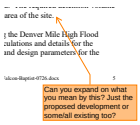
V3_Drainage Letter_COMMENTS.pdf Markup Summary

Glenn Reese - EPC Stormwater (6)



Subject: SW - Textbox with Arrow
Page Label: 8
Author: Glenn Reese - EPC Stormwater
Date: 8/11/2026 8:13:31 AM
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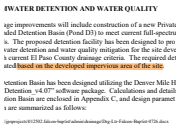
Can you expand on what you mean by this? Just the proposed development or some/all existing too?



Subject: SW - Highlight
Page Label: 8
Author: Glenn Reese - EPC Stormwater
Date: 8/11/2026 8:12:57 AM
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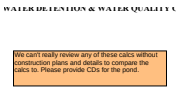
based on the developed impervious area of the site



Subject: SW - Textbox
Page Label: 13
Author: Glenn Reese - EPC Stormwater
Date: 8/11/2026 8:03:06 AM
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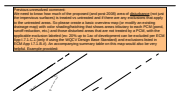
We can't really review any of these calcs without construction plans and details to compare the calcs to. Please provide CDs for the pond.



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Page Label: [1] D1
Author: Glenn Reese - EPC Stormwater
Date: 8/11/2026 8:01:05 AM
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Previous unresolved comment:
We need to know how much of the proposed (and post-2008) area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PCM (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PCM, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 (only if using the WQCV Design Base Standard) and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful. Example provided:

Subject: Image
Page Label: [1] D1
Author: Glenn Reese - EPC Stormwater
Date: 8/11/2026 8:00:52 AM
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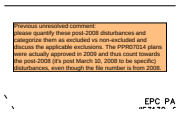

Subject: SW - Textbox
Page Label: [1] D1
Author: Glenn Reese - EPC Stormwater
Date: 8/11/2026 8:01:42 AM
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Previous unresolved comment:
please quantify these post-2008 disturbances and categorize them as excluded vs non-excluded and discuss the applicable exclusions. The PPR07014 plans were actually approved in 2009 and thus count towards the post-2008 (it's post March 10, 2008 to be specific) disturbances, even though the file number is from 2008.

eschoenheit (6)

Subject: Highlight
Page Label: 9
Author: eschoenheit
Date: 8/17/2026 4:21:41 PM
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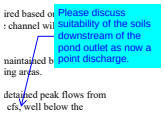

Subject: Callout
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Date: 8/17/2026 4:25:29 PM
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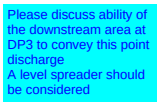
Please discuss suitability of the soils downstream of the pond outlet as now a point discharge.



Subject: Text Box
Page Label: 10
Author: eschoenheit
Date: 8/13/2026 4:53:08 PM
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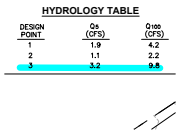
Please discuss ability of the downstream area at DP3 to convey this point discharge
A level spreader should be considered



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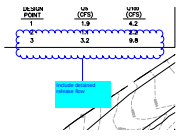

Subject: Cloud+
Page Label: [1] D1
Author: eschoenheit
Date: 8/17/2026 4:27:49 PM
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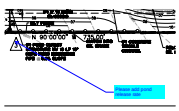
Include detained release flow



Subject: Callout
Page Label: [1] D1
Author: eschoenheit
Date: 8/17/2026 4:27:57 PM
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Please add pond release rate

DRAINAGE LETTER REPORT

for

FALCON BAPTIST CHURCH
11095 EGGAR DRIVE, PEYTON, CO 80831
LOT 1, HADDEN HEIGHTS

Prepared for:

High Way Baptist Church
11095 Eggar Drive
Peyton, CO 80831

July 7, 2025
Revised July 6, 2026

Prepared by:

19 E. Willamette Avenue
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

JPS Project No. 012502
PCD File No.: PPR2516

FALCON BAPTIST CHURCH – DRAINAGE LETTER REPORT
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DRAINAGE STATEMENT

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.

_____

John P. Schwab, P.E. #29891

Developer's Statement:

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

By:

_____

Printed Name: High Way Baptist Church Date
11095 Eggar Drive, Peyton, CO 80908

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.

_____

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

Conditions:

I. INTRODUCTION

A. Property Location and Description

Falcon Baptist Church (Owner) is planning to construct a building addition on the existing church site at 11095 Eggar Drive in the Falcon area of El Paso County, Colorado. The 5.1-acre property is described as Lot 1, Hadden Heights (EPC Parcel No. 53130-02-016).

The project consists of a proposed one-story building addition on the north, west, and south sides of the existing worship building ("Building A"), with associated parking and site improvements. The existing church campus includes three buildings, including the existing church worship building ("Building A"), a Youth Center ("Building B"), and the church office ("Building C"), with parking areas, a basketball court, and associated site improvements. Access to the site is provided by two existing driveway connections to Eggar Drive along the northwest boundary of the site. Eggar Drive is an existing gravel public road.

The property is zoned Rural Residential (RR-5).

The total anticipated land disturbance associated with the project is anticipated to be approximately 1.5 acres.

The site is located in the Sand Creek Drainage Basin, and surface drainage from this site sheet flows southwesterly to existing downstream drainage swales, ultimately flowing to the East Fork Sand Creek Sub-tributary, which drains to Sand Creek, and ultimately flows to Fountain Creek and the Arkansas River.

This report is intended to meet the requirements of a site-specific "Letter Type" drainage report in accordance with El Paso County subdivision drainage criteria.

B. Drainage Analysis Methods and Criteria

ITEM	DESCRIPTION	REFERENCE
Design Storm (initial/major)	5-year/100-year	CS/EPC DCM
Storm Runoff	Rational Method (Area<100acres)	CS/EPC DCM
Major Drainage Basin	Sand Creek	
Floodplain Impacts	Parcel is located outside any delineated FEMA floodplains	FIRM
Existing Downstream Facilities	Existing drainage swales flowing to East Fork Sand Creek Sub-tributary channel	

CS/EPC DCM = City of Colorado Springs & El Paso County Drainage Criteria Manual

C. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual (DCM)," revised October 31, 2018.

City of Colorado Springs "Drainage Criteria Manual, Volumes 1 and 2," revised October 31, 2018.

El Paso County "Engineering Criteria Manual," revised December 13, 2016.

FEMA, Flood Insurance Rate Map (FIRM) Number 08041C0575G, December 7, 2018.

Springs Engineering, "Falcon Baptist Church Final Drainage Letter," August, 2009 (approved by El Paso County 9/9/09).

II. EXISTING / PROPOSED DRAINAGE CONDITIONS

The site slopes downward to the south and southwest, with average grades of 1-5 percent.

Soils within the proposed warehouse site are classified by SCS as Type 8, "Blakeland loamy sand," and Type 95, "Truckton loamy sand" soils. These soils have high infiltration rates, rapid permeability, and low runoff potential. The soils are classified as hydrologic soils group A.

Hydrologic and hydraulic calculations for the site are detailed in the appendices (Appendix B and C), and peak flows are identified on Figure EX1 and D1 (Appendix D).

Subdivision Drainage Report

Drainage planning for this site was previously studied in the approved drainage report by Springs Engineering, entitled "Falcon Baptist Church Final Drainage Letter," dated August, 2009. At the time of the 2009 Drainage Letter, the church site was already developed with two buildings, parking areas, and associated site improvements, and the church was beginning construction of the current sanctuary building.

The previous Drainage Letter identifies the proposed sanctuary construction as "Phase 1," and the Drainage Plan shows a future parking lot along the east side of the property as "Phase 2." The Drainage Letter identifies a future Extended Detention Basin (EDB) to be constructed to meet water quality requirements for the ultimate development of the site. While the parking area currently proposed along the east side of the church building is smaller than envisioned in the 2009 Drainage Report, the proposed Extended Detention Basin will be constructed at this time.

Existing Drainage Conditions

As shown on the enclosed Existing Conditions Drainage Plan (Figure EX1, Appendix D), the site has been delineated as three existing drainage basins, consistent with the previously approved Final Drainage Letter.

The northwest edge of the site, which includes the existing west parking lot and the north side of the existing building on the west side of the property, has been delineated as existing Basin E-1 (1.38-acres). This basin flows southwesterly to the existing ditch along the east side of Eggar Drive. Existing peak flows from Basin E-1 (Design Point #1) are calculated as $Q_5 = 1.8$ cfs and $Q_{100} = 4.6$ cfs.

Basin E-2 (0.4-acres) comprises the southwest corner of the property, which also flows westerly to the existing ditch along the east side of Eggar Drive. Existing peak flows from Basin E-2 (Design Point #2) are calculated as $Q_5 = 1.1$ cfs and $Q_{100} = 2.2$ cfs.

The east side of the property has been delineated as Basin E-3 (3.29-acres), which flows south by sheet flow and drainage swales to an existing drainage swale at the south boundary of the property. Basin E-3 includes the existing Buildings A (Sanctuary) and Building C (church office) along with driveways, parking areas, and a basketball court. Existing peak flows from Basin E-3 (Design Point #3) are calculated as $Q_5 = 2.7$ cfs and $Q_{100} = 8.6$ cfs.

Developed Drainage Conditions

Developed drainage flows have been calculated based on the impervious areas associated with the proposed building and parking improvements. Surface drainage swales will continue to convey flows to the existing downstream drainage ditches and swales along the boundaries of the property.

The scope of this project consists of a one-story building addition along the north, west, and south sides of the existing sanctuary building, with associated parking and site improvements. The proposed building addition will add 3,213 square-feet to the existing 3,200 square-foot sanctuary building.

Recognizing that the existing drainage conditions along the north and west faces of the existing Building A provide less than adequate positive drainage away from the building, a new drainage swale will graded to provide an improved drainage path around the north and east sides of the building. The proposed drainage swale will extend southeasterly around the building area, connecting to the existing drainage swale at the south boundary of the site (Basin D-3).

Basin D-1

The northwest edge of the property (Basin D-1; 1.03-acres) will continue to flow southwesterly to the existing ditch along the east side of Eggar Drive. Developed peak

flows from Basin D-1 (Design Point #1) are calculated as Q_5 = 1.9 cfs and Q_{100} = 4.2 cfs. The proposed Drainage Swale around the north and ease sides of Building A will result in a reduction in the size of Basin D-1. As a result, the developed flows at Design Point #1 have a calculated reduction in comparison to existing conditions.

Basin D-2

Basin D-2 (0.4-acres) at the southwest corner of the property will continue to flow westerly to the existing ditch along the east side of Eggar Drive. Developed peak flows from Basin E-2 (Design Point #2) are calculated as Q_5 = 1.1 cfs and Q_{100} = 2.2 cfs (no change in comparison to existing conditions).

Basin D-3

The east side of the property (Basin D-3; 3.67-acres) will continue to flow southerly to the existing swale at the south boundary of the site. Developed peak flows from Basin D-3 (Design Point #3) are calculated as Q_5 = 3.2 cfs and Q_{100} = 9.8 cfs (minimal 100-year flow increase of 1.2 cfs compared to existing conditions). The calculated flows at Design Point #3 remain below the "Existing Conditions" flows for Basin E-3 in the previously approved Final Drainage Letter for the site (Q_5 = 8.6 cfs and Q_{100} = 16.5 cfs).

In accordance with the previously approved Final Drainage Letter, the proposed improvements in the easterly part of the site (east side of Basin D-3) would be expected to trigger the requirement for construction of the Water Quality Basin planned in the original site drainage report.

Developed flows from Basin D-3 will drain southerly into the proposed private Full-Spectrum Detention Pond D3 along the south boundary of the property. Detention Pond D3 has been designed to provide stormwater detention and water quality for mitigation of developed drainage impacts.

III. 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 ECM Appendix I.7., 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:

Step 1: Employ Runoff Reduction Practices

- Grass Swale: A grass-lined drainage swale has been designed along the east side of the building area to encourage stormwater infiltration and help reduce runoff from the site.
- Extended Detention Basin: Developed flows from the site will be routed through the proposed on-site detention basin, which will be grass-lined to encourage stormwater infiltration.

Step 2: Stabilize Drainageways

- There are no major drainageways within this project site. Implementation of the proposed on-site drainage improvements and detention basin will minimize downstream drainage impacts from this site.

Step 3: Provide Water Quality Capture Volume (WQCV)

- EDB: The developed site will drain through an on-site Private Extended Detention Basin (Pond D3) at the south boundary of the property. The extended detention basin which will capture and slowly release the WQCV over an extended release period.

Step 4: Consider Need for Industrial and Commercial Control Measures

- The property owner will implement a Stormwater Management Plan including proper housekeeping practices and spill containment procedures.
- On-site drainage will be routed through the Full-Spectrum Extended Detention Basin (Pond D3) to minimize introduction of contaminants to the downstream drainage system.

IV. FLOODPLAIN IMPACTS

According to the FEMA floodplain map for this area, El Paso County FIRM Panel No. 08041C0575G, dated December 7, 2018, the site is located beyond the limits of any delineated 100-year floodplains.

V. STORMWATER DETENTION AND WATER QUALITY

Proposed drainage improvements will include construction of a new Private Full-Spectrum Extended Detention Basin (Pond D3) to meet current full-spectrum detention design standards. The proposed detention facility has been designed to provide the required stormwater detention and water quality mitigation for the site development in accordance with current El Paso County drainage criteria. The required detention volume has been calculated based on the developed impervious area of the site.

The proposed Detention Basin has been designed utilizing the Denver Mile High Flood District's "MH-Detention_v4.07" software package. Calculations and details for the proposed Detention Basin are enclosed in Appendix C, and design parameters for the Detention Basin are summarized as follows:

Can you expand on what you mean by this? Just the proposed development or some/all existing too?

Detention Basin	Tributary Drainage Basins	Tributary Area (ac)	Impervious Percentage	Min. 100-Yr FSD Vol. (af)	Design Volume (af)
D3	D-3	3.67	22.3	0.16	0.18

The proposed on-site Full-Spectrum Detention Pond D3 provides a storage volume of 0.18 acre-feet, which meets the required 100-year detention and WQCV volume.

The proposed detention pond will include an outlet structure with a water quality orifice plate to maintain discharges below the allowable release rates. The pond outlet structure has been designed for a 40-hour release of the WQCV, and outlet structure sizing to maintain maximum allowable release rates from the pond. The detention pond will have a grass-lined bottom to encourage infiltration of stormwater prior to discharging into the downstream drainage system.

Based on the calculations in Appendix C, a forebay is not required based on flows entering the proposed detention pond. A concrete trickle channel will along the bottom of the pond.

Please discuss suitability of the soils downstream of the pond outlet as now a point discharge.

The new on-site Detention Basin will be privately owned and maintained by owner, and maintenance access will be provided from the parking areas.

As detailed in the detention basin calculations in Appendix C, detained peak flows from at Design Point #3 are calculated as $Q_5 = 0.0$ cfs and $Q_{100} = 2.0$ cfs, well below the calculated historic flows.

The estimated cost for the proposed private detention facilities is approximately $15,855 (see estimate in Appendix C).

VI. PUBLIC IMPROVEMENTS / DRAINAGE BASIN FEES

No public drainage improvements are required or proposed for this project.

The site lies completely within the Sand Creek Drainage Basin. Applicable drainage basin fees were paid at the time of platting, so no drainage basin fees or bridge fees are applicable at this time.

VII. SUMMARY

The developed drainage patterns for the proposed Falcon Baptist Church Building Addition project will remain consistent with the established drainage plan for this site. Developed flows from the site development area will drain through a Private Full-Spectrum Detention Pond along the south boundary of the property prior to discharging to the existing downstream drainage swale.

The existing grass-lined drainage swale downstream of the proposed detention pond outlet pipe and spillway (south boundary of the property) is in stable, well-vegetated condition, and the existing swale serves as a suitable drainage outfall.

The proposed on-site Detention Pond has been designed to provide both stormwater detention and water quality requirements for the site in accordance with El Paso County Drainage Criteria Manual standards. Construction and proper maintenance of the on-site drainage facilities and Extended Detention Basin, in conjunction with proper erosion control practices, will ensure that this developed site has no significant adverse drainage impact on downstream or surrounding areas.

Please discuss ability of the downstream area at DP3 to convey this point discharge
A level spreader should be considered

APPENDIX A

EXCERPTS FROM PREVIOUS DRAINAGE REPORT

Falcon Baptist Church
FINAL DRAINAGE LETTER
El Paso County, Colorado
August, 2009

Prepared for:

Falcon Baptist Church
11095 Eggar Drive
Peyton, Colorado 80831

Prepared by:

Springs Engineering
25 N Tejon Street
Suite 200
Colorado Springs, CO 80903
Phone: 719-227-7388

Project No. 0076

VERSION: 6
DATE: 8-25-09

Flow from O-2 combine with developed Basin D5 and discharge through the proposed Extended Detention Basin (EDB). The EDB will discharge at Design Point 4. Flows from this basin are 10.0 and 23.3 cfs for the 5 and 100 year storms.

This property can be further characterized by 3 on-site existing basins:

Eggar Drive is a rural roadway with a 15' asphalt mat. There are roadside ditches along both sides of the road. The ditch is grass lined with a parabolic shape, 6(h) to 1(v) side slopes adjacent to the road and 4(h) to 1(v) side slopes on the backslope. The grade of the ditch runs parallel with Eggar Drive, ranging from approximately 2% to 4.5%. The ditch appears to be in good condition; however, some sediment is evident in the channel bottom. At the south entrance of the church, there is an existing 18" corrugated metal pipe (cmp), which allows the flow to cross under the driveway and continue along Eggar Drive to the south, to the intersection of Garrett Road.

Basin E-1 is 2.1 acres and generates 7.0 cfs and 13.9 cfs for the 5-year and 100-year storms. This is the portion of the site, which flows towards the west and releases into the roadside ditch along Eggar Drive. The basin contains the majority of the sanctuary building, including some paved parking and sidewalks. This flow will combine with Basin E-2, and exit the site at Design Point 1.

Basin E-2, which is 0.4 acres, generates 1.6 cfs and 2.9 cfs for the 5 and 100-year storms. This area is a strip of land along the south boundary line and flows towards the west. The runoff from this basin is directed towards the roadside ditch in Eggar Drive, via a shallow riprap v-ditch. This basin combines with Basin E-1 in the roadside ditch prior to exiting the site.

Basin E-3 is 3.3 acres and generates 8.6 cfs and 16.5 cfs for each of the 5 and 100-year storms. This basin contains church offices/classroom building, along with the basketball and volleyball courts, plays areas and open space. The runoff from this basin flows towards the south through a wide shallow parabolic grass lined swale. The flow exits the site at approximately the mid point of the south property line, where it continues towards the south.

PHASING

The church sanctuary is proposed to be constructed in Phase 1 while the detention facility for the site will be constructed in Phase 2. The sanctuary will be constructed in the northwest corner of Basin E-3 as described above. The runoff from basin E-3 discharges along its historic path to the south at Design Point 2.

The construction of the sanctuary will create an impervious area of approximately 3,600 square feet that includes roof top and sidewalk. The sanctuary construction requires the removal of an existing paved surface currently used as a basketball court. The paved surface is approximately 2,350 square feet. The additional impervious surface created by the sanctuary construction is approximately 1,250 square feet.

the south. There has been a slight increase in flows at this discharge point. The runoff has increased from 16.3 cfs to 17.0 cfs. The existing ditch is able to handle the increase, and the increase is less than 5%.

Basin D4 is 0.70 acres, generates 2.2/4.0 cfs, and consists of existing pavement and structures. There are no new structures included in Basin D4. Basin D4 slopes to the south along existing drainage patterns and discharges onto the adjacent property to the south at an existing swale.

Basin D5, which is the remainder of the site, includes new structures new asphalt drives and parking and new gravel overflow parking and open spaces. The water quality pond will also be located within this basin. The basin is 2.78 acres and generates 8.7/16.2 cfs. Basin D5 is the only developed basin that contributes to the proposed EDB located at the southeast corner of the site.

The runoff captured by the EDB consists of runoff from Basin D5 and O-2. Flows from basin O-2 do not contribute to the size of the pond but are passed through. Design Point 4 is located along the property line to the south and is the historic discharge point for the site. Flows from Basin D4 and the EDB will discharge at this location. Historically, flow of 15.7 and 34.3 cfs are discharged at this location. After construction of the EDB and full development of the site, the release rate at this point will be 15.0 and 29.5 cfs which are slightly lower than the historic flows at this point.

WATER QUALITY:

There will be an Extended Detention Basin (EDB/Sedimentation Facility) along the south boundary line just east of the driveway. This will be designed to capture the first 0.18 watershed inches of runoff, which equates to about 0.59 acre-feet. This is the minimum required volume for 2.8 acres with 50% imperviousness. This is based on Basin D5 only contributing to the pond. This pond will be 3.7 feet deep with 3:1 sides for easy maintenance. This EDB will contain a 12-inch diameter HDPE pipe for the 5-year release. This simple design is easy for the owner to maintain. Maintenance is more likely when the procedure is easy and fast. The primary overflow for the major storm is a 6' broad-crested weir (0.9' deep). This will pass the Q100 storm. This weir is comprised of buried 6-inch riprap. Emergency overflows will overtop the EDB. The weir will be at the south side of the pond and the outlet structure will located at the southeast corner of the pond and will release into a small swale that will direct the flow to the existing low point along the south boundary at Design Point 4. This will allow the runoff to release and follow existing channels.

EROSION CONTROL

During construction, best management practices for erosion control will be employed based on the City of Colorado Springs/El Paso County Drainage Criteria and Volume II (the Erosion Control Manual) and the erosion control plans. The proposed water control facility will act as a sedimentation pond during the construction process. When construction is complete, this pond is

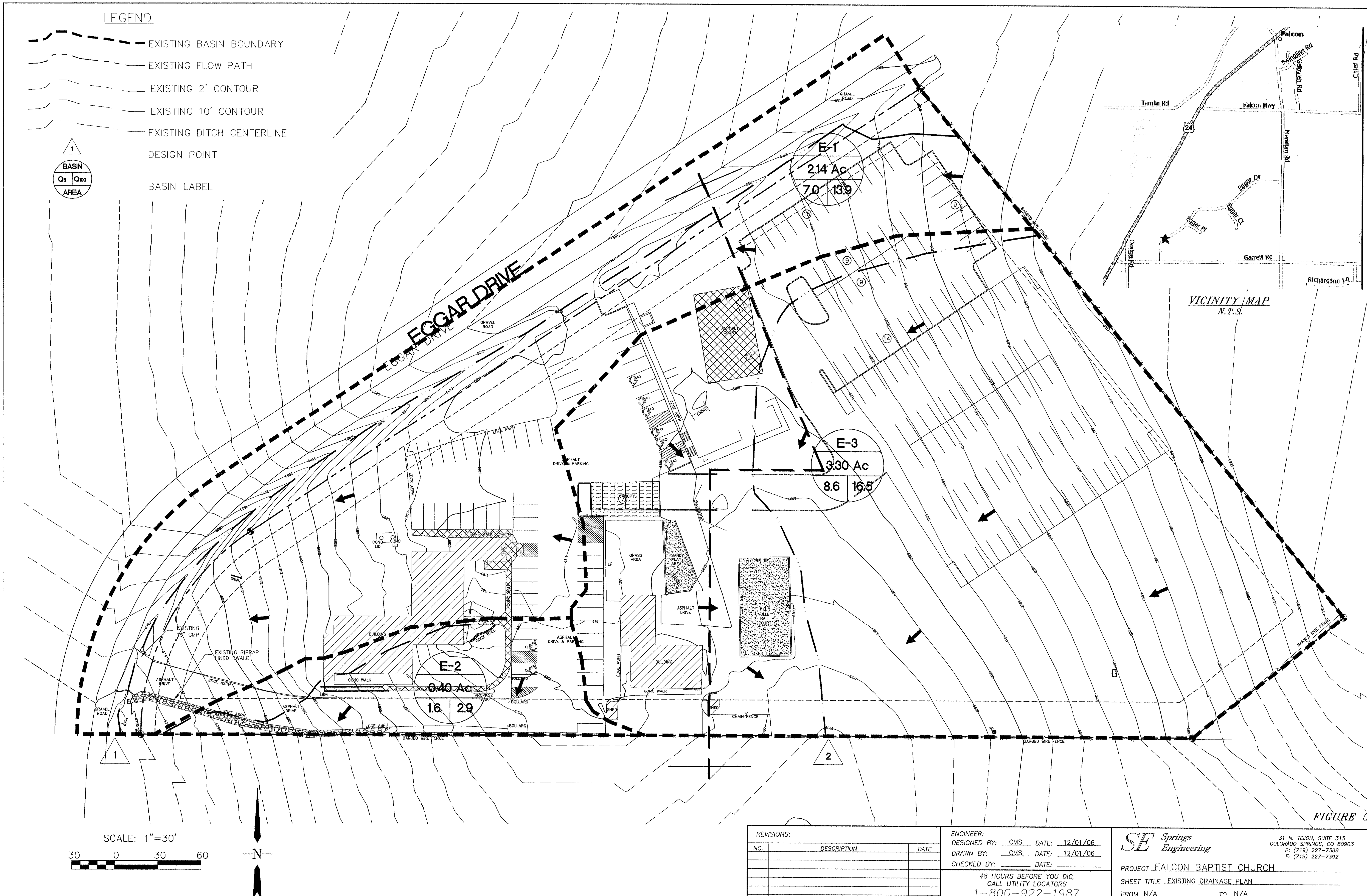

FIGURE 5

REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: CMS DATE: 12/01/06
DRAWN BY: CMS DATE: 12/01/06
CHECKED BY: ____ DATE: ____

48 HOURS BEFORE YOU DIG,
CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES
GAS, ELECTRIC, WATER AND WASTEWATER

SE Springs Engineering
31 N. TEJON, SUITE 315
COLORADO SPRINGS, CO 80903
P: (719) 227-7388
F: (719) 227-7392

PROJECT FALCON BAPTIST CHURCH
SHEET TITLE EXISTING DRAINAGE PLAN
FROM N/A TO N/A
JOB NO. 06-0076 SHEET 1 OF 1

LEGEND

- PROPOSED BASIN BOUNDARY
- PROPOSED FLOW PATH
- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- PROPOSED 1' CONTOUR
- PROPOSED 5' CONTOUR
- EXISTING DITCH CENTERLINE
- DESIGN POINT
- BASIN LABEL

BASIN | Qs | Q100 | AREA

D-1 | 0.55 Ac | 2.6 | 4.7

D-2 | 1.62 Ac | 6.3 | 11.8

D-3 | 0.18 Ac | 0.8 | 1.5

D-4 | 0.70 Ac | 2.2 | 4.0

D-5 | 2.78 Ac | 8.7 | 16.2

EGGAR DRIVE

PROPOSED 18" PIPE

ASPHALT PARKING LOT

NEW BUILDING

GRAVEL OVERFLOW PARKING

PROPOSED SWALE

EXIST. 18" CMP

EXIST. RIPRAP LINED CHANNEL

PROPOSED LOW FLOW CHANNEL

PROPOSED SWALE

PROPOSED 12" OUTLET PIPE

PROPOSED 6' OVERFLOW WEIR

0.75%

5.0%

1.8%

HP

WATER QUALITY P
MIN VOL=.058 AC
BOTTOM ELEV=68
PROPOSED WS EL

VICINITY MAP
N.T.S.

Falcon
Swingline Rd
Gatewell Rd
Tamlin Rd
Falcon Hwy
Meridian Rd
Eggar Dr
Eggar Ct
Eggar Pl
Dodge Rd
Garrett Rd
Richardson Ln

SCALE: 1"=30'

30 0 30 60

N

FIGURE 6

REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: CMS DATE: 12/01/06
DRAWN BY: CMS DATE: 12/01/06
CHECKED BY: DATE:

48 HOURS BEFORE YOU DIG,
CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES
GAS, ELECTRIC, WATER AND WASTEWATER

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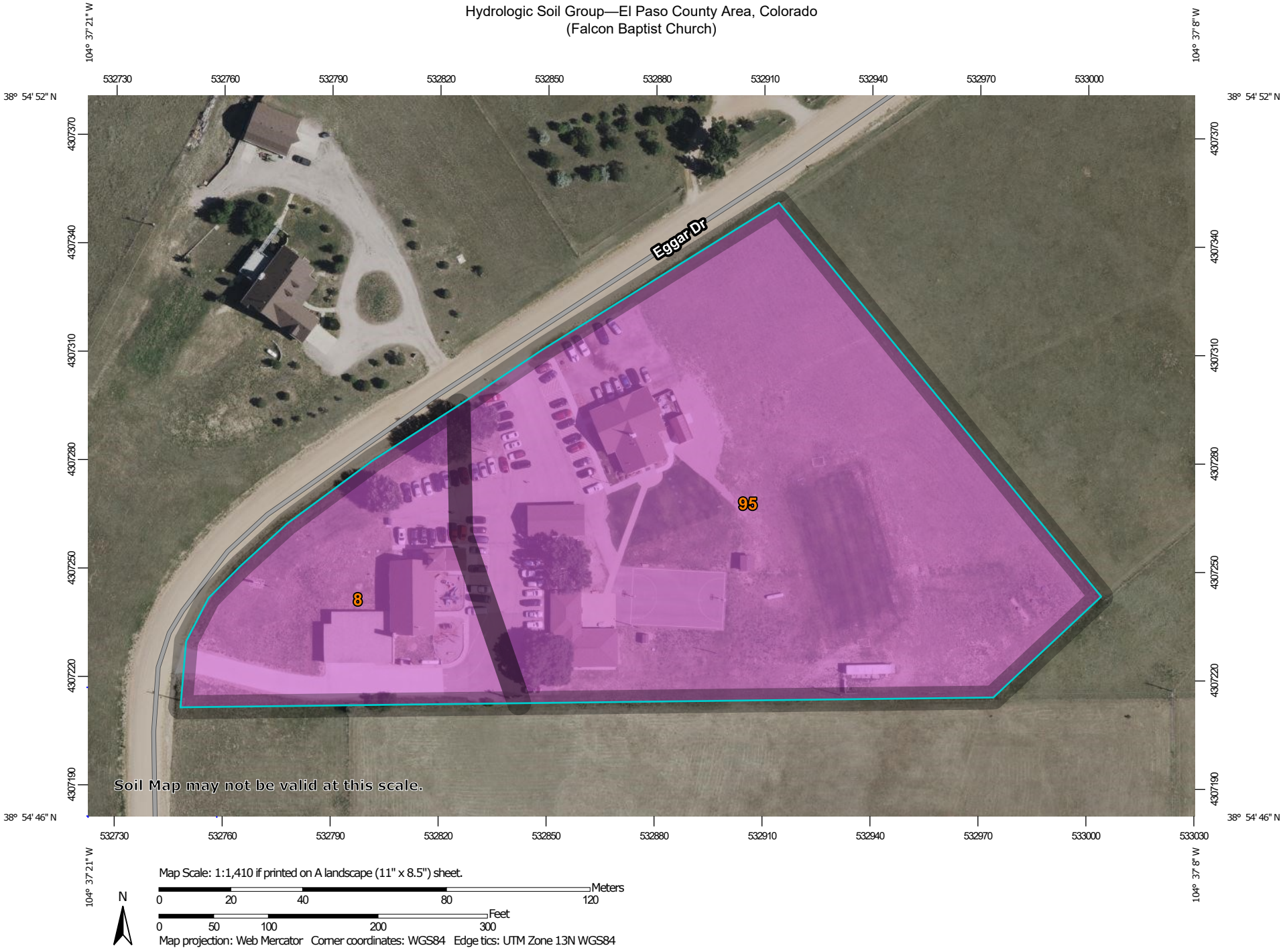
PROJECT FALCON BAPTIST CHURCH
SHEET TITLE EXISTING DRAINAGE PLAN
FROM N/A TO N/A
JOB NO. 06-0076 SHEET 1 OF 1

APPENDIX B

HYDROLOGIC CALCULATIONS

Hydrologic Soil Group—El Paso County Area, Colorado
(Falcon Baptist Church)



Map Scale: 1:1,410 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 22, Sep 3, 2024

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	1.2	22.2%
95	Truckton loamy sand, 1 to 9 percent slopes	A	4.1	77.8%
Totals for Area of Interest			**5.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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

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

3.2 Time of Concentration

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

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

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

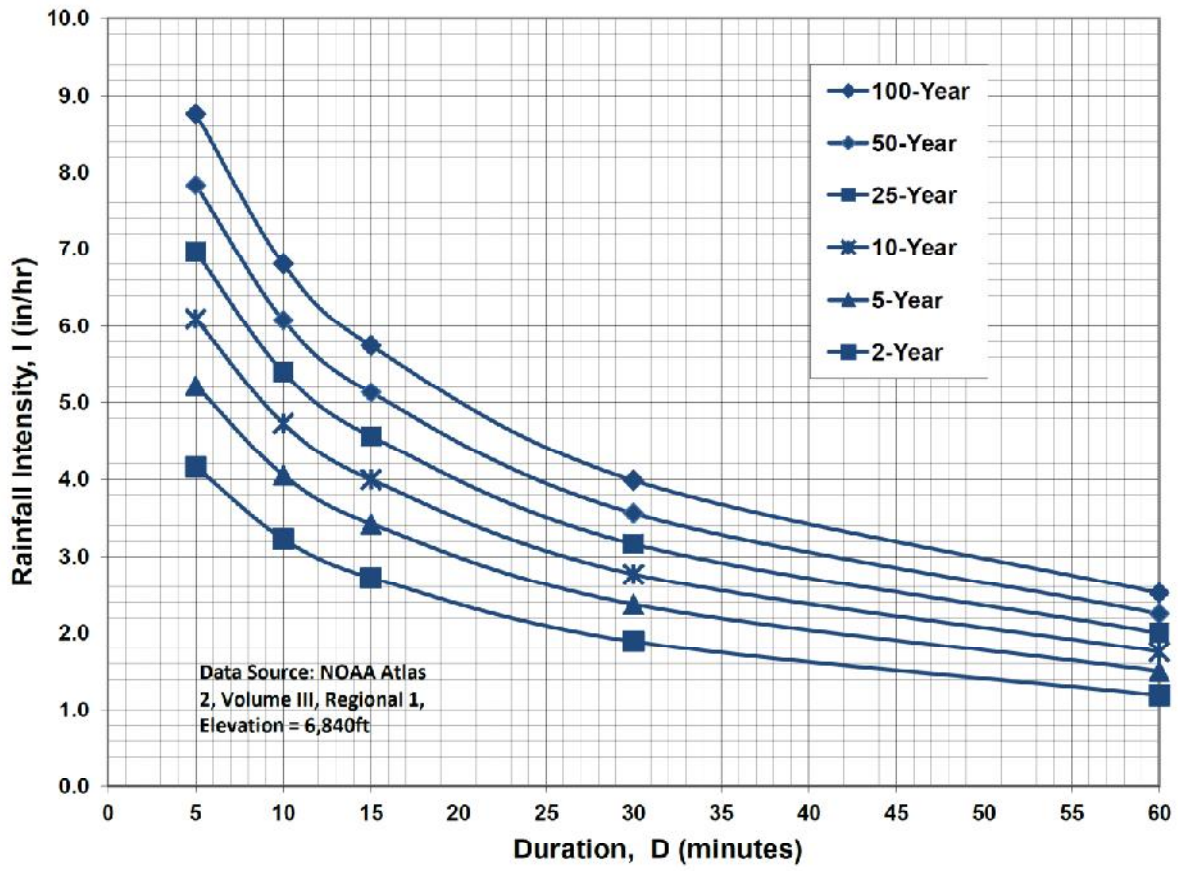
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

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.

FALCON BAPTIST CHURCH
COMPOSITE RUNOFF COEFFICIENTS

EXISTING CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
E-1	1.38	0.500	PAVED/IMPERVIOUS	0.9	0.88	LANDSCAPED	0.08				0.377
E-2	0.40	0.240	PAVED/IMPERVIOUS	0.9	0.16	LANDSCAPED	0.08				0.572
E-3	3.29	0.690	PAVED/IMPERVIOUS	0.9	2.60	LANDSCAPED	0.08				0.252

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
E-1	1.38	0.500	PAVED/IMPERVIOUS	0.96	0.88	LANDSCAPED	0.35				0.571
E-2	0.40	0.240	PAVED/IMPERVIOUS	0.96	0.16	LANDSCAPED	0.35				0.716
E-3	3.29	0.690	PAVED/IMPERVIOUS	0.96	2.60	LANDSCAPED	0.35				0.478

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
E-1	1.38	0.500	PAVED/IMPERVIOUS	100	0.88	LANDSCAPED	0.00				36.232
E-2	0.40	0.240	PAVED/IMPERVIOUS	100	0.16	LANDSCAPED	0.00				60.000
E-3	3.29	0.690	PAVED/IMPERVIOUS	100	2.60	LANDSCAPED	0.00				20.973

FALCON BAPTIST CHURCH
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
D-1	1.03	0.510	PAVED/IMPERVIOUS	0.9	0.52	LANDSCAPED	0.08				0.486
D-2	0.40	0.240	PAVED/IMPERVIOUS	0.9	0.16	LANDSCAPED	0.08				0.572
D-3	3.67	0.820	PAVED/IMPERVIOUS	0.9	2.85	LANDSCAPED	0.08				0.263

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
D-1	1.03	0.510	PAVED/IMPERVIOUS	0.96	0.52	LANDSCAPED	0.35				0.652
D-2	0.40	0.240	PAVED/IMPERVIOUS	0.96	0.16	LANDSCAPED	0.35				0.716
D-3	3.67	0.820	PAVED/IMPERVIOUS	0.96	2.85	LANDSCAPED	0.35				0.486

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
D-1	1.03	0.510	PAVED/IMPERVIOUS	100	0.52	LANDSCAPED	0.00				49.515
D-2	0.40	0.240	PAVED/IMPERVIOUS	100	0.16	LANDSCAPED	0.00				60.000
D-3	3.67	0.820	PAVED/IMPERVIOUS	100	2.85	LANDSCAPED	0.00				22.343

FALCON BAPTIST CHURCH
RATIONAL METHOD

EXISTING CONDITIONS

					Overland Flow			Channel flow									
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
E-1	1	1.38	0.377	0.571	100	0.010	13.2	370	15	0.042	3.07	2.0	15.2	15.2	3.50	5.87	1.82	4.63
E-2	2	0.40	0.572	0.716	100	0.030	6.7	200	20	0.06	4.90	0.7	7.4	7.4	4.58	7.70	1.05	2.20
E-3	3	3.29	0.252	0.478	100	0.018	12.8	365	15	0.006	1.16	5.2	18.0	18.0	3.25	5.45	2.69	8.57

DEVELOPED CONDITIONS

					Overland Flow			Channel flow									
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	LENGTH (FT)	SLOPE (FT/FT)	Tco [1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS [2] VELOCITY (FT/S)	Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
D-1	1	1.03	0.486	0.652	100	0.010	11.2	370	15	0.042	3.07	2.0	13.2	13.2	3.71	6.22	1.86	4.18
D-2	2	0.40	0.572	0.716	100	0.030	6.7	200	20	0.06	4.90	0.7	7.4	7.4	4.58	7.70	1.05	2.20
D-3	3	3.67	0.263	0.486	100	0.018	12.6	365	15	0.006	1.16	5.2	17.8	17.8	3.26	5.47	3.15	9.76

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333)
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES
3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
I_5 = -1.5 * ln(Tc) + 7.583
I_{100} = -2.52 * ln(Tc) + 12.735
6) Q = CiA

APPENDIX C

STORMWATER DETENTION & WATER QUALITY CALCULATIONS

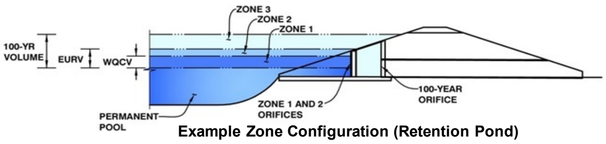
We can't really review any of these calcs without construction plans and details to compare the calcs to. Please provide CDs for the pond.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Falcon Baptist Church

Basin ID: EDB-D3



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**	
Watershed Area =	3.67	acres
Watershed Length =	465	ft
Watershed Length to Centroid =	230	ft
Watershed Slope =	0.009	ft/ft
Watershed Imperviousness =	22.30%	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) =	0.038	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.075	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.048	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.068	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.087	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.144	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.198	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.271	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	0.429	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	0.047	acre-feet		
Approximate 5-yr Detention Volume =	0.063	acre-feet		
Approximate 10-yr Detention Volume =	0.080	acre-feet		
Approximate 25-yr Detention Volume =	0.102	acre-feet		
Approximate 50-yr Detention Volume =	0.122	acre-feet		
Approximate 100-yr Detention Volume =	0.158	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.038	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.037	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.083	acre-feet
Total Detention Basin Volume =	0.158	acre-feet

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	--	--	--	10	0.000		
Bot EL=6806.0	--	0.90	--	--	--	3,553	0.082	1,603	0.037
Spillway=6807.0	--	1.90	--	--	--	9,094	0.209	7,927	0.182
Top Berm=6808.0	--	2.90	--	--	--	12,000	0.275	18,474	0.424
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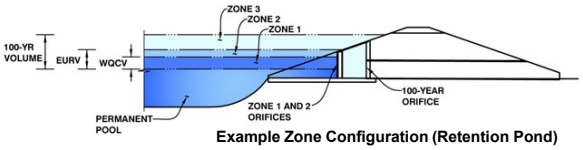
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Falcon Baptist Church

Basin ID: EDB-D3



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.92	0.038	Orifice Plate
Zone 2 (EURV)	1.27	0.037	Orifice Plate
Zone 3 (100-year)	1.79	0.083	Weir&Pipe (Restrict)
Total (all zones)		0.158	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
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 SCM)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	2.361E-03	ft²
Depth at top of Zone using Orifice Plate =	1.27	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	9.60	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.34	sq. inches (diameter = 5/8 inch)	Elliptical Slot Area =	N/A	ft²

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.42	0.85					
Orifice Area (sq. inches)	0.34	0.34	0.34					

	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				
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A ft²
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				
Overflow Weir Front Edge Height, Ho =	1.40	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.40	N/A feet
Overflow Weir Front Edge Length =	4.00	N/A	feet	Overflow Weir Slope Length =	2.50	N/A feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	17.38	N/A
Horiz. Length of Weir Sides =	2.50	N/A	feet	Overflow Grate Open Area w/o Debris =	6.96	N/A ft²
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	3.48	N/A ft²
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				
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.40	N/A ft²
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.25	N/A feet
Restrictor Plate Height Above Pipe Invert =	5.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.11	N/A radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.90	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.26	feet
Spillway Crest Length =	8.00	feet	Stage at Top of Freeboard =	2.86	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.27	acres
Freeboard above Max Water Surface =	0.70	feet	Basin Volume at Top of Freeboard =	0.41	acre-ft

Calculated Parameters for Spillway

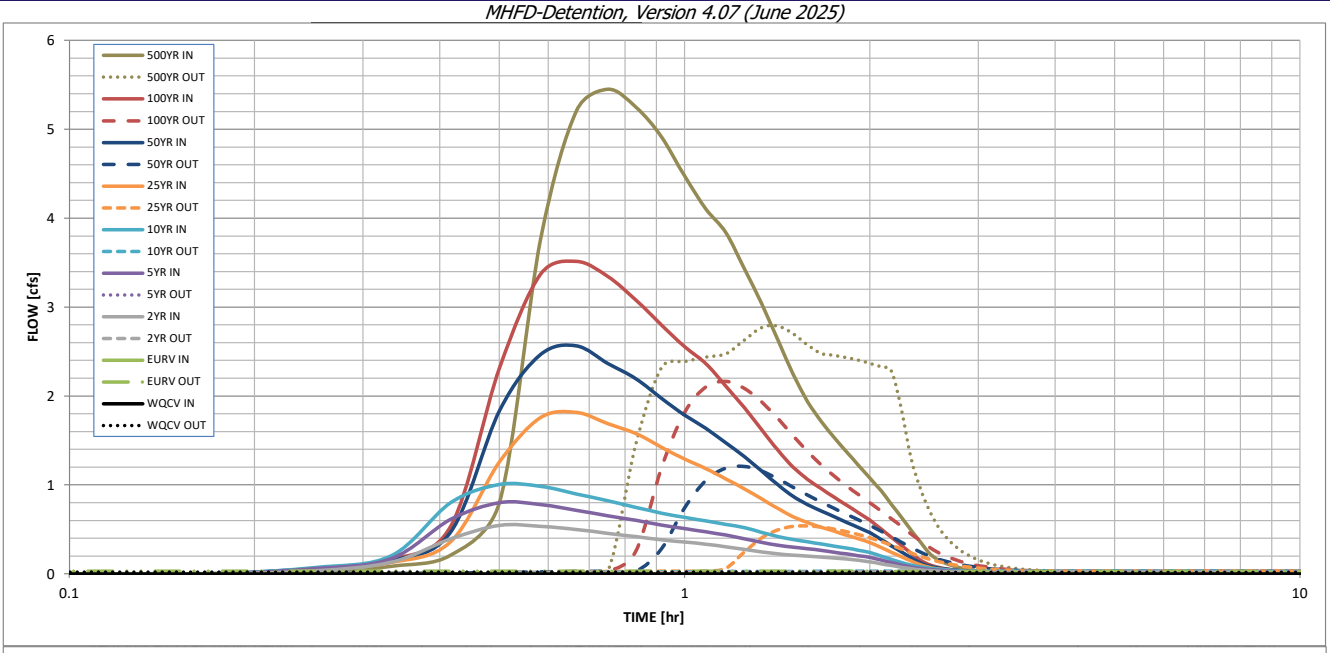
Routed Hydrograph Results

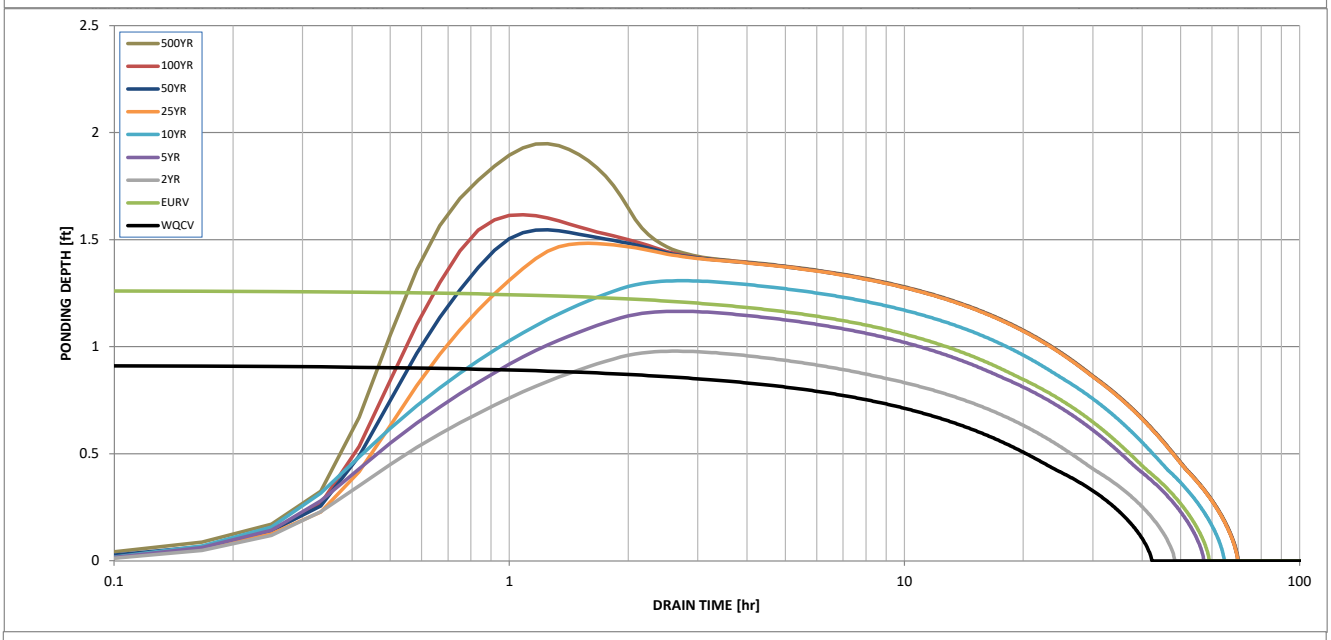
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

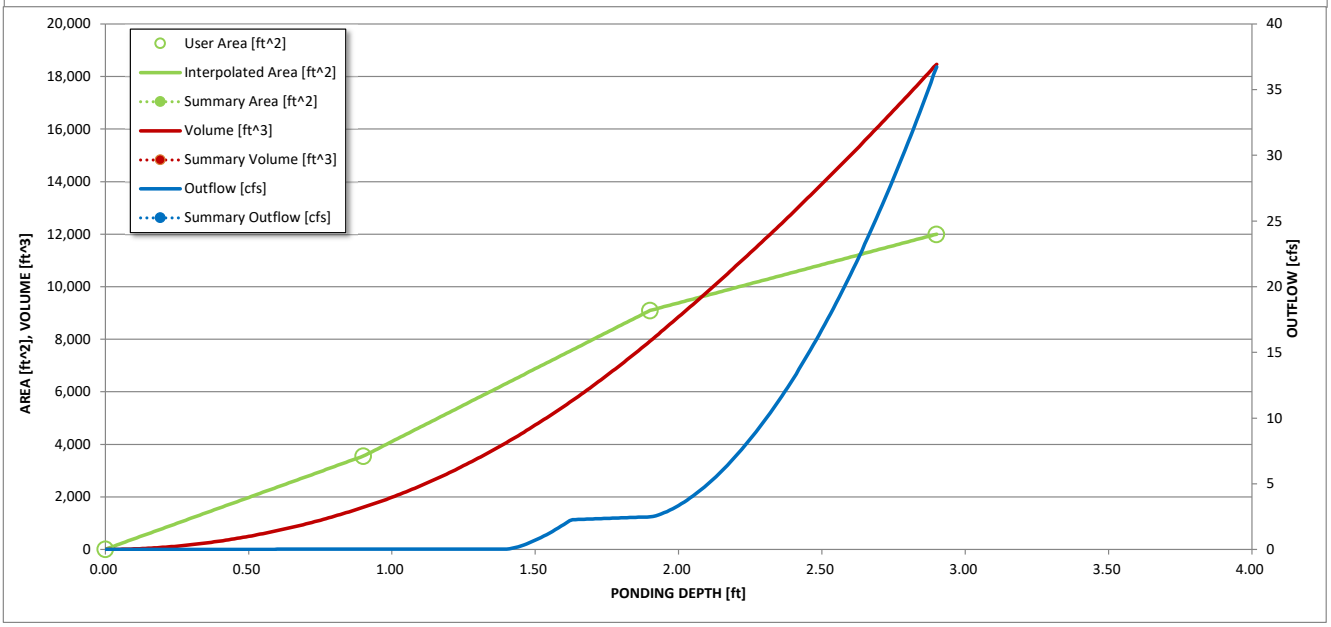
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.038	0.075	0.048	0.068	0.087	0.144	0.198	0.271	0.429
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.048	0.068	0.087	0.144	0.198	0.271	0.429
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.1	0.2	0.8	1.5	2.4	4.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.04	0.05	0.23	0.42	0.65	1.14
Peak Inflow Q (cfs) =	N/A	N/A	0.5	0.8	1.0	1.8	2.6	3.5	5.5
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.5	1.2	2.2	2.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.2	0.6	0.8	0.9	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.1	0.2	0.3	0.4
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) =	38	52	43	51	57	59	56	52	47
Time to Drain 99% of Inflow Volume (hours) =	**41**	56	46	54	61	65	64	62	59
Maximum Ponding Depth (ft) =	0.92	1.27	0.98	1.17	1.31	1.48	1.55	1.62	1.95
Area at Maximum Ponding Depth (acres) =	0.08	0.13	0.09	0.11	0.13	0.16	0.16	0.17	0.21
Maximum Volume Stored (acre-ft) =	0.038	0.076	0.043	0.062	0.080	0.106	0.115	0.127	0.190

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0	0.00	0.04	0.06	0.07	0.05	0.06	0.06	0.09
	0:20:00	0	0.00	0.13	0.17	0.20	0.13	0.15	0.16	0.21
	0:25:00	0	0.00	0.40	0.61	0.80	0.36	0.47	0.54	0.81
	0:30:00	0	0.00	0.55	0.80	1.01	1.26	1.84	2.32	3.76
	0:35:00	0	0.00	0.54	0.78	0.98	1.76	2.47	3.37	5.21
	0:40:00	0	0.00	0.50	0.72	0.90	1.82	2.57	3.52	5.45
	0:45:00	0	0.00	0.46	0.66	0.82	1.69	2.37	3.35	5.25
	0:50:00	0	0.00	0.42	0.60	0.75	1.58	2.20	3.08	4.91
	0:55:00	0	0.00	0.39	0.55	0.68	1.43	1.98	2.80	4.47
	1:00:00	0	0.00	0.36	0.51	0.64	1.29	1.79	2.55	4.10
	1:05:00	0	0.00	0.34	0.47	0.60	1.18	1.63	2.36	3.84
	1:10:00	0	0.00	0.31	0.44	0.56	1.07	1.47	2.11	3.43
	1:15:00	0	0.00	0.28	0.40	0.52	0.96	1.32	1.87	3.04
	1:20:00	0	0.00	0.25	0.36	0.47	0.84	1.16	1.62	2.63
	1:25:00	0	0.00	0.23	0.32	0.42	0.74	1.00	1.39	2.25
	1:30:00	0	0.00	0.21	0.30	0.39	0.64	0.87	1.20	1.94
	1:35:00	0	0.00	0.20	0.28	0.36	0.58	0.78	1.07	1.72
	1:40:00	0	0.00	0.19	0.26	0.34	0.53	0.71	0.96	1.53
	1:45:00	0	0.00	0.18	0.24	0.31	0.48	0.64	0.86	1.37
	1:50:00	0	0.00	0.17	0.22	0.29	0.44	0.58	0.77	1.22
	1:55:00	0	0.00	0.15	0.21	0.27	0.39	0.52	0.69	1.08
	2:00:00	0	0.00	0.14	0.19	0.24	0.35	0.46	0.60	0.94
	2:05:00	0	0.00	0.12	0.16	0.20	0.30	0.39	0.51	0.79
	2:10:00	0	0.00	0.10	0.13	0.16	0.25	0.32	0.41	0.64
	2:15:00	0	0.00	0.08	0.10	0.13	0.19	0.25	0.32	0.49
	2:20:00	0	0.00	0.06	0.08	0.10	0.15	0.18	0.23	0.35
	2:25:00	0	0.00	0.05	0.06	0.08	0.10	0.12	0.15	0.23
	2:30:00	0	0.00	0.04	0.05	0.07	0.07	0.09	0.10	0.16
	2:35:00	0	0.00	0.03	0.04	0.05	0.06	0.07	0.08	0.11
	2:40:00	0	0.00	0.03	0.03	0.05	0.04	0.05	0.06	0.08
	2:45:00	0	0.00	0.02	0.03	0.04	0.04	0.04	0.04	0.06
	2:50:00	0	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.05
	2:55:00	0	0.00	0.01	0.02	0.03	0.02	0.03	0.02	0.03
	3:00:00	0	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	3:05:00	0	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.02
	3:10:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:15:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:20:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:25:00	0	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	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: JPS
Company: JPS
Date: July 4, 2026
Project: Falcon Baptist Church
Location: Detention Pond D3

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 22.3 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.223

C) Contributing Watershed Area — Area = 3.670 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} = 0.038 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: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = 0.075 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 = 4.0 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 3.00 ft / ft

DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 0% of the WQCV) — V_{FMIN} = 0.000 ac-ft

A FOREBAY MAY NOT BE NECESSARY FOR THIS SIZE SITE

B) Actual Forebay Volume — V_F = 0.000 ac-ft

C) Forebay Depth (D_F = 12 inch maximum) — D_F = 0.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge — Q_{100} = 0.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$) — Q_F = 0.00 cfs

E) Forebay Discharge Design

Choose One
- ○ Berm With Pipe
- ○ Wall with Rect. Notch
- ○ Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches) — Calculated D_P = in

G) Rectangular Notch Width — Calculated W_N = in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: JPS
Company: JPS
Date: July 4, 2026
Project: Falcon Baptist Church
Location: Detention Pond D3

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 = 10 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = 0.63 inches
E) Total Outlet Area	A_{ot} = 1.02 square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 5 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 4.0 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = 37 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.)	*S.S. Well Screen with 60% Open Area*
Other (Y/N): N	
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} = 62 sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= 1.27 feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= 43.24 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: JPS
Company: JPS
Date: July 4, 2026
Project: Falcon Baptist Church
Location: Detention Pond D3

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

Buried Soil 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 removal as needed; Access ramp provided to pond bottom

Notes:

Falcon Baptist Church
Detention Pond D3 Spillway

Figure 13-12c. Emergency Spillway Protection

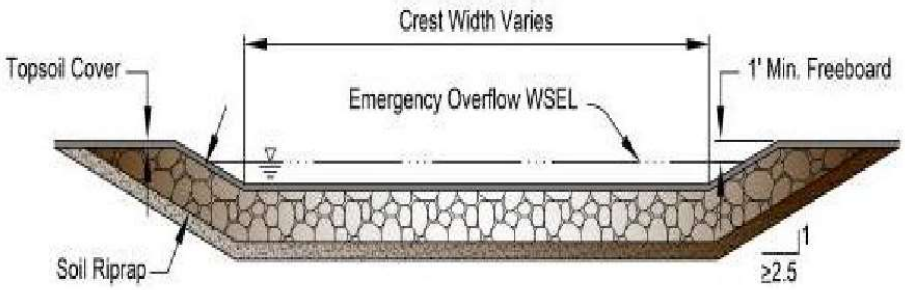
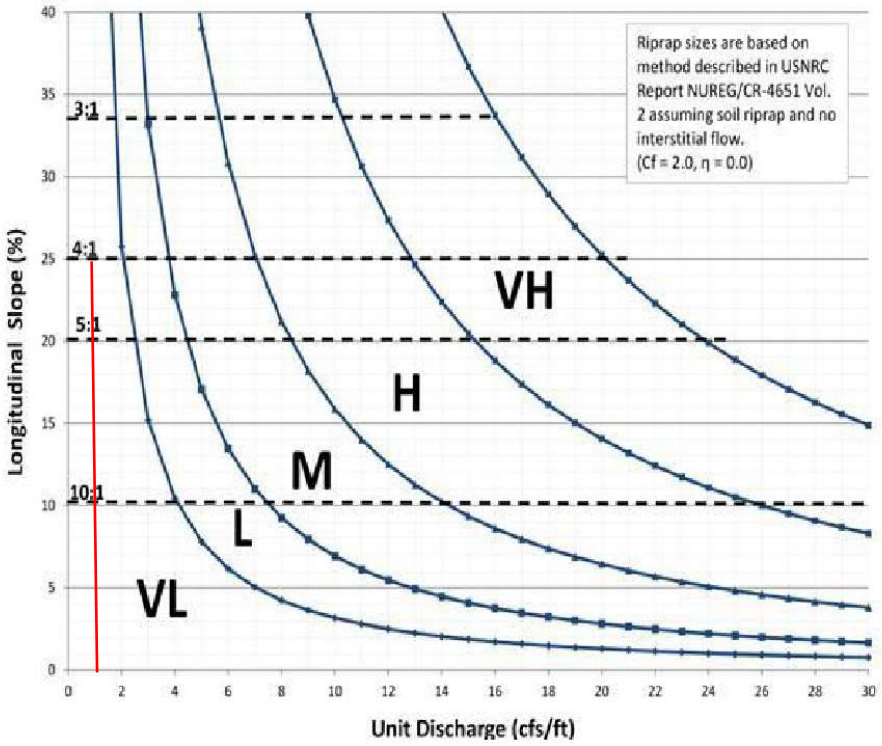


Figure 13-12d. Riprap Types for Emergency Spillway Protection



Spillway Q100 = 9.8 cfs (Undetained DP-D3)
Unit Discharge = (9.8 cfs / 8 ft) = 1.2
....Use Type M Riprap (conservative)

Q100 (Pond Discharge) = 2.2 cfs; D = 1.5 ft
Q / D^1.5 = 2.2 / (1.5^1.5) = 1.2

$$H_a = \frac{(H + Y_n)}{2}$$ Equation 9-19

Where the maximum value of H_a shall not exceed H, and:

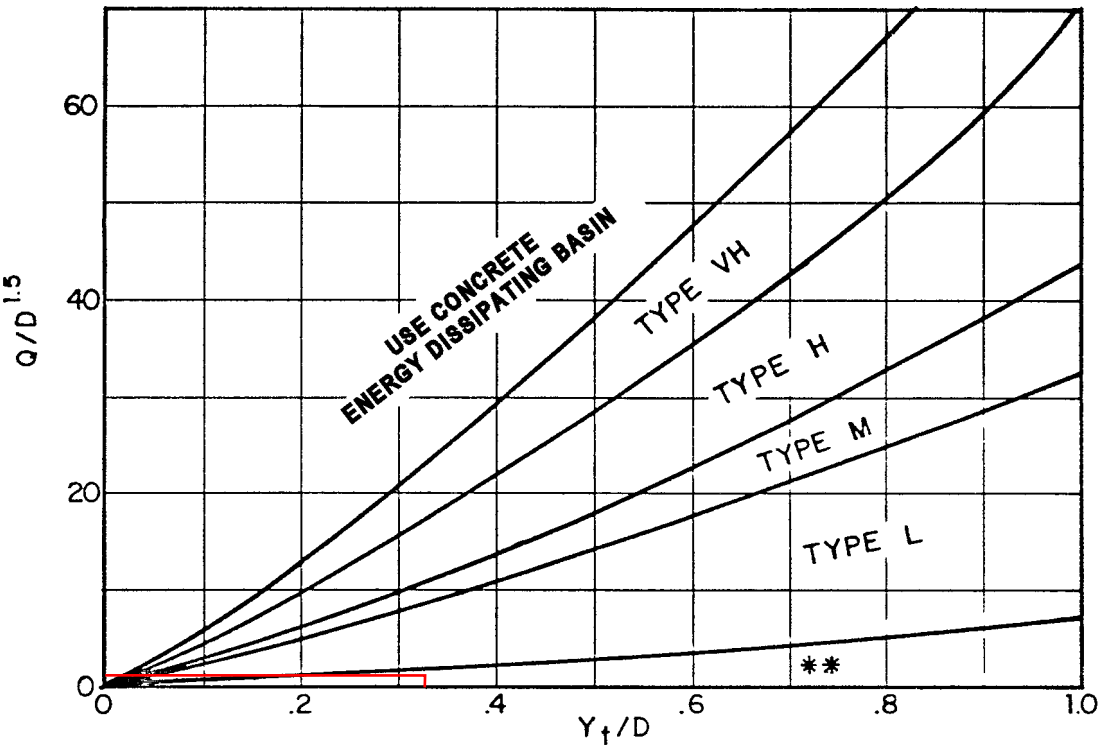
D_a = parameter to use in place of D in Figure 9-38 when flow is supercritical (ft)

D_c = diameter of circular culvert (ft)

H_a = parameter to use in place of H in Figure 9-39 when flow is supercritical (ft)

H = height of rectangular culvert (ft)

Y_n = normal depth of supercritical flow in the culvert (ft)



Yt = 0.5 ft; Yt / D = (0.5 / 1.5) = 0.33

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

Use Type M (Conservative)

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

FALCON BAPTIST CHURCH - 11095 EGGAR DRIVE
ENGINEER'S COST ESTIMATE
DRAINAGE IMPROVEMENTS - FULL-SPECTRUM DETENTION FACILITY (PRIVATE)

Item No.	Description	Quantity	Unit	Unit Cost ($$$)	Total Cost ($$$)
	PRIVATE DRAINAGE FACILITIES (NON-REIMBURSABLE)				
	Earthwork	700	CY	$5	$3,500
	Riprap Aprons (12" Riprap)	3	CY	$65	$195
	Concrete Trickle Channel	64	SY	$40	$2,560
	18" HDPE Pond Discharge Line	19	LF	$50	$950
	Detention Basin Outlet Structure	1	LS	$8,000	$8,000
	Buried Riprap Spillway	10	CY	$65	$650
	TOTAL				**$15,855**

The cost estimate submitted herein is based on time-honored practices within the construction industry. As such the engineer does not control the cost of labor, materials, equipment or a contractor's method of determining prices and competitive bidding practices or market conditions. The estimate represents our best judgement as design professionals using current information available at the time of the preparation. The engineer cannot guarantee that proposals, bids and/or construction costs will not vary from this cost estimate.

APPENDIX D

FIGURES

N

30' 0 30' 60'

ORIGINAL SCALE: 1"=30' (24"x36" SHEET)
CONTOUR INTERVAL: 1'

DRAINAGE PLAN LEGEND

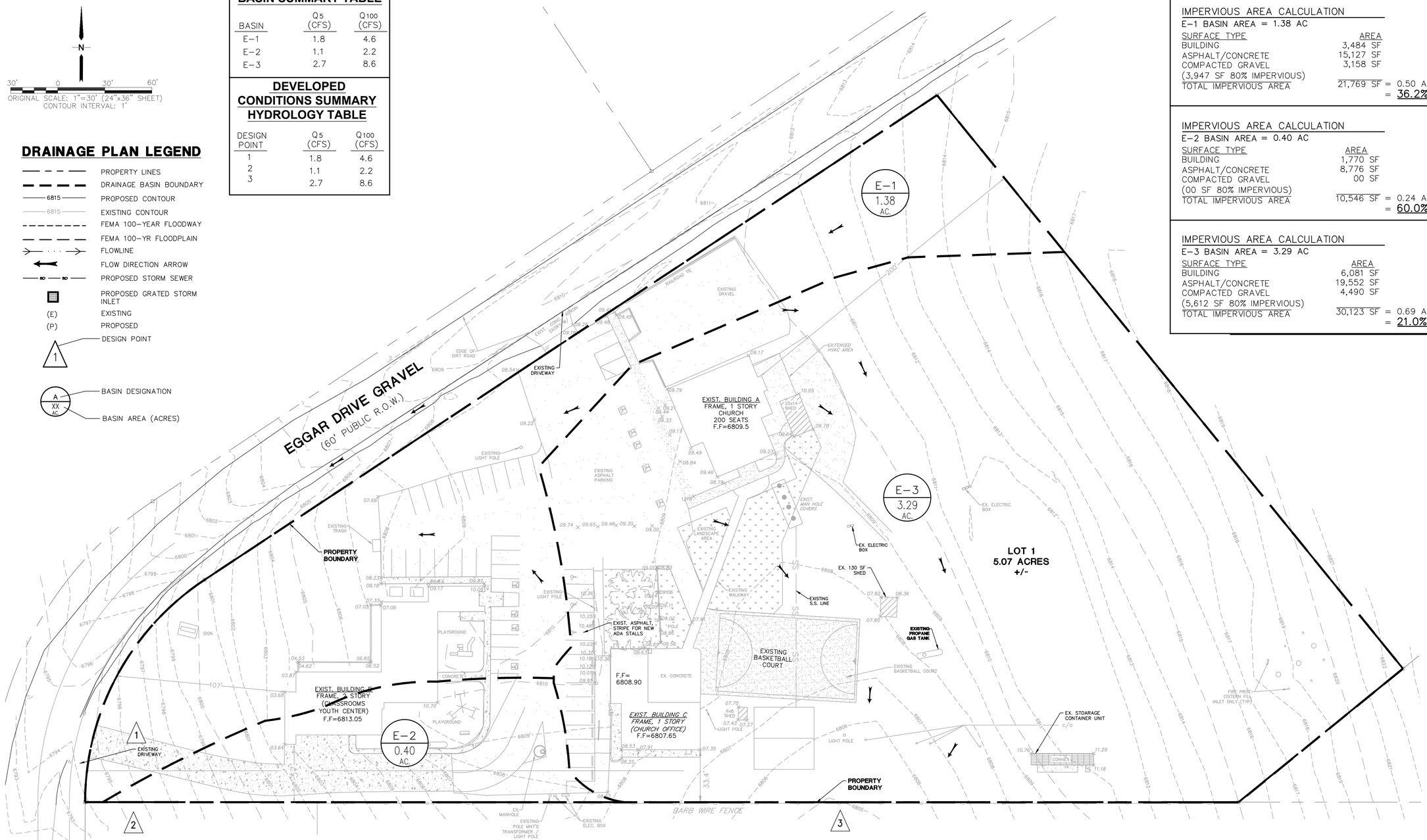
- PROPERTY LINES
- DRAINAGE BASIN BOUNDARY
- 6815 — PROPOSED CONTOUR
- 6815 — EXISTING CONTOUR
- FEMA 100-YEAR FLOODWAY
- FEMA 100-YR FLOODPLAIN
- FLOWLINE
- FLOW DIRECTION ARROW
- PROPOSED STORM SEWER
- PROPOSED GRATED STORM INLET
- (E) EXISTING
- (P) PROPOSED
- 1 — DESIGN POINT
- A / XX AC — BASIN DESIGNATION / BASIN AREA (ACRES)

BASIN SUMMARY TABLE

BASIN	Q5 (CFS)	Q100 (CFS)
E-1	1.8	4.6
E-2	1.1	2.2
E-3	2.7	8.6

DEVELOPED CONDITIONS SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
1	1.8	4.6
2	1.1	2.2
3	2.7	8.6



BENCHMARK:
EXISTING BUILDING A
FF EL=6809.5

IMPERVIOUS AREA CALCULATION

E-1 BASIN AREA = 1.38 AC

SURFACE TYPE	AREA
BUILDING	3,484 SF
ASPHALT/CONCRETE	15,127 SF
COMPACTED GRAVEL	3,158 SF
(3,947 SF 80% IMPERVIOUS)	
TOTAL IMPERVIOUS AREA	21,769 SF = 0.50 AC = 36.2%

IMPERVIOUS AREA CALCULATION

E-2 BASIN AREA = 0.40 AC

SURFACE TYPE	AREA
BUILDING	1,770 SF
ASPHALT/CONCRETE	8,776 SF
COMPACTED GRAVEL	00 SF
(00 SF 80% IMPERVIOUS)	
TOTAL IMPERVIOUS AREA	10,546 SF = 0.24 AC = 60.0%

IMPERVIOUS AREA CALCULATION

E-3 BASIN AREA = 3.29 AC

SURFACE TYPE	AREA
BUILDING	6,081 SF
ASPHALT/CONCRETE	19,552 SF
COMPACTED GRAVEL	4,490 SF
(5,612 SF 80% IMPERVIOUS)	
TOTAL IMPERVIOUS AREA	30,123 SF = 0.69 AC = 21.0%

FALCON BAPTIST CHURCH BUILDING ADDITION
LOT 1, HADDEN HEIGHTS

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
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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
	EPC SUBMITTAL	JPS	06/04/25

EXISTING CONDITIONS DRAINAGE PLAN

HORZ. SCALE: 1"=30'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: POLARIS	CHECKED: JPS
CREATED: 03/05/25	LAST MODIFIED: 07/04/25
PROJECT NO: 012502	MODIFIED BY: PV
SHEET: EX1	

IMPERVIOUS AREA CALCULATION

D–1 BASIN AREA = 1.03 AC.

SURFACE TYPE	AREA	
BUILDING	3,484 SF	
ASPHALT/CONCRETE	15,555 SF	
COMPACTED GRAVEL (3,947 SF 80% IMPERVIOUS)	3,158 SF	
TOTAL IMPERVIOUS AREA	22,197 SF	= 0.51 AC = 49.5%

IMPERVIOUS AREA CALCULATION

D–2 BASIN AREA = 0.4 AC.

SURFACE TYPE	AREA	
BUILDING	1,770 SF	
ASPHALT/CONCRETE	8,776 SF	
COMPACTED GRAVEL (00 SF 80% IMPERVIOUS)	00 SF	
TOTAL IMPERVIOUS AREA	10,546 SF	= 0.24 AC = 60.0%

IMPERVIOUS AREA CALCULATION

D–3 BASIN AREA = 3.67 AC.

SURFACE TYPE	AREA	
BUILDING	9,517 SF	
ASPHALT/CONCRETE	25,325 SF	
COMPACTED GRAVEL (1,330 SF 80% IMPERVIOUS)	1,064 SF	
TOTAL IMPERVIOUS AREA	35,906 SF	= 0.82 AC = 22.34%

BASIN SUMMARY TABLE

BASIN	Q5 (CFS)	Q100 (CFS)
D–1	1.9	4.2
D–2	1.1	2.2
D–3	3.2	9.8

DEVELOPED CONDITIONS SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
1	1.9	4.2
2	1.1	2.2
3	3.2	9.8

Include detained release flow

30' 0 30' 60'

ORIGINAL SCALE: 1"=30' (24"x36" SHEET)
CONTOUR INTERVAL: 1'

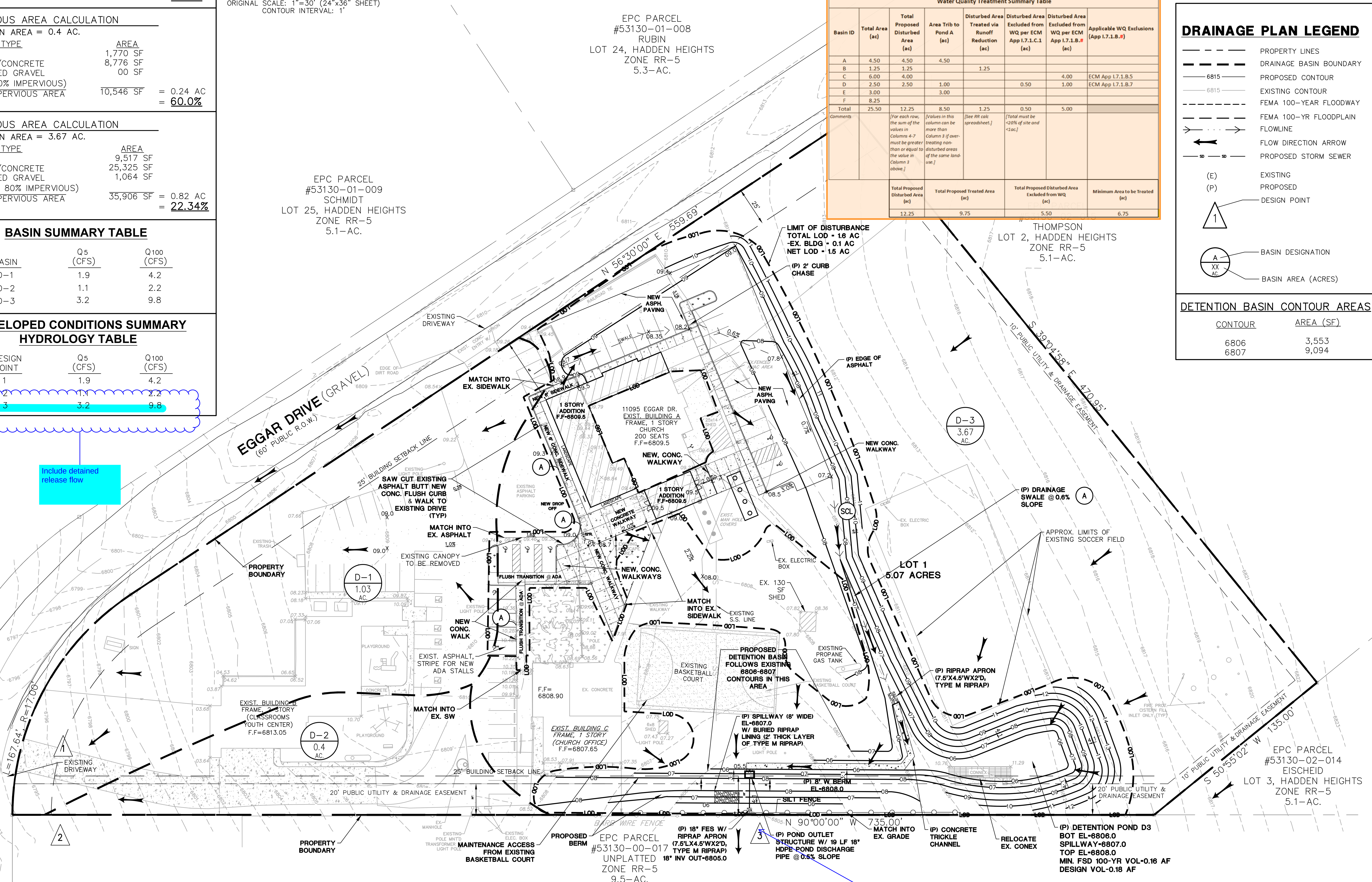
Previous unresolved comment:
please quantify these post-2008 disturbances and categorize them as excluded vs non-excluded and discuss the applicable exclusions. The PPR07014 plans were actually approved in 2009 and thus count towards the post-2008 (it's post March 10, 2008 to be specific) disturbances, even though the file number is from 2008.

Previous unresolved comment:
We need to know how much of the proposed (and post-2008) area of disturbance (not just the impervious surfaces) is treated vs untreated and if there are any exclusions that apply to the untreated areas. So please create a basic overview map (or modify an existing drainage map) with color shading/hatching that shows areas tributary to each PCM (pond, runoff reduction, etc.) and those disturbed areas that are not treated by a PCM, with the applicable exclusion labeled (ex: 20% up to 1ac of development can be excluded per ECM App I.7.1.C.1 (only if using the WQCV Design Base Standard) and exclusions listed in ECM App I.7.1.B.#). An accompanying summary table on this map would also be very helpful. Example provided:

Water Quality Treatment Summary Table

Basin ID	Total Area (ac)	Total Proposed Disturbed Area (ac)	Area Trib to Pond A (ac)	Disturbed Area Treated via Runoff Reduction (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.C.1 (ac)	Disturbed Area Excluded from WQ per ECM App I.7.1.B.# (ac)	Applicable WQ Exclusions (App I.7.1.B.#)
A	4.50	4.50	4.50				
B	1.25	1.25		1.25			
C	6.00	4.00				4.00	ECM App I.7.1.B.5
D	2.50	2.50	1.00		0.50	1.00	ECM App I.7.1.B.7
E	3.00		3.00				
F	8.25						
Total	25.50	12.25	8.50	1.25	0.50	5.00	
Comments		[For each row, the sum of the values in Columns 4-7 must be greater than or equal to the value in Column 3 above.]	[Values in this column can be more than Column 3 if over-treating non-disturbed areas of the same land-use.]	[See RR calc spreadsheet.]	[Total must be <20% of site and <1ac.]		

Total Proposed Disturbed Area (ac)	Total Proposed Treated Area (ac)	Total Proposed Disturbed Area Excluded from WQ (ac)	Minimum Area to be Treated (ac)
12.25	9.75	5.50	6.75



Please add pond release rate

BENCHMARK
EXISTING BUILDING A
FF EL=6809.5

GRASS–LINED SWALE SECTION (A)
NTS

DRAINAGE PLAN LEGEND

- PROPERTY LINES
- DRAINAGE BASIN BOUNDARY
- PROPOSED CONTOUR
- EXISTING CONTOUR
- FEMA 100–YEAR FLOODWAY
- FEMA 100–YR FLOODPLAIN
- FLOWLINE
- FLOW DIRECTION ARROW
- PROPOSED STORM SEWER
- (E) EXISTING
- (P) PROPOSED
- DESIGN POINT
- BASIN DESIGNATION
- BASIN AREA (ACRES)

DETENTION BASIN CONTOUR AREAS

CONTOUR	AREA (SF)
6806	3,553
6807	9,094

FALCON BAPTIST CHURCH BUILDING ADDITION
LOT 1, HADDEN HEIGHTS

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Colorado Springs, CO 80903
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No.	REVISION	BY	DATE
A			
B			
C			
D			
E			

DEVELOPED DRAINAGE PLAN

HORZ. SCALE: 1"=30'	DRAWN: PV
VERT. SCALE: N/A	DESIGNED: EVELOPED
SURVEYED: POLARIS	CHECKED: JPS
CREATED: 03/05/25	LAST MODIFIED: 07/06/26
PROJECT NO: 012502	MODIFIED BY: PV

SHEET: D1