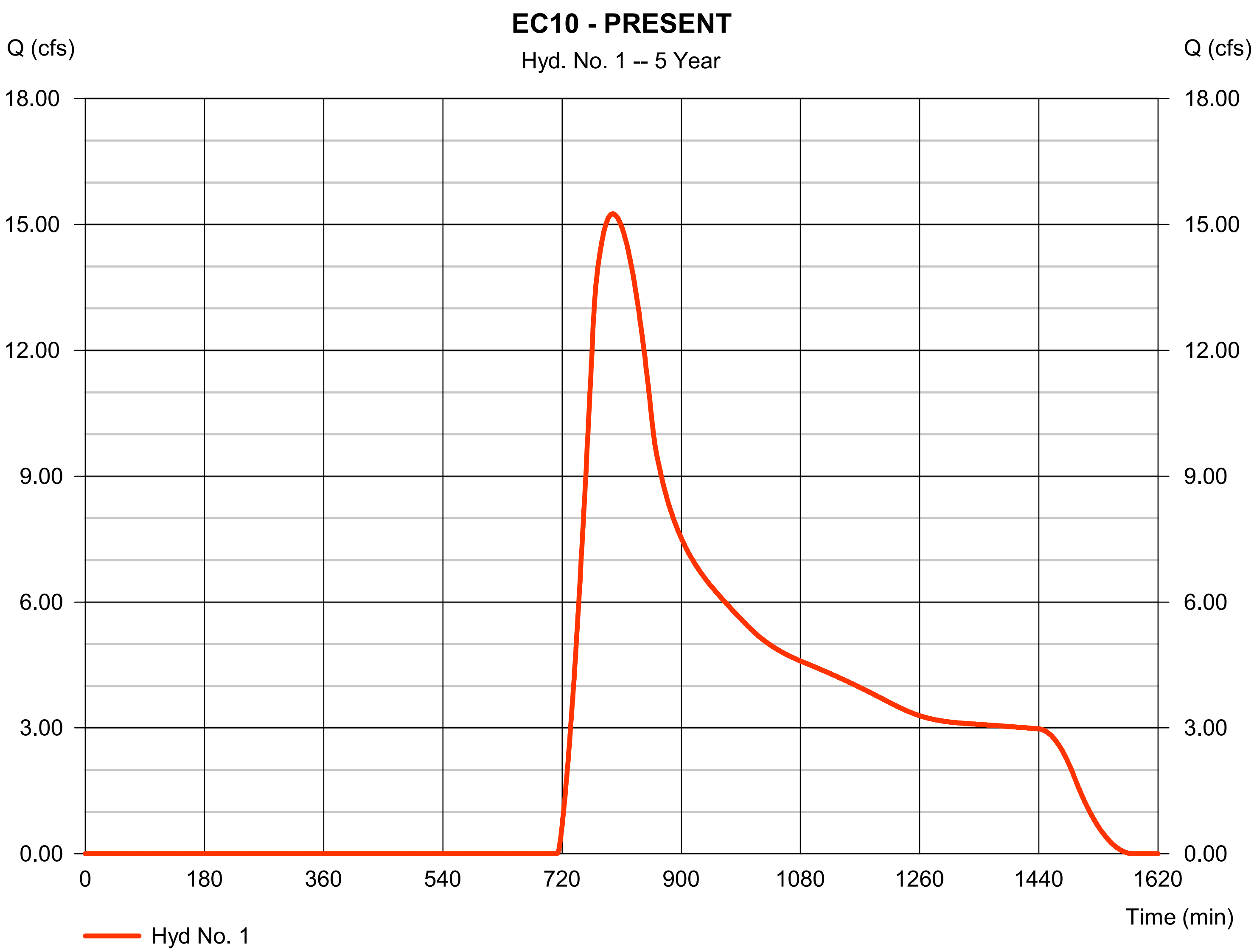
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 08 / 26 / 2022

Hyd. No. 1

EC10 - PRESENT

Hydrograph type	= SCS Runoff	Peak discharge	= 15.25 cfs
Storm frequency	= 5 yrs	Time to peak	= 797 min
Time interval	= 1 min	Hyd. volume	= 262,872 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 90.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



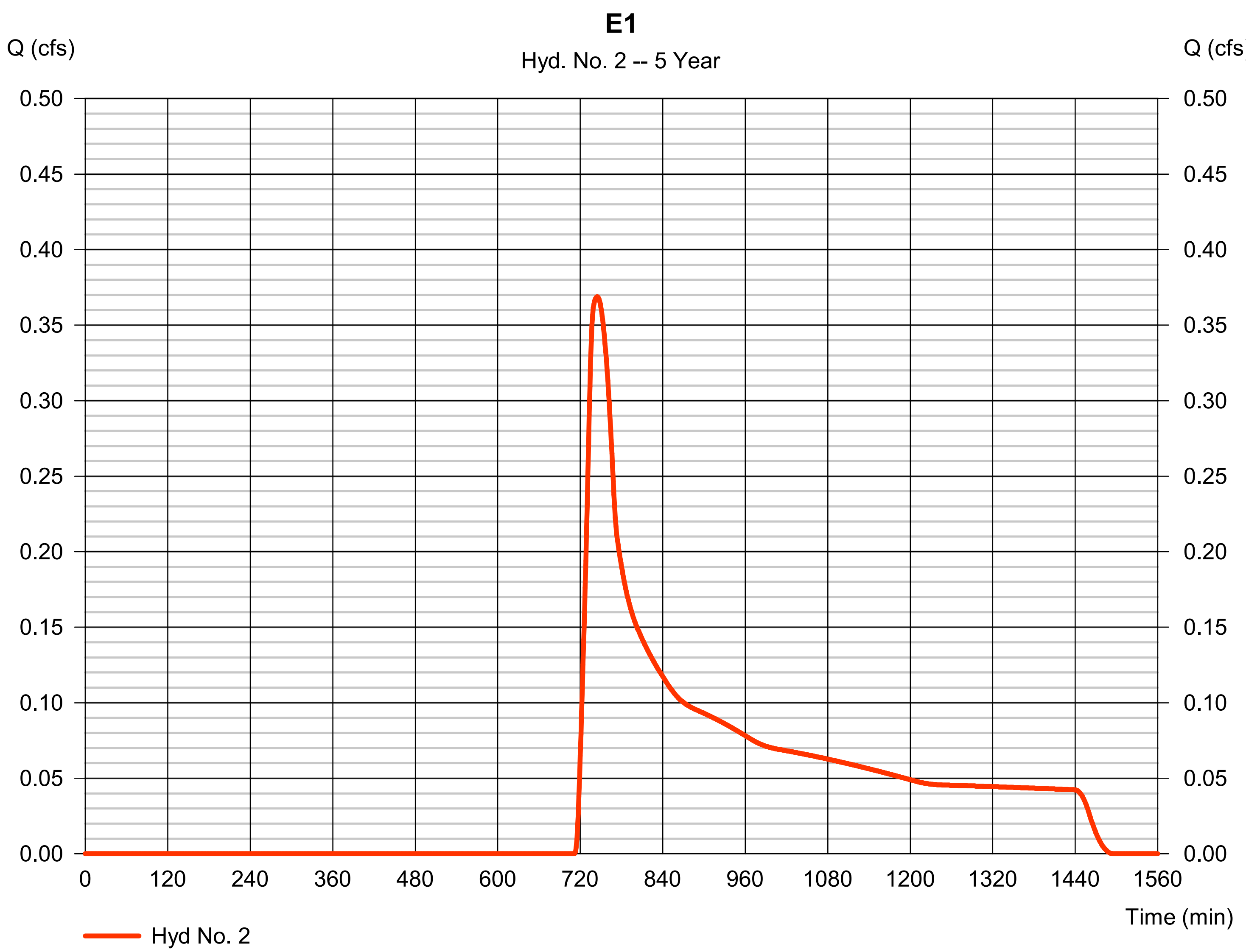
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 08 / 26 / 2022

Hyd. No. 2

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.369 cfs
Storm frequency	= 5 yrs	Time to peak	= 745 min
Time interval	= 1 min	Hyd. volume	= 3,803 cuft
Drainage area	= 4.630 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 2.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



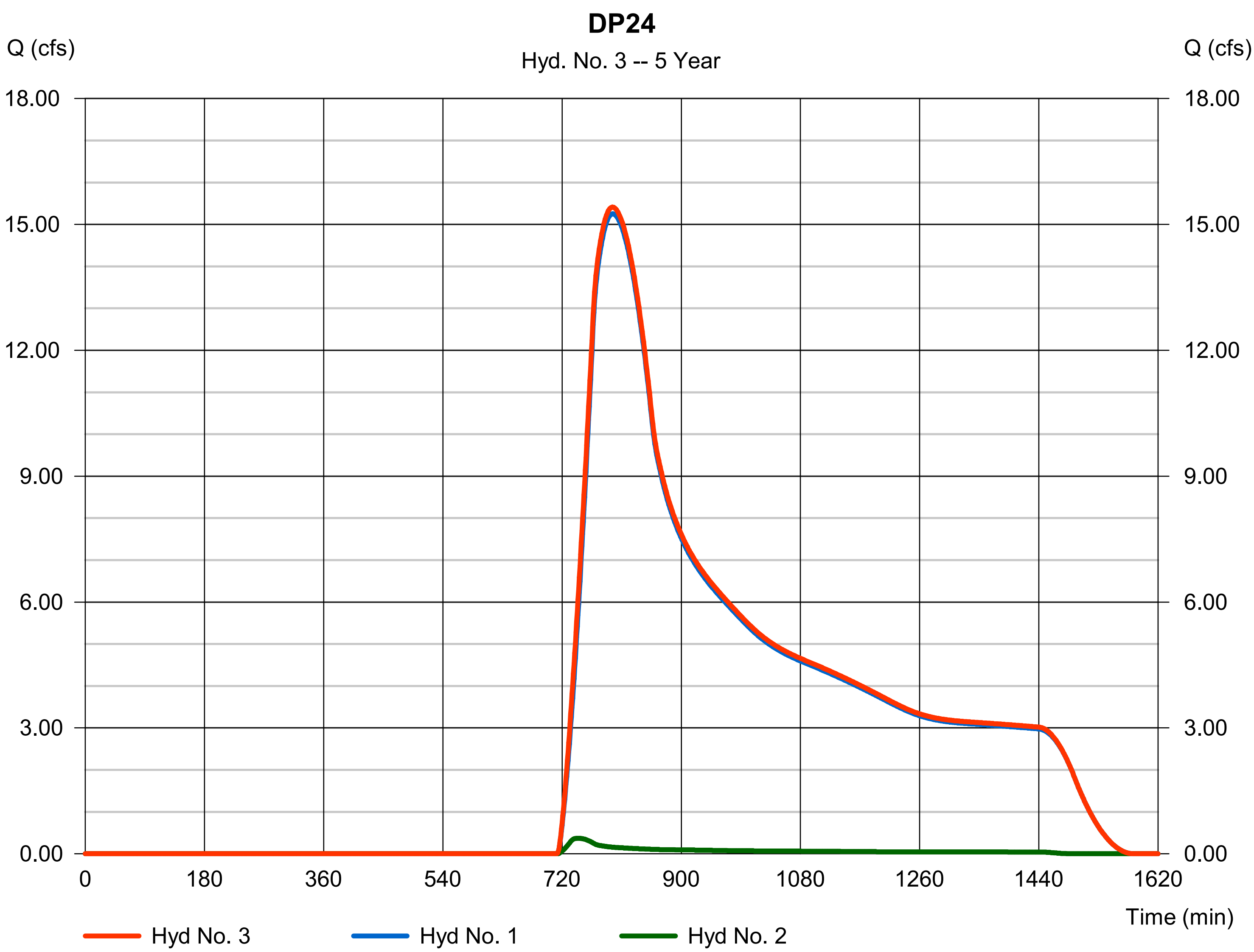
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 08 / 26 / 2022

Hyd. No. 3

DP24

Hydrograph type	= Combine	Peak discharge	= 15.41 cfs
Storm frequency	= 5 yrs	Time to peak	= 796 min
Time interval	= 1 min	Hyd. volume	= 266,675 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 324.630 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	110.89	1	772	1,189,408	------	------	------	EC10 - PRESENT
2	SCS Runoff	3.248	1	736	17,209	------	------	------	E1
3	Combine	111.80	1	772	1,206,616	1, 2	------	------	DP24

SCS ROUTING.gpw	Return Period: 100 Year	Friday, 08 / 26 / 2022

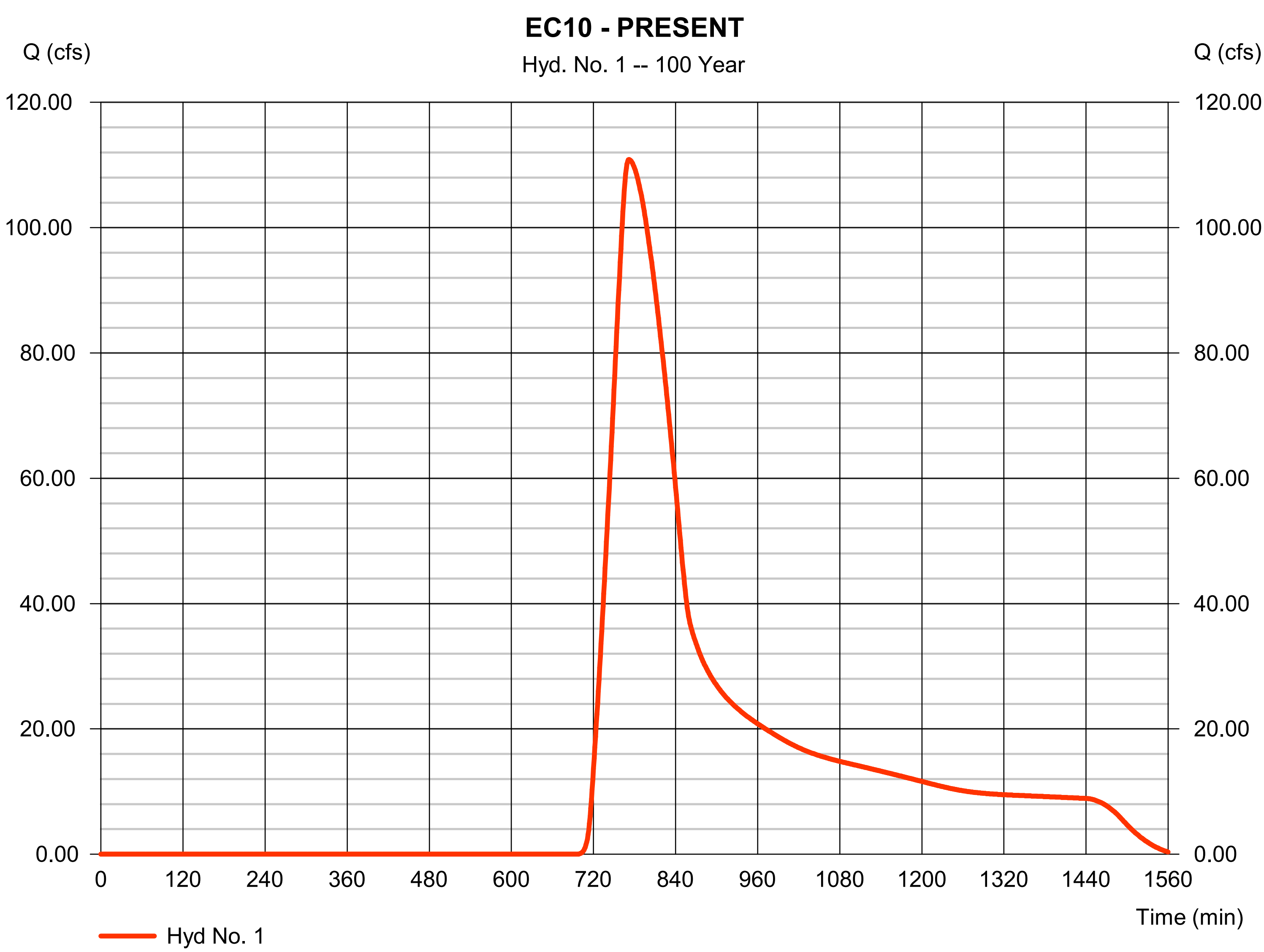
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 08 / 26 / 2022

Hyd. No. 1

EC10 - PRESENT

Hydrograph type	= SCS Runoff	Peak discharge	= 110.89 cfs
Storm frequency	= 100 yrs	Time to peak	= 772 min
Time interval	= 1 min	Hyd. volume	= 1,189,408 cuft
Drainage area	= 320.000 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 90.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



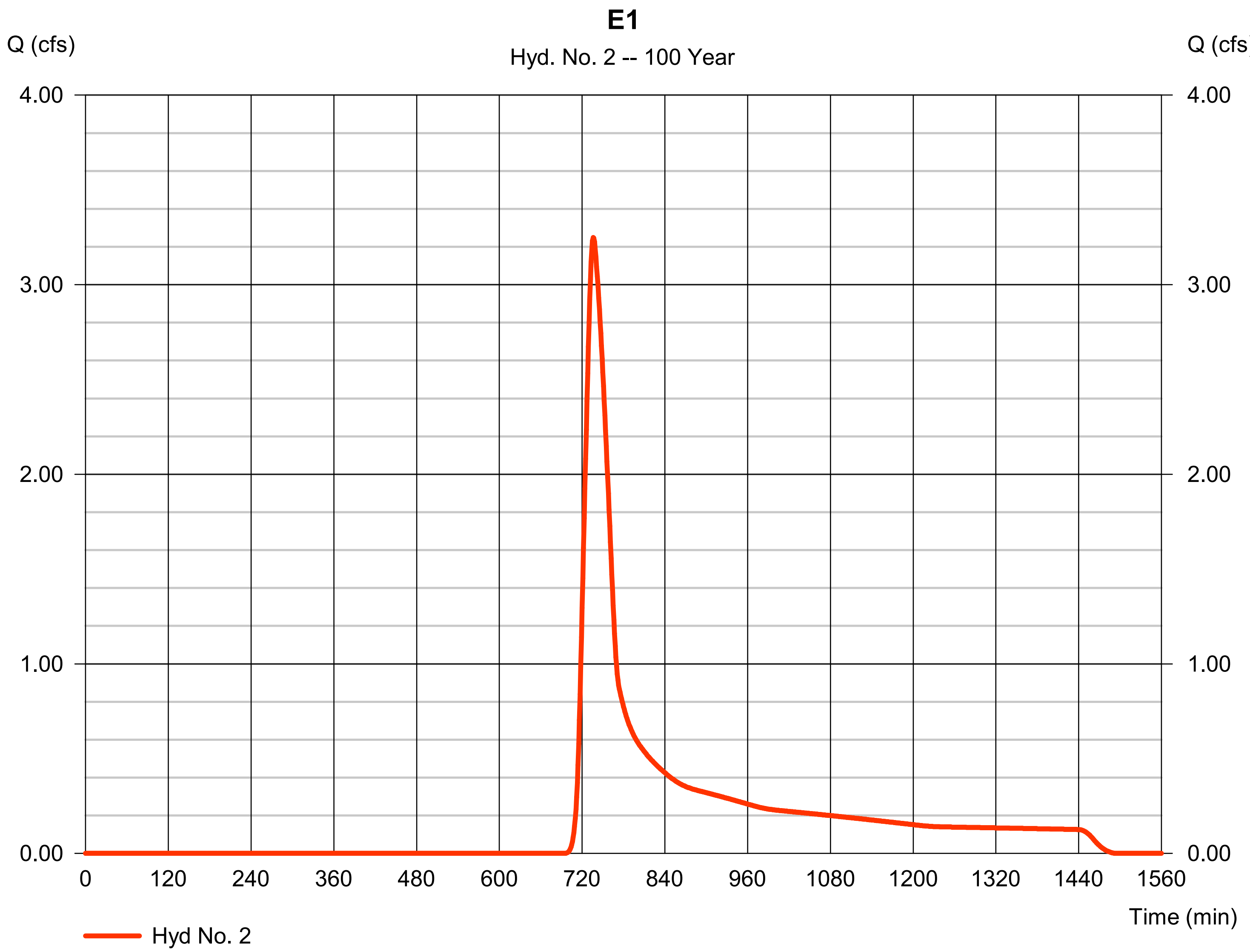
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 08 / 26 / 2022

Hyd. No. 2

E1

Hydrograph type	= SCS Runoff	Peak discharge	= 3.248 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 1 min	Hyd. volume	= 17,209 cuft
Drainage area	= 4.630 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 34.00 min
Total precip.	= 4.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



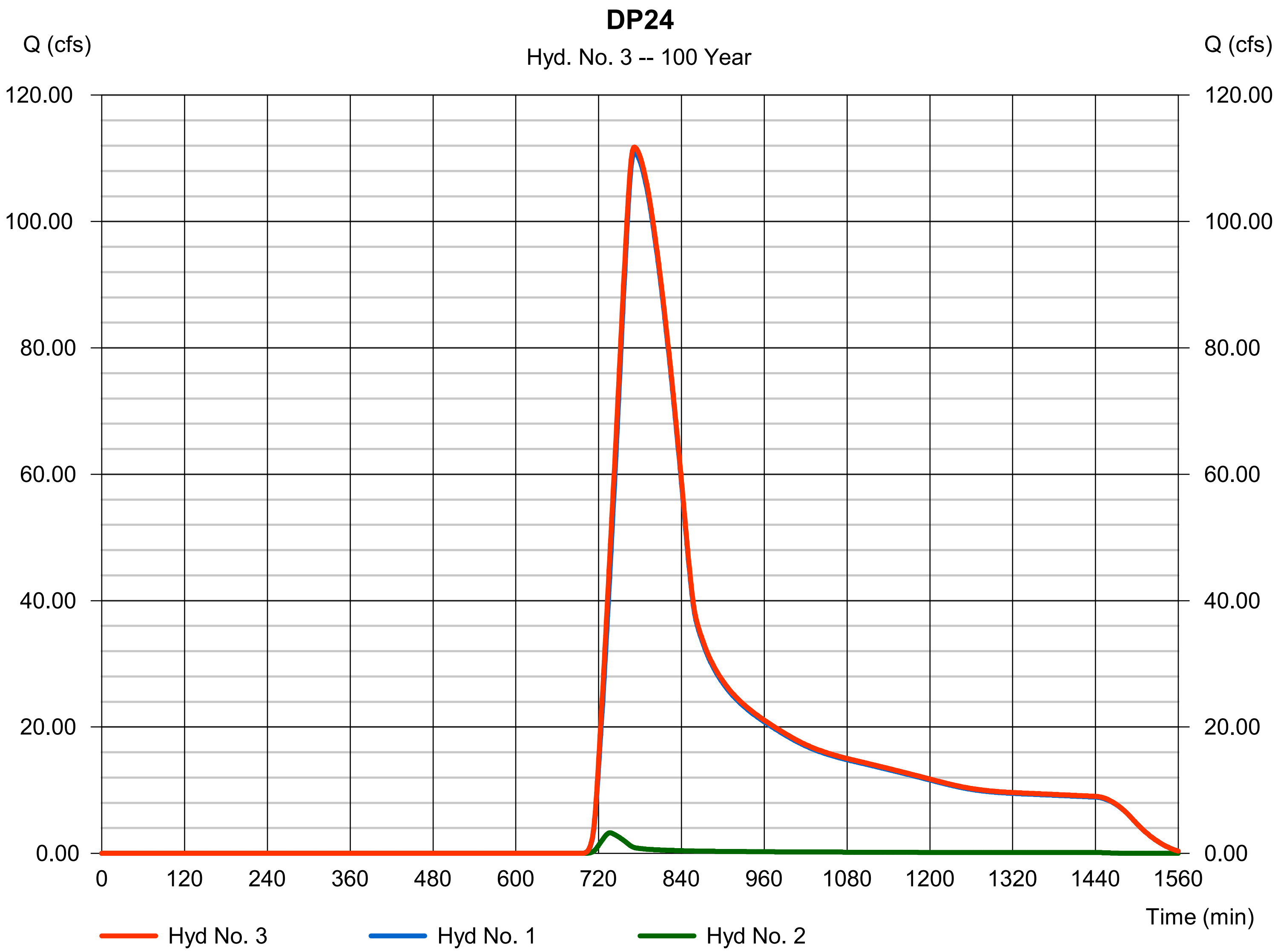
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Friday, 08 / 26 / 2022

Hyd. No. 3

DP24

Hydrograph type	= Combine	Peak discharge	= 111.80 cfs
Storm frequency	= 100 yrs	Time to peak	= 772 min
Time interval	= 1 min	Hyd. volume	= 1,206,616 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 324.630 ac



POST-DEVELOPMENT C VALUES

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 8/29/2022
Project: Mayberry Filing 3
Location: El Paso County

Global Parameters[1]			
Land Use	% Imp.	C_5	C_{100}
SF LOTS (1/6 AC)	47.5	0.375	0.545
Hardscape	100	0.9	0.96
Commercial/Industrial	80	0.59	0.7
Landscape/Park	2	0.08	0.35

Summary	
Total Area (ac)	198.39
Composite Impervious	41.5%
Cells of this color are for required user-input	
Cells of this color are for optional user-input	

[1] From Table 6-6 in El Paso County DCM
[2] From Table 6-6 in El Paso County DCM

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)		Hardscape		Commercial/Industrial		Landscape/Park		% Check	Percent Imperviousness	Runoff Coefficient, C[2]				
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%			2-yr	5-yr	10-yr	25-yr	100-yr
C2.1	0.77	A	0.77	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C2.2	0.33	A	0.33	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C2.3	11.41	A	11.41	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
C2.4	1.16	A	0.00	0.0%	0.93	80.0%	0.00	0.0%	0.23	20.0%	100.00%	80.4%		0.74			0.84
C3.0	35.40	A	17.70	50.0%	0.00	0.0%	0.00	0.0%	17.70	50.0%	100.00%	24.8%		0.23			0.45
D1.1	10.45	A	10.45	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.2	2.57	A	2.57	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.3	2.02	A	2.02	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.4	3.55	A	3.55	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.5	9.37	A	0.00	0.0%	0.00	0.0%	9.37	100.0%	0.00	0.0%	100.00%	80.0%		0.59			0.70
D1.6	1.94	A	1.94	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.7	1.56	A	1.56	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.8	1.30	A	1.30	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.9	0.54	A	0.54	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.10	2.12	A	2.12	100.0%	0.00	0.0%	0.00	0.0%	0.00	0.0%	100.00%	47.5%		0.38			0.55
D1.11	1.23	A	0.00	0.0%	0.98	80.0%	0.00	0.0%	0.25	20.0%	100.00%	80.4%		0.74			0.84
D2.0	11.90	A	9.50	79.8%	0.00	0.0%	0.00	0.0%	2.40	20.2%	100.00%	38.3%		0.32			0.51
E1	4.63	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	4.63	100.0%	100.00%	2.0%		0.08			0.35
D2.1	3.15	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	3.15	100.0%	100.00%	2.0%		0.08			0.35

Basin D1.1 does not account for the commercial development of filing 2. Please revise accordingly.

80% impervious appears low for a property zoned commercial. This basin encompasses Future filing 4 which is zoned CS (commercial service). A 90-95% impervious value is more in line with the current zoning of the property and would allow more flexibility when developing this filing. Please update.

these calculations have been revised to reflect the commercial land classification

POST-DEVELOPMENT CN VALUES

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 8/29/2022
Project: Mayberry Filing 3
Location: El Paso County

Global Parameters[1]	
Land Use	CN
SF LOTS (1/6 AC)	80
PASTURE - GOOD	61
COMMERCIAL	92
OPEN SPACE - GOOD	61
PAVED STREETS	98

Basin Name	Area (ac)	NRCS Hydrologic Soil Group	SF LOTS (1/6 AC)		PASTURE - GOOD		COMMERCIAL		OPEN SPACE - GOOD		PAVED STREETS		% Check	SCS CN
			Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%		CN
E1	4.63	A	0.00	0.0%	0.00	0.0%	0.00	0.0%	4.63	100.0%	0.00	0.0%	100.00%	61.00
EC10	317.30		0.00		317.30		0.00		0.00		0.00			61.00

TIME OF CONCENTRATION

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 8/29/2022
Project: Aspen Distillers
Location: El Paso County

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_i^{0.33}}$$

$$\text{Computed } t_c = t_i + t_t$$

$$t_{minimum} = 5 \text{ (urban)}$$
$$t_{minimum} = 10 \text{ (non-urban)}$$

Non Urban Li max = 300'
Urban Li Max = 100'

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

$$\text{Selected } t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

Cells of this color are for required user-input

ENGINEERS SURVEYORS INC

Subbasin Data				Overland (Initial) Flow Time			Channelized (Travel) Flow Time					Time of Concentration			
Basin	Area	% Impervious	C5	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	Remarks
C2.1	0.77	47.5%	0.38	100.00	0.020	10.41	242.00	0.020	20	2.83	1.43	11.84	19.75	11.84	
C2.2	0.33	47.5%	0.38	36.00	0.020	6.25	152.00	0.020	20	2.83	0.90	7.14	19.07	7.14	
C2.3	11.41	47.5%	0.38	100.00	0.020	10.41	1165.00	0.010	20	2.00	9.71	20.12	30.33	20.12	
C2.4	1.16	80.4%	0.74	12.00	0.020	1.81	534.00	0.009	20	1.90	4.69	6.50	16.96	6.50	
C3.0	35.40	24.8%	0.23	100.00	0.020	12.53	1536.00	0.010	20	2.00	12.80	25.33	42.33	25.33	
D1.1	10.45	47.5%	0.38	100.00	0.020	10.41	1356.00	0.010	20	2.00	11.30	21.71	32.37	21.71	
D1.2	2.57	47.5%	0.38	100.00	0.020	10.41	533.00	0.010	20	2.00	4.44	14.86	23.60	14.86	
D1.3	2.02	47.5%	0.38	36.00	0.020	6.25	495.00	0.010	20	2.00	4.13	10.37	23.20	10.37	
D1.4	3.55	47.5%	0.38	100.00	0.020	10.41	634.00	0.014	20	2.37	4.47	14.88	23.63	14.88	
D1.5	9.37	80.0%	0.59	100.00	0.020	7.33	856.00	0.010	20	2.00	7.13	14.46	19.46	14.46	
D1.6	1.94	47.5%	0.38	100.00	0.020	10.41	534.00	0.010	20	2.00	4.45	14.86	23.61	14.86	
D1.7	1.56	47.5%	0.38	100.00	0.020	10.41	530.00	0.010	20	2.00	4.42	14.83	23.57	14.83	
D1.8	1.30	47.5%	0.38	100.00	0.020	10.41	325.00	0.010	20	2.00	2.71	13.12	21.39	13.12	
D1.9	0.54	47.5%	0.38	36.00	0.020	6.25	389.00	0.010	20	2.00	3.24	9.49	22.07	9.49	
D1.10	2.12	47.5%	0.38	36.00	0.020	6.25	465.00	0.010	20	2.00	3.88	10.12	22.88	10.12	
D1.11	1.23	80.4%	0.74	12.00	0.020	1.81	962.00	0.017	20	2.61	6.15	7.96	18.40	7.96	
D2.0	11.90	38.3%	0.32	100.00	0.020	11.27	1750.00	0.011	20	2.10	13.90	25.17	38.84	25.17	
D2.1	3.15	2.0%	0.08	100.00	0.021	14.42						14.42		14.42	
E1	4.63	2.0%	0.08				2811.00	0.008	15	1.37	34.28		81.07	34.28	
EC10	317.30		0.08	1000.00	0.010	58.24	8100.00	0.045	20	4.24	31.82	90.06	96.71	90.06	

max 300 ft for non-urban land uses (DCMV1 CH6 section 3.2). Please revise

this has been revised

PROPOSED STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer: ESJ
Company: R&R Engineers-Surveyors
Date: 8/29/2022
Project: Mayberry Filing 3
Location: El Paso County

Cells of this color are for required user-input
Cells of this color are for optional user-input

$I_5 = -1.50 \ln(D) + 7.583$

R&R ENGINEERS SURVEYORS INC

DESGIN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS		PIPE			TRAVEL TIME				Remarks
		Basin Name	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ac)	Sum C*A (ac)	I in/hr	Q cfs	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l	
		C2.1	0.77	0.38	11.8	0.29	3.88	1.12															
1	C2.1								11.8	0.77	0.29	3.88	1.12						33	5	0.10		
		C2.2	0.33	0.38	7.1	0.12	4.63	0.57															
2	DP1, C2.2								11.9	1.10	0.41	3.86	1.59						450	5	1.50		
		C2.3	11.41	0.38	20.1	4.28	3.08	13.18											10	5	0.00		
3	C2.3, DP2								20.1	12.51	4.69	3.08	14.45						64	5	0.20		
		C2.4	1.16	0.74	6.5	0.85	4.77	4.08															
4	C2.3, DP3								20.3	13.67	5.55	3.07	17.00						1590	5	5.30		
		D1.1	10.45	0.38	21.7	3.92	2.97	11.62															
5	D1.1								21.7	10.45	3.92	2.97	11.62						28	5	0.10		
		D1.2	2.57	0.38	14.9	0.96	3.54	3.41															
6	D1.2								14.9	2.57	0.96	3.54	3.41						10	5	0.00		
7	DP5, DP6								21.8	13.02	4.88	2.96	14.45						512	5	1.70		
		D1.3	2.02	0.38	10.4	0.76	4.07	3.09															
8	D1.3								10.4	2.02	0.76	4.07	3.09						27	5	0.10		
9	DP7, DP8								23.51	15.04	5.64	2.85	16.06						10	5	0.00		
		D1.4	3.55	0.38	14.9	1.33	3.53	4.70															
10	DP9, D1.4								23.51	18.6	7.0	2.85	19.84						827	5	2.80		
		EC10	317.30		90.1		0.83																
11	EC10												15.25						2811.6	5	9.40		Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method
		D1.5	9.37	0.59	14.5	5.53	3.58	19.8															
12	D1.5								14.5	9.37	5.53	3.58	19.77						135	5	0.50		
		D1.6	1.94	0.38	14.9	0.73	3.53	2.6															
13	DP12, D1.6								14.96	11.3	6.3	3.53	22.05						35	5	0.10		
		D1.7	1.56	0.38	14.8	0.59	3.54	2.1															
14	DP13, D1.7								15.06	12.9	6.8	3.52	24.05						232	5	0.80		
		D1.8	1.3	0.38	13.1	0.49	3.72	1.8															
15	DP14, D1.8								15.86	14.2	7.3	3.44	25.19						35	5	0.10		
		D1.9	0.54	0.38	9.5	0.20	4.21	0.9															
16	DP15, D1.9								15.96	14.7	7.5	3.43	25.82						137	5	0.50		
		D1.10	2.12	0.38	10.1	0.80	4.11	3.3															
17	D1.10								10.12	2.1	0.8	4.11	3.27						20	5	0.10		
		D1.11	1.23	0.74	8.0	0.91	4.47	4.0											10	5	0.00		
18	D1.11, DP17, DP10								26.3	21.9	8.7	2.68	23.22						63	5	0.20		
19	DP16, DP18								26.5	36.7	16.2	2.67	43.20						1024	5	3.40		Total into upper Channel D, Input from Hydraflow Hydrographs
		D2.0	11.9	0.32	25.2	3.75	2.74	10.3															

20	DP19, D2.0								29.91	48.6	20.0	2.49	49.60										
		C3.0	35.4	0.23	25.3	8.05	2.73	22.0															
21	DP4, C3.0								25.6	49.1	13.6	2.72	36.96										To channel C2
		D2.1	3.15	0.08	14.4	0.25	3.58	0.9															
22	D2.1, DP20, DP21								26.5	100.8	33.8	2.67	90.15			90.1							
23	POND D OUTFLOW												1.20										100 YEAR RELEASE RATE FOR POND D
		E1	4.63	0.08	34.3	0.37		0.4					0.40										Input from Hydraflow Hydrographs, Calculated via SCS Method
24	E1, DP11									321.9			15.40										
25	DP23, DP24												16.60										

5 yr release rate?

revised, should say 100 year

PROPOSED STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer:	ESJ
Company:	R&R Engineers-Surveyors
Date:	8/29/2022
Project:	Mayberry Filing 3
Location:	El Paso County

Cells of this color are for required user-input

Cells of this color are for optional user-input

$$I_{100} = -2.52 \ln(D) + 12.735$$

DESGIN POINT	STREET/ CONTRIBUTING BASINS	DIRECT RUNOFF							TOTAL RUNOFF					STREET BYPASS		PIPE			TRAVEL TIME				
		Basin Name	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ac)	Sum C*A (ac)	I in/hr	Q cfs	Slope %	Street Q cfs	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l	Remarks
		C2.1	0.77	0.55	11.8	0.42	6.51	2.73															
1	C2.1								11.8	0.77	0.42	6.51	2.73						33	5	0.10		
		C2.2	0.33	0.55	7.1	0.18	7.78	1.40															
2	DP1, C2.2								11.9	1.10	0.60	6.49	3.89						450	5	1.50		
		C2.3	11.41	0.55	20.1	6.22	5.17	32.15											10	5	0.00		
3	C2.3, DP2								20.1	12.51	6.82	5.17	35.25						64	5	0.20		
		C2.4	1.16	0.84	6.5	0.97	8.02	7.79															
4	C2.3, DP3								20.3	13.67	7.79	5.15	40.08						1590	5	5.30		
		D1.1	10.45	0.55	21.7	5.70	4.98	28.35															
5	D1.1								21.7	10.45	5.70	4.98	28.35						28	5	0.10		
		D1.2	2.57	0.55	14.9	1.40	5.94	8.31															
6	D1.2								14.9	2.57	1.40	5.94	8.31						10	5	0.00		
7	DP5, DP6								21.8	13.02	7.10	4.97	35.25						512	5	1.70		
		D1.3	2.02	0.55	10.4	1.10	6.84	7.53															
8	D1.3								10.4	2.02	1.10	6.84	7.53						27	5	0.10		
9	DP7, DP8								23.51	15.04	8.20	4.78	39.16						10	5	0.00		
		D1.4	3.55	0.55	14.9	1.93	5.93	11.48															
10	DP9, D1.4								23.51	18.6	10.1	4.78	48.41						827	5	2.80		
		EC10	317.30		90.1																		
11	EC10												110.89						2811.6	5	9.40		Offsite flow, Input from Hydraflow Hydrographs, Calculated via SCS Method
		D1.5	9.37	0.70	14.5	6.56	6.00	39.4															
12	D1.5								14.5	9.37	6.56	6.00	39.38						135	5	0.50		
		D1.6	1.94	0.55	14.9	1.06	5.93	6.3															
13	DP12, D1.6								14.96	11.3	7.6	5.92	45.07						35	5	0.10		
		D1.7	1.56	0.55	14.8	0.85	5.94	5.0															
14	DP13, D1.7								15.06	12.9	8.5	5.90	49.96						232	5	0.80		
		D1.8	1.3	0.55	13.1	0.71	6.25	4.4															
15	DP14, D1.8								15.86	14.2	9.2	5.77	52.94						35	5	0.10		
		D1.9	0.54	0.55	9.5	0.29	7.06	2.1															
16	DP15, D1.9								15.96	14.7	9.5	5.75	54.49						137	5	0.50		
		D1.10	2.12	0.55	10.1	1.16	6.90	8.0															
17	D1.10								10.12	2.1	1.2	6.90	7.97						20	5	0.10		
		D1.11	1.23	0.84	8.0	1.03	7.51	7.7											10	5	0.00		
18	D1.11, DP17, DP10								26.3	21.9	12.3	4.49	55.36						63	5	0.20		
19	DP16, DP18								26.5	36.7	21.8	4.48	97.50						1024	5	3.40		Total into upper Channel D, Input from Hydraflow Hydrographs
		D2.0	11.9	0.51	25.2	6.02	4.61	27.7															
20	DP19, D2.0								29.91	48.6	27.8	4.17	115.98										

		C3.0	35.4	0.45	25.3	15.84	4.59	72.7															
21	DP4, C3.0								25.6	49.1	23.6	4.56	107.80										To channel C2
		D2.1	3.15	0.35	14.4	1.10	6.01	6.6															
22	D2.1, DP20, DP21								26.5	100.8	52.5	4.48	235.13			235.1							
23	POND D OUTFLOW												39.60										100 YEAR RELEASE RATE FOR POND D
		E1	4.63	0.35	34.3	1.62		3.3					3.25										Input from Hydraflow Hydrographs, Calculated via SCS Method
24	E1, DP11									321.9			111.80										
25	DP23, DP24												151.40										

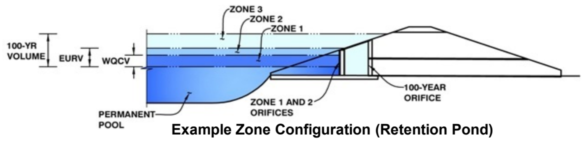
APPENDIX B - HYDRAULIC COMPUTATIONS

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: MAYBERRY FILING 3

Basin ID: DETENTION POND D



Example Zone Configuration (Retention Pond)

Depth Increment = ______ ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	170	0.004		
6027	--	1.00	--	--	--	3,344	0.077	1,757	0.040
6028	--	2.00	--	--	--	25,396	0.583	16,127	0.370
6029	--	3.00	--	--	--	50,286	1.154	53,968	1.239
6030	--	4.00	--	--	--	72,956	1.675	115,589	2.654
6031	--	5.00	--	--	--	95,393	2.190	199,763	4.586
6032	--	6.00	--	--	--	118,525	2.721	306,722	7.041
6033	--	7.00	--	--	--	141,085	3.239	436,527	10.021
6034	--	8.00	--	--	--	164,866	3.785	589,503	13.533
6035	--	9.00	--	--	--	191,669	4.400	767,770	17.626
	--		--	--	--				
	--		--	--	--				
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Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	101.00	acres
Watershed Length =	2,867	ft
Watershed Length to Centroid =	1,433	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	41.00%	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 =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

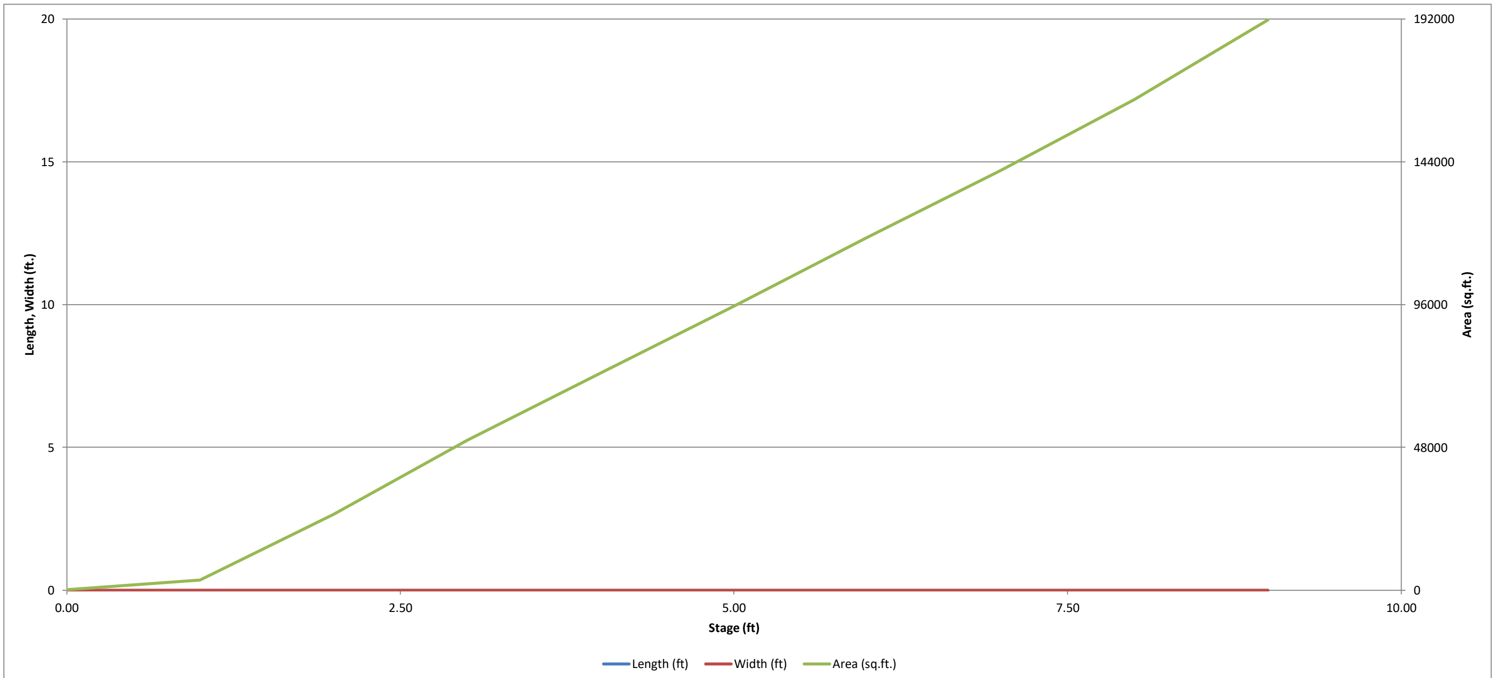
After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	1.536	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	4.517	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	3.434	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	4.616	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	5.562	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	7.292	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	8.982	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	11.188	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	15.946	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	2.879	acre-feet		
Approximate 5-yr Detention Volume =	3.810	acre-feet		
Approximate 10-yr Detention Volume =	4.693	acre-feet		
Approximate 25-yr Detention Volume =	5.813	acre-feet		
Approximate 50-yr Detention Volume =	6.565	acre-feet		
Approximate 100-yr Detention Volume =	7.595	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	1.536	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.981	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	3.846	acre-feet
Total Detention Basin Volume =	8.363	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet


20
15
10
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192000
144000
96000
48000
0
Length, Width (ft.)
Area (sq.ft.)
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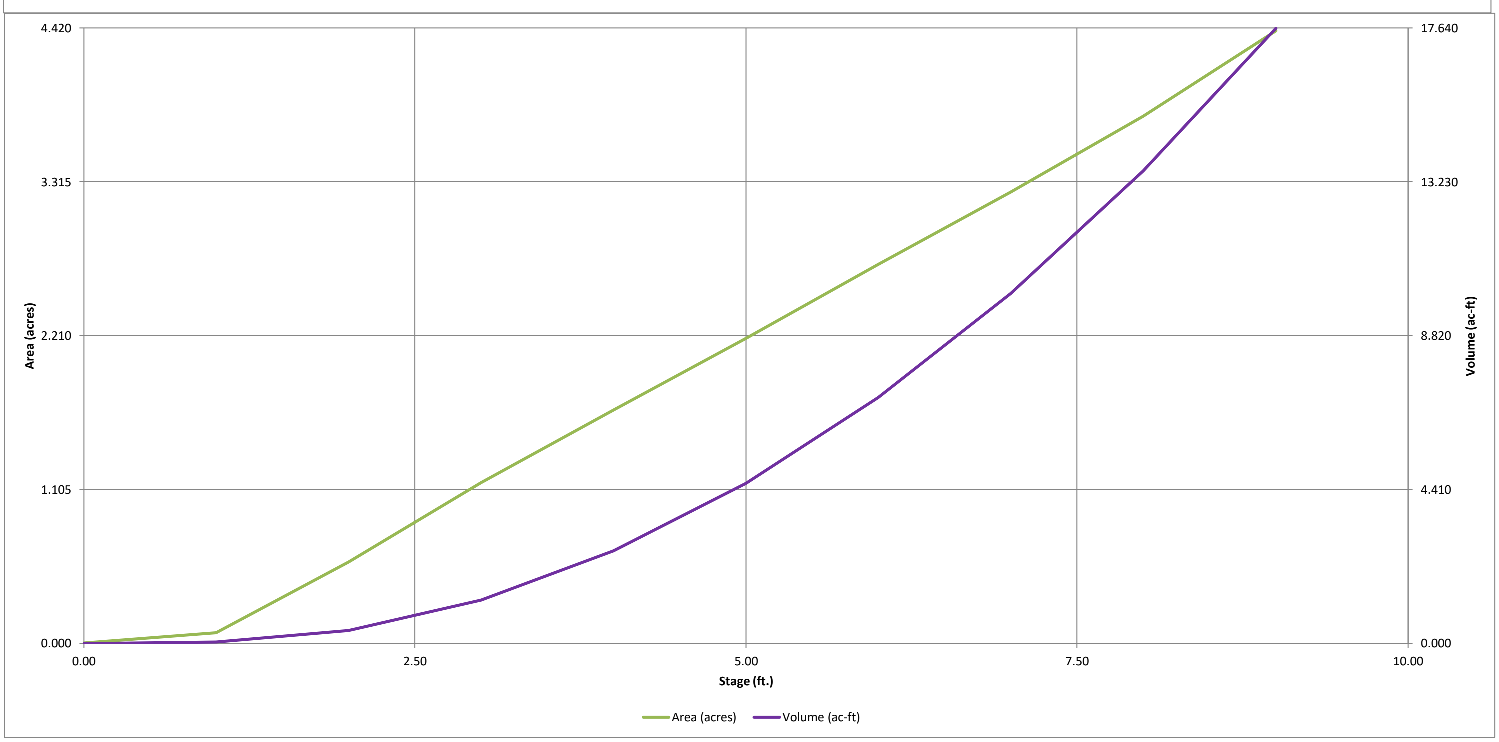
2.50
5.00
7.50
10.00
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

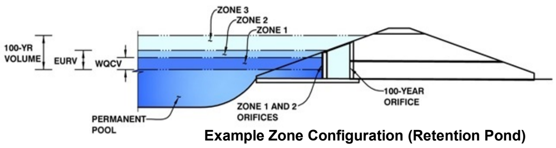

4.420
3.315
2.210
1.105
0.000
17.640
13.230
8.820
4.410
0.000
Area (acres)
Volume (ac-ft)
0.00
2.50
5.00
7.50
10.00
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: **MAYBERRY FILING 3**

Basin ID: **DETENTION POND D**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.25	1.536	Orifice Plate
Zone 2 (EURV)	4.97	2.981	Orifice Plate
Z3 (100+1/2WQCV)	6.47	3.846	Weir&Pipe (Restrict)
Total (all zones)		8.363	

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

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

(Calculated Parameters for Underdrain)

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

Centroid of Lowest Orifice =	0.00	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 =	4.97	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 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.66	3.32					
Orifice Area (sq. inches)	6.00	7.00	9.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

(Calculated Parameters for Vertical Orifice)

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 =	5.50	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.50	N/A	feet
Overflow Weir Front Edge Length =	7.00	N/A	feet	Overflow Weir Slope Length =	6.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.46	N/A	
Horiz. Length of Weir Sides =	6.00	N/A	feet	Overflow Grate Open Area w/o Debris =	29.23	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	14.62	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

(Calculated Parameters for Overflow Weir)

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 =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	4.53	N/A	ft^2
Outlet Pipe Diameter =	36.00	N/A	inches	Outlet Orifice Centroid =	1.04	N/A	feet
Restrictor Plate Height Above Pipe Invert =	22.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.79	N/A	radians

(Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate)

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.72	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	4.22	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	16.38	acre-ft

(Calculated Parameters for Spillway)

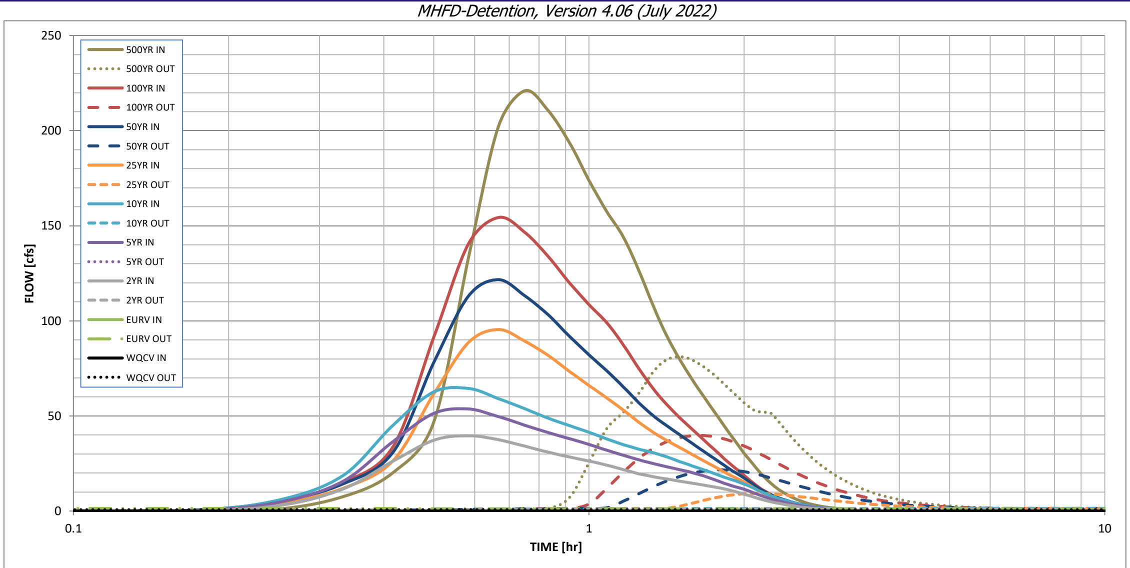
Routed Hydrograph Results

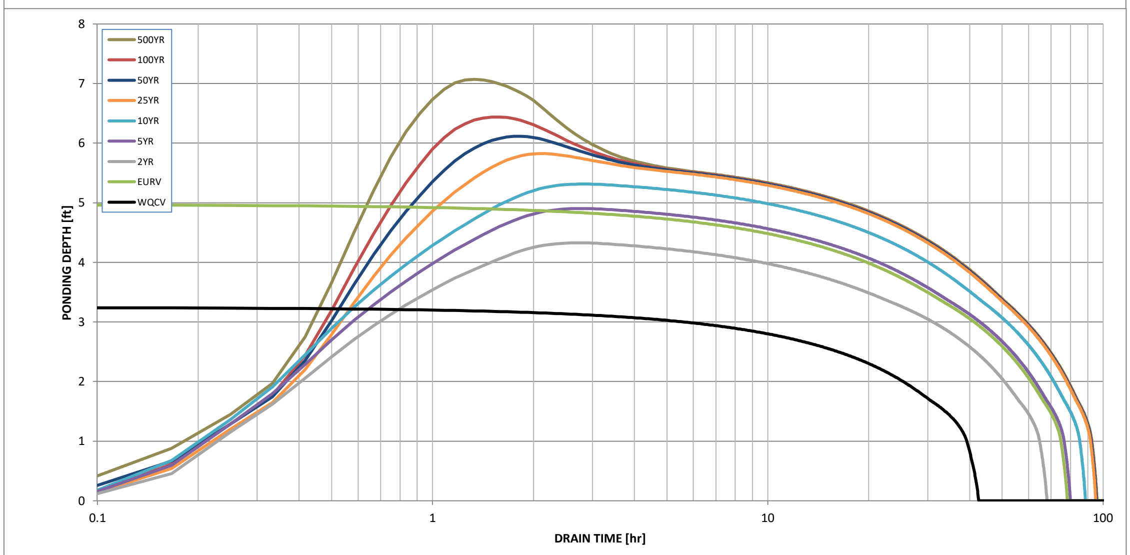
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

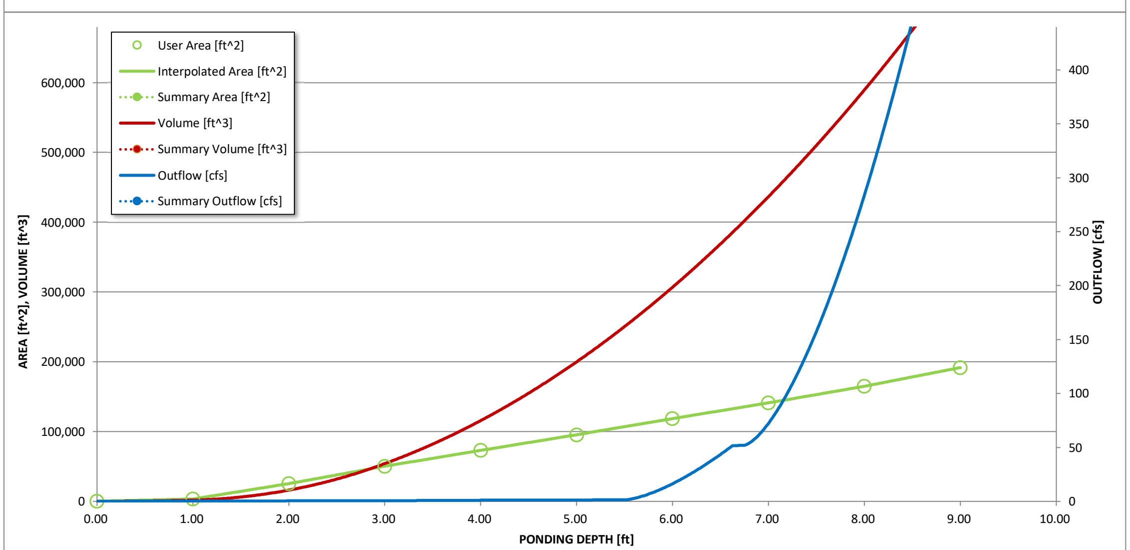
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	1.536	4.517	3.434	4.616	5.562	7.292	8.982	11.188	15.946
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.434	4.616	5.562	7.292	8.982	11.188	15.946
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.6	1.2	1.7	15.8	31.6	52.4	95.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.01	0.02	0.16	0.31	0.52	0.94
Peak Inflow Q (cfs) =	N/A	N/A	39.6	53.6	64.5	95.4	121.6	154.4	221.0
Peak Outflow Q (cfs) =	0.7	1.3	1.1	1.2	1.3	9.2	21.6	39.6	81.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.8	0.6	0.7	0.8	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.7	1.3	1.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	70	61	71	79	83	81	80	76
Time to Drain 99% of Inflow Volume (hours) =	**41**	75	65	76	84	90	89	89	86
Maximum Ponding Depth (ft) =	3.25	4.97	4.33	4.90	5.31	5.83	6.11	6.44	7.07
Area at Maximum Ponding Depth (acres) =	1.28	2.17	1.84	2.14	2.35	2.63	2.78	2.94	3.27
Maximum Volume Stored (acre-ft) =	1.544	4.520	3.216	4.370	5.290	6.560	7.344	8.259	10.217

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 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	0.33	0.03	1.06
	0:15:00	0.00	0.00	2.83	4.61	5.75	3.89	5.06	4.81	7.48
	0:20:00	0.00	0.00	11.58	15.65	18.69	12.00	14.26	15.04	20.21
	0:25:00	0.00	0.00	26.23	36.54	45.11	26.36	31.00	33.85	46.70
	0:30:00	0.00	0.00	37.24	51.33	62.55	61.58	78.11	91.35	132.74
	0:35:00	0.00	0.00	39.59	53.59	64.46	88.46	112.86	140.38	202.05
	0:40:00	0.00	0.00	37.47	49.62	59.12	95.38	121.60	154.38	220.99
	0:45:00	0.00	0.00	34.08	45.13	53.77	89.26	113.22	146.64	210.50
	0:50:00	0.00	0.00	30.91	41.27	48.81	81.79	103.12	133.85	193.65
	0:55:00	0.00	0.00	28.35	37.99	44.88	73.39	91.80	119.99	173.89
	1:00:00	0.00	0.00	26.20	34.94	41.34	66.03	82.14	108.52	157.39
	1:05:00	0.00	0.00	24.10	31.93	37.92	59.47	73.62	98.94	143.85
	1:10:00	0.00	0.00	21.73	29.24	34.82	52.95	65.16	87.17	126.32
	1:15:00	0.00	0.00	19.59	26.85	32.54	46.64	56.91	74.81	107.56
	1:20:00	0.00	0.00	18.01	24.92	30.63	41.23	50.04	64.10	91.81
	1:25:00	0.00	0.00	16.79	23.25	28.36	37.06	44.78	55.85	79.59
	1:30:00	0.00	0.00	15.69	21.71	25.98	33.28	40.04	49.01	69.33
	1:35:00	0.00	0.00	14.67	20.26	23.76	29.76	35.62	43.07	60.44
	1:40:00	0.00	0.00	13.64	18.43	21.67	26.45	31.47	37.54	52.20
	1:45:00	0.00	0.00	12.61	16.44	19.66	23.35	27.56	32.29	44.39
	1:50:00	0.00	0.00	11.59	14.50	17.74	20.38	23.81	27.31	37.05
	1:55:00	0.00	0.00	10.19	12.81	15.91	17.64	20.36	22.76	30.35
	2:00:00	0.00	0.00	8.82	11.35	14.18	15.20	17.29	18.70	24.42
	2:05:00	0.00	0.00	7.36	9.64	12.06	12.29	13.88	14.65	19.08
	2:10:00	0.00	0.00	6.03	7.92	9.91	9.71	10.94	11.33	14.69
	2:15:00	0.00	0.00	4.89	6.41	8.05	7.69	8.63	8.78	11.27
	2:20:00	0.00	0.00	3.99	5.21	6.56	6.16	6.89	6.86	8.71
	2:25:00	0.00	0.00	3.23	4.22	5.31	4.91	5.49	5.35	6.72
	2:30:00	0.00	0.00	2.60	3.42	4.27	3.93	4.38	4.16	5.16
	2:35:00	0.00	0.00	2.08	2.73	3.39	3.10	3.45	3.20	3.92
	2:40:00	0.00	0.00	1.65	2.15	2.65	2.42	2.68	2.48	3.03
	2:45:00	0.00	0.00	1.32	1.67	2.07	1.88	2.09	1.93	2.36
	2:50:00	0.00	0.00	1.04	1.31	1.62	1.48	1.64	1.53	1.87
	2:55:00	0.00	0.00	0.81	1.02	1.27	1.16	1.28	1.21	1.47
	3:00:00	0.00	0.00	0.61	0.76	0.97	0.88	0.97	0.92	1.11
	3:05:00	0.00	0.00	0.44	0.55	0.71	0.65	0.71	0.67	0.80
	3:10:00	0.00	0.00	0.30	0.38	0.49	0.45	0.49	0.46	0.55
	3:15:00	0.00	0.00	0.18	0.25	0.31	0.29	0.32	0.29	0.34
	3:20:00	0.00	0.00	0.10	0.15	0.17	0.17	0.18	0.16	0.18
	3:25:00	0.00	0.00	0.04	0.07	0.08	0.08	0.08	0.07	0.07
	3:30:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.01	0.01
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer:	**ESJ**
Company:	**R&R ENGINEERS**
Date:	**August 29, 2022**
Project:	**Mayberry, Colorado Springs**
Location:	**Detention Basin D**

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a	I_a = 41.0 %
B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	i = 0.410
C) Contributing Watershed Area	Area = 101.000 ac
D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = in
E) Design Concept (Select EURV when also designing for flood control)	Choose One: ○ Water Quality Capture Volume (WQCV) ● Excess Urban Runoff Volume (EURV)
F) Design Volume (WQCV) Based on 40-hour Drain Time ($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)	V_{DESIGN} = 1.536 ac-ft
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume ($V_{WQCV\ OTHER} = (d_6*(V_{DESIGN}/0.43))$)	$V_{DESIGN\ OTHER}$ = ac-ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{DESIGN\ USER}$ = ac-ft
I) NRCS Hydrologic Soil Groups of Tributary Watershed	
i) Percentage of Watershed consisting of Type A Soils	HSG_A = 100 %
ii) Percentage of Watershed consisting of Type B Soils	HSG_B = 0 %
iii) Percentage of Watershed consisting of Type C/D Soils	$HSG_{C/D}$ = 0 %
J) Excess Urban Runoff Volume (EURV) Design Volume For HSG A: $EURV_A = 1.68 * i^{1.28}$ For HSG B: $EURV_B = 1.36 * i^{1.08}$ For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$	$EURV_{DESIGN}$ = 4.517 ac-f t
K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)	$EURV_{DESIGN\ USER}$ = ac-f t
2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)	L : W = 2.0 : 1
3. Basin Side Slopes	
A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Z = 4.00 ft / ft
4. Inlet	
A) Describe means of providing energy dissipation at concentrated inflow locations:	Concrete Forebay
5. Forebay	
A) Minimum Forebay Volume (V_{FMIN} = 3% of the WQCV)	V_{FMIN} = 0.046 ac-ft
B) Actual Forebay Volume	V_F = 0.063 ac-ft
C) Forebay Depth (D_F = 30 inch maximum)	D_F = 12.0 in
D) Forebay Discharge	
i) Undetained 100-year Peak Discharge	Q_{100} = 154.40 cfs
ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)	Q_F = 3.09 cfs
E) Forebay Discharge Design	Choose One: ● Berm With Pipe ○ Wall with Rect. Notch ○ Wall with V-Notch Weir
F) Discharge Pipe Size (minimum 8-inches)	Calculated D_P = 12 in
G) Rectangular Notch Width	Calculated W_N = in

ROUND UP TO NEAREST PIPE SIZE
SINGLE PIPE DOESN'T HAVE ADEQUATE CAPACITY BASED ON FOREBAY DEPTH. MULTIPLE PIPES MAY BE USED BUT SIZING IS NOT PROVIDED. CONSIDER USING A BERM WITH NOTCH OR INCREASE THE FOREBAY DEPTH.

Design Procedure Form: Extended Detention Basin (EDB)

Designer: ESJ
Company: R&R ENGINEERS
Date: August 29, 2022
Project: Mayberry, Colorado Springs
Location: Detention Basin D

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: ● Concrete ○ Soft Bottom
F) Slope of Trickle Channel	S = 0.0050 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 170 sq ft
C) Outlet Type	Choose One: ● Orifice Plate ○ Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 6.00 inches
E) Total Outlet Area	A_{ot} = 22.00 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = 201 cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 56.7 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 479 square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.) Other (Y/N): N	*Aluminum Amico-Klemp SR Series with Cross Rods 4" O.C.*
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = 622 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 4.97 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 87.64 inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = 12.0 inches **VALUE LESS THAN RECOMMENDED MIN. WIDTH. WIDTH HAS BEEN SET TO 12 INCHES.**

Design Procedure Form: Extended Detention Basin (EDB)

Designer:	**ESJ**
Company:	**R&R ENGINEERS**
Date:	**August 29, 2022**
Project:	**Mayberry, Colorado Springs**
Location:	**Detention Basin D**

10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	Buried Riprap Spillway
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Ze = 4.00 ft / ft
11. Vegetation	Choose One: ○ Irrigated ● Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	Periodic inspection and sediment removal as required; Access ramp provided to pond bottom

Notes:

R&R Engineers-Surveyors

Mayberry Filing 3

MC22110

8/22/2022

Extended Detention Basin - Forebay 1 Sizing Calculations

SEDIMENT FOREBAY SIZING		
Contributing Tributary Area	48.60	AC
Imperviousness	52.0%	
Contributing Area WQCV	0.212	watershed inches
Required WQCV	0.858	AC-ft
	37,361	ft^3
Contributing Impervious Acres	> 20 Acres	
Req. % of WQCV	3%	
Minimum Forebay Volume	1,121	ft^3
Maximum Forebay Depth	2.5	ft
Provided Forebay Depth	1.00	ft
Provided Forebay Volume	1,360	ft^3

FOREBAY RELEASE RATE CALCULATIONS			
Pipe Diameter (feet)	0.83	ft	
Undetained 100-Year Peak Flow	116.0	cfs	
Required Outlet Flow (q)	2.3	cfs	
Provided Max Outlet Flow	1.3	cfs	* From Hydraflow Express

R&R Engineers-Surveyors

Mayberry Filing 3

MC22110

8/22/2022

Extended Detention Basin - Forebay 2 Sizing Calculations

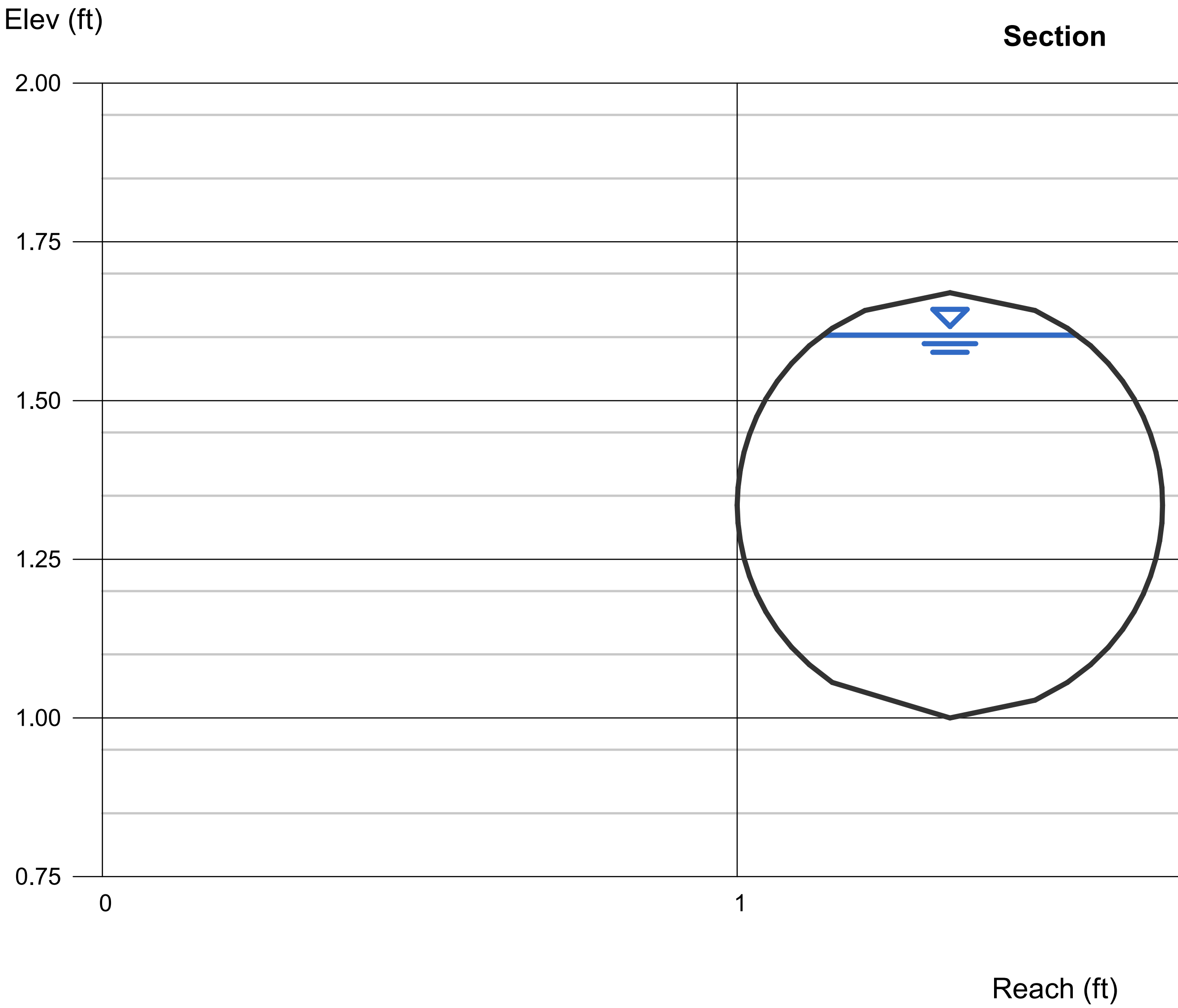
SEDIMENT FOREBAY SIZING		
Contributing Tributary Area	49.10	AC
Imperviousness	32.0%	
Contributing Area WQCV	0.158	watershed inches
Required WQCV	0.645	AC-ft
	28,083	ft^3
Contributing Impervious Acres	5-20 Acres	
Req. % of WQCV	3%	
Minimum Forebay Volume	842	ft^3
Maximum Forebay Depth	2.5	ft
Provided Forebay Depth	1.00	ft
Provided Forebay Volume	1,370	ft^3

FOREBAY RELEASE RATE CALCULATIONS			
Pipe Diameter (feet)	0.67	ft	
Undetained 100-Year Peak Flow	107.8	cfs	
Required Outlet Flow (q)	2.2	cfs	
Provided Max Outlet Flow	1.3	cfs	* From Hydraflow Express

Channel Report

Forebay 1 and 2 - Outlet Pipe

Circular		**Highlighted**	
Diameter (ft)	= 0.67	Depth (ft)	= 0.60
		Q (cfs)	= 1.333
		Area (sqft)	= 0.33
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 3.99
Slope (%)	= 0.50	Wetted Perim (ft)	= 1.68
N-Value	= 0.009	Crit Depth, Yc (ft)	= 0.55
		Top Width (ft)	= 0.40
Calculations		EGL (ft)	= 0.85
Compute by:	Q vs Depth		
No. Increments	= 10		



Scenario: 5 year
Current Time Step: 0.000 h
FlexTable: Conduit Table

Start Node	Stop Node	Invert (Start) (ft)	Section Type	Span (ft)	Rise (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
C2.4C	C2.5B	6,047.92	Circle	-	-	6,046.35	313.6	0.005	24.0	0.013	1.59	3.25	6,048.36	6,047.93	6,048.51	6,047.93
C2.4A	C2.4B	6,049.40	Circle	-	-	6,049.21	37.3	0.005	18.0	0.013	1.12	3.05	6,049.80	6,049.60	6,049.94	6,049.75
C2.4B	C2.4C	6,048.71	Circle	-	-	6,048.02	138.3	0.005	24.0	0.013	1.59	3.25	6,049.15	6,048.45	6,049.30	6,048.61
C2.5B	C2.5C	6,046.25	Circle	-	-	6,045.91	68.6	0.005	36.0	0.013	14.45	5.85	6,047.46	6,047.36	6,047.92	6,047.64
C2.5A	C2.5B	6,046.42	Circle	-	-	6,046.36	5.4	0.010	30.0	0.013	13.18	7.44	6,047.64	6,047.47	6,048.11	6,048.08
C2.5C	O-4	6,045.81	Circle	-	-	6,045.48	65.9	0.005	36.0	0.013	17.00	6.13	6,047.13	6,046.72	6,047.63	6,047.31
2.8C	C2.8D	6,042.53	Circle	-	-	6,041.27	234.4	0.005	36.0	0.013	14.10	5.98	6,043.73	6,042.49	6,044.17	6,042.91
C2.8C	2.8C	6,042.85	Circle	-	-	6,042.82	5.5	0.005	18.0	0.013	3.00	3.98	6,044.16	6,044.15	6,044.21	6,044.21
C2.8A	2.8C	6,043.21	Circle	-	-	6,043.03	27.5	0.007	30.0	0.013	11.62	6.16	6,044.35	6,044.07	6,044.79	6,044.63
C2.9C	D1.5D	6,037.56	Circle	-	-	6,034.76	559.5	0.005	36.0	0.013	19.51	6.36	6,038.98	6,036.56	6,039.52	6,036.86
C2.8D	C2.8E	6,041.07	Circle	-	-	6,039.92	144.0	0.008	36.0	0.013	14.10	6.90	6,042.27	6,041.41	6,042.71	6,041.66
C2.8E	C2.9A	6,039.82	Circle	-	-	6,038.89	133.6	0.007	36.0	0.013	14.10	6.57	6,041.02	6,040.58	6,041.46	6,040.77
C2.9A	C2.9B	6,038.79	Circle	-	-	6,038.76	5.7	0.005	36.0	0.013	15.72	6.13	6,040.39	6,040.39	6,040.65	6,040.64
C2.9B	C2.9C	6,038.66	Circle	-	-	6,037.66	199.3	0.005	36.0	0.013	19.51	6.36	6,040.08	6,039.50	6,040.63	6,039.79
2.9A	C2.9A	6,039.55	Circle	-	-	6,039.39	32.5	0.005	30.0	0.013	3.09	3.83	6,040.65	6,040.65	6,040.68	6,040.67
D1.3B	D1.4A	6,038.48	Ellipse	3.8	2.4	6,036.82	237.7	0.007	-	0.013	24.05	7.39	6,039.81	6,037.93	6,040.35	6,038.78
D1.3A	D1.3B	6,039.00	Ellipse	3.8	2.4	6,038.78	32.3	0.007	-	0.013	22.05	7.13	6,040.27	6,039.89	6,040.78	6,040.61
D1.4B	D4	6,036.42	Ellipse	3.8	2.4	6,034.71	199.4	0.009	-	0.013	25.82	8.11	6,037.80	6,035.81	6,038.37	6,036.83
D1.4A	D1.4B	6,036.72	Ellipse	3.8	2.4	6,036.52	32.3	0.006	-	0.013	25.19	7.19	6,038.08	6,037.73	6,038.64	6,038.48
D4	O-6	6,034.18	Ellipse	3.8	2.4	6,033.86	45.4	0.007	-	0.013	25.82	7.58	6,035.56	6,035.05	6,036.13	6,035.88
D1.5D	MH-3	6,034.66	Circle	-	-	6,034.48	34.5	0.005	36.0	0.013	22.91	6.73	6,036.20	6,035.94	6,036.81	6,036.64
D1.6	D1.5D	6,035.01	Circle	-	-	6,034.86	7.5	0.020	18.0	0.013	4.00	2.26	6,036.78	6,036.77	6,036.86	6,036.85
D1.5A	D1.5D	6,035.53	Circle	-	-	6,034.86	66.5	0.010	18.0	0.013	3.30	5.27	6,036.85	6,036.79	6,036.91	6,036.84
H-1	D1.3A	6,039.79	Ellipse	3.8	2.4	6,039.11	136.0	0.005	-	0.013	19.77	6.21	6,041.00	6,040.22	6,041.48	6,040.82
MH-3	O-7	6,034.38	Ellipse	3.8	2.4	6,033.86	58.1	0.009	-	0.013	22.91	7.93	6,035.68	6,034.91	6,036.20	6,035.81

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Please provide a schematic of the storm pipes. As the storm pipes/inlets are not labeled on the drainage plan it is difficult to discern where each of the storm pipes occur.

schematic is now included

Scenario: 100 Year
Current Time Step: 0.000 h
FlexTable: Conduit Table

Start Node	Stop Node	Invert (Start) (ft)	Section Type	Span (ft)	Rise (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
C2.4C	C2.5B	6,047.92	Circle	-	-	6,046.35	313.6	0.005	24.0	0.013	3.89	4.20	6,049.14	6,049.07	6,049.20	6,049.09
C2.4A	C2.4B	6,049.40	Circle	-	-	6,049.21	37.3	0.005	18.0	0.013	2.73	3.91	6,050.03	6,049.84	6,050.26	6,050.07
C2.4B	C2.4C	6,048.71	Circle	-	-	6,048.02	138.3	0.005	24.0	0.013	3.89	4.20	6,049.40	6,049.17	6,049.65	6,049.23
C2.5B	C2.5C	6,046.25	Circle	-	-	6,045.91	68.6	0.005	36.0	0.013	35.25	7.29	6,048.41	6,048.31	6,049.06	6,048.84
C2.5A	C2.5B	6,046.42	Circle	-	-	6,046.36	5.4	0.010	30.0	0.013	32.15	9.25	6,048.35	6,048.19	6,049.32	6,049.28
C2.5C	O-4	6,045.81	Circle	-	-	6,045.48	65.9	0.005	36.0	0.013	40.08	7.49	6,047.93	6,047.54	6,048.81	6,048.47
2.8C	C2.8D	6,042.53	Circle	-	-	6,041.27	234.4	0.005	36.0	0.013	34.41	7.49	6,044.54	6,044.24	6,045.27	6,044.61
C2.8C	2.8C	6,042.85	Circle	-	-	6,042.82	5.5	0.005	18.0	0.013	7.31	4.14	6,045.10	6,045.07	6,045.36	6,045.34
C2.8A	2.8C	6,043.21	Circle	-	-	6,043.03	27.5	0.007	30.0	0.013	28.35	7.59	6,045.03	6,044.81	6,045.88	6,045.70
C2.9C	D1.5D	6,037.56	Circle	-	-	6,034.76	559.5	0.005	36.0	0.013	47.60	6.73	6,040.63	6,037.78	6,041.34	6,038.49
C2.8D	C2.8E	6,041.07	Circle	-	-	6,039.92	144.0	0.008	36.0	0.013	34.41	8.73	6,043.94	6,043.57	6,044.32	6,043.94
C2.8E	C2.9A	6,039.82	Circle	-	-	6,038.89	133.6	0.007	36.0	0.013	34.41	4.87	6,043.26	6,042.90	6,043.63	6,043.27
C2.9A	C2.9B	6,038.79	Circle	-	-	6,038.76	5.7	0.005	36.0	0.013	38.36	5.43	6,042.48	6,042.47	6,042.94	6,042.92
C2.9B	C2.9C	6,038.66	Circle	-	-	6,037.66	199.3	0.005	36.0	0.013	47.60	6.73	6,042.19	6,041.17	6,042.89	6,041.87
2.9A	C2.9A	6,039.55	Circle	-	-	6,039.39	32.5	0.005	30.0	0.013	7.53	1.53	6,042.97	6,042.96	6,043.01	6,043.00
D1.3B	D1.4A	6,038.48	Ellipse	3.8	2.4	6,036.82	237.7	0.007	-	0.013	49.96	9.02	6,040.41	6,039.01	6,041.43	6,039.83
D1.3A	D1.3B	6,039.00	Ellipse	3.8	2.4	6,038.78	32.3	0.007	-	0.013	45.07	8.75	6,040.84	6,040.46	6,041.75	6,041.56
D1.4B	D4	6,036.42	Ellipse	3.8	2.4	6,034.71	199.4	0.009	-	0.013	54.49	9.97	6,038.42	6,036.42	6,039.55	6,037.97
D1.4A	D1.4B	6,036.72	Ellipse	3.8	2.4	6,036.52	32.3	0.006	-	0.013	52.94	8.55	6,038.70	6,038.61	6,039.79	6,039.60
D4	O-6	6,034.18	Ellipse	3.8	2.4	6,033.86	45.4	0.007	-	0.013	54.49	9.13	6,036.18	6,035.75	6,037.31	6,037.01
D1.5D	MH-3	6,034.66	Circle	-	-	6,034.48	34.5	0.005	36.0	0.013	54.60	7.72	6,037.28	6,036.88	6,038.36	6,038.14
D1.6	D1.5D	6,035.01	Circle	-	-	6,034.86	7.5	0.020	18.0	0.013	7.70	4.36	6,038.19	6,038.15	6,038.48	6,038.44
D1.5A	D1.5D	6,035.53	Circle	-	-	6,034.86	66.5	0.010	18.0	0.013	8.00	4.53	6,038.51	6,038.13	6,038.83	6,038.45
H-1	D1.3A	6,039.79	Ellipse	3.8	2.4	6,039.11	136.0	0.005	-	0.013	39.38	7.54	6,041.52	6,041.24	6,042.33	6,041.78
MH-3	O-7	6,034.38	Ellipse	3.8	2.4	6,033.86	58.1	0.009	-	0.013	54.60	10.15	6,036.38	6,035.62	6,037.52	6,037.09

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Culvert Report

this has been added to the plan

Please label these on the Drainage Plan

Culverts E1 and E2

Invert Elev Dn (ft)	=	6038.35
Pipe Length (ft)	=	115.00
Slope (%)	=	0.70
Invert Elev Up (ft)	=	6039.16
Rise (in)	=	38.0
Shape	=	Elliptical
Span (in)	=	60.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Square edge w/headwall (H)
Coeff. K,M,c,Y,k	=	0.01, 2, 0.0398, 0.67, 0.5

Embankment

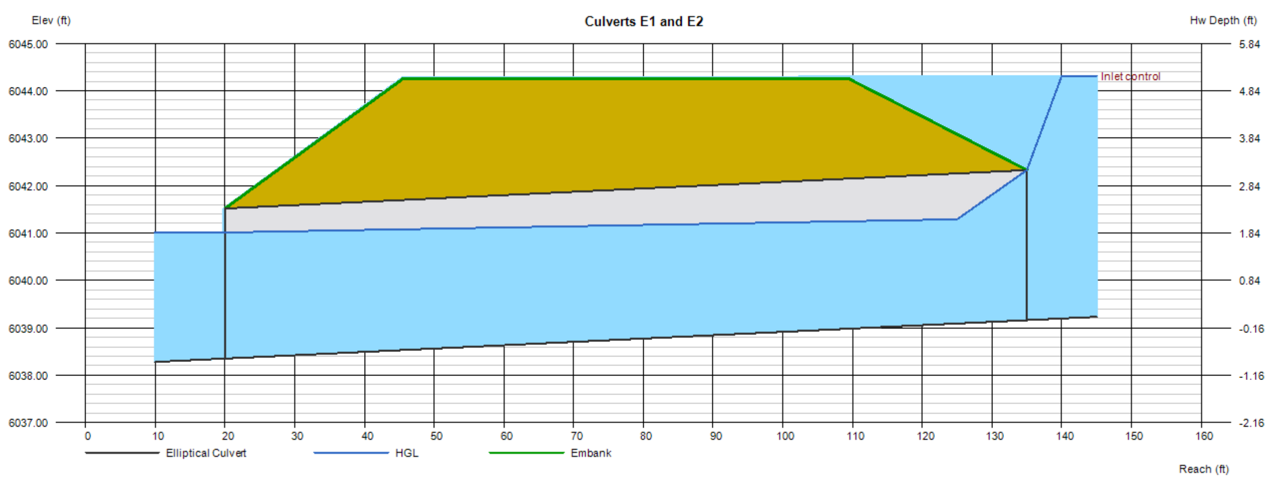
Top Elevation (ft)	=	6044.25
Top Width (ft)	=	64.00
Crest Width (ft)	=	60.80

Calculations

Qmin (cfs)	=	15.00
Qmax (cfs)	=	115.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	111.00
Qpipe (cfs)	=	108.71
Qovertop (cfs)	=	2.29
Veloc Dn (ft/s)	=	9.35
Veloc Up (ft/s)	=	11.66
HGL Dn (ft)	=	6041.01
HGL Up (ft)	=	6041.31
Hw Elev (ft)	=	6044.31
Hw/D (ft)	=	1.63
Flow Regime	=	Inlet Control

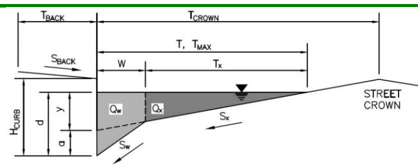


MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: MAYBERRY FILING 3
Inlet ID: C2.3 - DP3



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	28.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	28.0	28.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

Maximum Capacity for 1/2 Street based On Allowable Spread

		Minor Storm	Major Storm	
Water Depth without Gutter Depression (Eq. ST-2)	y =	6.72	6.72	inches
Vertical Depth between Gutter Lip and Gutter Flowline (usually 2")	d_C =	2.0	2.0	inches
Gutter Depression (d_C - (W * S_x * 12))	a =	1.51	1.51	inches
Water Depth at Gutter Flowline	d =	8.23	8.23	inches
Allowable Spread for Discharge outside the Gutter Section W (T - W)	T_X =	26.0	26.0	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.209	0.209	
Discharge outside the Gutter Section W, carried in Section T_X	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_T - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Maximum Flow Based On Allowable Spread	**Q_T =**	**SUMP**	**SUMP**	**cfs**
Flow Velocity within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity times Gutter Flowline Depth	V*d =	0.0	0.0	

Maximum Capacity for 1/2 Street based on Allowable Depth

		Minor Storm	Major Storm	
Theoretical Water Spread	T_{TH} =	18.7	43.7	ft
Theoretical Spread for Discharge outside the Gutter Section W (T - W)	$T_{X\ TH}$ =	16.7	41.7	ft
Gutter Flow to Design Flow Ratio by FHWA HEC-22 method (Eq. ST-7)	E_O =	0.318	0.130	
Theoretical Discharge outside the Gutter Section W, carried in Section $T_{X\ TH}$	$Q_{X\ TH}$ =	0.0	0.0	cfs
Actual Discharge outside the Gutter Section W, (limited by distance T_{CROWN})	Q_X =	0.0	0.0	cfs
Discharge within the Gutter Section W (Q_d - Q_X)	Q_W =	0.0	0.0	cfs
Discharge Behind the Curb (e.g., sidewalk, driveways, & lawns)	Q_{BACK} =	0.0	0.0	cfs
Total Discharge for Major & Minor Storm (Pre-Safety Factor)	Q =	0.0	0.0	cfs
Average Flow Velocity Within the Gutter Section	V =	0.0	0.0	fps
V*d Product: Flow Velocity Times Gutter Flowline Depth	V*d =	0.0	0.0	
Slope-Based Depth Safety Reduction Factor for Major & Minor (d $\geq$ 6") Storm	R =	SUMP	SUMP	
Max Flow Based on Allowable Depth (Safety Factor Applied)	**Q_d =**	**SUMP**	**SUMP**	**cfs**
Resultant Flow Depth at Gutter Flowline (Safety Factor Applied)	d =			inches
Resultant Flow Depth at Street Crown (Safety Factor Applied)	d_{CROWN} =			inches

		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**

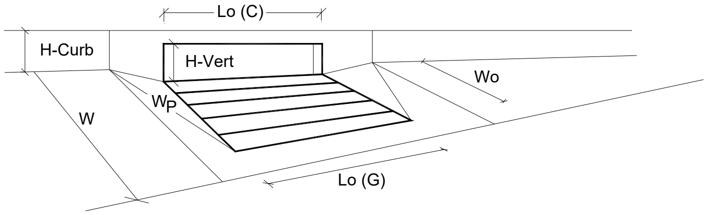
this basin has now been broken into 2: C2.3 and D2.5. An addition inlet has been placed upstream to break up flows

The County is not inclined to allow such a large inlet. Per the flow at this location it appears that a smaller inlet would work. Please reduce as much as possible.

I ran the calculation using an older MHFD version and the latest 5.02 and it appears that a 15' inlet may work. Please verify/revise the calc. accordingly.

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

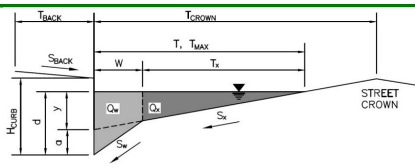
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	☑ Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	30.00	30.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	30.00	30.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	18.7	43.7	ft.>T-Crown
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	3.8	inches
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**18.0**	**78.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	13.2	32.2	cfs

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: MAYBERRY FILING 3
Inlet ID: C2.1 - DP1



Gutter Geometry:

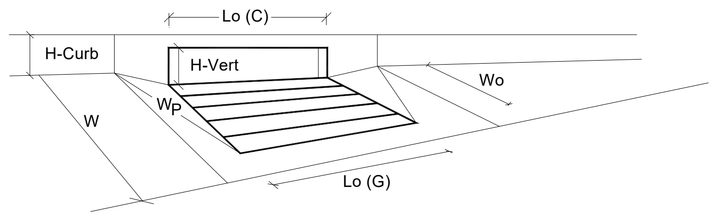
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.7	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.7	16.7	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	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**

INLEET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	Override Depths
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.9	4.9	
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

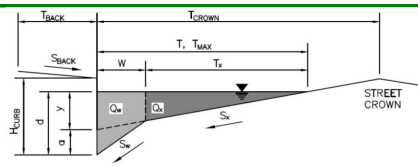
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.31	0.31	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.63	0.63	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**4.0**	**4.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q PEAK REQUIRED =	1.1	2.7	cfs

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

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

Project: MAYBERRY FILING 3
Inlet ID: C2.2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.7	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

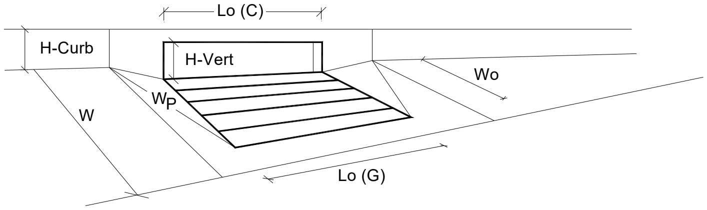
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.7	16.7	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.9	4.9	Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

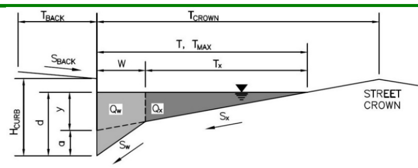
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.31	0.31	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.63	0.63	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**4.0**	**4.0**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.6	1.4	cfs

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

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

Project: MAYBERRY FILING 3
Inlet ID: D1.1 - DP5



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

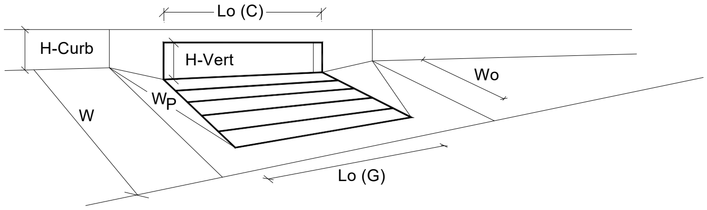
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

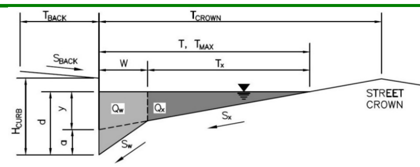
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.0**	**39.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Minor Storm	$Q_{PEAK\ REQUIRED}$ =	11.6	28.4	cfs

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

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

Project: MAYBERRY FILING 3
Inlet ID: D1.2 - DP6



Gutter Geometry:

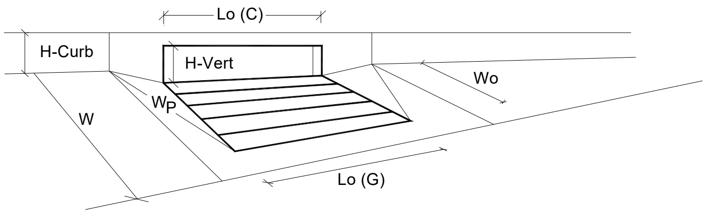
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.5	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	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)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	5.6	12.0	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.53	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.76	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**8.0**	**39.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.4	8.3	cfs

a 5' inlet is shown on the CD's and is drawn on the drainage plan. Revise.

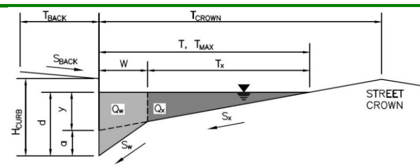
these have been coordinated

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

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

Project: MAYBERRY FILING 3

Inlet ID: D1.3 - DP8



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

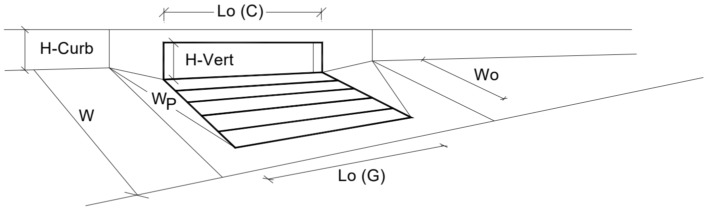
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	12.0	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	15.00	15.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.70	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ =	**6.8**	**39.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.1	7.5	cfs

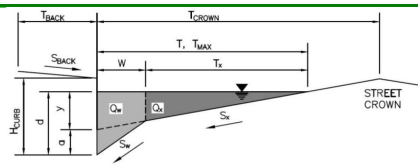
5' shown on the CD's and drainage plan. Revise

these have been coordinated

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

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

Project: MAYBERRY FILING 3
Inlet ID: D1.4



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

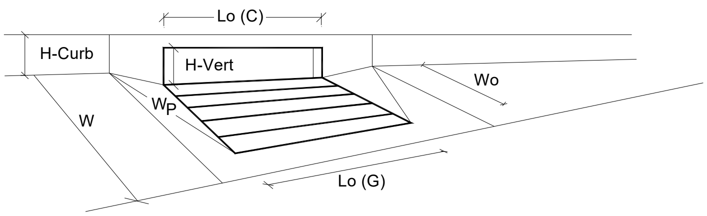
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

There is only approx 7.5 ft. to the ROW. revise

this has been revised

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	12.0	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	10.00	10.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.45	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.85	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.7**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.7	11.5	cfs

a 5' inlet is shown on the CD's. Revise the CD's accordingly so that they are consistent.

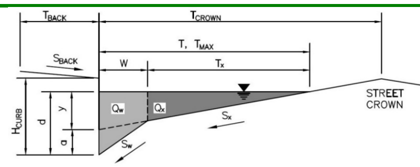
Verify that all storm inlets provided on the CD's match with the design calculations.

these have been coordinated

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

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

Project: MAYBERRY FILING 3
Inlet ID: D1.6



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

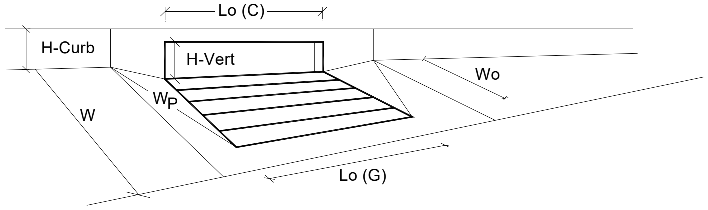
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

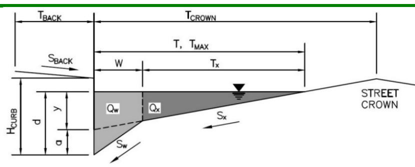


		MINOR	MAJOR	
Design Information (Input)				
Type of Inlet — CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.8**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.6	6.3	cfs

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

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

Project: **MAYBERRY FILING 3**
Inlet ID: **D1.7**



Gutter Geometry:

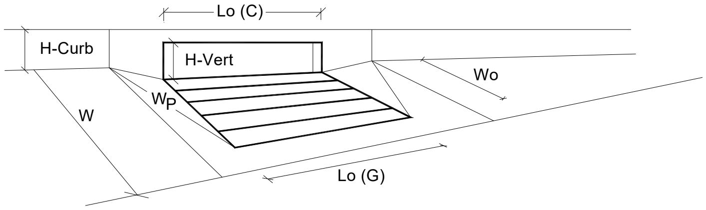
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2		ft
Gutter Width	W =	1.17		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



CDOT Type R Curb Opening

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	12.0	☑ Override Depths
Grate Information		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

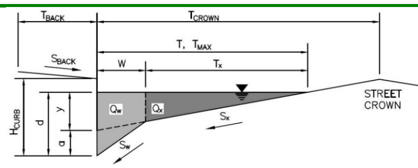
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.8**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.1	5.0	cfs

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

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

Project: MAYBERRY FILING 3

Inlet ID: D1.8



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

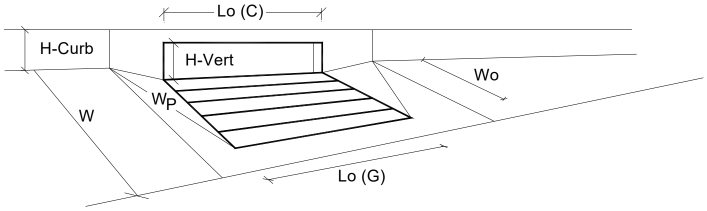
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	4.8	12.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

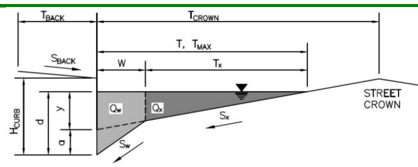
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.8**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.8	4.4	cfs

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

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

Project: MAYBERRY FILING 3
Inlet ID: D1.9



Gutter Geometry:

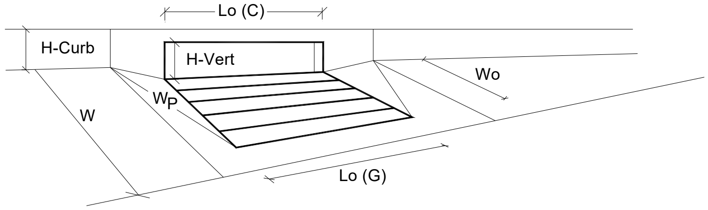
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.2		ft
Gutter Width	W =	1.17		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.2	16.2	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

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

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



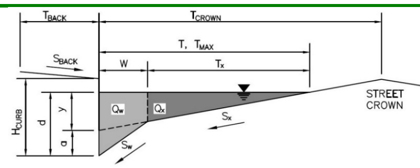
Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	4.8	12.0	inches
Grate Information			MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.17	1.17	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.30	0.90	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.61	1.00	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		Q_a =	**3.8**	**12.3**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)		$Q_{PEAK\ REQUIRED}$ =	0.9	2.1	cfs

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

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

Project: MAYBERRY FILING 3

Inlet ID: D1.10



Gutter Geometry:

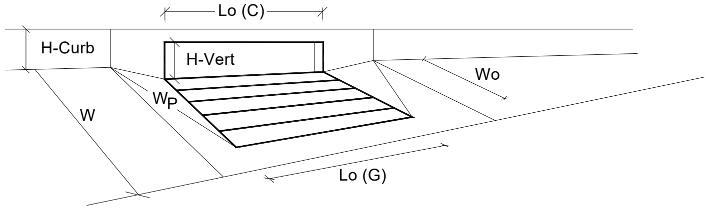
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	28.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	28.0	28.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	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)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	6.0	8.2	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	

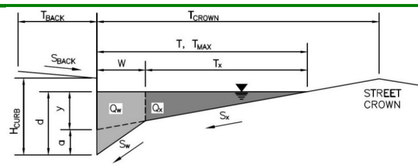
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.52	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**5.4**	**9.6**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.3	8.0	cfs

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

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

Project: MAYBERRY FILING 3
Inlet ID: Mayberry Drive



Gutter Geometry:

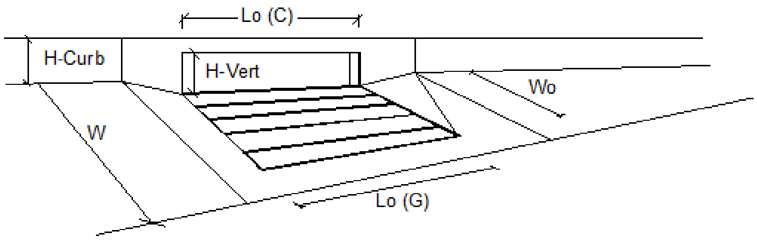
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	28.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.010		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	28.0	28.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	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 Spread Criterion	**Q_{allow} =**	**17.0**	**50.0**	**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 =			
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =			inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =			
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =			ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =			ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =			
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =			

		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**			**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**			**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**			**%**

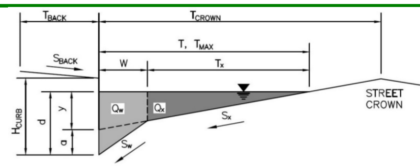
LOWEST LONGITUDINAL SLOPE OF THIS ROADWAY SECTION

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: MAYBERRY FILING 3
Inlet ID: 50' ROW - 6" Rollover Curb



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	7.5	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} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	16.7	ft
Gutter Width	W =	1.17	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.008	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	16.7	16.7	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	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 Spread Criterion MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**10.7**	**10.7**	**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'

Please provide a capacity calculation for the roadway Galveston Terrace (60' ROW). This roadway is conveying the majority of the runoff from basin C2.3 to DP3 in Mayberry drive. Staff has concerns as to whether it has the capacity to convey these flows.

this has been studied and confirmed galveston terrace can convey the flows tributary to it. the calcs have been included in the report

Channel Report

Channel C2 - 5 Year (DP21)

Trapezoidal

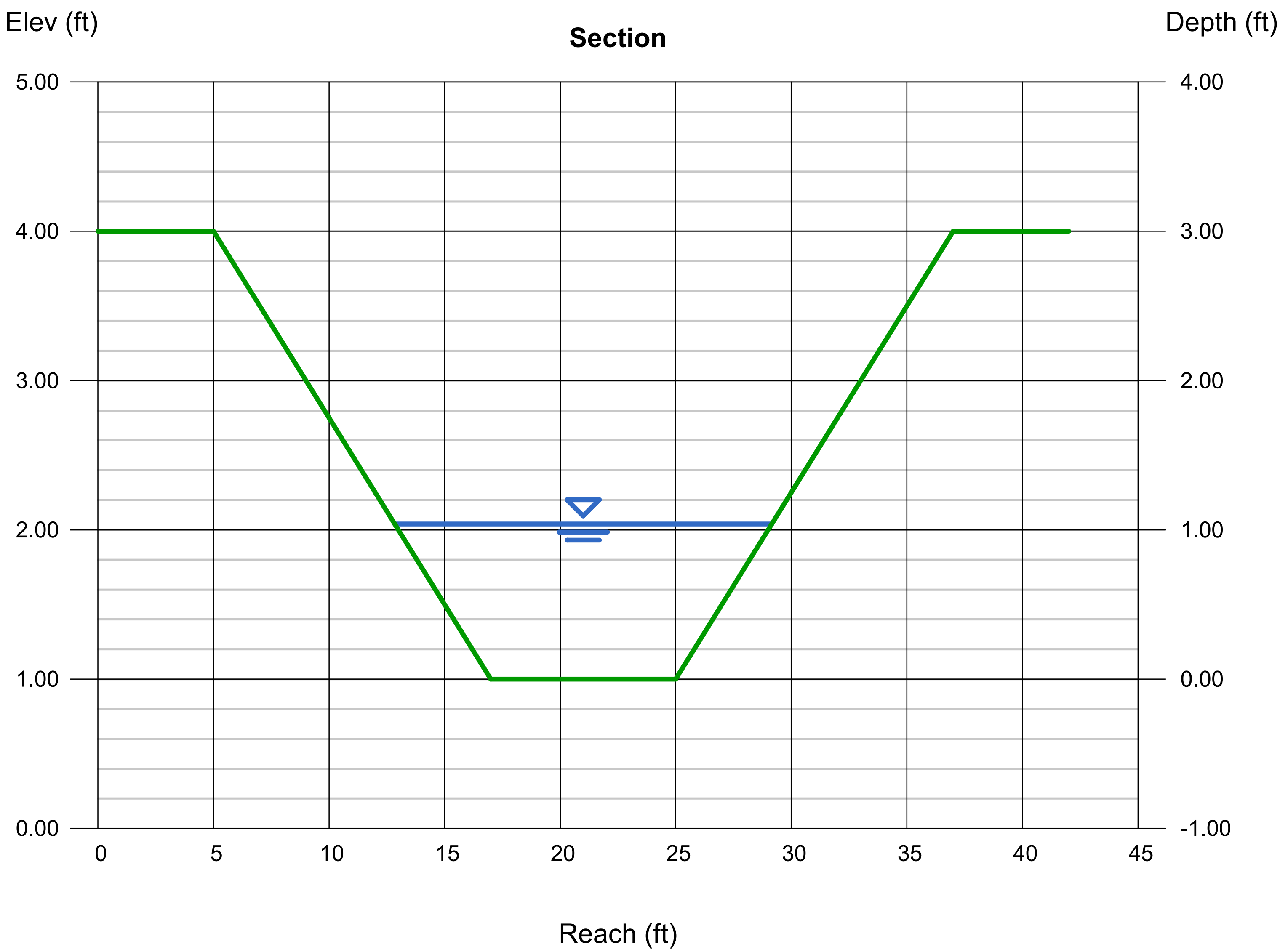
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 36.96

Highlighted

Depth (ft)	= 1.04
Q (cfs)	= 36.96
Area (sqft)	= 12.65
Velocity (ft/s)	= 2.92
Wetted Perim (ft)	= 16.58
Crit Depth, Yc (ft)	= 0.77
Top Width (ft)	= 16.32
EGL (ft)	= 1.17



Channel Report

Channel C2 - 100 Year (DP21)

Trapezoidal

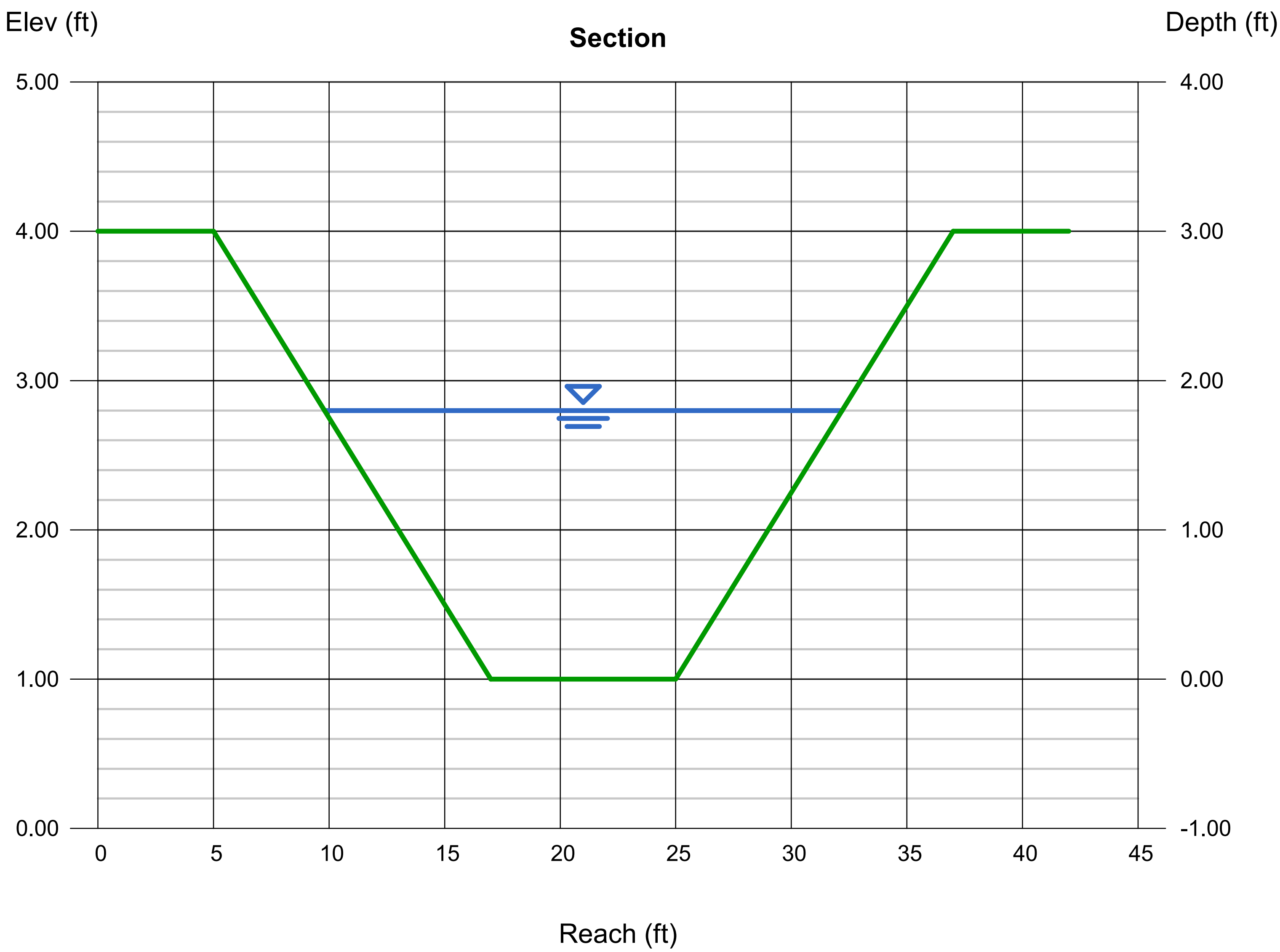
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 107.80

Highlighted

Depth (ft)	= 1.80
Q (cfs)	= 107.80
Area (sqft)	= 27.36
Velocity (ft/s)	= 3.94
Wetted Perim (ft)	= 22.84
Crit Depth, Yc (ft)	= 1.41
Top Width (ft)	= 22.40
EGL (ft)	= 2.04



Channel Report

Channel D - DP20 5 YEAR FLOW

Trapezoidal

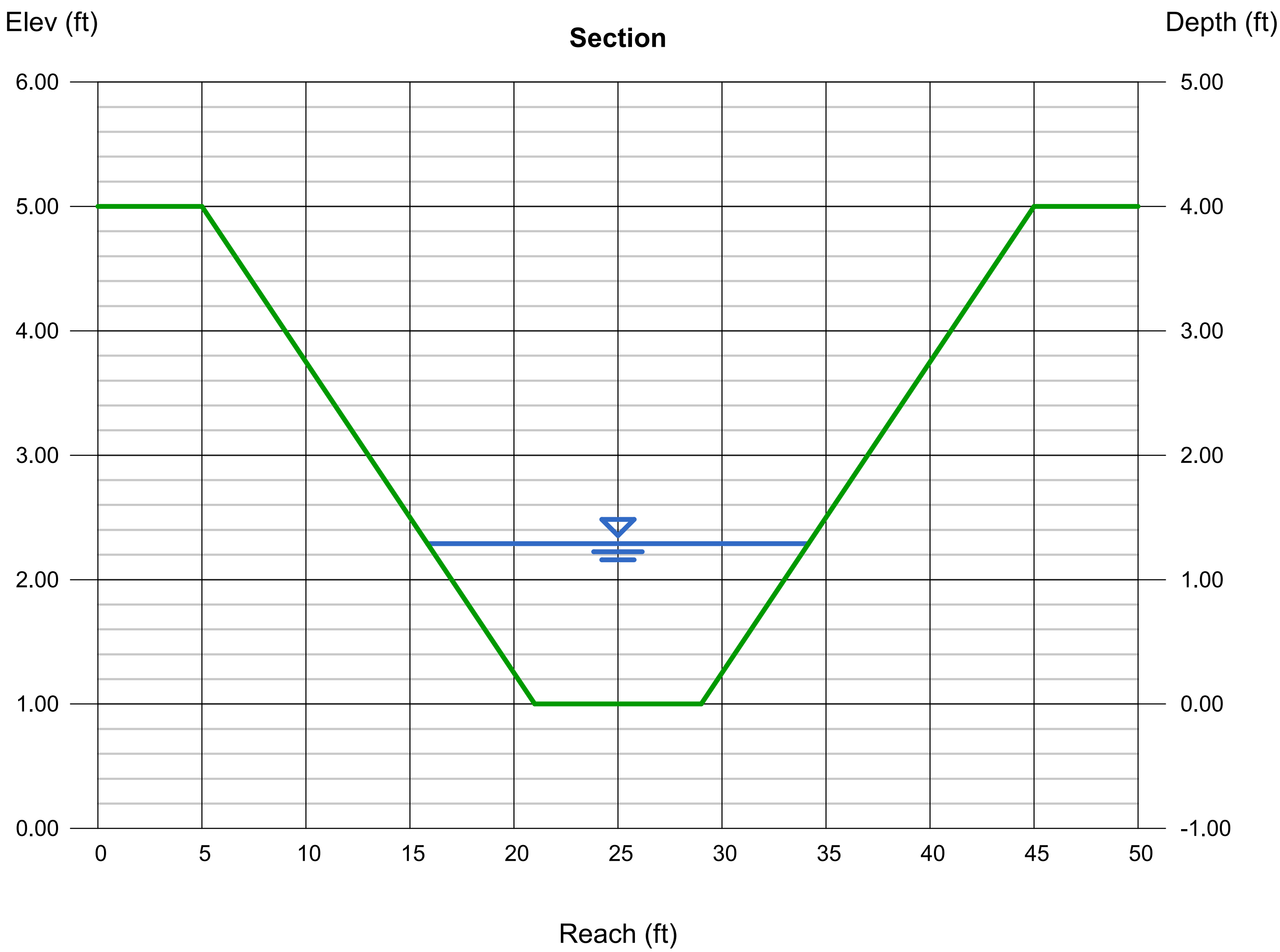
Bottom Width (ft)	= 8.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.40
N-Value	= 0.030

Calculations

Compute by:	Known Q
Known Q (cfs)	= 49.60

Highlighted

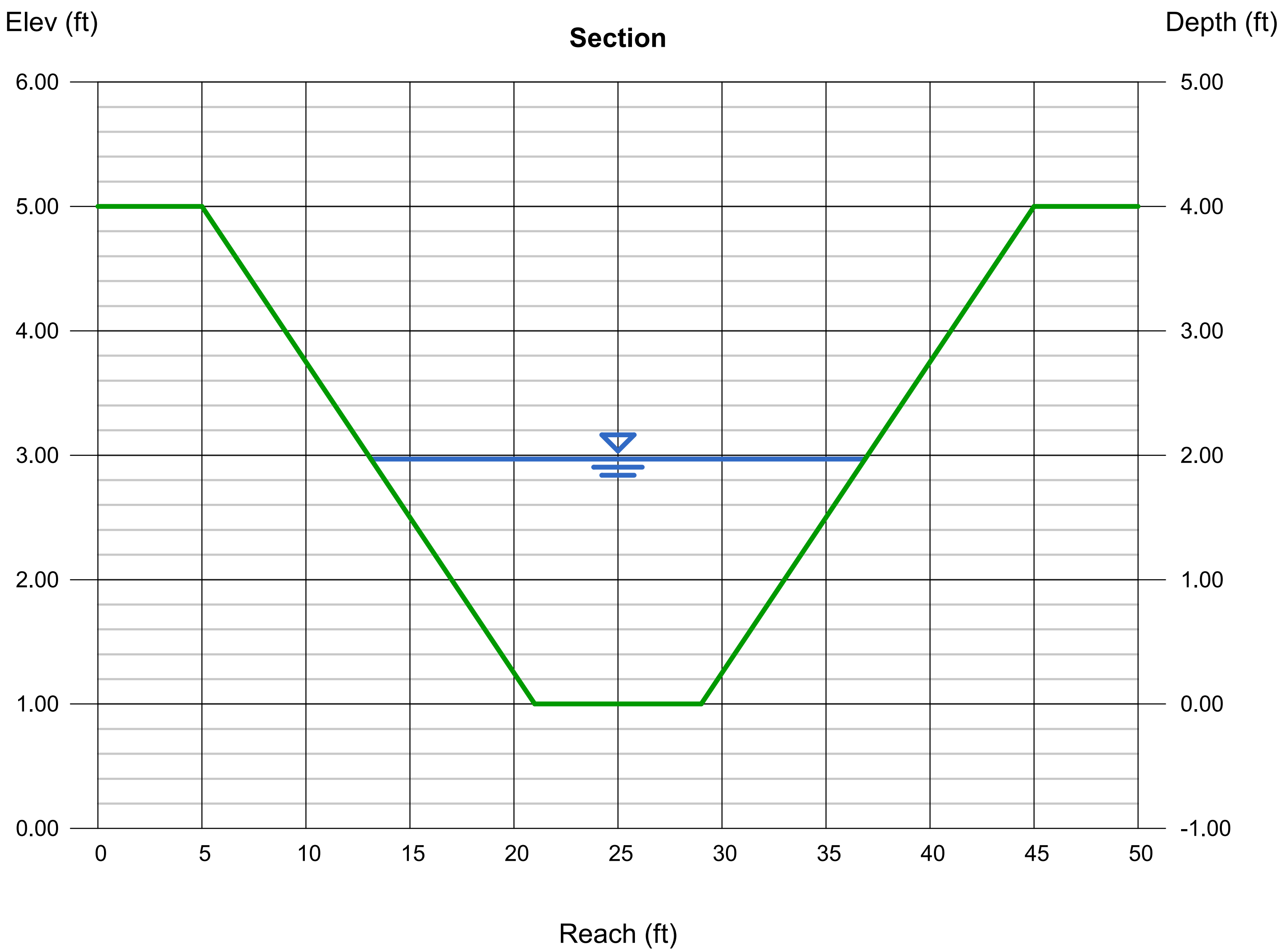
Depth (ft)	= 1.29
Q (cfs)	= 49.60
Area (sqft)	= 16.98
Velocity (ft/s)	= 2.92
Wetted Perim (ft)	= 18.64
Crit Depth, Yc (ft)	= 0.91
Top Width (ft)	= 18.32
EGL (ft)	= 1.42



Channel Report

Channel D - DP20 100 YEAR

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 8.00	Depth (ft)	= 1.97
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 115.98
Total Depth (ft)	= 4.00	Area (sqft)	= 31.28
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 3.71
Slope (%)	= 0.40	Wetted Perim (ft)	= 24.25
N-Value	= 0.030	Crit Depth, Yc (ft)	= 1.46
		Top Width (ft)	= 23.76
Calculations		EGL (ft)	= 2.18
Compute by:	Known Q		
Known Q (cfs)	= 115.98		



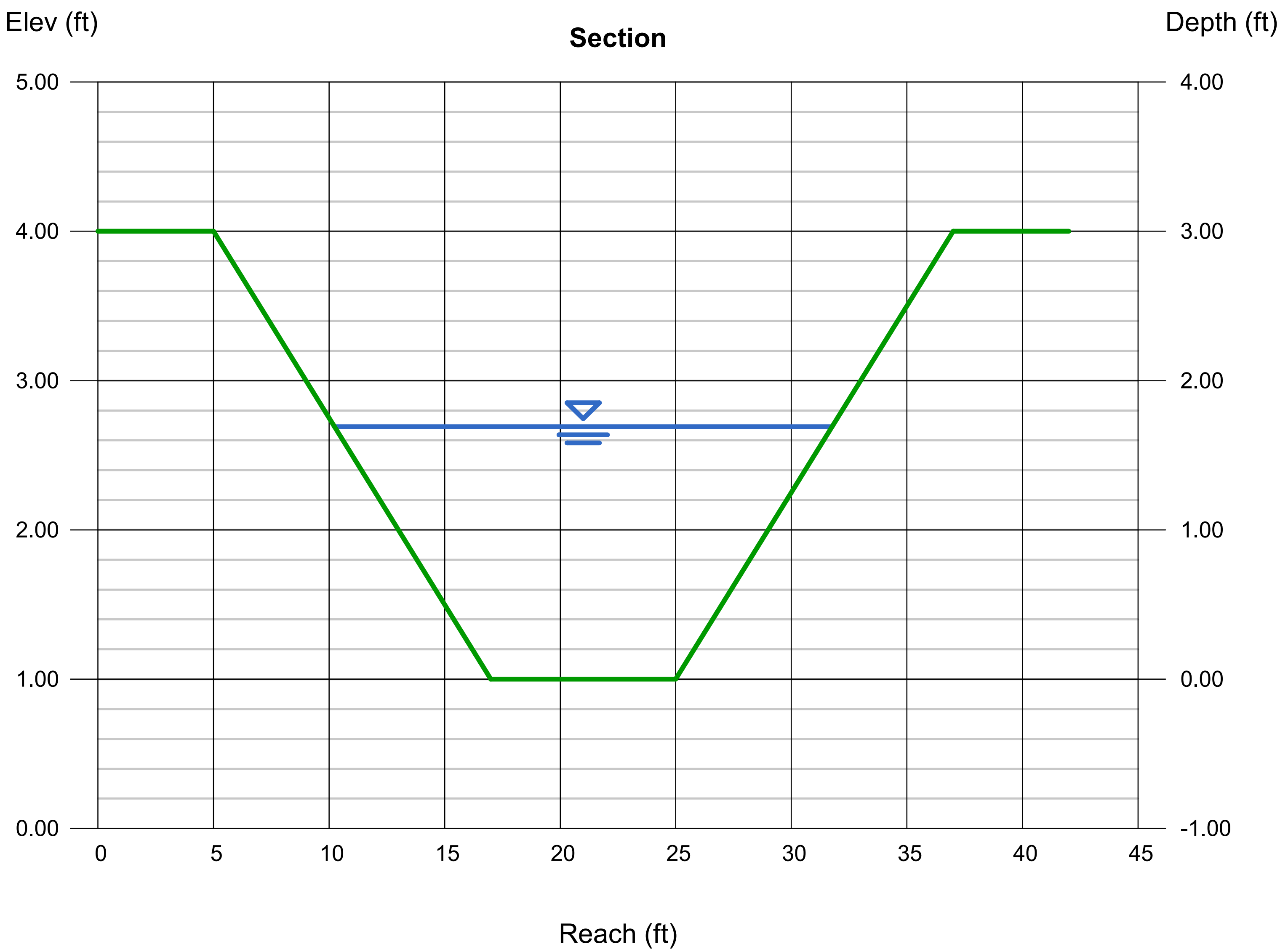
Channel Report

Channel E - DP24 100 Year

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 8.00	Depth (ft)	= 1.69
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 111.80
Total Depth (ft)	= 3.00	Area (sqft)	= 24.94
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 4.48
Slope (%)	= 0.70	Wetted Perim (ft)	= 21.94
N-Value	= 0.030	Crit Depth, Yc (ft)	= 1.44
		Top Width (ft)	= 21.52
		EGL (ft)	= 2.00

Calculations

Compute by:	Known Q
Known Q (cfs)	= 111.80



Channel E - Superelevation Calculation		
C	0.5	
Velocity (V - fps)	4.5	*From Hydraflow Express
Channel Width (W - ft)	21.5	*From Hydraflow Express
g - constant (ft/sec^2)	32.2	
Channel /Bend Radius (ft)	50	
H - additional freeboard - (ft)	0.14	
Depth at 100 Year Flow (ft)	1.70	*From Hydraflow Express
Channel Depth Provided (ft)	3	
Total Freeboard Provided (ft)	1.30	*min 1.14 feet required

$$H = C \frac{v^2 W}{gR} \qquad (10-4)$$

where:

C = coefficient;

= 0.5, subcritical flow, simple curve

= 1.0, supercritical flow, simple curve

v = average velocity of flow in channel, in fps;

W = channel width at level water surface

g = acceleration of gravity constant, 32.2 ft/sec ^{2};

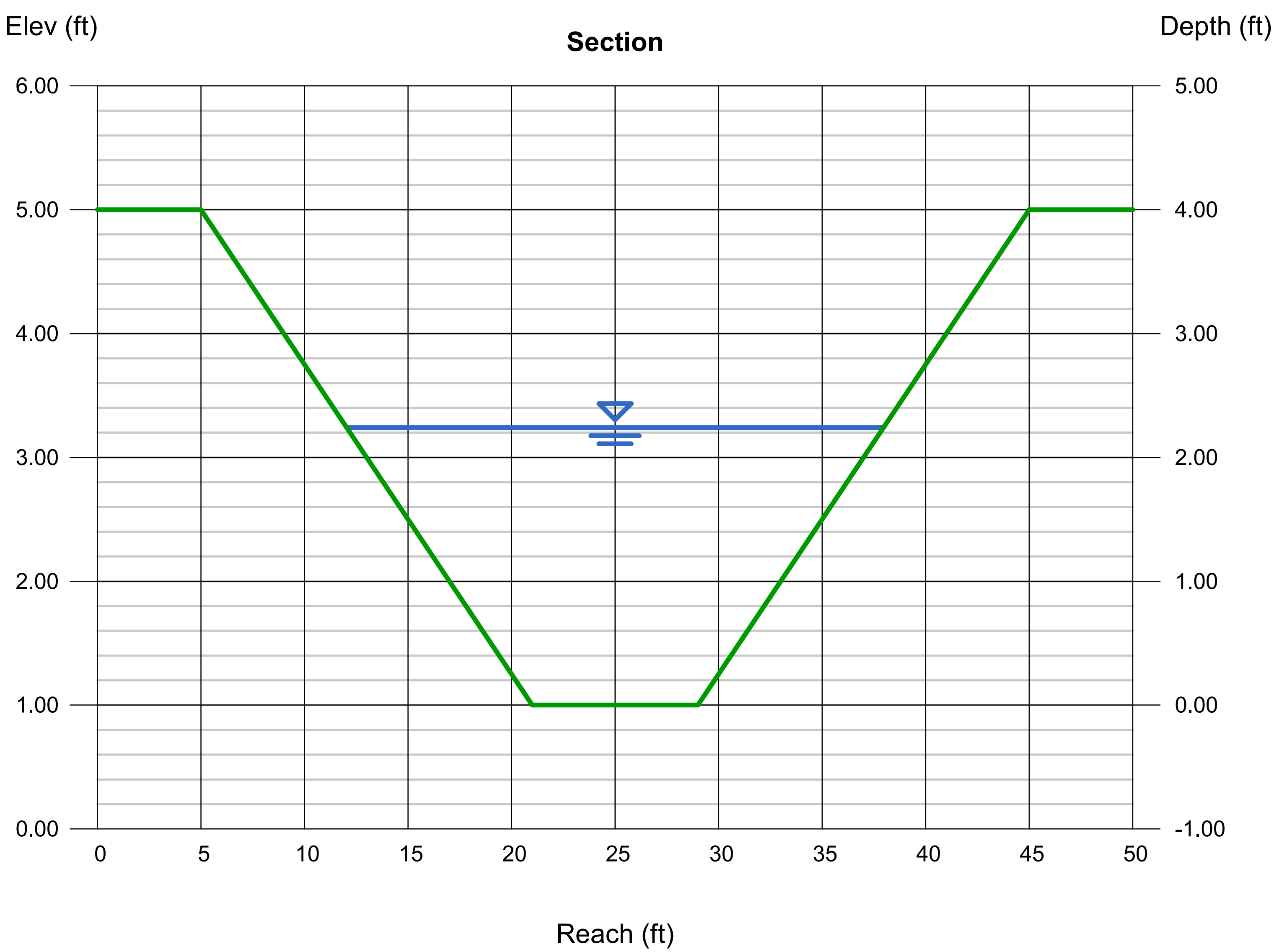
R = channel centerline radius of curvature, in ft; and

H = additional height of freeboard on outside edge of channel, in ft.

Channel Report

CHANNEL F - 100 YEAR FLOW

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 8.00	Depth (ft)	= 2.24
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 151.40
Total Depth (ft)	= 4.00	Area (sqft)	= 37.99
Invert Elev (ft)	= 1.00	Velocity (ft/s)	= 3.99
Slope (%)	= 0.40	Wetted Perim (ft)	= 26.47
N-Value	= 0.030	Crit Depth, Yc (ft)	= 1.69
		Top Width (ft)	= 25.92
Calculations		EGL (ft)	= 2.49
Compute by:	Known Q		
Known Q (cfs)	= 151.40		



Mayberry Filing 3
Flow into Channel C2

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	3
Design Discharge	ft^3/s	40.1
Tailwater Depth	ft	1.7
Allowable Velocity	ft/s	5
Required Area of Flow	ft^2	8.02
Froude Parameter		2.57
Tailwater Depth/Conduit Diameter		0.57
Expansion Factor		6.6
Length of Protection	**ft**	**12**
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	4.332314
Width of Protection	**ft**	**5**
RipRap Size (Figure 9-38)		
Q/D^1.5		7.72
Yt/D		0.57
RipRap Size (Figure 9-38)		TYPE L

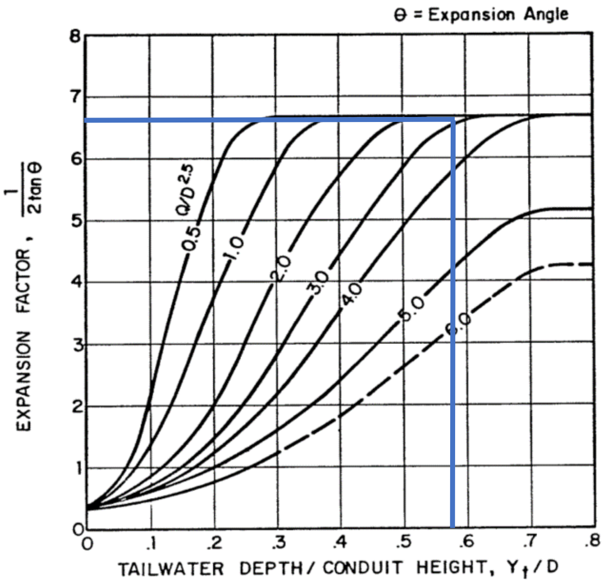
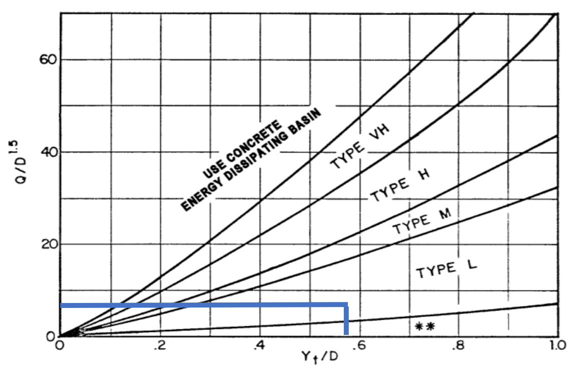


Figure 9-35. Expansion factor for circular conduits



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

Mayberry Filing 3
Flow into Channel D

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	3.75
Design Discharge	ft^3/s	97.5
Tailwater Depth	ft	1.97
Allowable Velocity	ft/s	5
Required Area of Flow	ft^2	19.5
Froude Parameter		3.58
Tailwater Depth/Conduit Diameter		0.53
Expansion Factor		5.5
Length of Protection	**ft**	**34**
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	5.194429
Width of Protection	**ft**	**10**
RipRap Size (Figure 9-38)		
Q/D^1.5		13.43
Yt/D		0.53
RipRap Size (Figure 9-38)		Type L

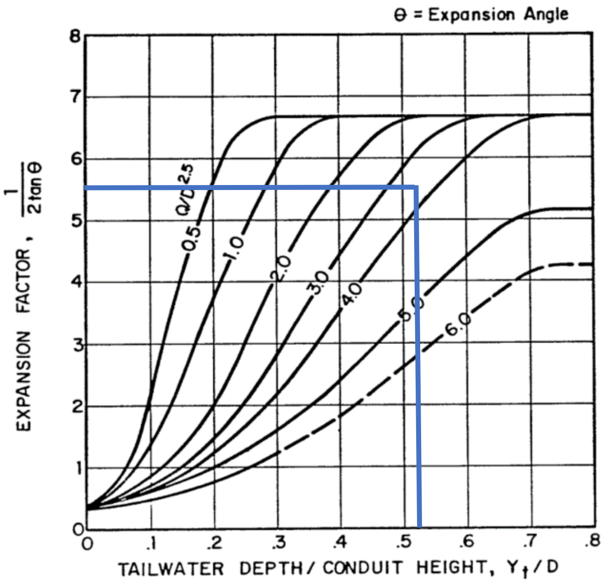


Figure 9-35. Expansion factor for circular conduits

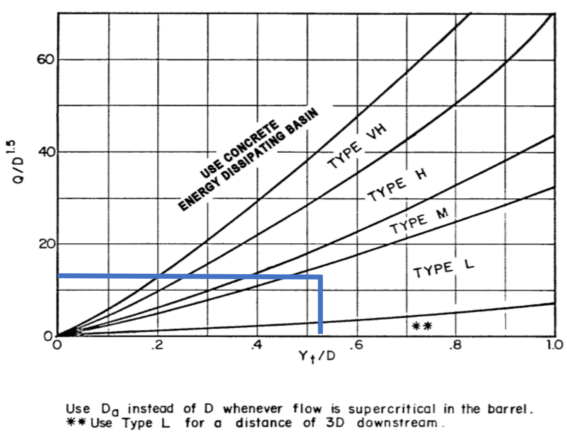


Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

Mayberry Filing 3
POND D OUTFALL

Per UDFCD Section 3.2.1 - Riprap Apron

Parameter	Unit	Value
Diameter of Conduit	ft	3
Design Discharge	ft^3/s	39.6
Tailwater Depth	ft	2.24
Allowable Velocity	ft/s	5
Required Area of Flow	ft^2	7.92
Froude Parameter		2.54
Tailwater Depth/Conduit Diameter		0.75
Expansion Factor		6.8
Length of Protection	**ft**	**4**
*Length will extend until tie out to existing grade		
Expansion Angle	degrees	4.205357
Width of Protection	**ft**	**4**
RipRap Size (Figure 9-38)		
Q/D^1.5		7.62
Yt/D		0.75
RipRap Size (Figure 9-38)		Type L

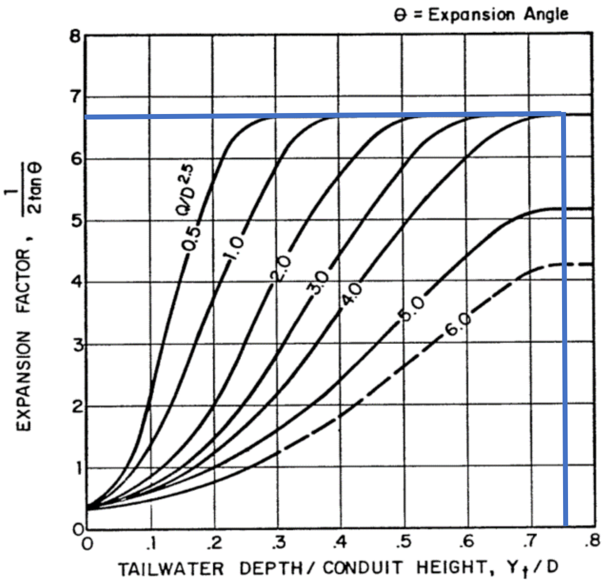
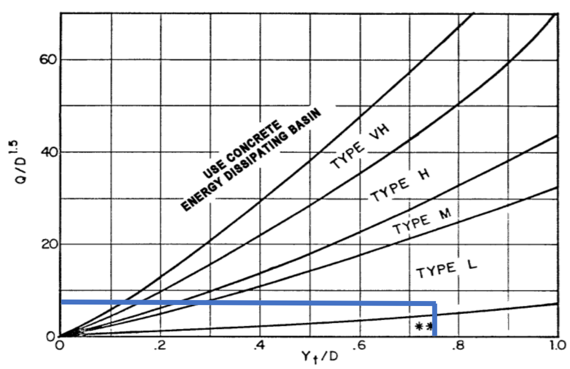


Figure 9-35. Expansion factor for circular conduits



Use D_a instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

APPENDIX C – REFERENCE INFORMATION

ENGINEER'S OPINION OF PROBABLE COSTS

FOR

Mayberry Filing 3 - Drainage Improvements

Item	Description	Total Work Units	Unit Price ($)	Total Cost ($)
Riprap		10 CY	125.00 CY	1,250.00
18" RCP		104 LF	$ 67.00 LF	$ 6,968.00
24" RCP		907 LF	$ 81.00 LF	$ 73,467.00
30" RCP		989 LF	$ 100.00 LF	$ 98,900.00
36" RCP		2,712 LF	$ 124.00 LF	$ 336,288.00
29"x45" RCP		927 LF	$ 202.00 LF	$ 187,254.00
5' Type R		6 EA	$ 5,736.00 EA	$ 34,416.00
10' Type R		6 EA	$ 7,894.00 EA	$ 47,364.00
15' Type R		4 EA	$ 10,265.00 EA	$ 41,060.00
Storm Manhole		15 EA	$ 6,619.00 EA	$ 99,285.00
36" FES		1 EA	$ 744.00 EA	$ 744.00
60" FES		2 EA	$ 1,788.00 EA	$ 3,576.00
Pond Forebay		2 EA	$ 4,000.00 EA	$ 8,000.00
Pond Outlet Structure		1 EA	$ 8,000.00 EA	$ 8,000.00
Grass Channels		3 AC	$ 1,520.00 EA	$ 4,560.00
SUBTOTAL				$ 946,572.00
Contingency (15%)				$ 141,985.80
TOTAL				**$ 1,088,557.80**

Hydrologic Soil Group—El Paso County Area, Colorado
(Ellicott Town Center)

Map Scale: 1:12,000 if printed on A portrait (8.5" x 11") sheet.

0 150 300 600 900 Meters

0 500 1000 2000 3000 Feet

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84 is severely eroded and blowouts have developed, the new seeding should be fertilized.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This sandy soil requires special management practices to reduce water erosion and soil blowing. Capability subclasses IIIe, irrigated, and IVe, nonirrigated.

7—Bijou sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on flood plains, terraces, and uplands. It formed in sandy alluvium and eolian material derived from arkose deposits. Elevation ranges from 5,400 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown or grayish brown sandy loam about 24 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Olney sandy loam, 3 to 5 percent slopes; Valent sand, 1 to 9 percent slopes; Vona sandy loam, 3 to 9 percent slopes; and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Bijou soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is low. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

Almost all areas of this soil are used for range.

This soil is suited to the production of native vegetation suitable for grazing. Because of the hazards of water erosion and soil blowing, the soil is not suited to nonirrigated crops.

Native vegetation is dominantly blue grama, sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is a suitable practice if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, the new seeding should be fertilized. Brush control and grazing management may be needed to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, by properly managing livestock grazing, and by reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This soil requires special management practices to reduce water erosion and soil blowing. Capability subclass VIe.

8—Blakeland loamy sand, 1 to 9 percent slopes. This deep, somewhat excessively drained soil formed in alluvial and eolian material derived from arkosic sedimentary rock on uplands. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; Truckton sandy loam, 3 to 9 percent slopes; and Stapleton sandy loam, 3 to 8 percent slopes. In some areas, mainly north of Colorado Springs in the Cottonwood Creek area, arkosic beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Blakeland soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Organic matter content of the surface layer is medium. Surface runoff is slow, the hazard of erosion is moderate, and the hazard of soil blowing is severe.

Most areas of this soil are used for range, homesites, and wildlife habitat.

Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. This soil is best suited to deep-rooted grasses.

Proper range management is necessary to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for urban development. Soil blowing is a hazard if protective vegetation is removed. Special erosion control practices must be provided to minimize soil losses. Capability subclass VIe.

9—Blakeland complex, 1 to 9 percent slopes. This complex is on uplands, mostly in the Falcon area. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the frost-free period is about 135 days.

This complex is about 60 percent Blakeland loamy sand, about 30 percent Fluvaquentic Haplaquolls, and 10 percent other soils.

Included with these soils in mapping are areas of Columbine gravelly sandy loam, 0 to 3 percent slopes, Ellicott loamy coarse sand, 0 to 5 percent slopes, and Ustic Torrifluvents, loamy.

The Blakeland soil is in the more sloping areas. It is deep and somewhat excessively drained. It formed in sandy alluvium and eolian material derived from arkosic sedimentary rock. Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches or more.

Permeability of the Blakeland soil is rapid. The effective rooting depth is more than 60 inches. The available water capacity is moderate to low. Surface runoff is slow, and the hazard of erosion is moderate.

The Fluvaquentic Haplaquolls are in swale areas. They are deep, poorly drained soils. They formed in alluvium derived from arkosic sedimentary rock. Typically, the surface layer is brown. The texture is variable throughout. The water table is at a depth of 0 to 3 feet.

The Blakeland soil is well suited to deep-rooted grasses. Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. Rangeland vegetation on the Fluvaquentic Haplaquolls is dominantly tall grasses, including sand bluestem, switchgrass, prairie cordgrass, little bluestem, and sand reedgrass. Cattails and bulrushes are common in the swampy areas.

Proper range management is needed to prevent excess removal of plant cover from these soils. It is also needed to maintain the productive grasses. Interseeding improves the existing vegetation. Deferment of grazing during the growing season increases plant vigor and soil stability, and it helps to maintain and improve range condition. Proper location of livestock watering facilities helps to control grazing of animals.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and low available water capacity are the main limitations to the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

The Blakeland soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed. Wetland wildlife can be attracted to the Fluvaquentic Haplaquolls and the wetland habitat can be enhanced by several means. Shallow water developments can be created by digging or by blasting potholes to create open-water areas. Fencing to control livestock grazing is beneficial, and it allows wetland plants such as cattails, reed canarygrass, and rushes to grow. Control of unplanned burning and prevention of drainage that would remove water from the wetlands are good practices. Openland wildlife use the vegetation on these soils for nesting and escape cover. These shallow marsh areas are especially important for winter cover if natural vegetation is allowed to grow.

The Blakeland soil has good potential for homesites, roads, and streets. It needs to be protected from erosion when vegetation has been removed from building sites. The Fluvaquentic Haplaquolls have poor potential for homesites. Their main limitations for this use are the high water table and the hazard of flooding. Capability subclass VIe.

10—Blendon sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in sandy arkosic alluvium on alluvial fans and terraces. The average annual precipitation is about 15 inches, the mean annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The soils in this complex are used as rangeland, for recreation and wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the main limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife species, such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

The main limitations for urban uses are frost-action potential and slope on the Crowfoot soil and slope on the Tomah soil. Buildings and roads must be designed to overcome these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass VIe.

94—Travessilla-Rock outcrop complex, 8 to 90 percent slopes. This moderately sloping to extremely steep complex is mostly on rocky uplands (fig. 5). Elevation ranges from 6,200 to 6,700 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Travessilla soil makes up about 45 percent of the complex, Rock outcrop about 30 percent, and included areas about 25 percent.

Included with this complex in mapping are areas of Bresser sandy loam, 5 to 9 percent slopes, Elbeth sandy loam, 8 to 15 percent slopes, Kettle gravelly loamy sand, 8 to 40 percent slopes, and Louviers silty clay loam, 3 to 18 percent slopes. The Elbeth and Kettle soils commonly are on the north-facing slopes.

The Travessilla soil is shallow and well drained. It formed in residuum derived from sandstone. Typically, the surface layer is light brownish gray sandy loam about 3 inches thick. The underlying material is pale brown sandy loam about 8 inches thick. Hard arkosic sandstone that has some fractures is at a depth of about 11 inches.

Permeability of the Travessilla soil is moderately rapid. Effective rooting depth is 6 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is high. Gullies are common along drainageways and trails.

Rock outcrop occurs mostly as ledges on cliffs.

This complex is used for urban development, as homesites, and for recreation and wildlife habitat.

This complex is suited to the production of ponderosa pine. The main limitations are the presence of stones and rock outcrop on the surface and a high hazard of erosion. Stones on the surface can hinder felling, yarding, and other operations involving the use of equipment. Practices must be used to minimize soil erosion when harvesting timber. The low available water capacity can influence seedling survival.

Wildlife on these soils is limited mostly to small animals such as cottontail, squirrel, and birds because of the extent of urban development. Ponderosa pine, mountain-mahogany, Gambel oak, and various grasses provide food, cover, and nesting areas.

This complex is extensively used for urban development and as homesites (fig. 6). The main limitations for these uses are depth to bedrock, rock outcrop, and steep slopes. Septic tank absorption fields do not function properly because of the depth to bedrock. Special designs for buildings and roads and streets are needed to overcome the limitations. Plans for homesite development should provide for the preservation of as many trees as possible because of their esthetic value. Capability subclass VIIe.

95—Truckton loamy sand, 1 to 9 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown loamy sand about 8 inches thick. The subsoil is brown sandy loam about 18 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 3 to 5 percent sloeps; Bresser sandy loam, 5 to 9 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is moderate to high.

Almost all areas of this soil are used as rangeland. A few areas of crops such as alfalfa and corn are grown under sprinkler irrigation.

This soil is well suited to the production of native vegetation suitable for grazing. It is best suited to deep-rooted grasses. The native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand is the main limitation for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to openland and rangeland wildlife habitat. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitation of this soil for roads and streets is frost action potential. Special designs for roads are needed to minimize this limitation. Practices are needed to control soil blowing and water erosion on construction sites where the plant cover has been removed. Capability subclass VIe, nonirrigated.

96—Truckton sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperatue is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 0 to 3 percent slopes; Ellicott loamy coarse sand, 0 to 5 percent slopes; and Ustic Torrifluvents, loamy.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

This soil is used mainly for cultivated crops. It is also used for livestock grazing, for wildlife habitat, and as homesites.

Crops are commonly grown in combination with summer fallow because moisture is insufficient for annual cropping. Alfalfa can also be grown on this soil. When this soil is used as cropland, crop residue management and minimum tillage are necessary conservation practices.

This soil is well suited to the production of native vegetation suitable for grazing (fig. 7). It favors deep-rooted grasses. The native vegetation is mainly cool- and warm-season grasses such as western wheatgrass, side-oats grama, and needleandthread.

Proper range management is needed to prevent excessive removal of the plant cover. Interseeding is used to improve the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, undisturbed nesting cover is vital and should be provided in plans for habitat development. This is especially true in areas of intensive farming. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. The main limitation of this soil for roads and streets is frost-action potential. Special designs for roads are needed to overcome this limitation. Capability subclasses IIIe, nonirrigated, and IIe, irrigated.

97—Truckton sandy loam, 3 to 9 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 5 inches thick. The next layer is dark grayish brown sandy loam about 3 inches thick. The subsoil is brown sandy loam about 16 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Alamosa:							
1	C	Frequent	Brief	May-Jun	>60	---	High.
Ascalon:							
2, 3	B	None	---	---	>60	---	Moderate.
Badland:							
4	D	---	---	---	---	---	---
Bijou:							
5, 6, 7	B	None	---	---	>60	---	Low.
Blakeland:							
8	A	None	---	---	>60	---	Low.
[1]9:							
Blakeland part	A	None	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part	D	Common	Very brief	Mar-Aug	>60	---	High.
Blendon:							
10	B	None	---	---	>60	---	Moderate.
Bresser:							
11, 12, 13	B	None	---	---	>60	---	Low.
Brussett:							
14, 15	B	None	---	---	>60	---	Moderate.
Chaseville:							
16, 17	A	None	---	---	>60	---	Low.
[1]18:							
Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine:							
19	A	None to rare	---	---	>60	---	Low.
Connerton:							
[1]20:							
Connerton part	B	None	---	---	>60	---	High.
Rock outcrop part	D	---	---	---	---	---	---
Cruckton:							
21	B	None	---	---	>60	---	Moderate.
Cushman:							
22, 23	C	None	---	---	20-40	Rippable	Moderate.
[1]24:							
Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth:							
25, 26	B	None	---	---	>60	---	Moderate.
[1]27:							
Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Tomah:							
[1]92, [1]93:							
Tomah part	B	None	---	---	>60	---	Moderate.
Crowfoot part	B	None	---	---	>60	---	Moderate.
Travessilla:							
[1]94:							
Travessilla part	D	None	---	---	6-20	Hard	Low.
Rock outcrop part	D	---	---	---	---	---	---
Truckton:							
95, 96, 97	B	None	---	---	>60	---	Moderate.
[1]98:							
Truckton part	B	None	---	---	>60	---	Moderate.
Blakeland part	A	None	---	---	>60	---	Low.
[1]99, [1]100:							
Truckton part	B	None	---	---	>60	---	Moderate.
Bresser part	B	None	---	---	>60	---	Low.
Ustic Torrifluvents:							
101	B	Occasional	Very brief	Mar-Aug	>60	---	Moderate.
Valent:							
102, 103	A	None	---	---	>60	---	Low.
Vona:							
104, 105	B	None	---	---	>60	---	Moderate.
Wigton:							
106	A	None	---	---	>60	---	Low.
Wiley:							
107, 108	B	None	---	---	>60	---	Low.
Yoder:							
109, 110	B	None	---	---	>60	---	Low.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior characteristics of the map unit.

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

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Silver Spring, MD 20910-3282

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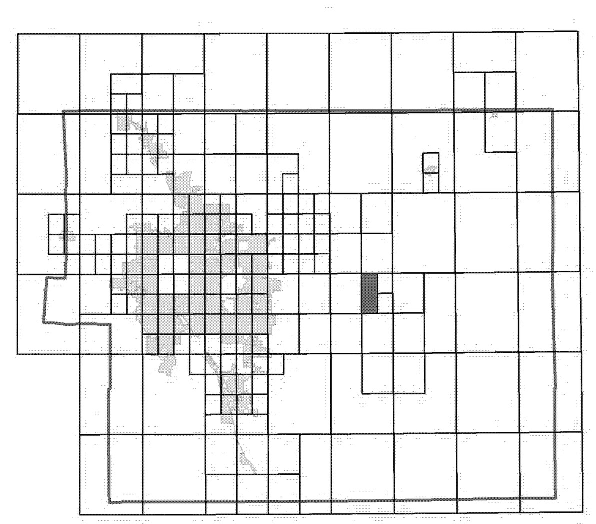
If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



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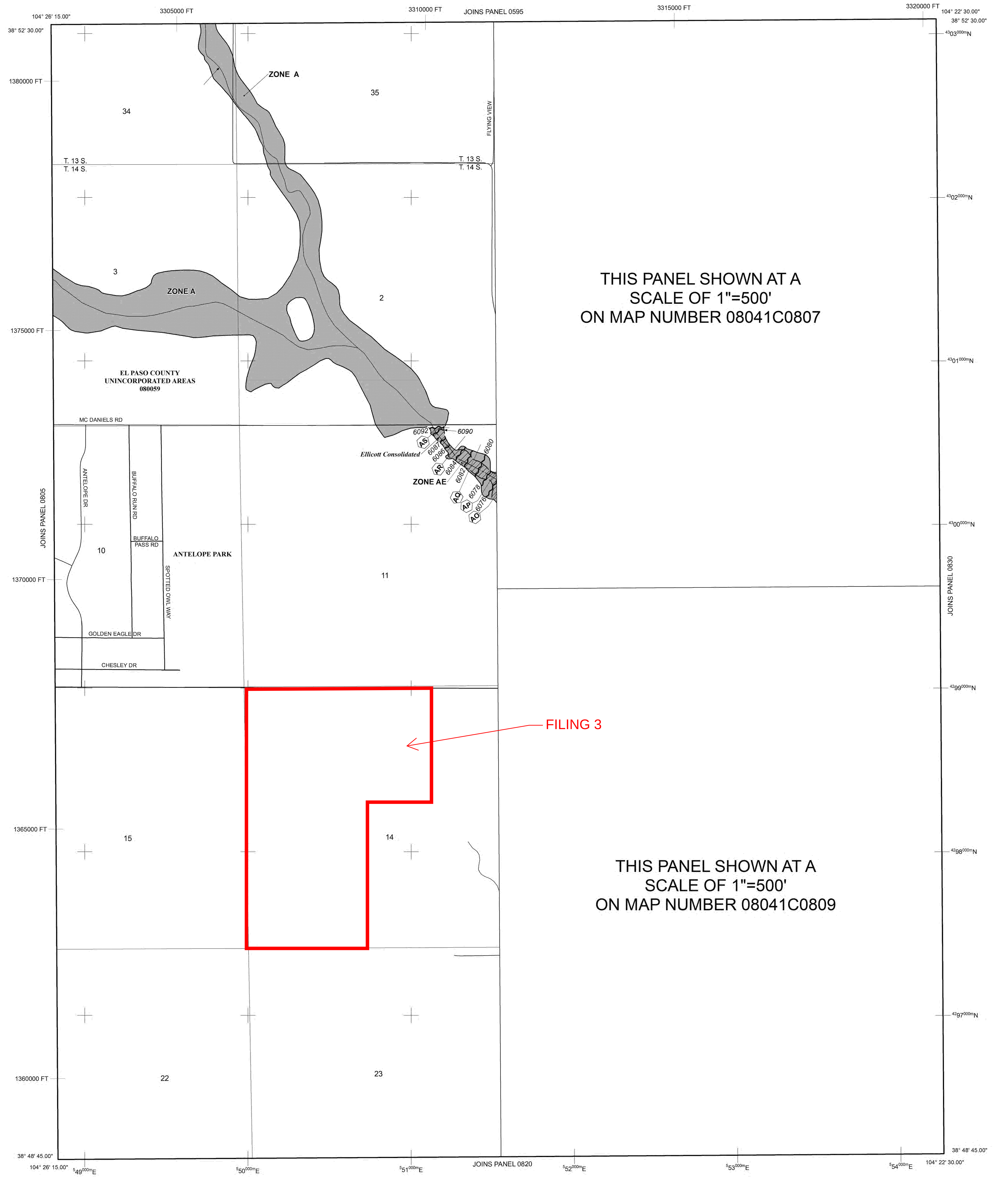

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 13 SOUTH, RANGE 63 WEST, AND TOWNSHIP 14 SOUTH, RANGE 63 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~ Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A——A Cross section line
23- - - - -23 Transect line
97° 07' 30.00" 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

PANEL 0810G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 810 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0810	G

Notice to User: The **Map Number** shown below should be used when placing map orders: the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 08041C0810G

MAP REVISED DECEMBER 7, 2018

Federal Emergency Management Agency

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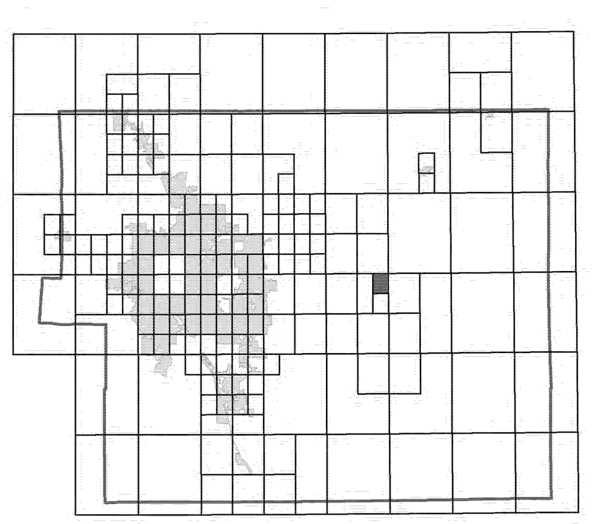

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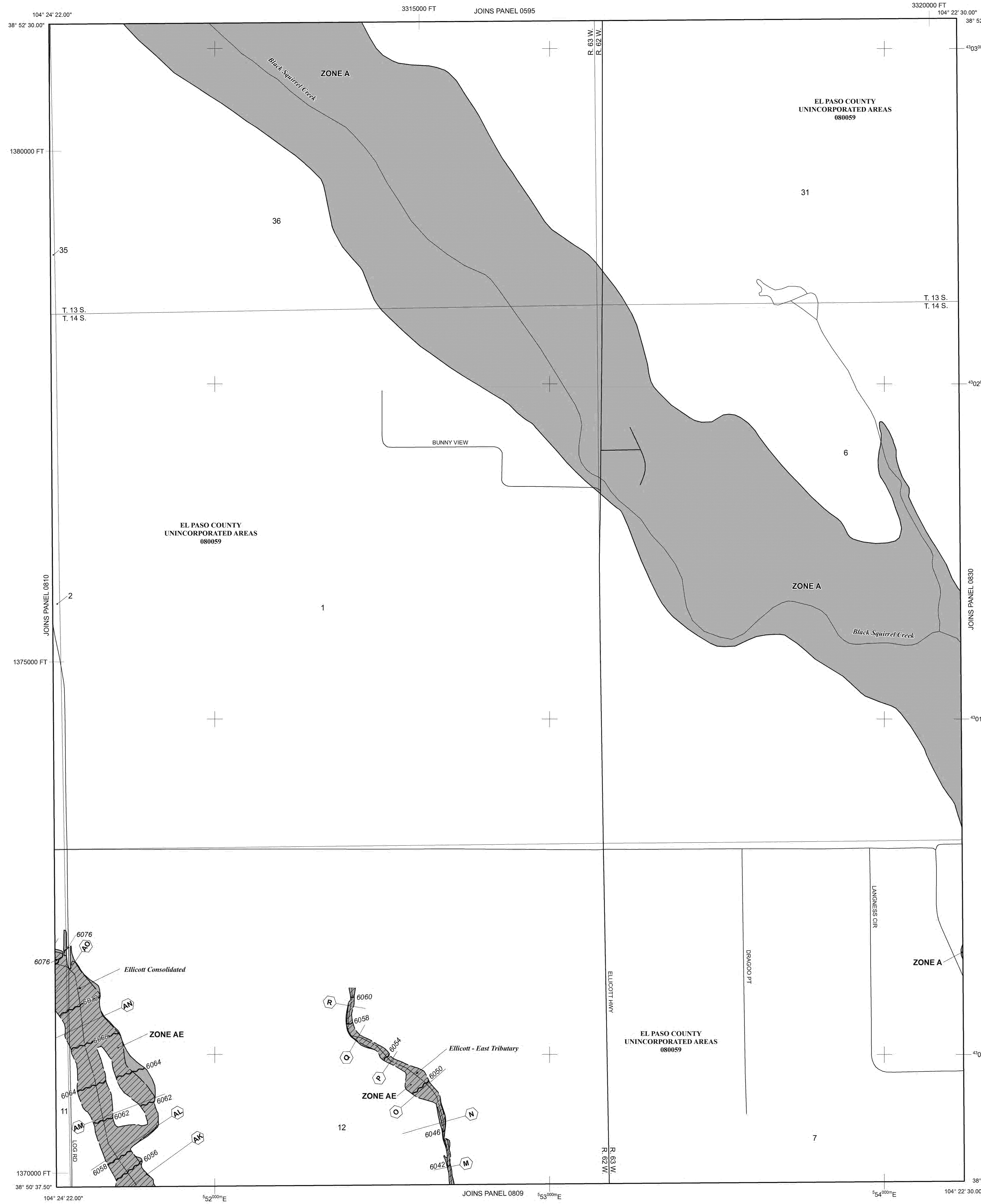

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ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
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(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

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A —— A	Cross section line
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EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

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MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0807G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 807 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0807	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0807G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

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Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

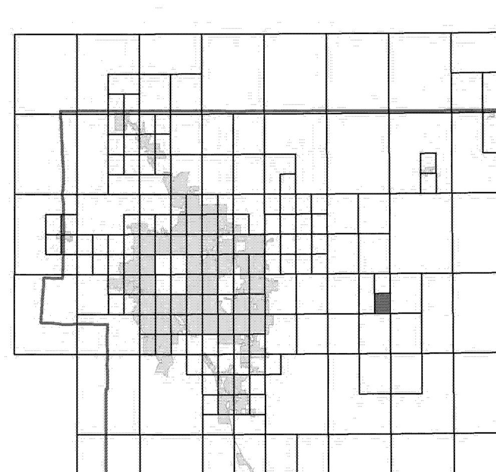
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 14 SOUTH, RANGE 62 WEST, AND TOWNSHIP 14 SOUTH, RANGE 63 WEST.

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D Boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~ Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

(A)——(A) Cross section line
(23)--------(23) Transect line
97° 07' 30.00" / 32° 22' 30.00" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
$^{42}75^{000m}$N 1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0809G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 809 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

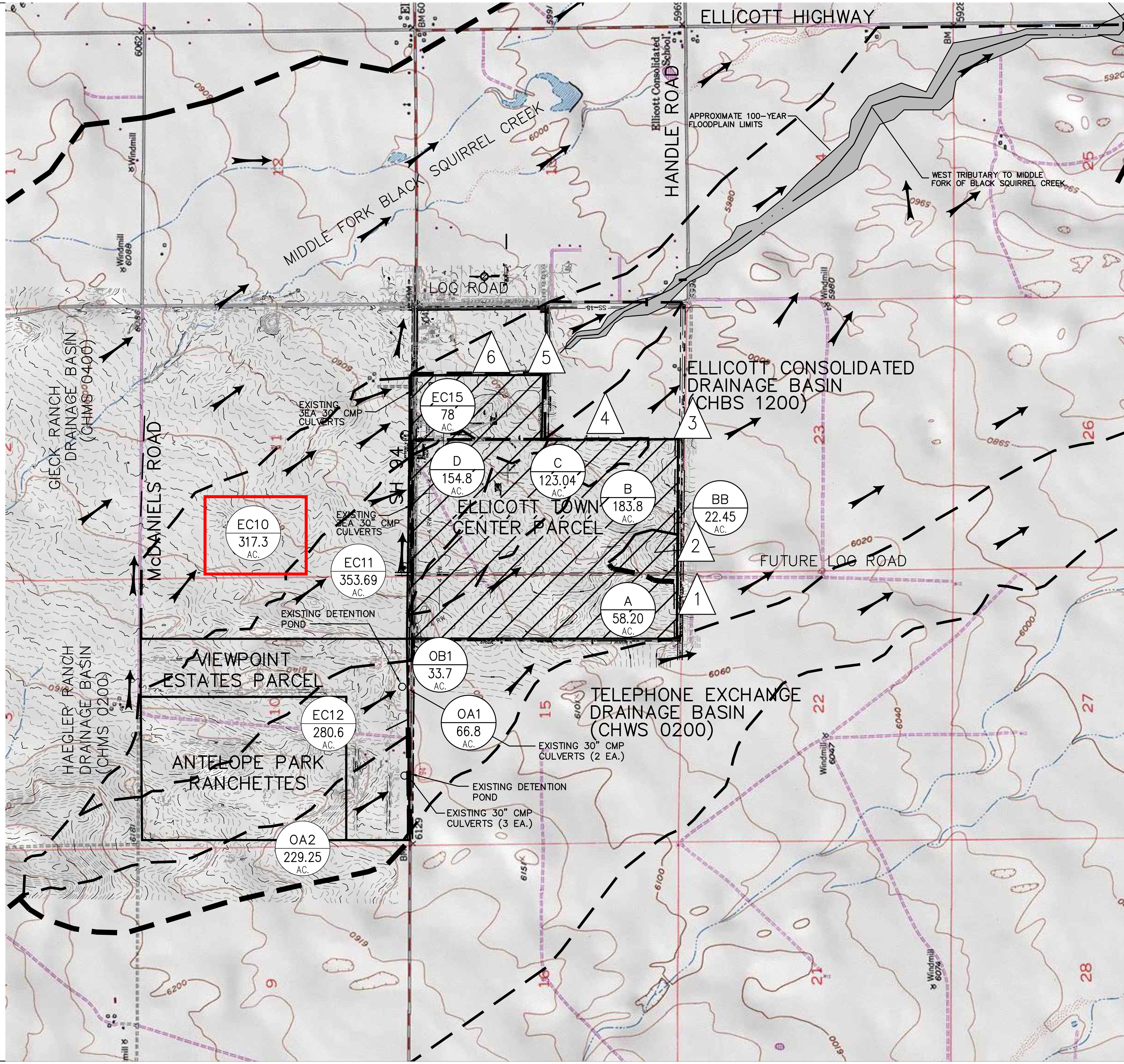
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0809	G

Notice to User: The **Map Number** shown below should be used when placing map orders: the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0809G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency



SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
1	4.9	34.4
2	11.3	28.0
3	8.7	60.8
4	5.5	42.2
(REFER TO MDDP)		
5	30.6	174.9
6	19.1	111.4

LEGEND

OD1 296 AC. — DRAINAGE BASIN AREA (AC)

5 — DESIGN POINT

MAJOR BASIN LINE

BASIN LINE

ORIGINAL SCALE: 1"=1000'

1000 0 1000 2000

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
john@jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

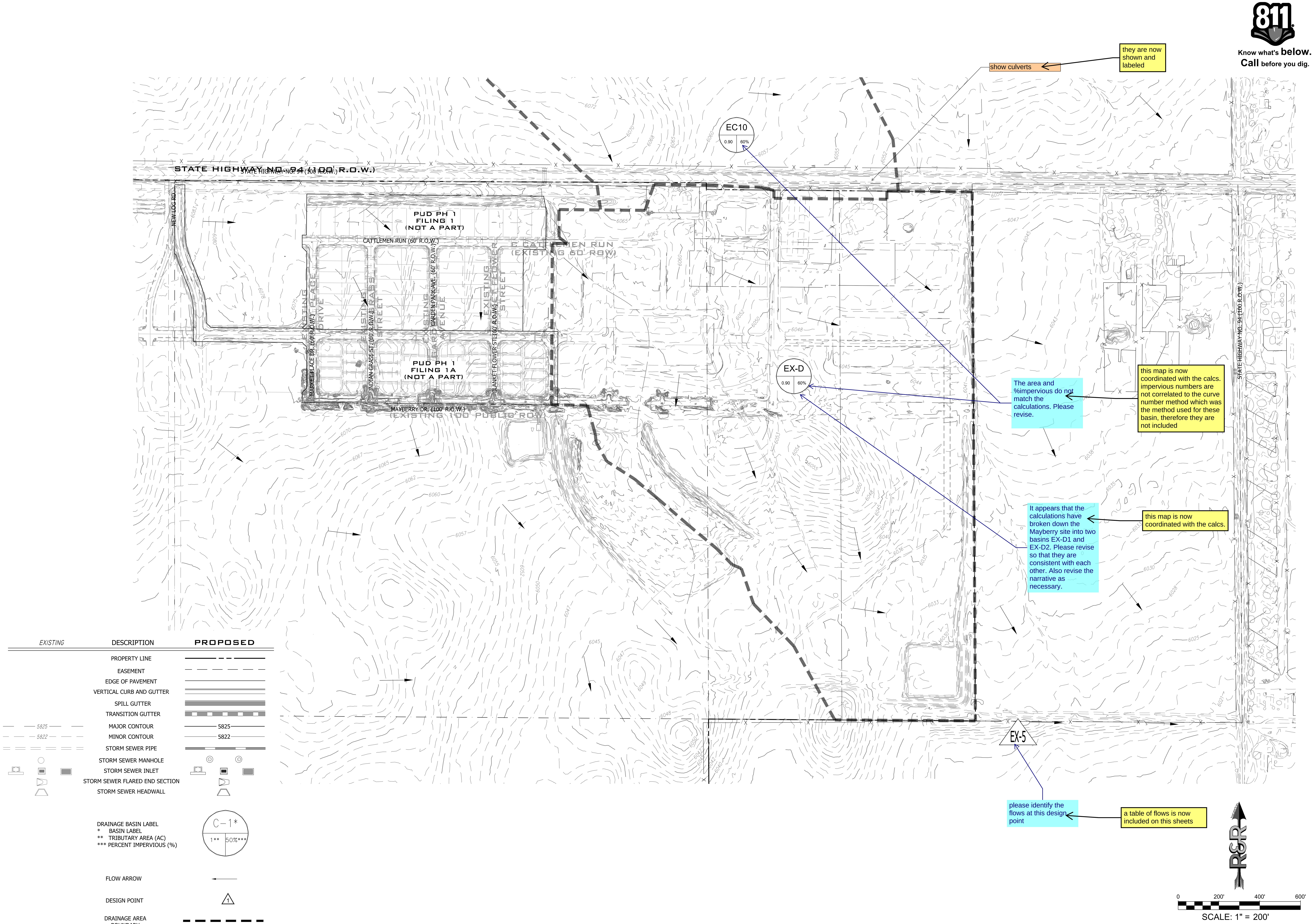
No.	REVISION	BY	DATE

ELLICOTT TOWN CENTER

MAJOR BASIN / HISTORIC DRAINAGE PLAN

HORZ. SCALE:	1"=1000'	DRAWN:	MJP
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	UP&E	CHECKED:	JPS
CREATED:	12/3/00	LAST MODIFIED:	9/12/19
PROJECT NO:	090001	MODIFIED BY:	BJJ
SHEET:		EX1	

Z:\090001.EllicottTC\dwg\Civil\EX1 - F1.dwg Sep 16, 2019 - 8:26am



NO.	REVISION	BY	DATE

R&R ENGINEERS SURVEYORS INC

R&R ENGINEERS-SURVEYORS, INC.
1635 WEST 13TH AVENUE, SUITE 310
DENVER, COLORADO 80204
PHONE: 303-753-6730
WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS
EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC
3296 DEVINE HEIGHTS #208
COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

JOB NO. MC22110
ORG. SUBM. DATE 06/16/2022
DWN: LAO CHKD: CJD
NAME

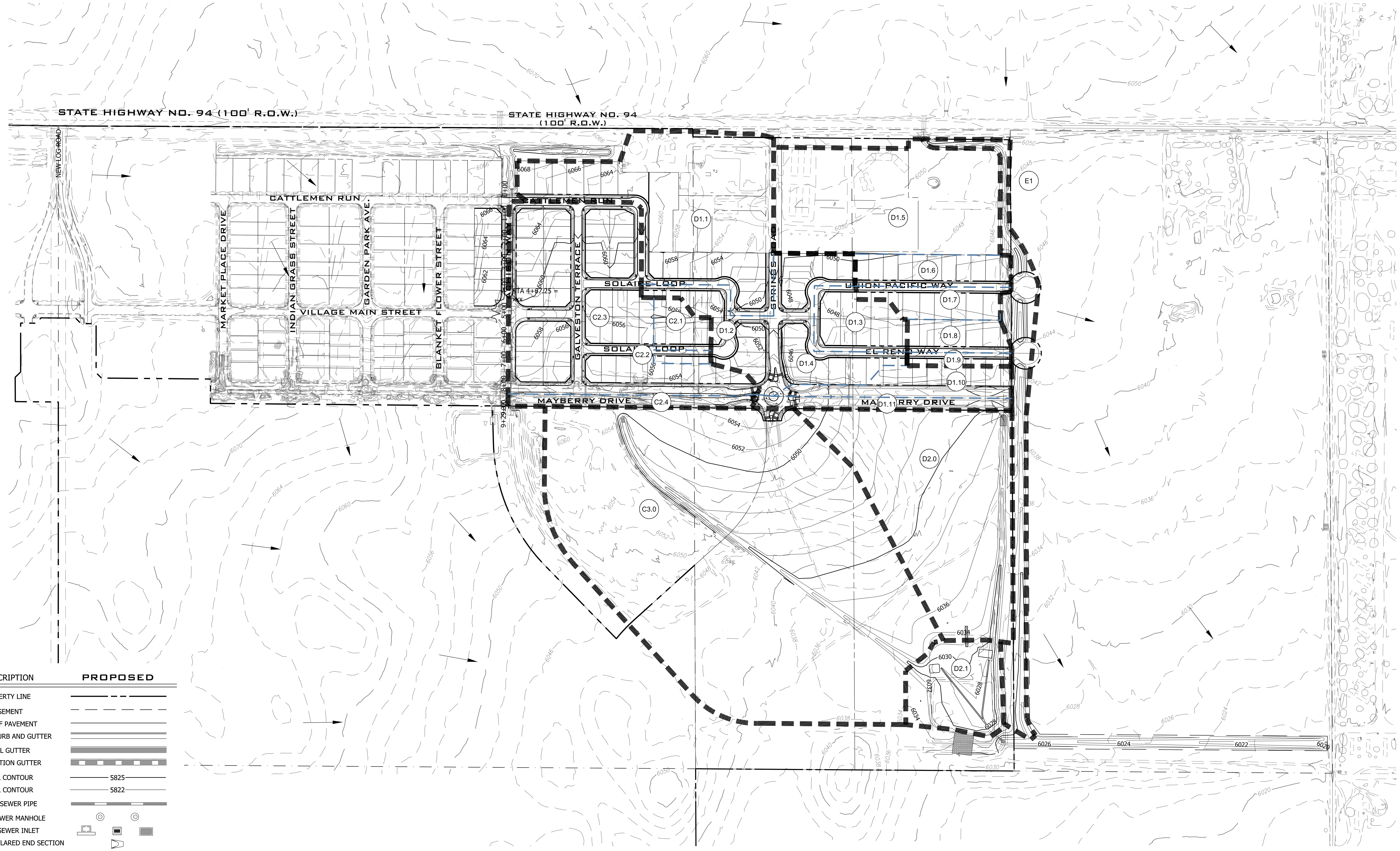
FILING 3 HISTORIC DRAINAGE PLAN

NO. EX2

PATH: \\192.168.100.23\PROJECTS\MC22110 MAYBERRY FILING NO. 3\ENGINEERING\4 DRAWINGS\PLANS\DRAINAGE MAPS\MC22110-XE-DRNG MAP — DWG. PLOT DATE 8/29/2022 10:06:33 AM BY: LIZ JONES

CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERSN & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

811. Know what's **below.** **Call** before you dig.



EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	STORM SEWER MANHOLE	
	STORM SEWER INLET	
	STORM SEWER FLARED END SECTION	
	STORM SEWER HEADWALL	

DRAINAGE BASIN LABEL
* BASIN LABEL
** TRIBUTARY AREA (AC)
*** PERCENT IMPERVIOUS (%)

C-1* / ** 50%***

FLOW ARROW

DESIGN POINT

DRAINAGE AREA BOUNDARY

0 200' 400' 600'
SCALE: 1" = 200'

NO.	REVISION	BY	DATE

R&R ENGINEERS SURVEYORS INC

R&R ENGINEERS-SURVEYORS, INC.
1635 WEST 13TH AVENUE, SUITE 310
DENVER, COLORADO 80204
PHONE: 303-753-6730
WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3

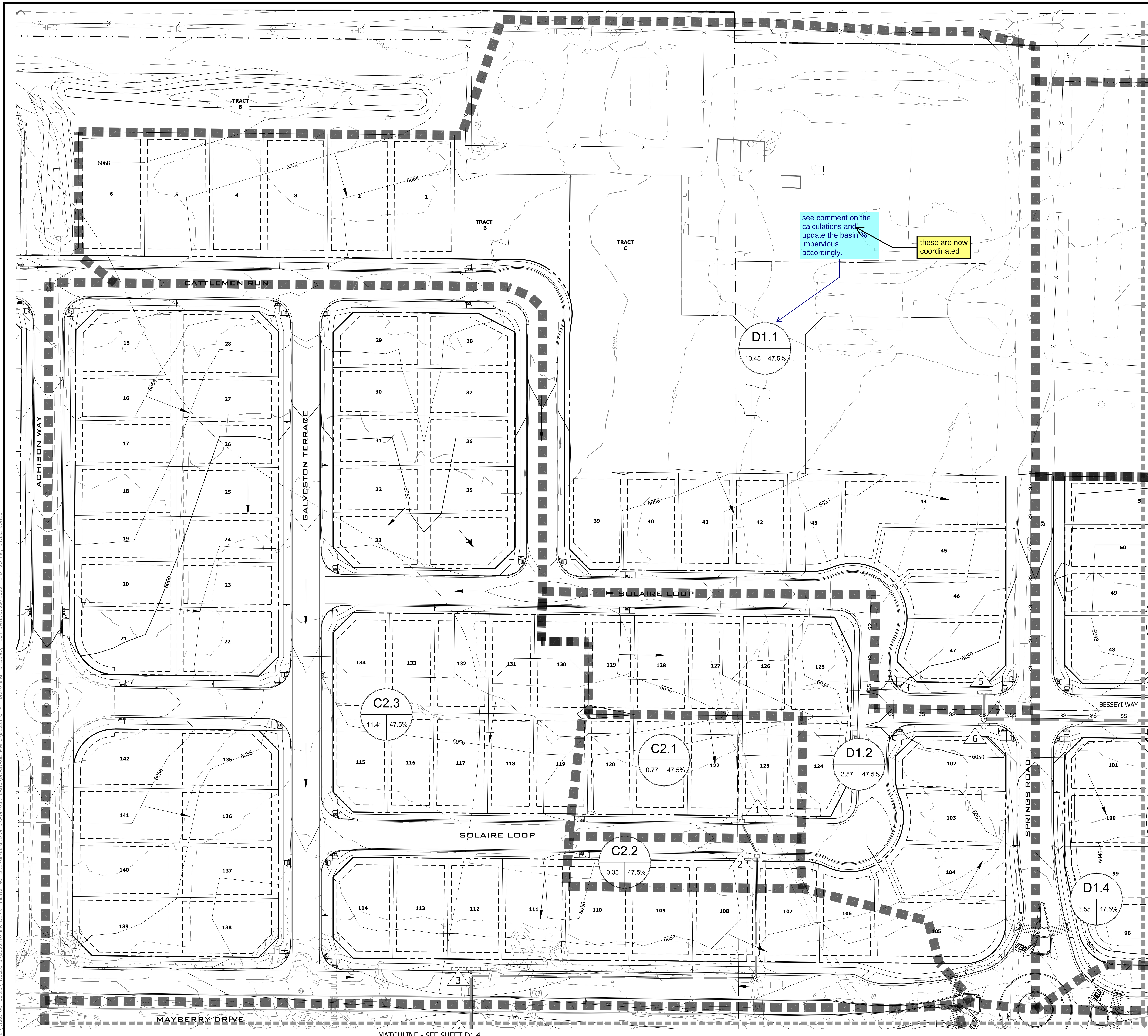
SITE ADDRESS: MAYBERRY, COLORADO SPRINGS EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC 3296 DEVINE HEIGHTS #208 COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

JOB NO.	MC22110
ORG. SUBM. DATE	06/16/2022
DWN: LAO	CHKD: CJD
NAME	OVERALL FILING 3 PROPOSED DRAINAGE PLAN
NO.	D1.1

PATH: \\192.168.100.23\PROJECTS\MC22110 MAYBERRY FILING NO. 3\ENGINEERING\4 DRAWINGS\PLANS\DRAINAGE MAPS\MC22110-XP-DRNG MAP.DWG PLOT DATE 8/29/2022 12:01:16 PM BY: LIZ JONES



CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERSN & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

811. Know what's **below.** **Call** before you dig.

? — revised

Please label all storm sewers, culverts, inlets, manholes on the drainage plan (size and type) — labels have been added

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	STORM SEWER MANHOLE	
	STORM SEWER INLET	
	STORM SEWER FLARED END SECTION	
	STORM SEWER HEADWALL	

DRAINAGE BASIN LABEL
* BASIN LABEL
** TRIBUTARY AREA (AC)
*** PERCENT IMPERVIOUS (%)

C-1* 1** 50%***

FLOW ARROW

DESIGN POINT

DRAINAGE AREA BOUNDARY

correct, this has been coordinated

I believe this should be C2.4 as DP3 already accounts for basin C2.4

MATCHLINE - SEE SHEET D1.3

DESIGN POINT SUMMARY TABLE

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	C2.1	0.8	1.1	2.7
2	DP1, C2.2	1.1	1.6	3.9
3	C2.3, DP2	12.5	14.5	35.3
4	C2.3, DP3	13.7	17.0	40.1
5	D1.1	10.5	11.6	28.4
6	D1.2	2.6	3.4	8.3
7	DP5, DP6	13.0	14.4	35.2
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	15.0	16.1	39.2
10	DP9, D1.4	18.6	19.8	48.4
11	EC10	317.30	15.3	110.9
12	D1.5	9.4	19.8	39.4
13	DP12, D1.6	11.3	22.1	45.1
14	DP13, D1.7	12.9	24.0	50.0
15	DP14, D1.8	14.2	25.2	52.9
16	DP15, D1.9	14.7	25.8	54.5
17	D1.10	2.12	3.3	8.0
18	D1.11, DP17, DP10	21.9	23.2	55.4
19	DP16, DP18	36.7	43.2	97.5
20	DP19, D2.0	48.6	49.6	116.0
21	DP4, C3.0	49.1	37.0	107.8
22	D2.1, DP20, DP21	100.8	90.1	235.1
23	POND D OUTFLOW		1.2	39.6
24	E1, DP11	321.93	15.4	111.80
25	DP23, DP24		16.6	151.40

BASIN SUMMARY TABLE

Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
C2.1	0.77	1.1	2.7
C2.2	0.33	0.6	1.4
C2.3	11.41	13.2	32.2
C2.4	1.16	4.1	7.8
C3.0	35.40	22.0	72.7
D1.1	10.45	11.6	28.4
D1.2	2.57	3.4	8.3
D1.3	2.02	3.1	7.5
D1.4	3.55	4.7	11.5
D1.5	9.37	19.8	39.4
D1.6	1.94	2.6	6.3
D1.7	1.56	2.1	5.0
D1.8	1.30	1.8	4.4
D1.9	0.54	0.9	2.1
D1.10	2.12	3.3	8.0
D1.11	1.23	4.0	7.7
D2.0	11.90	10.3	27.7
E1	4.63	0.4	3.3
D2.1	3.15	0.9	6.6
EC10	317.30	15.3	110.9

NORTH

0 50' 100' 150'

SCALE: 1" = 50'

NO. | REVISION | BY | DATE

R&R ENGINEERS-SURVEYORS, INC
R&R ENGINEERS-SURVEYORS, INC.
1635 WEST 13TH AVENUE, SUITE 310
DENVER, COLORADO 80204
PHONE: 303-753-6730
WWW.RRENGINEERS.COM

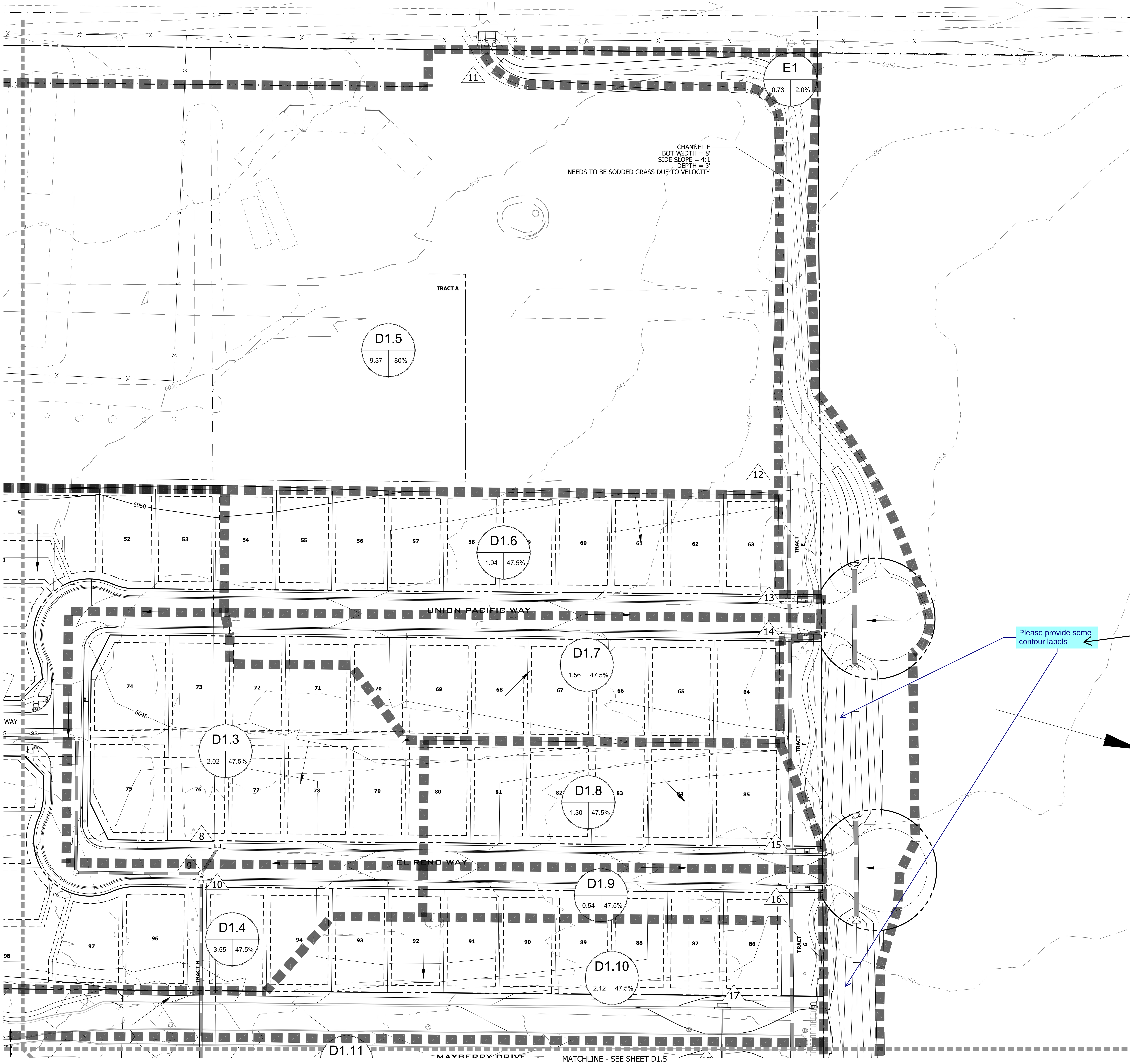
MAYBERRY PUD PH1 - FILING NO. 3

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS, EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC, 3296 DEVINE HEIGHTS #208, COLORADO SPRINGS, CO 80922

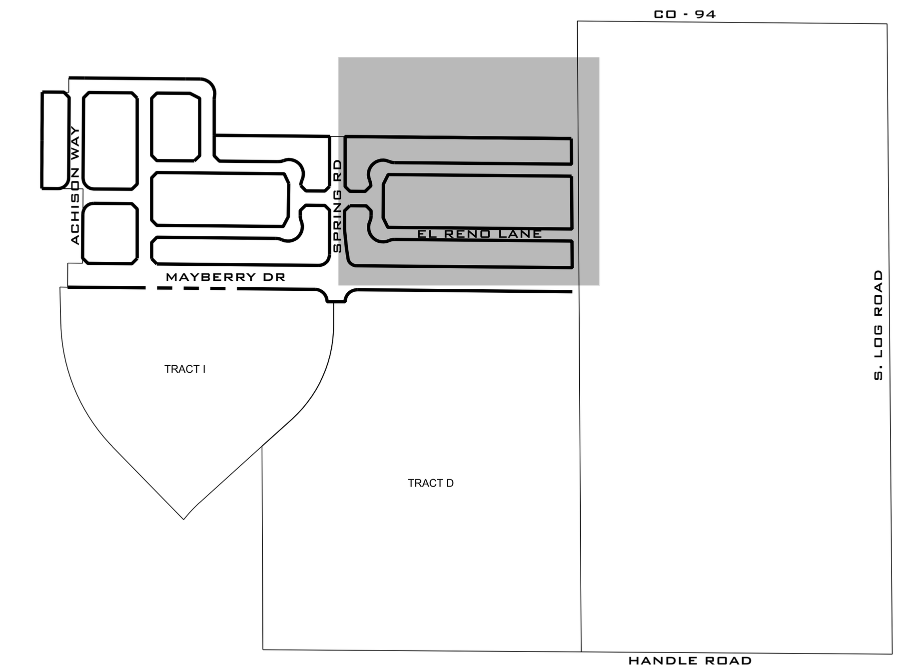
CONSTRUCTION DOCUMENTS

JOB NO.	MC22110
ORG. SUBM. DATE	06/16/2022
DWN: LAO	CHKD: CJD
NAME	FILING 3 DETAILED DRAINAGE PLAN - NORTH WEST
NO.	D1.2



CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERSN & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

811 Know what's **below.** **Call** before you dig.



KEY MAP
N.T.S.

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	STORM SEWER MANHOLE	
	STORM SEWER INLET	
	STORM SEWER FLARED END SECTION	
	STORM SEWER HEADWALL	

DRAINAGE BASIN LABEL
* BASIN LABEL
** TRIBUTARY AREA (AC)
*** PERCENT IMPERVIOUS (%)
C-1* / 1** / 50%***

FLOW ARROW

DESIGN POINT

DRAINAGE AREA BOUNDARY

DESIGN POINT SUMMARY TABLE

Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
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4	C2.3, DP3	13.7	17.0	40.1
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6	D1.2	2.6	3.4	8.3
7	DP5, DP6	13.0	14.4	35.2
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	15.0	16.1	39.2
10	DP9, D1.4	18.6	19.8	48.4
11	EC10	317.30	15.3	110.9
12	D1.5	9.4	19.8	39.4
13	DP12, D1.6	11.3	22.1	45.1
14	DP13, D1.7	12.9	24.0	50.0
15	DP14, D1.8	14.2	25.2	52.9
16	DP15, D1.9	14.7	25.8	54.5
17	D1.10	2.12	3.3	8.0
18	D1.11, DP17, DP10	21.9	23.2	55.4
19	DP16, DP18	36.7	43.2	97.5
20	DP19, D2.0	48.6	49.6	116.0
21	DP4, C3.0	49.1	37.0	107.8
22	D2.1, DP20, DP21	100.8	90.1	235.1
23	POND D OUTFLOW		1.2	39.6
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25	DP23, DP24		16.6	151.40

BASIN SUMMARY TABLE

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D1.1	10.45	11.6	28.4
D1.2	2.57	3.4	8.3
D1.3	2.02	3.1	7.5
D1.4	3.55	4.7	11.5
D1.5	9.37	19.8	39.4
D1.6	1.94	2.6	6.3
D1.7	1.56	2.1	5.0
D1.8	1.30	1.8	4.4
D1.9	0.54	0.9	2.1
D1.10	2.12	3.3	8.0
D1.11	1.23	4.0	7.7
D2.0	11.90	10.3	27.7
E1	4.63	0.4	3.3
D2.1	3.15	0.9	6.6
EC10	317.30	15.3	110.9

NORTH

0 50' 100' 150'
SCALE: 1" = 50'

NO. | REVISION | BY | DATE

R&R ENGINEERS-SURVEYORS, INC.
1635 WEST 13TH AVENUE, SUITE 310
DENVER, COLORADO 80204
PHONE: 303-753-6730
WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3

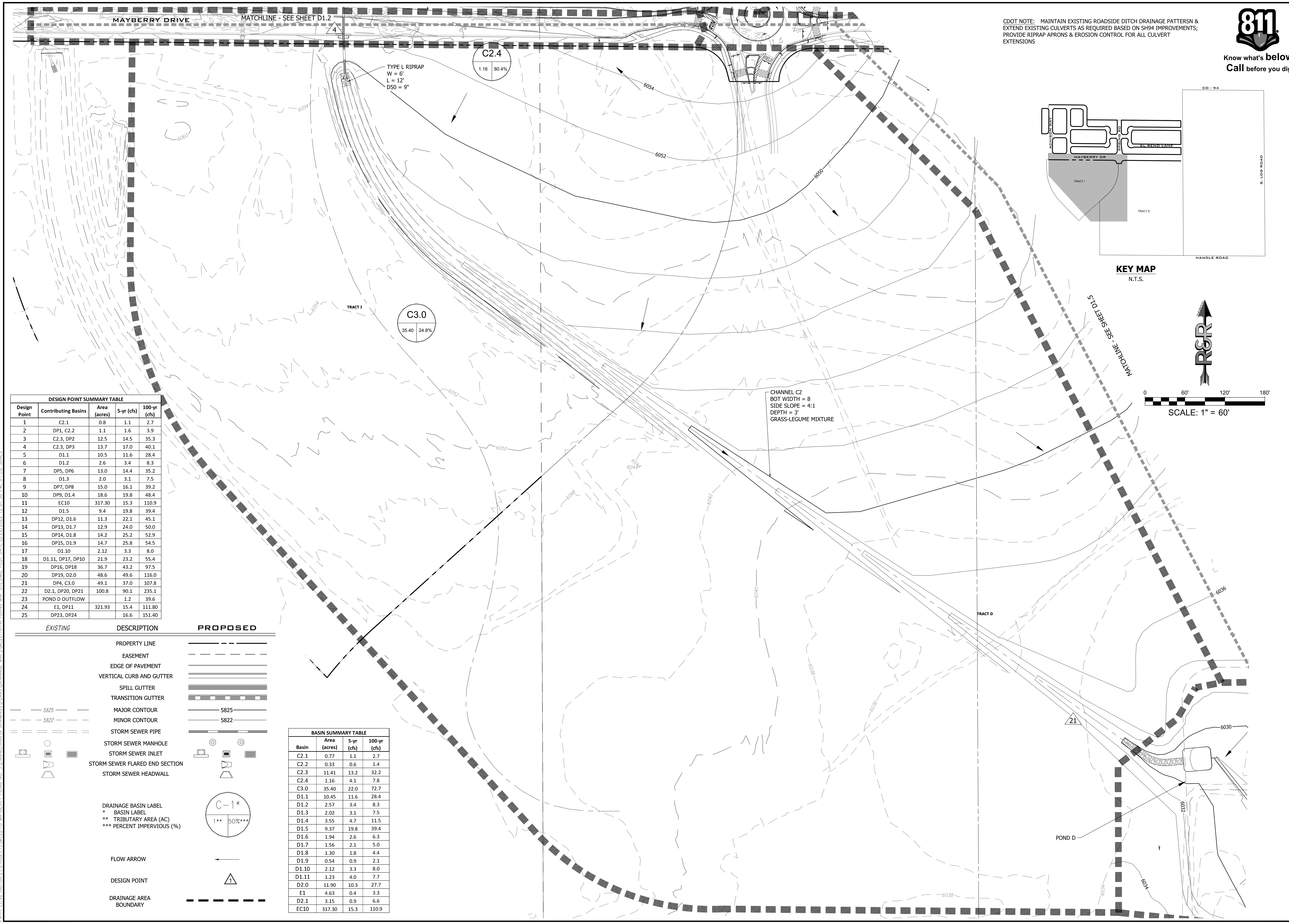
SITE ADDRESS: MAYBERRY, COLORADO SPRINGS, EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC, 3296 DEVINE HEIGHTS #208, COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

JOB NO. MC22110
ORG. SUBM. DATE 06/16/2022
DWN: LAO CHKD: CJD
NAME: FILING 3 DETAILED DRAINAGE PLAN - NORTH EAST
NO. D1.3

PATH: \\192.168.100.23\PROJECTS\MC22110 MAYBERRY FILING NO. 3\ENGINEERING\4 DRAWINGS\PLANS\DRAINAGE MAPS\MC22110-XP-DRNG MAP DTL.DWG PLOT DATE 8/29/2022 12:01:29 PM BY: LIZ JONES



DESIGN POINT SUMMARY TABLE				
Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	C2.1	0.8	1.1	2.7
2	DP1, C2.2	1.1	1.6	3.9
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4	C2.3, DP3	13.7	17.0	40.1
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6	D1.2	2.6	3.4	8.3
7	DP5, DP6	13.0	14.4	35.2
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	15.0	16.1	39.2
10	DP9, D1.4	18.6	19.8	48.4
11	EC10	317.30	15.3	110.9
12	D1.5	9.4	19.8	39.4
13	DP12, D1.6	11.3	22.1	45.1
14	DP13, D1.7	12.9	24.0	50.0
15	DP14, D1.8	14.2	25.2	52.9
16	DP15, D1.9	14.7	25.8	54.5
17	D1.10	2.12	3.3	8.0
18	D1.11, DP17, DP10	21.9	23.2	55.4
19	DP16, DP18	36.7	43.2	97.5
20	DP19, D2.0	48.6	49.6	116.0
21	DP4, C3.0	49.1	37.0	107.8
22	D2.1, DP20, DP21	100.8	90.1	235.1
23	POND D OUTFLOW		1.2	39.6
24	E1, DP11	321.93	15.4	111.80
25	DP23, DP24		16.6	151.40

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	STORM SEWER MANHOLE	
	STORM SEWER INLET	
	STORM SEWER FLARED END SECTION	
	STORM SEWER HEADWALL	
	DRAINAGE BASIN LABEL * BASIN LABEL ** TRIBUTARY AREA (AC) *** PERCENT IMPERVIOUS (%)	C-1* / 1** / 50%***
	FLOW ARROW	
	DESIGN POINT	1
	DRAINAGE AREA BOUNDARY	

BASIN SUMMARY TABLE			
Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
C2.1	0.77	1.1	2.7
C2.2	0.33	0.6	1.4
C2.3	11.41	13.2	32.2
C2.4	1.16	4.1	7.8
C3.0	35.40	22.0	72.7
D1.1	10.45	11.6	28.4
D1.2	2.57	3.4	8.3
D1.3	2.02	3.1	7.5
D1.4	3.55	4.7	11.5
D1.5	9.37	19.8	39.4
D1.6	1.94	2.6	6.3
D1.7	1.56	2.1	5.0
D1.8	1.30	1.8	4.4
D1.9	0.54	0.9	2.1
D1.10	2.12	3.3	8.0
D1.11	1.23	4.0	7.7
D2.0	11.90	10.3	27.7
E1	4.63	0.4	3.3
D2.1	3.15	0.9	6.6
EC10	317.30	15.3	110.9

PATH: \\192.168.100.23\PROJECTS\MC22110 MAYBERRY FILING NO. 3\ENGINEERING\4 DRAWINGS\PLANS\DRAINAGE MAPS\MC22110-XP-DRNG MAP DTL.DWG, PLOT DATE: 8/29/2022 12:01:36 PM, BY: LIZ JONES

NO.	REVISION	BY	DATE

R&R ENGINEERS-SURVEYORS, INC.
1635 WEST 13TH AVENUE, SUITE 310
DENVER, COLORADO 80204
PHONE: 303-753-6730
WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS
EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC
3296 DEVINE HEIGHTS #208
COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

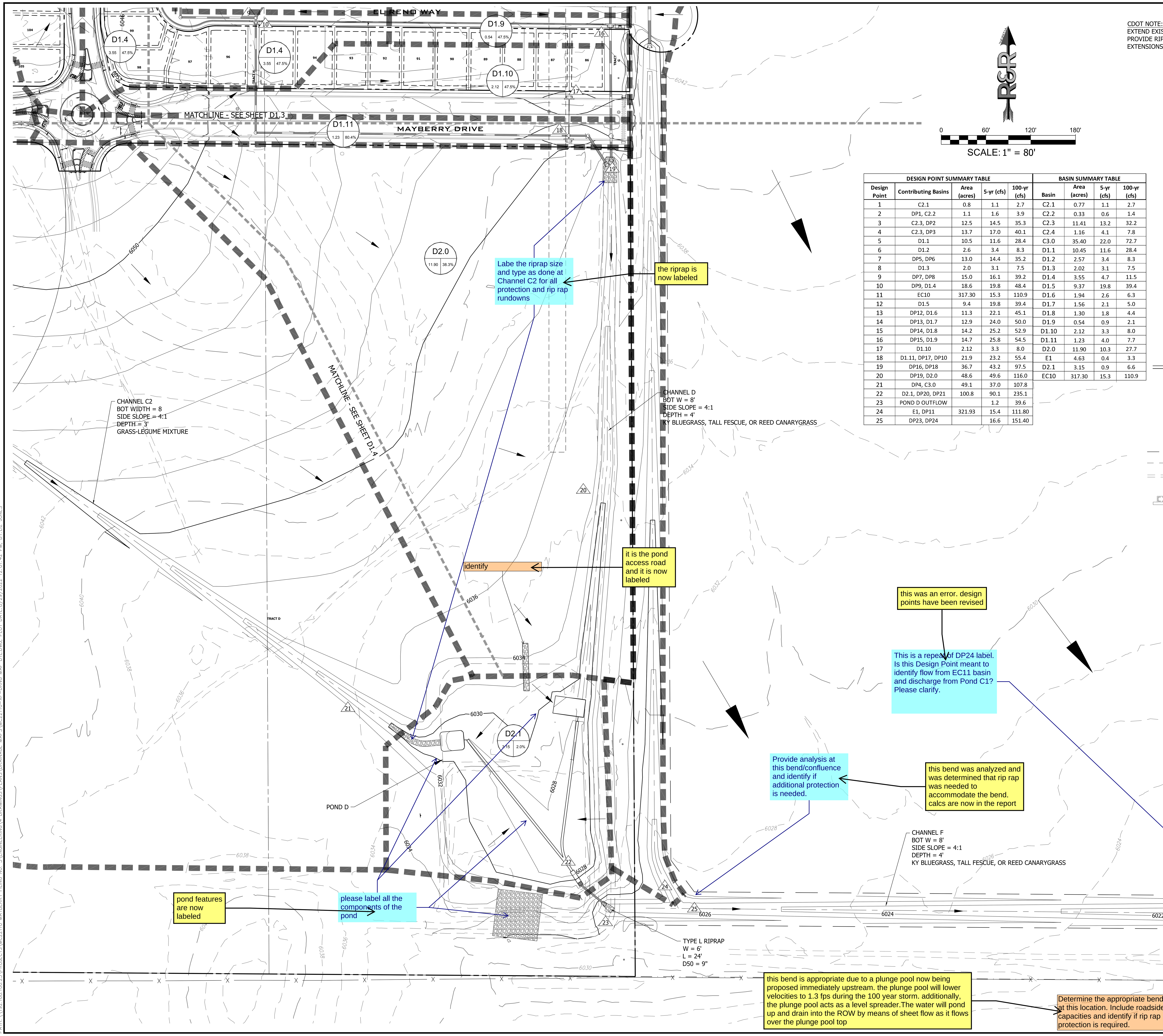
JOB NO. MC22110
ORG. SUBM. DATE 06/16/2022
DWN: LAO CHKD: CJD

NAME: FILING 3 DETAILED DRAINAGE PLAN - SOUTH WEST

NO. D1.4

CDOT NOTE: MAINTAIN EXISTING ROADSIDE DITCH DRAINAGE PATTERNS & EXTEND EXISTING CULVERTS AS REQUIRED BASED ON SH94 IMPROVEMENTS; PROVIDE RIPRAP APRONS & EROSION CONTROL FOR ALL CULVERT EXTENSIONS

811 Know what's **below.** **Call** before you dig.



0 60' 120' 180'

SCALE: 1" = 80'

DESIGN POINT SUMMARY TABLE				
Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	C2.1	0.8	1.1	2.7
2	DP1, C2.2	1.1	1.6	3.9
3	C2.3, DP2	12.5	14.5	35.3
4	C2.3, DP3	13.7	17.0	40.1
5	D1.1	10.5	11.6	28.4
6	D1.2	2.6	3.4	8.3
7	DP5, DP6	13.0	14.4	35.2
8	D1.3	2.0	3.1	7.5
9	DP7, DP8	15.0	16.1	39.2
10	DP9, D1.4	18.6	19.8	48.4
11	EC10	317.30	15.3	110.9
12	D1.5	9.4	19.8	39.4
13	DP12, D1.6	11.3	22.1	45.1
14	DP13, D1.7	12.9	24.0	50.0
15	DP14, D1.8	14.2	25.2	52.9
16	DP15, D1.9	14.7	25.8	54.5
17	D1.10	2.12	3.3	8.0
18	D1.11, DP17, DP10	21.9	23.2	55.4
19	DP16, DP18	36.7	43.2	97.5
20	DP19, D2.0	48.6	49.6	116.0
21	DP4, C3.0	49.1	37.0	107.8
22	D2.1, DP20, DP21	100.8	90.1	235.1
23	POND D OUTFLOW		1.2	39.6
24	E1, DP11	321.93	15.4	111.80
25	DP23, DP24		16.6	151.40

BASIN SUMMARY TABLE			
Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
C2.1	0.77	1.1	2.7
C2.2	0.33	0.6	1.4
C2.3	11.41	13.2	32.2
C2.4	1.16	4.1	7.8
C3.0	35.40	22.0	72.7
D1.1	10.45	11.6	28.4
D1.2	2.57	3.4	8.3
D1.3	2.02	3.1	7.5
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D2.1	3.15	0.9	6.6
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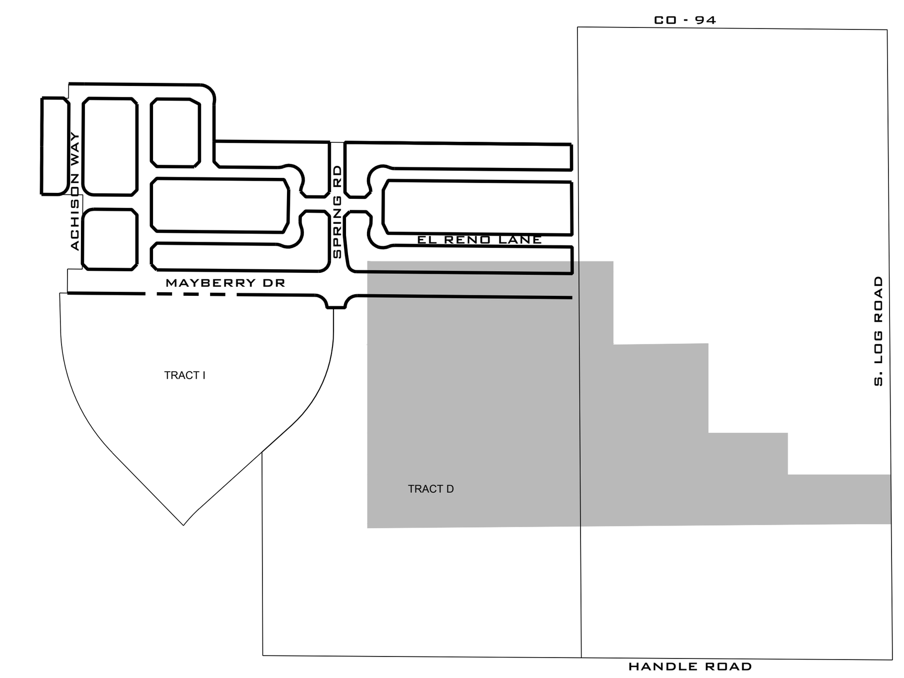

KEY MAP

N.T.S.

EXISTING	DESCRIPTION	PROPOSED
	PROPERTY LINE	
	EASEMENT	
	EDGE OF PAVEMENT	
	VERTICAL CURB AND GUTTER	
	SPILL GUTTER	
	TRANSITION GUTTER	
5825	MAJOR CONTOUR	5825
5822	MINOR CONTOUR	5822
	STORM SEWER PIPE	
	STORM SEWER MANHOLE	
	STORM SEWER INLET	
	STORM SEWER FLARED END SECTION	
	STORM SEWER HEADWALL	

DRAINAGE BASIN LABEL
* BASIN LABEL
** TRIBUTARY AREA (AC)
*** PERCENT IMPERVIOUS (%)
C-1* 1** 50%***

FLOW ARROW

DESIGN POINT

DRAINAGE AREA BOUNDARY

NO.	REVISION	BY	DATE

R&R ENGINEERS SURVEYORS INC

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1635 WEST 13TH AVENUE, SUITE 310
DENVER, COLORADO 80204
PHONE: 303-753-6730
WWW.RRENGINEERS.COM

MAYBERRY PUD PH1 - FILING NO. 3

SITE ADDRESS: MAYBERRY, COLORADO SPRINGS EL PASO COUNTY

PREPARED FOR: MAYBERRY COMMUNITIES, LLC 3296 DEVINE HEIGHTS #208 COLORADO SPRINGS, CO 80922

CONSTRUCTION DOCUMENTS

JOB NO. MC22110
ORG. SUBM. DATE 06/16/2022
DWN: LAO CHKD: CJD
NAME FILING 3 DETAILED DRAINAGE PLAN - SOUTH EAST
NO. D1.5