Please revise to Final Drainage Report. Letter type reports are only allowed where a complete drainage report has previously been approved.

DRAINAGE LETTER for

# Legacy Church
# 10460 W Hwy 24,
# Green Mountain Falls, CO

Prepared for:

**Pearson Ministries International**
**P.O. Box 340**
**Woodland Park, CO 80866**
**(817) 992-2657**
**Contact: Lauren Leeper**

Prepared by:

**Kimley-Horn and Associates, Inc.**
**2 North Nevada Avenue, Suite 300**
**Colorado Springs, Colorado 80903**
**(719) 453-0180**
**Contact: Eric Gunderson**

Project #: 096856000

Prepared: July 19, 2019

Kimley»Horn

Add PCD File No. PPR1933

## CERTIFICATION

### *ENGINEERS 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 City/County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): _____

Colorado P.E. No. 49487 Date

### *DEVELOPER'S STATEMENT*

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

_____

Business Name

_____

By:

_____

Title:

_____

Address:

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

### *EL PASO COUNTY STATEMENT*

Filed in accordance with Section 51.1 of the El Paso Land Development Code, as amended.

_____ _____

Director of Public Works Date

Conditions:

Revise to:
Jennifer Irvine, P.E.
County Engineer/ECM Administrator

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## INTRODUCTION

Report

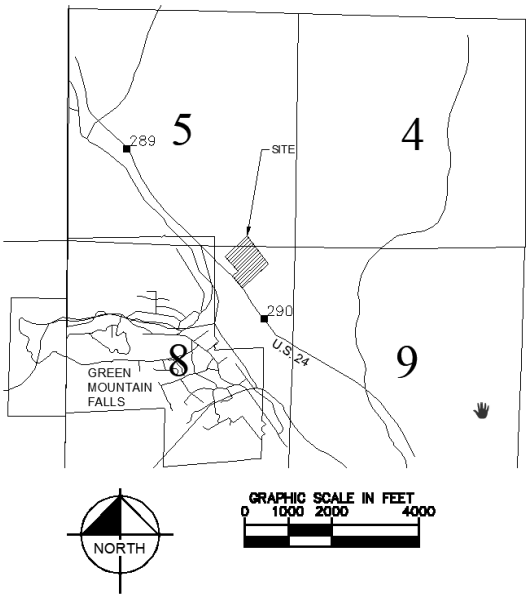
### *PURPOSE AND SCOPE OF STUDY*

The purpose of this report is to outline the Final Drainage Letter for Legacy Church – Green Mountain Falls, located in on U.S. Highway 24 between mile marker 289 and 290 (the "Property"), City of Green Mountain Falls, Colorado (the "City"). This Final Drainage Letter identifies on-site and offsite drainage patterns, storm sewer and inlet locations, areas tributary to the site and proposes to safely route developed storm water to adequate outfalls. The Property approximately 148 acres in size; however, the limits of project area are approximately 3.66 acres.

### *GENERAL PROJECT DESCRIPTION*

The proposed improvements consist of the paving of approximately 1.7 acres of an existing gravel parking lot, as well as the construction of 2 detention ponds and associated storm infrastructure (the "Project") within the Property (the "Site"). The Project will be processed through El Paso County. Additional outside agency review or processing is not anticipated as part of the Project.

The Project is located within the Southeast Quarter of the Southeast Quarter of Section 5 and the East half of the Northeast Quarter of Section 8, Township 13 South, Range 68 West of the Sixth Principal Meridian, City of Colorado Springs, County of El Paso, State of Colorado (see Vicinity Map). The Property is bounded by U.S. Highway 24 to the South, dispersed residential homes to the East and West, and undeveloped forest to the North. The Property is currently developed and consists of a +/- 19,000 SF building that will be repurposed for the church's use, as well as several small cabins. The Property generally slopes from northeast to southwest with the anticipated stormwater outfall being the existing outfall near U.S. 24 and conveyed to the south side of the highway (herein the "ultimate outfall").




Please add description of the existing ground cover of the property.



Kimley»Horn

A topographic field survey was completed for the Project by Barron Land, LLC. dated June 27, 2019 and is the basis for design for the drainage improvements.

## PROJECT CHARACTERISTICS

Along the project frontage, US Highway 24 slopes from east to west at approximately 1.5%, the western and eastern project boundaries slope from north to south at approximately 10%, and the northern project boundary slopes from east to west at approximately 3%, This historic runoff pattern will be maintained and unaffected with the proposed Project.

The proposed building, parking lot, paved drives, and other impervious surfaces comprise 77.1 percent (102,938 square feet) of the overall Project. Landscape areas internal to the site consist of landscape islands within the parking lot, and landscape zones within the building and landscape setback areas. The proposed internal landscaping areas make up 22.9 percent (30,646 square feet) of the Project. Landscape improvements (grass, tree lawns, shrubs, trees etc.) are proposed along the project perimeter.

There are no major irrigation facilities within the Site. The Site does not currently provide on-site water quality or detention for the Project area. The existing land use is mixed with residential and commercial buildings with several cabins. The proposed land use is a church with several cabins.

### *SOILS CONDITIONS*

NRCS soil data is available for this Site and it has been noted that soils onsite are generally USCS Type D. The NRSC Soils map is provided in the Appendix.

## DRAINAGE DESIGN CRITERIA

Provide major basin drainage characteristics. Identify the drainage basin that the site is located in and any major drainageways/floodplains in the vicinity of the site. This is an unstudied basin but a report was done for by Fountain Creek watershed district and can be found on their website.

### *REGULATIONS*

There are no provisions selected or deviations from the El Paso County Drainage Criteria Manual, dated May 2014, for the proposed development.

Drainage Criteria Manual

### *DEVELOPMENT DESIGN CRITERIA REFERENCE AND CONSTRAINTS*

The proposed storm facilities follow the El Paso County Storm Drainage Criteria (the "CRITERIA") and the Urban Storm Drainage Criteria Manual (the "MANUAL"). Site drainage is not significantly impacted by such constraints as utilities or existing development. Further detail regarding onsite drainage patterns is provided in the Proposed Drainage Conditions Section.

chapter 6

### *HYDROLOGIC CRITERIA*

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per section 6 of the CRITERIA. Table 6-2 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-6 of the MANUAL by calculating weighted impervious values for each specific site basin. The

This should be "Criteria"

Note that the county only adopted chapter 6 and section 3.2.1 of chapter 13 in May of 2014. Staff recommends removing the date as the drainage criteria manual as a whole was not completely updated.

detention storage requirement was calculated using Full Spectrum Detention methods as specified in the CRITERIA and MANUAL. The detention basin's outlet structure was designed to release the Water Quality Capture Volume (WQCV) in 40 hours. Based upon this approach, we feel that the drainage design provided for the Site is conservative and in keeping with the zoning and historic drainage concept for the area.

Calculations are not in the report. Make sure to provide hydraulic calculations for existing and proposed storm lines. Also provide calculations of any outlet protection required.

### *HYDRAULIC CRITERIA*

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using FIRM panels by FEMA and information provided in the CRITERIA. Hydraulic calculations were computed using StormCAD. Results of the hydraulic calculations are summarized in the Appendix.

### *VARIANCES FROM CRITERIA*

Drainage Criteria Manual

There are no proposed variances from the El Paso County Drainage Criteria, ~~dated May 2014~~, for the proposed development.

Provide discussion of existing/historic drainage conditions. Include an existing conditions drainage plan. Additionally provide discussion of any offsite drainage flow and their impact on the development.

## PROPOSED DRAINAGE CONDITIONS

### *PROPOSED CONDITIONS SUB-BASIN DESCRIPTION*

The developed runoff from the Project will generally be collected by means of private roof drains and storm sewer inlets located in the paved driveways within each delineated basin area. The runoff collected from each basin and the roof system of the proposed building will be conveyed to either of the two-proposed private water quality and detention basins at the western edge of the Site. The controlled stormwater release from the outlet structures within the ponds will be conveyed through the existing private 24" PVC storm sewer pipe which discharges to the CDOT ROW along US Hwy 24.

The Property has been divided into six sub-basins, A1-A5 and R1. The runoff generated on the building roof area, sub-basins R1, is collected and conveyed via a private roof drain system which outfalls to the proposed water quality detention basins. Sub-basins A1-A5 are all internal areas within the parking lot and driveway. Each of the sub-basins drains to an inlet or curb cut within the parking lot and is routed to the two water quality detention basins (west and east ponds). A proposed conditions map is provided in the Appendix.

Runoff from the roof will drain to the front and rear of the building. Is there a gutter system that routes all the runoff to a single location where the private underground storm sewer is? Please show this storm sewer on the drainage plan.

#### Sub-Basin R1

Sub-basin R1 consists of the rooftop of the proposed building. The runoff developed within this sub-basin is collected via private building roof drains. These roof drains discharge to the private underground storm sewer and into the proposed west pond. Developed runoff during the 5-year and 100-year events are 1.62 cfs and 3.01 cfs respectively.

per the contours shown, the flows are going to the southwest.

#### Sub-Basin A1

Sub-basin A1 is located at the southeast corner of the Site and consists of 0.27 acres of the drive aisle at the southeast corner of the building with a basin impervious value of 80.8%. Developed runoff for the 5-year and 100-year storm events are 1.03 and 1.96 cfs respectively and flows from south to north to a proposed curb cut and directly to the east pond at design point 1. Flows are conveyed via a private storm sewer outfall to the ultimate outfall.

Provide discussion of flows from areas/sub-basins within the property but outside the proposed area of development and how the they impact the proposed development. Also provide discussion regarding existing culverts on site. Will they remain? What is their impact on the development area? Are the proposed storm facilities accounting for any flow from these areas/sub-basins?



Sub-basin A2 is located along the north east portion of the site and consists of 0.75 acres of mostly pavement area with a basin impervious value of 95.4%. Developed runoff for the 5-year and 100-year storm events are 3.28 and 5.96 cfs respectively and flows from the south to the north to a 5' Type R inlet located at design point 2. Flows are conveyed via a private storm line to the west pond.

### Sub-Basin A3

Sub-basin A3 is located along the northern and western portions of the site and consists of 1.18 acres of mostly pavement area with some landscape area, with a basin impervious value of 85.0%. Developed runoff for the 5-year and 100-year storm events are 4.64 and 8.73 cfs respectively and flows from the north and the south to a curb cut located at design point 3 which outfalls to the west pond.

### Sub-Basin A4

Sub-basin A4 is located southeast of the building and consists of 0.26 acres of landscape area with a basin impervious value of 2.0%. Developed runoff for the 5-year and 100-year storm events are 0.10 and 0.64 cfs respectively and flows into the east pond outlet structure at design point 4. The outlet structure intercepts the 5-year and 100-year storm event. Flows are conveyed via a private storm line to the ultimate outfall.

### Sub-Basin A5

Sub-basin A5 is located at the southern portion of the site and consists of 0.18 acres of landscape area with a basin impervious value of 2.0%. Developed runoff for the 5-year and 100-year storm events are 0.07 and 0.50 cfs respectively and flows into the west pond outlet structure at design point 5. The outlet structure intercepts the 5-year and 100-year storm event. Flows are conveyed via a private storm line to ultimate outfall.

Provide discussion of driveway portion of development. This area does not flow into the WQ ponds. Site County criteria that allows for runoff from this development area to not be treated. See ECM section I.7.1.C.1

### *EMERGENCY OVERFLOW ROUTING*

Emergency overflow routing consists of flows following the propos[illegible] to south. Once the flows reach the south portion of the site, they w[illegible] and gutter and sheet flow directly south to the existing culver unde[illegible]

### *DETENTION REQUIREMENTS*

The water quality capture volume and 100 year detention volume is required to be detained on-site. This is accomplished through the two proposed 100 year and water quality detention ponds located at the west side of the Site. Each of these ponds were sized per UDFCD criteria and the water quality and detention calculations are provided in the Appendix of this letter. The proposed private water quality and detention basins will be maintained by the Owner.

### Four-Step Process

The four-step process per the MANUAL provides guidance and requirements for the selection of siting of structural Best Management Practices (BMPs) for new development and significant redevelopment.

**Step 1: Employ Runoff Reduction Practices**

Currently the site is developed land with surrounding vacant land. Development of the site will increase current runoff conditions due to increased imperviousness values. However, implementation of landscaping throughout the site, the proposed storm sewer infrastructure,

and the two proposed private water quality and detention basins will help slow runoff and encourage infiltration.

**Step 2: Provide Water Quality Capture Volume (WQCV)**
The water quality capture volume will be detained using two proposed private water quality detention basins with water quality outlet structures located in the south portion of the property. The outfall pipes from the water quality outlet structures will control the release of stormwater to less than historic rates.

**Step 3: Stabilize Drainageways**
There are no current drainageways conveyed through this property. No changes in stabilization are anticipated.

**Step 4: Consider need for Industrial and Commercial BMPs**
Erosion control features for the final stages of the Project will be designed to reduce contamination. Source control BMPs will include the use of, inlet protection, silt fences, concrete washout areas, stockpile management, and stabilized staging areas. The Grading and Erosion Control Plans will be submitted as a separate construction document set.

## Detention and Water Quality Design

Each water quality detention basin is designed with an outlet structure that is fitted with a restrictor plate to release the WQCV in a 40-hour time period per the MANUAL.

Calculations included in the Appendix provide details regarding the private water quality and detention basins design. The calculations include determination of the storage volumes required for full spectrum detention for the WQCV and 100 year detention and allowable release rates.

Overall, 0.214 acre-feet of water quality and detention storage volume is required for the east detention pond and the proposed basin provides 0.398 acre-feet of storage. Sub-basins A1, A2, A4, and R1 have a total area of 1.71 acres (77.7% imperviousness) contributing flow to the east water quality and detention basin.

A5

Overall, 0.163 acre-feet of water quality and detention storage volume is required for the west detention pond and the proposed basin provides 0.312 acre-feet of storage. Sub-basins A3-A4 have a total area of 1.35 acres (74.1% imperviousness) contributing flow to the west detention pond.

The required 5-year and 100-year detention volumes are 0.172 acre-feet and 0.214 acre-feet respectively for the east pond and 0.122 acre-feet and 0.163 acre-feet respectively for the west pond.

It appears that the wrong manual and/or section has been referenced as there isn't a section 13 in the County DCM. Please revise.

### Outlet Requirements

The water quality standards established by the CRITERIA in section 13.5.10 are met by the proposed water quality detention basins. The water quality outlet structures were designed per the specifications in section 13.5.10 of the CRITERIA. The structures meet the micro-pool requirement that it be integrated into the design of the structure with an additional initial surcharge volume. The orifice plates of the structures were designed based on section 13.4.2.2 of the CRITERIA. The orifice plates will allow the Water Quality Capture Volume to be drained from the structure in 40 hours. The calculations for the design of the water quality outlet structure are presented in the Appendix.

Should this be the "Manual" (Urban Drainage).

### Channel Design and Soil Erodibility

A proposed concrete lined trickle channel within the basin was designed per the CRITERIA. A forebay structure is located at the upstream entrance to the basin. This forebay structure was designed per the CRITERIA. The surrounding protection is designed as Type L riprap. Calculations detailing the design and dimensions of the trickle channel and forebay structure are included in the Appendix.

Calculations have not been provided. Please include the appropriate calculations(UD_BMP) for review.

### Emergency Spillway Path

Two private water quality detention basins are proposed on the west side of the property. Both of these basins have been designed with an emergency spillway/overflow path with Type L riprap that would direct flow to the south portion of the site to the culvert under US Highway 24. The design for each pond also includes an outfall pipe that directs flow from the ponds to the culvert running under US Highway 24.

## EROSION CONTROL PLAN

Erosion Control Plans will be submitted separately as a standalone construction document.

## FLOODPLAIN STATEMENT

The Flood Insurance Rate Maps (FIRM) 08041C0459G effective date December 7, 2018, by FEMA, indicates that the Site is located in Zone D (Area of Undetermined Flood Hazard). This panel is included in the Appendix.

## MAINTENANCE AND OPERATIONS

It is our recommendation that the detention basins maintenance cycles consist of twice per year inspections (spring and fall), evaluation of sedimentation within the basins, and removal of sediment if levels exceed two inches deep or if discharge is otherwise deemed insufficient. This satisfies the maintenance and access requirement set by the CRITERIA.

## SUMMARY

Drainage Criteria Manual

### *COMPLIANCE WITH STANDARDS*

The drainage design presented within this report for Legacy Church – Green Mountain Falls, conforms to the El Paso County Storm Drainage Criteria and the Urban Drainage and Flood Control District Manual. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments.

Provide statement regarding drainage fees such as that this basin is an unstudied basin with no associated drainage fees. Also fees are not required with a site development plan application.

## REFERENCES

1. City of Colorado Springs Drainage Criteria Manual, May 2014.
2. El Paso County Drainage Criteria Manual, Vol. 1 and 2, October 1994.

How do the proposed developed flows compare to the existing/historic flows. Are the proposed developed flows at or below historic as required by County criteria.

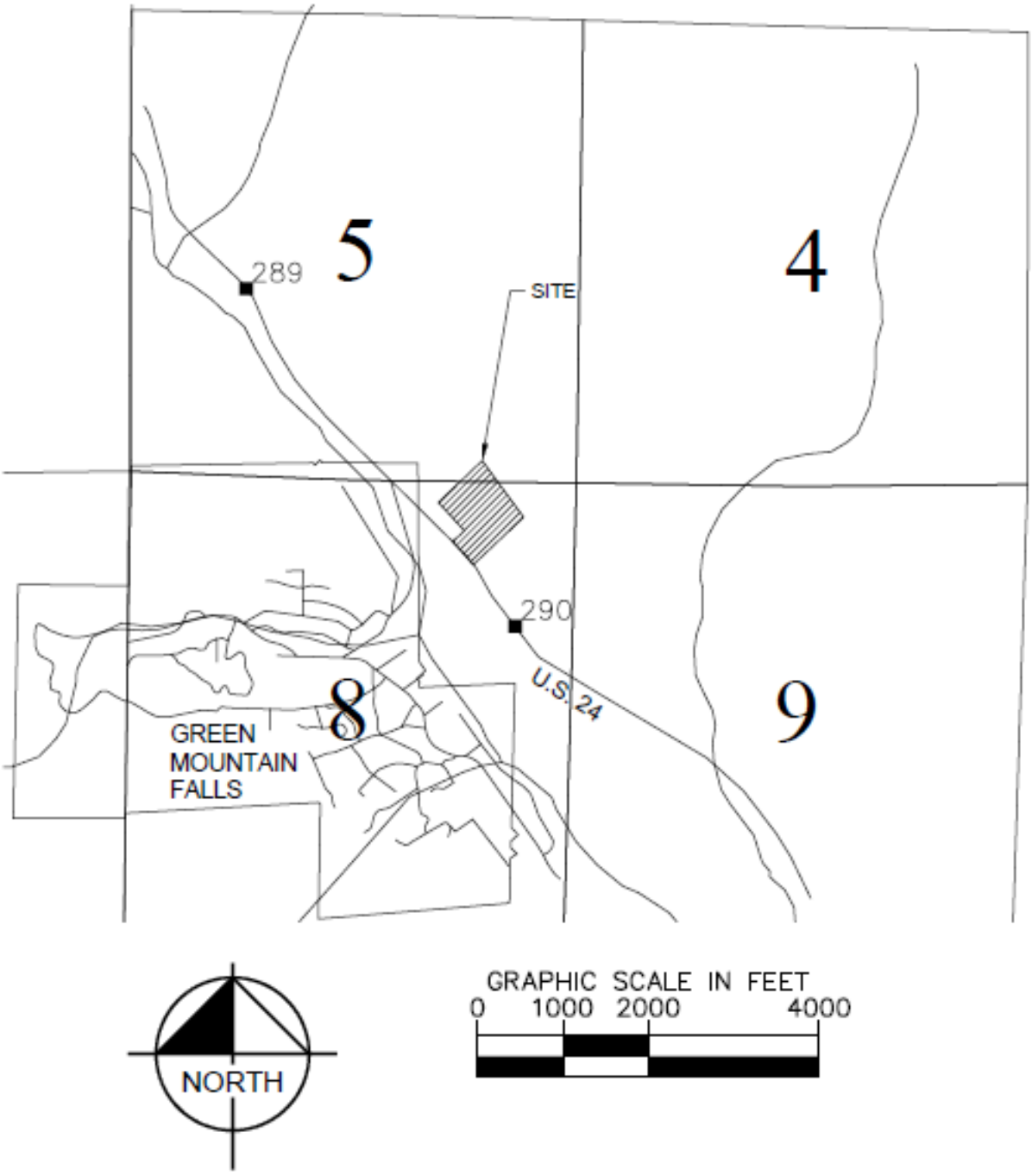
3. Urban Drainage and Flood Control District Drainage Criteria Manual (UDFCDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.

4. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0459G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).

## APPENDIX

***VICINITY MAP***

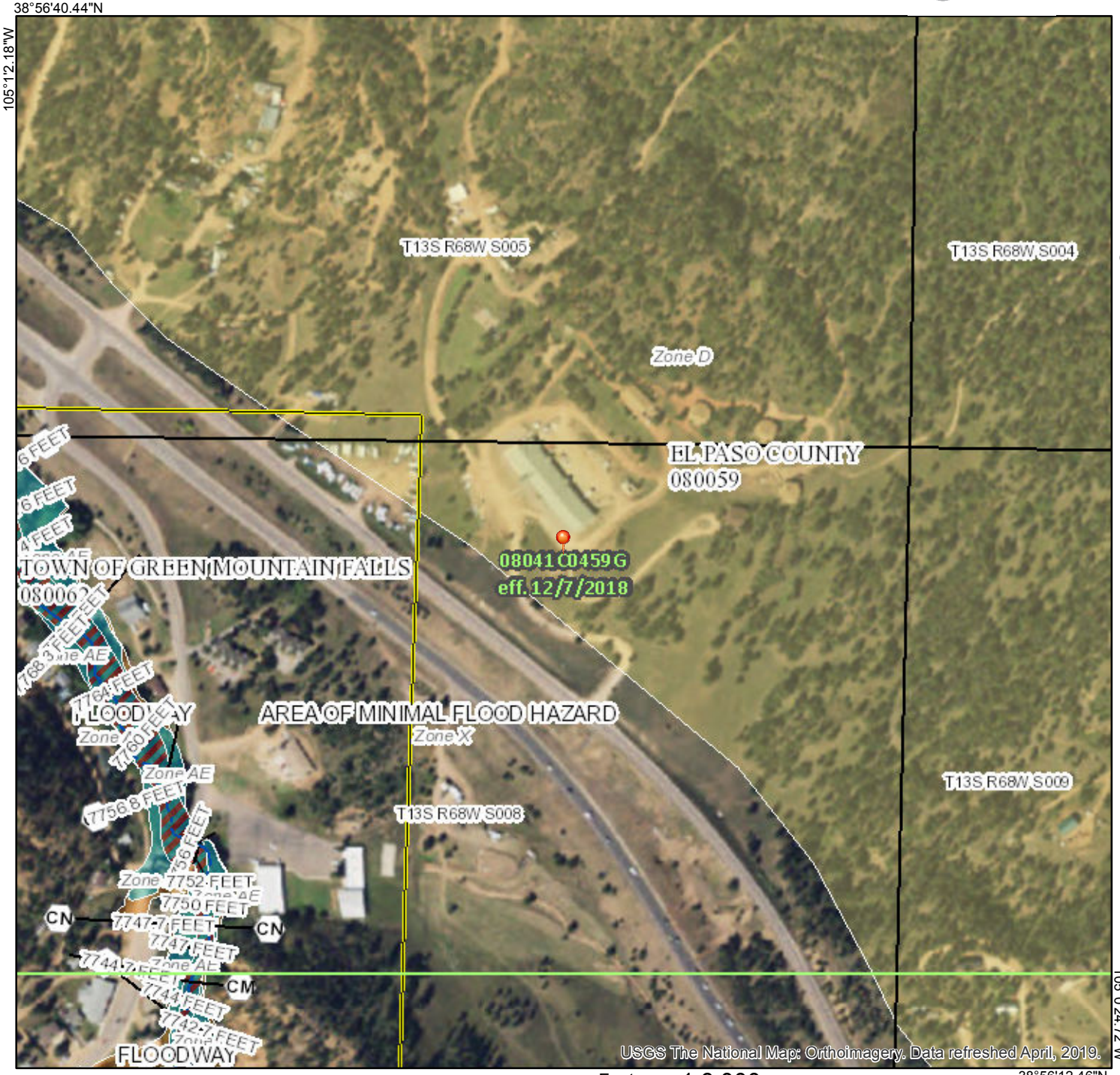
## VICINITY MAP



***SOILS MAP AND FEMA FIRM PANEL***

# National Flood Hazard Layer FIRMette

FEMA




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

1:6,000

## Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/18/2019 at 4:06:34 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Pike National Forest, Eastern Part, Colorado, Parts of Douglas, El Paso, Jefferson, and Teller Counties


July 18, 2019

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report
## Soil Map


Map Scale: 1:3,390 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Pike National Forest, Eastern Part, Colorado, Parts of Douglas, El Paso, Jefferson, and Teller Counties
Survey Area Data: Version 5, Sep 10, 2018

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

Date(s) aerial images were photographed: Jul 4, 2010—Oct 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

## MAP LEGEND

## MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 47 | Sphinx, warm-Rock outcrop complex, 15 to 80 percent slopes | 47.6 | 100.0% |
| **Totals for Area of Interest** | | **47.6** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# Pike National Forest, Eastern Part, Colorado, Parts of Douglas, El Paso, Jefferson, and Teller Counties

## 47—Sphinx, warm-Rock outcrop complex, 15 to 80 percent slopes

### Map Unit Setting

*National map unit symbol:* jpjz
*Elevation:* 6,500 to 9,200 feet
*Mean annual precipitation:* 15 to 24 inches
*Mean annual air temperature:* 43 to 48 degrees F
*Frost-free period:* 70 to 125 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Sphinx, warm, and similar soils:* 60 percent
*Rock outcrop:* 25 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Sphinx, Warm

#### Setting

*Landform:* Mountain slopes
*Landform position (three-dimensional):* Mountaintop, mountainflank
*Down-slope shape:* Linear, convex
*Across-slope shape:* Linear, convex
*Parent material:* Weathered from granite

#### Typical profile

*Oi - 0 to 1 inches:* slightly decomposed plant material
*A - 1 to 5 inches:* gravelly coarse sandy loam
*AC - 5 to 13 inches:* very gravelly loamy coarse sand
*Cr - 13 to 61 inches:* weathered bedrock

#### Properties and qualities

*Slope:* 15 to 70 percent
*Depth to restrictive feature:* 10 to 20 inches to paralithic bedrock
*Natural drainage class:* Somewhat excessively drained
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
*Available water storage in profile:* Very low (about 0.9 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 7e
*Hydrologic Soil Group:* D
*Other vegetative classification:* Ponderosa pine/kinnikinnick (PIPO/ARUV) (C1140)
*Hydric soil rating:* No

## Description of Rock Outcrop

### Setting

*Landform:* Mountain slopes
*Landform position (three-dimensional):* Mountaintop, mountainflank
*Down-slope shape:* Linear, convex
*Across-slope shape:* Linear, convex

### Typical profile

*R - 0 to 61 inches:* bedrock

### Properties and qualities

*Slope:* 15 to 80 percent
*Depth to restrictive feature:* 0 inches to lithic bedrock
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
*Available water storage in profile:* Very low (about 0.0 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 8
*Hydrologic Soil Group:* D
*Hydric soil rating:* No

## Minor Components

### Sphinx, dark surface

*Percent of map unit:* 10 percent
*Landform:* Mountain slopes
*Landform position (three-dimensional):* Mountainflank
*Down-slope shape:* Linear, convex
*Across-slope shape:* Linear, convex
*Other vegetative classification:* Ponderosa pine/kinnikinnick (PIPO/ARUV) (C1140)
*Hydric soil rating:* No

### Garber

*Percent of map unit:* 5 percent
*Landform:* Drainageways, mountain slopes
*Landform position (three-dimensional):* Mountainbase
*Down-slope shape:* Linear, convex, concave
*Across-slope shape:* Linear, convex, concave
*Hydric soil rating:* No

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***HYDROLOGIC CALCULATIONS***

$$I = \frac{28.5\ P_1}{(10+T_D)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

$P_1$ = one-hour rainfall depth (inches) from Table 6-2 One-hour Point Rainfall D
City of Colorado Springs Drainage Design

$T_C$ = storm duration (minutes)

| | 2-yr | 5-yr | 10-yr | 100-yr |
|---|---|---|---|---|
| $P_1$ = | 1.19 | 1.50 | 1.75 | 2.52 |

Time Intensity Frequency Tabulation

| TIME | 2 YR | 5 YR | 10 YR | 100 YR |
|---|---|---|---|---|
| 5 | 4.04 | 5.09 | 5.94 | 8.55 |
| 10 | 3.22 | 4.06 | 4.73 | 6.82 |
| 15 | 2.70 | 3.41 | 3.97 | 5.72 |
| 30 | 1.87 | 2.35 | 2.75 | 3.95 |
| 60 | 1.20 | 1.52 | 1.77 | 2.55 |
| 120 | 0.74 | 0.93 | 1.09 | 1.57 |

**2570 Zeppelin Road**
**Drainage Report**
**Colorado Springs, CO**



Revise title

Runoff coefficients used appear to be for hydrologic soils type A/B instead of type D. Please revise.

## Weighted Imperviousness Calculations

| SUB-BASIN | AREA (SF) | AREA (Acres) | ROOF AREA | ROOF IMPERVIOUSNESS | ROOF C2 | ROOF C5 | ROOF C10 | ROOF C100 | LANDSCAPE AREA | LANDSCAPE IMPERVIOUSNESS | LANDSCAPE C2 | LANDSCAPE C5 | LANDSCAPE C10 | LANDSCAPE C100 | PAVEMENT AREA | PAVEMENT IMPERVIOUSNESS | PAVEMENT C2 | PAVEMENT C5 | PAVEMENT C10 | PAVEMENT C100 | WEIGHTED IMPERVIOUSNESS | WEIGHTED COEFFICIENTS C2 | WEIGHTED COEFFICIENTS C5 | WEIGHTED COEFFICIENTS C10 | WEIGHTED COEFFICIENTS C100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | 11,853 | 0.27 | 0 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 2,326 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 9,527 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 80.8% | 0.72 | 0.74 | 0.77 | 0.84 |
| A2 | 32,590 | 0.75 | 0 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 1,536 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 31,054 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 95.4% | 0.85 | 0.86 | 0.88 | 0.93 |
| A3 | 51,202 | 1.18 | 0 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 7,814 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 43,388 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 85.0% | 0.76 | 0.78 | 0.81 | 0.87 |
| R1 | 18,969 | 0.44 | 18,969 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 0 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 0 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 90.0% | 0.71 | 0.73 | 0.75 | 0.81 |
| A4 | 11,161 | 0.26 | 0 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 11,161 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 0 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 2.0% | 0.03 | 0.09 | 0.17 | 0.36 |
| A5 | 7,809 | 0.18 | 0 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 7,809 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 0 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 2.0% | 0.03 | 0.09 | 0.17 | 0.36 |
| TOTAL | 133,584 | 3.07 | 18,969 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 30,646 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 83,969 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 76.1% | 0.67 | 0.69 | 0.72 | 0.80 |
| NORTH POND (A1-A4, A10, R1) | 74,573 | 1.71 | 18,969 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 15,023 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 40,581 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 77.7% | 0.67 | 0.69 | 0.73 | 0.80 |
| SOUTH POND (A5-A9,R2) | 59,011 | 1.35 | 0 | 90% | 0.71 | 0.73 | 0.75 | 0.81 | 15,623 | 2% | 0.03 | 0.09 | 0.17 | 0.36 | 43,388 | 100% | 0.89 | 0.90 | 0.92 | 0.96 | 74.1% | 0.66 | 0.69 | 0.72 | 0.80 |

Provide calculations for existing conditions

**Green Mountain Falls Church - Drainage Report**
**Proposed Runoff Calculations**
**Time of Concentration**

Watercourse Coefficient

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Forest & Meadow | 2.50 | Short Grass Pasture & Lawns | 7.00 | Grassed Waterway | 15.00 |
| Fallow or Cultivation | 5.00 | Nearly Bare Ground | 10.00 | Paved Area & Shallow Gutter | 20.00 |

| | SUB-BASIN DATA | | | | INITIAL / OVERLAND TIME | | | TRAVEL TIME T(t) | | | | | T(c) CHECK (URBANIZED BASINS) | | | FINAL T(c) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIGN POINT | DRAIN BASIN | AREA sq. ft. | AREA ac. | C(5) | Length ft. | Slope % | T(i) min | Length ft. | Slope % | Coeff. | Velocity fps | T(t) min. | COMP. T(c) | TOTAL LENGTH | L/180+10 | min. |
| 1 | A1 | 11,853 | 0.27 | 0.74 | 10 | 10.0% | 1.0 | 313 | 6.4% | 20.00 | 5.1 | 1.0 | 5.0 | 323 | 11.8 | 5.0 |
| 2 | A2 | 32,590 | 0.75 | 0.86 | 10 | 10.0% | 0.6 | 440 | 4.3% | 20.00 | 4.2 | 1.8 | 5.0 | 450 | 12.5 | 5.0 |
| 3 | A3 | 51,202 | 1.18 | 0.78 | 10 | 10.0% | 0.9 | 482 | 6.1% | 20.00 | 4.9 | 1.6 | 5.0 | 492 | 12.7 | 5.0 |
| 4 | R1 | 18,969 | 0.44 | 0.73 | 10 | 26.0% | 0.7 | 35 | 5.3% | 20.00 | 4.6 | 0.1 | 5.0 | 45 | 10.3 | 5.0 |
| 5 | A4 | 11,161 | 0.26 | 0.09 | 102 | 7.4% | 9.6 | 0 | 1.0% | 15.00 | 1.5 | 0.0 | 9.6 | 102 | 10.6 | 9.6 |
| 6 | A5 | 7,809 | 0.18 | 0.09 | 70 | 10.0% | 7.2 | 0 | 1.0% | 15.00 | 1.5 | 0.0 | 7.2 | 70 | 10.4 | 7.2 |

***Green Mountain Falls Church - Drainage Report***
***Proposed Runoff Calculations*** ***Design Storm 5 Year***
*(Rational Method Procedure)*

| BASIN INFORMATION | | | | DIRECT RUNOFF | | | | CUMULATIVE RUNOFF | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIGN POINT | DRAIN BASIN | AREA ac. | RUNOFF COEFF | T(c) min | C x A | I in/hr | Q cfs | T(c) min | C x A | I in/hr | Q cfs | |
| 1 | A1 | 0.27 | 0.74 | 5.0 | 0.20 | 5.09 | 1.03 | | | | | A portion of the east drive aisle and pavement draining to a riprap swale. |
| 2 | A2 | 0.75 | 0.86 | 5.0 | 0.64 | 5.09 | 3.28 | | | | | A portion of the east drive aisle and the north parking lot draining to a Type R inlet |
| 3 | A3 | 1.18 | 0.78 | 5.0 | 0.91 | 5.09 | 4.64 | | | | | The majority of the west and south sides of the building draining to a curb cut and riprap swale. |
| 4 | R1 | 0.44 | 0.73 | 5.0 | 0.32 | 5.09 | 1.62 | | | | | This basin is for the roof flows, draining to roof drains and to Basin A4 |
| 5 | A4 | 0.26 | 0.09 | 9.6 | 0.02 | 4.12 | 0.10 | | | | | Landscaping and the North Detention Pond |
| 6 | A5 | 0.18 | 0.09 | 7.2 | 0.02 | 4.57 | 0.07 | | | | | Landscaping and the South Detention Pond |

**Green Mountain Falls Church - Drainage Report**
**Proposed Runoff Calculations** **Design Storm 100 Year**
*(Rational Method Procedure)*

| BASIN INFORMATION | | | | DIRECT RUNOFF | | | | CUMULATIVE RUNOFF | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIGN POINT | DRAIN BASIN | AREA ac. | RUNOFF COEFF | T(c) min | C x A | I in/hr | Q cfs | T(c) min | C x A | I in/hr | Q cfs | |
| 1 | A1 | 0.27 | 0.84 | 5.0 | 0.23 | 8.55 | 1.96 | | | | | A portion of the east drive aisle and pavement draining to a riprap swale. |
| 2 | A2 | 0.75 | 0.93 | 5.0 | 0.70 | 8.55 | 5.96 | | | | | A portion of the east drive aisle and the north parking lot draining to a Type R inlet |
| 3 | A3 | 1.18 | 0.87 | 5.0 | 1.02 | 8.55 | 8.73 | | | | | The majority of the west and south sides of the building draining to a curb cut and riprap swale. |
| 4 | R1 | 0.44 | 0.81 | 5.0 | 0.35 | 8.55 | 3.01 | | | | | This basin is for the roof flows, draining to roof drains and to Basin A4 |
| 5 | A4 | 0.26 | 0.36 | 9.6 | 0.09 | 6.93 | 0.64 | | | | | Landscaping and the North Detention Pond |
| 6 | A5 | 0.18 | 0.36 | 7.2 | 0.06 | 7.68 | 0.50 | | | | | Landscaping and the South Detention Pond |

Revise title

| SUMMARY - PROPOSED RUNOFF TABLE | | | | | | |
|---|---|---|---|---|---|---|
| **DESIGN POINT** | **BASIN DESIGNATION** | **BASIN AREA (ACRES)** | **DIRECT 5-YR RUNOFF (CFS)** | **DIRECT 100-YR RUNOFF (CFS)** | **CUMULATIVE 5-YR RUNOFF (CFS)** | **CUMULATIVE 100-YR RUNOFF (CFS)** |
| 1 | A1 | 0.27 | 1.03 | 1.96 | 1.03 | 1.96 |
| 2 | A2 | 0.75 | 3.28 | 5.96 | 3.28 | 5.96 |
| 3 | A3 | 1.18 | 4.64 | 8.73 | 4.64 | 8.73 |
| 4 | R1 | 0.44 | 1.62 | 3.01 | 1.62 | 3.01 |
| 5 | A4 | 0.26 | 0.10 | 0.64 | 0.10 | 0.64 |
| 6 | A5 | 0.18 | 0.07 | 0.50 | 0.07 | 0.50 |

***WATER QUALITY CALCULATIONS***

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

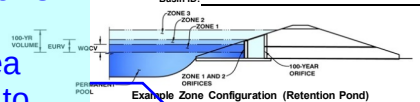
UD-Detention, Version 3.07 (February 2017)

It appears that flows outside the development area may be tributary to the pond. Please revise accordingly.

Please include in your analysis.

Project: Legacy Church - Green Mountain Falls- West Pond

Basin ID:




Example Zone Configuration (Retention Pond)

**Required Volume Calculation**

| | | |
|---|---|---|
| Selected BMP Type = | EDB | |
| Watershed Area = | 1.35 | acres |
| Watershed Length = | 445 | ft |
| Watershed Slope = | 0.080 | ft/ft |
| Watershed Imperviousness = | 74.10% | percent |
| Percentage Hydrologic Soil Group A = | 0.0% | percent |
| Percentage Hydrologic Soil Group B = | 0.0% | percent |
| Percentage Hydrologic Soil Groups C/D = | 100.0% | percent |
| Desired WQCV Drain Time = | 40.0 | hours |
| Location for 1-hr Rainfall Depths = | User Input | |
| Water Quality Capture Volume (WQCV) = | 0.033 | acre-feet |
| Excess Urban Runoff Volume (EURV) = | 0.098 | acre-feet |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 0.094 | acre-feet |
| 5-yr Runoff Volume (P1 = 1.51 in.) = | 0.130 | acre-feet |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 0.156 | acre-feet |
| 25-yr Runoff Volume (P1 = 0 in.) = | 0.000 | acre-feet |
| 50-yr Runoff Volume (P1 = 0 in.) = | 0.000 | acre-feet |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 0.261 | acre-feet |
| 500-yr Runoff Volume (P1 = 0 in.) = | 0.000 | acre-feet |
| Approximate 2-yr Detention Volume = | 0.088 | acre-feet |
| Approximate 5-yr Detention Volume = | 0.122 | acre-feet |
| Approximate 10-yr Detention Volume = | 0.140 | acre-feet |
| Approximate 25-yr Detention Volume = | 0.000 | acre-feet |
| Approximate 50-yr Detention Volume = | 0.000 | acre-feet |
| Approximate 100-yr Detention Volume = | 0.163 | acre-feet |

| Optional User Override 1-hr Precipitation | |
|---|---|
| 1.19 | inches |
| 1.51 | inches |
| 1.75 | inches |
| | inches |
| | inches |
| 2.52 | inches |
| | inches |

**Stage-Storage Calculation**

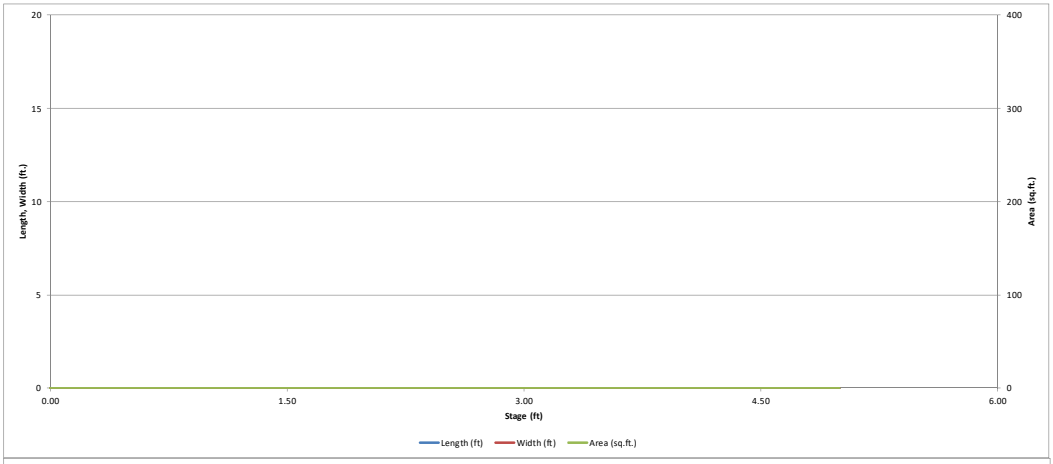
| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 0.033 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 0.064 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 0.065 | acre-feet |
| Total Detention Basin Volume = | 0.163 | acre-feet |
| Initial Surcharge Volume (ISV) = | user | ft^3 |
| Initial 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 |

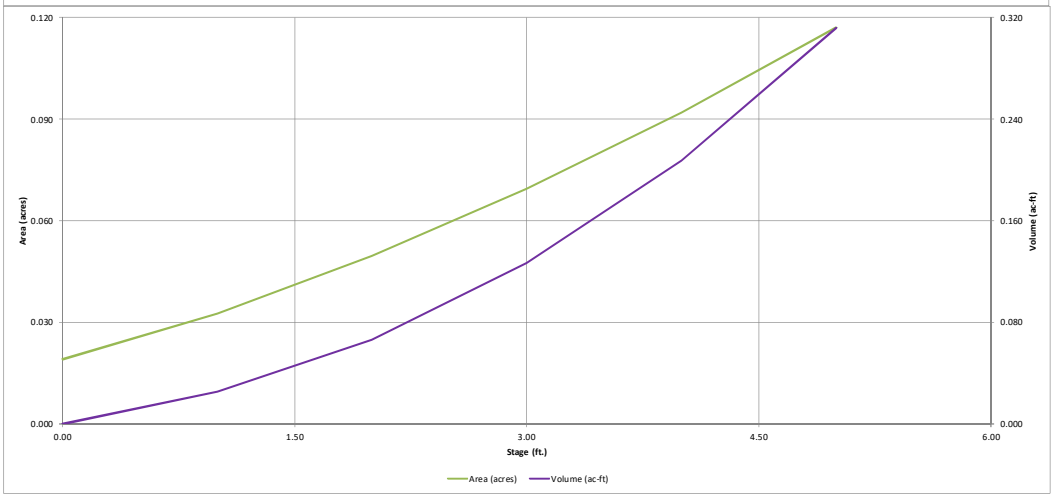
Depth Increment = 1 ft

| Stage - Storage Description | Stage (ft) | Optional Override Stage (ft) | Length (ft) | Width (ft) | Area (ft^2) | Optional Override Area (ft^2) | Area (acre) | Volume (ft^3) | Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| Top of Micropool | -- | 0.00 | -- | -- | -- | 832 | 0.019 | | |
| | -- | 1.00 | -- | -- | -- | 1,422 | 0.033 | 1,113 | 0.026 |
| | -- | 2.00 | -- | -- | -- | 2,159 | 0.050 | 2,896 | 0.066 |
| | -- | 3.00 | -- | -- | -- | 3,022 | 0.069 | 5,508 | 0.126 |
| | -- | 4.00 | -- | -- | -- | 4,004 | 0.092 | 9,021 | 0.207 |
| | -- | 5.00 | -- | -- | -- | 5,093 | 0.117 | 13,569 | 0.312 |

## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



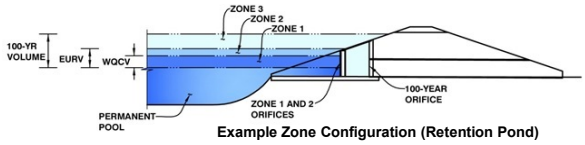



# Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

**Project:** Legacy Church - Green Mountain Falls - West Pond

**Basin ID:**




Example Zone Configuration (Retention Pond)

| | Stage (ft) | Zone Volume (ac-ft) | Outlet Type |
|---|---|---|---|
| Zone 1 (WQCV) | 1.22 | 0.033 | Orifice Plate |
| Zone 2 (EURV) | 2.56 | 0.064 | Orifice Plate |
| Zone 3 (100-year) | 3.49 | 0.065 | Weir&Pipe (Rect.) |
| | | 0.163 | Total |

Note that additional comments may be provided upon submittal of pond construction plans.

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

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

**Calculated Parameters for Underdrain**

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

| | | | | | |
|---|---|---|---|---|---|
| Invert of Lowest Orifice = | 0.00 | ft (relative to basin bottom at Stage = 0 ft) | WQ Orifice Area per Row = | 2.708E-03 | $ft^2$ |
| Depth at top of Zone using Orifice Plate = | 3.04 | ft (relative to basin bottom at Stage = 0 ft) | Elliptical Half-Width = | N/A | feet |
| Orifice Plate: Orifice Vertical Spacing = | N/A | inches | Elliptical Slot Centroid = | N/A | feet |
| Orifice Plate: Orifice Area per Row = | 0.39 | sq. inches (diameter = 11/16 inch) | Elliptical Slot Area = | N/A | $ft^2$ |

**Calculated Parameters for Plate**

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

| | Row 1 (required) | Row 2 (optional) | Row 3 (optional) | Row 4 (optional) | Row 5 (optional) | Row 6 (optional) | Row 7 (optional) | Row 8 (optional) |
|---|---|---|---|---|---|---|---|---|
| Stage of Orifice Centroid (ft) | 0.00 | 0.61 | 1.22 | | | | | |
| Orifice Area (sq. inches) | 0.39 | 0.39 | 0.39 | | | | | |

| | 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) |
| Depth at top of Zone using Vertical Orifice = | N/A | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Vertical Orifice Diameter = | N/A | N/A | inches |

**Calculated Parameters for Vertical Orifice**

| | Not Selected | Not Selected | |
|---|---|---|---|
| Vertical Orifice Area = | N/A | N/A | $ft^2$ |
| Vertical Orifice Centroid = | N/A | N/A | feet |

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

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Overflow Weir Front Edge Height, Ho = | 3.04 | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Overflow Weir Front Edge Length = | 4.00 | N/A | feet |
| Overflow Weir Slope = | 0.00 | N/A | H:V (enter zero for flat grate) |
| Horiz. Length of Weir Sides = | 4.00 | N/A | feet |
| Overflow Grate Open Area % = | 70% | N/A | %, grate open area/total area |
| Debris Clogging % = | 50% | N/A | % |

**Calculated Parameters for Overflow Weir**

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Height of Grate Upper Edge, $H_t$ = | 3.04 | N/A | feet |
| Over Flow Weir Slope Length = | 4.00 | N/A | feet |
| Grate Open Area / 100-yr Orifice Area = | | N/A | should be $\geq 4$ |
| Overflow Grate Open Area w/o Debris = | 11.20 | N/A | $ft^2$ |
| Overflow Grate Open Area w/ Debris = | 5.60 | N/A | $ft^2$ |

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

| | Zone 3 Rectangular | Not Selected | |
|---|---|---|---|
| Depth to Invert of Outlet Pipe = | | N/A | ft (distance below basin bottom at Stage = 0 ft) |
| Rectangular Orifice Width = | | N/A | inches |
| Rectangular Orifice Height = | | | inches |

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

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

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

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

Please fill out all necessary cells

**Calculated Parameters for Spillway**

| | | |
|---|---|---|
| Spillway Design Flow Depth= | | feet |
| Stage at Top of Freeboard = | | feet |
| Basin Area at Top of Freeboard = | | acres |

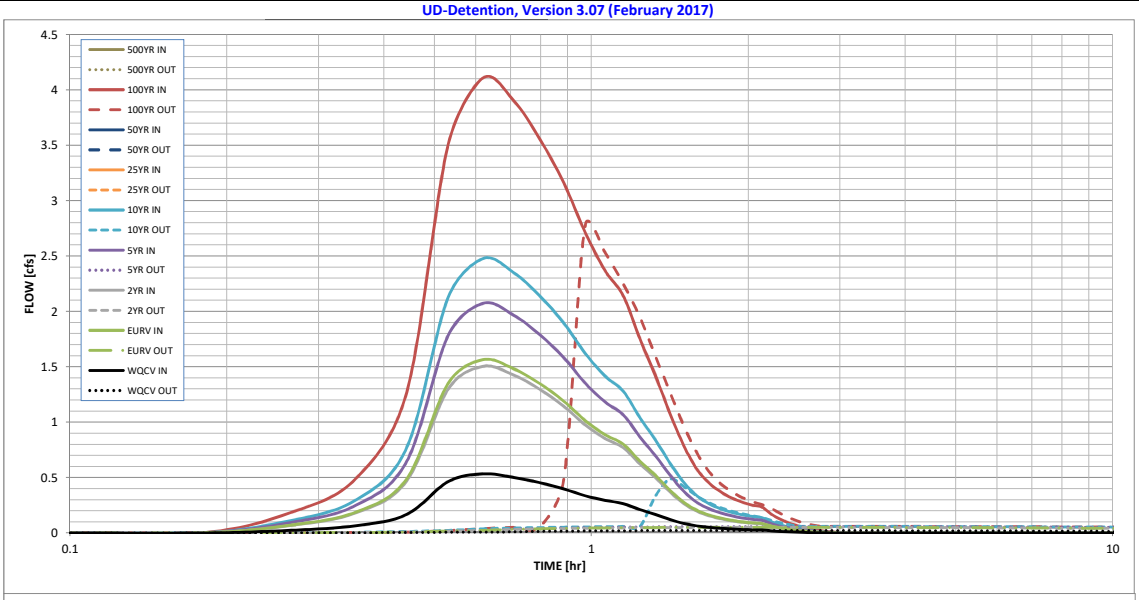
**Routed Hydrograph Results**

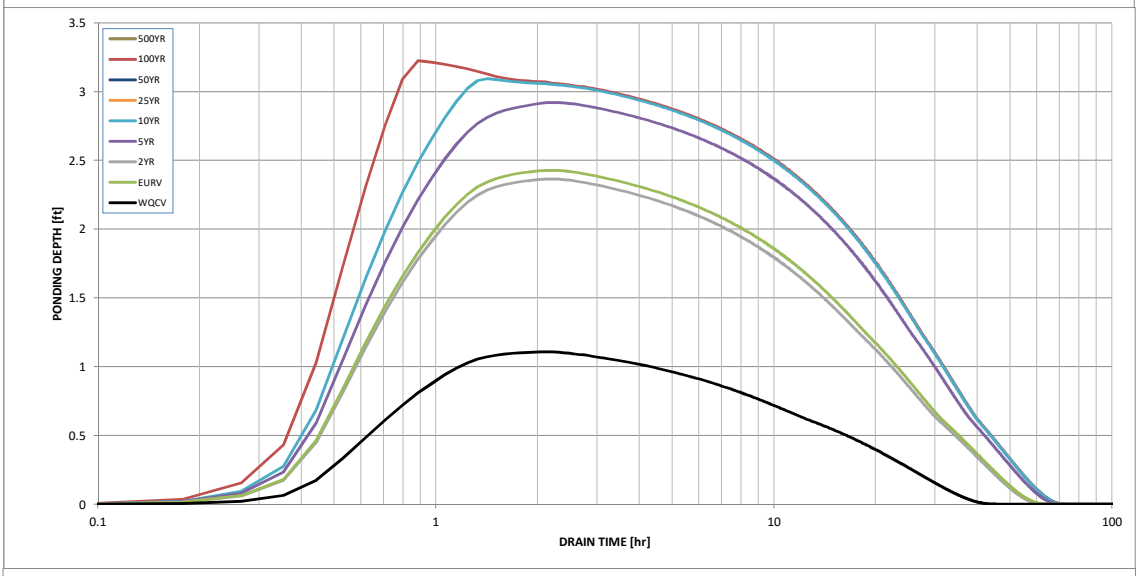
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | 0.53 | 1.07 | 1.19 | 1.51 | 1.75 | 0.00 | 0.00 | 2.52 | 0.00 |
| Calculated Runoff Volume (acre-ft) = | 0.033 | 0.098 | 0.094 | 0.130 | 0.156 | 0.000 | 0.000 | 0.261 | 0.000 |
| OPTIONAL Override Runoff Volume (acre-ft) = | | | | | | | | | |
| Inflow Hydrograph Volume (acre-ft) = | 0.033 | 0.098 | 0.094 | 0.130 | 0.156 | #N/A | #N/A | 0.260 | #N/A |
| Predevelopment Unit Peak Flow, q (cfs/acre) = | 0.00 | 0.00 | 0.01 | 0.11 | 0.31 | 0.00 | 0.00 | 1.27 | 0.00 |
| Predevelopment Peak Q (cfs) = | 0.0 | 0.0 | 0.0 | 0.2 | 0.4 | 0.0 | 0.0 | 1.7 | 0.0 |
| Peak Inflow Q (cfs) = | 0.5 | 1.6 | 1.5 | 2.1 | 2.5 | #N/A | #N/A | 4.1 | #N/A |
| Peak Outflow Q (cfs) = | 0.0 | 0.1 | 0.1 | 0.1 | 0.5 | #N/A | #N/A | 2.8 | #N/A |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 0.4 | 1.2 | #N/A | #N/A | 1.6 | #N/A |
| Structure Controlling Flow = | Plate | Plate | Plate | Plate | Overflow Grate 1 | #N/A | #N/A | Overflow Grate 1 | #N/A |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | 0.0 | #N/A | #N/A | 0.0 | #N/A |
| Max Velocity through Grate 2 (fps) = | N/A | N/A | N/A | N/A | N/A | #N/A | #N/A | N/A | #N/A |
| Time to Drain 97% of Inflow Volume (hours) = | 37 | 49 | 49 | 54 | 54 | #N/A | #N/A | 49 | #N/A |
| Time to Drain 99% of Inflow Volume (hours) = | 40 | 55 | 55 | 61 | 62 | #N/A | #N/A | 59 | #N/A |
| Maximum Ponding Depth (ft) = | 1.11 | 2.43 | 2.36 | 2.92 | 3.09 | #N/A | #N/A | 3.22 | #N/A |
| Area at Maximum Ponding Depth (acres) = | 0.03 | 0.06 | 0.06 | 0.07 | 0.07 | #N/A | #N/A | 0.07 | #N/A |
| Maximum Volume Stored (acre-ft) = | 0.029 | 0.090 | 0.086 | 0.121 | 0.133 | #N/A | #N/A | 0.142 | #N/A |

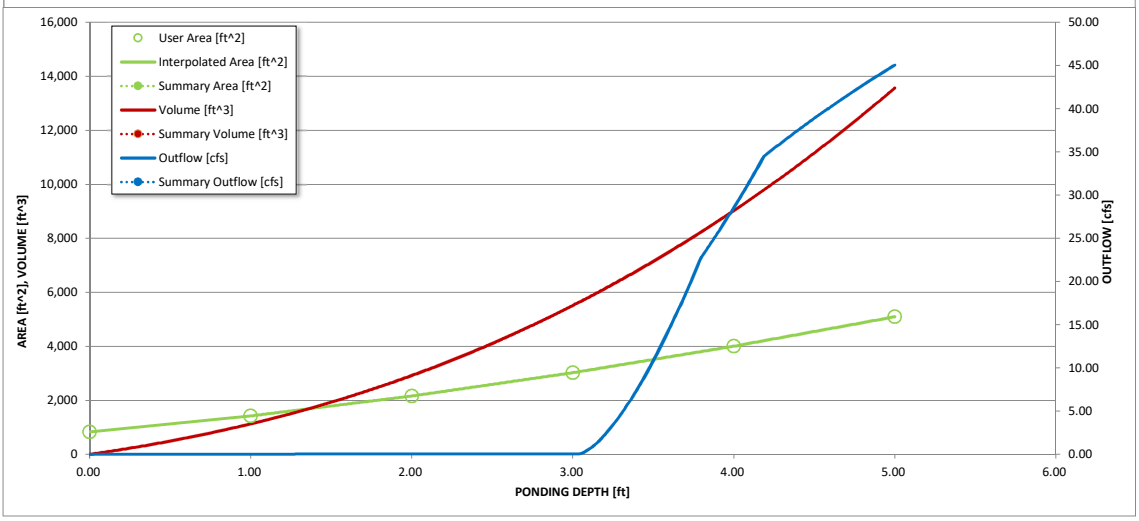
Flows shall be at or below historic. Revise accordingly.

# Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)




| 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:

**Storm Inflow Hydrographs** **UD-Detention, Version 3.07 (February 2017)**

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

| Time Interval | SOURCE | WORKBOOK | WORKBOOK | WORKBOOK | WORKBOOK | WORKBOOK | #N/A | #N/A | WORKBOOK | #N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| | 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] |
| 5.31 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 0:05:19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| Hydrograph | 0:10:37 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| Constant | 0:15:56 | 0.02 | 0.07 | 0.07 | 0.10 | 0.11 | #N/A | #N/A | 0.19 | #N/A |
| 0.941 | 0:21:14 | 0.07 | 0.19 | 0.18 | 0.25 | 0.30 | #N/A | #N/A | 0.50 | #N/A |
| | 0:26:33 | 0.17 | 0.49 | 0.47 | 0.65 | 0.77 | #N/A | #N/A | 1.27 | #N/A |
| | 0:31:52 | 0.46 | 1.35 | 1.30 | 1.78 | 2.12 | #N/A | #N/A | 3.50 | #N/A |
| | 0:37:10 | 0.53 | 1.56 | 1.50 | 2.07 | 2.48 | #N/A | #N/A | 4.11 | #N/A |
| | 0:42:29 | 0.50 | 1.48 | 1.43 | 1.97 | 2.35 | #N/A | #N/A | 3.91 | #N/A |
| | 0:47:47 | 0.45 | 1.35 | 1.30 | 1.79 | 2.14 | #N/A | #N/A | 3.56 | #N/A |
| | 0:53:06 | 0.40 | 1.19 | 1.15 | 1.58 | 1.90 | #N/A | #N/A | 3.16 | #N/A |
| | 0:58:25 | 0.34 | 1.01 | 0.98 | 1.35 | 1.62 | #N/A | #N/A | 2.71 | #N/A |
| | 1:03:43 | 0.30 | 0.89 | 0.85 | 1.18 | 1.42 | #N/A | #N/A | 2.37 | #N/A |
| | 1:09:02 | 0.27 | 0.80 | 0.77 | 1.07 | 1.28 | #N/A | #N/A | 2.14 | #N/A |
| | 1:14:20 | 0.21 | 0.65 | 0.62 | 0.87 | 1.04 | #N/A | #N/A | 1.75 | #N/A |
| | 1:19:39 | 0.17 | 0.52 | 0.50 | 0.70 | 0.84 | #N/A | #N/A | 1.42 | #N/A |
| | 1:24:58 | 0.12 | 0.39 | 0.37 | 0.52 | 0.63 | #N/A | #N/A | 1.08 | #N/A |
| | 1:30:16 | 0.09 | 0.28 | 0.27 | 0.38 | 0.46 | #N/A | #N/A | 0.79 | #N/A |
| | 1:35:35 | 0.07 | 0.21 | 0.20 | 0.28 | 0.34 | #N/A | #N/A | 0.58 | #N/A |
| | 1:40:53 | 0.05 | 0.16 | 0.16 | 0.22 | 0.26 | #N/A | #N/A | 0.45 | #N/A |
| | 1:46:12 | 0.04 | 0.13 | 0.13 | 0.18 | 0.22 | #N/A | #N/A | 0.37 | #N/A |
| | 1:51:31 | 0.04 | 0.12 | 0.11 | 0.15 | 0.19 | #N/A | #N/A | 0.32 | #N/A |
| | 1:56:49 | 0.03 | 0.10 | 0.10 | 0.14 | 0.16 | #N/A | #N/A | 0.28 | #N/A |
| | 2:02:08 | 0.03 | 0.09 | 0.09 | 0.12 | 0.15 | #N/A | #N/A | 0.25 | #N/A |
| | 2:07:26 | 0.03 | 0.09 | 0.08 | 0.12 | 0.14 | #N/A | #N/A | 0.23 | #N/A |
| | 2:12:45 | 0.02 | 0.06 | 0.06 | 0.08 | 0.10 | #N/A | #N/A | 0.17 | #N/A |
| | 2:18:04 | 0.02 | 0.05 | 0.04 | 0.06 | 0.07 | #N/A | #N/A | 0.13 | #N/A |
| | 2:23:22 | 0.01 | 0.03 | 0.03 | 0.05 | 0.05 | #N/A | #N/A | 0.09 | #N/A |
| | 2:28:41 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | #N/A | #N/A | 0.07 | #N/A |
| | 2:33:59 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | #N/A | #N/A | 0.05 | #N/A |
| | 2:39:18 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | #N/A | #N/A | 0.03 | #N/A |
| | 2:44:37 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | #N/A | #N/A | 0.02 | #N/A |
| | 2:49:55 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | #N/A | #N/A | 0.01 | #N/A |
| | 2:55:14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.01 | #N/A |
| | 3:00:32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:05:51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:11:10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:16:28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:21:47 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:27:05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:32:24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:37:43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:43:01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:48:20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:53:38 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:58:57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:04:16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:09:34 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:14:53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:20:11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:25:30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:30:49 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:36:07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:41:26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:46:44 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:52:03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:57:22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:02:40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:07:59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:13:17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:18:36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:23:55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:29:13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:34:32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:39:50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:45:09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:50:28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:55:46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 6:01:05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 6:06:23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 6:11:42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 6:17:01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 6:22:19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |

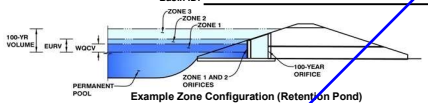
It appears that flows outside the development area may be tributary to the pond. Please revise accordingly.

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

**Project:** Legacy Church - Green Mountain Falls - East Pond

**Basin ID:**




**Example Zone Configuration (Retention Pond)**

## Required Volume Calculation

| | | | |
|---|---|---|---|
| Selected BMP Type = | EDB | | |
| Watershed Area = | 1.71 | acres | |
| Watershed Length = | 454 | ft | |
| Watershed Slope = | 0.060 | ft/ft | |
| Watershed Imperviousness = | 77.70% | percent | |
| Percentage Hydrologic Soil Group A = | 0.0% | percent | |
| Percentage Hydrologic Soil Group B = | 0.0% | percent | |
| Percentage Hydrologic Soil Groups C/D = | 100.0% | percent | |
| Desired WQCV Drain Time = | 40.0 | hours | |
| Location for 1-hr Rainfall Depths = | User Input | | |
| Water Quality Capture Volume (WQCV) = | 0.045 | acre-feet | |
| Excess Urban Runoff Volume (EURV) = | 0.130 | acre-feet | |
| 2-yr Runoff Volume (P1 = 1.19 in.) = | 0.125 | acre-feet | |
| 5-yr Runoff Volume (P1 = 1.51 in.) = | 0.172 | acre-feet | |
| 10-yr Runoff Volume (P1 = 1.75 in.) = | 0.206 | acre-feet | |
| 25-yr Runoff Volume (P1 = 0 in.) = | 0.000 | acre-feet | |
| 50-yr Runoff Volume (P1 = 0 in.) = | 0.000 | acre-feet | |
| 100-yr Runoff Volume (P1 = 2.52 in.) = | 0.336 | acre-feet | |
| 500-yr Runoff Volume (P1 = 0 in.) = | 0.000 | acre-feet | |
| Approximate 2-yr Detention Volume = | 0.118 | acre-feet | |
| Approximate 5-yr Detention Volume = | 0.162 | acre-feet | |
| Approximate 10-yr Detention Volume = | 0.185 | acre-feet | |
| Approximate 25-yr Detention Volume = | 0.000 | acre-feet | |
| Approximate 50-yr Detention Volume = | 0.000 | acre-feet | |
| Approximate 100-yr Detention Volume = | 0.214 | acre-feet | |

Optional User Override 1-hr Precipitation

| | |
|---|---|
| 1.19 | inches |
| 1.51 | inches |
| 1.75 | inches |
| | inches |
| | inches |
| 2.52 | inches |
| | inches |

## Stage-Storage Calculation

| | | |
|---|---|---|
| Zone 1 Volume (WQCV) = | 0.045 | acre-feet |
| Zone 2 Volume (EURV - Zone 1) = | 0.085 | acre-feet |
| Zone 3 Volume (100-year - Zones 1 & 2) = | 0.084 | acre-feet |
| Total Detention Basin Volume = | 0.214 | 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 |

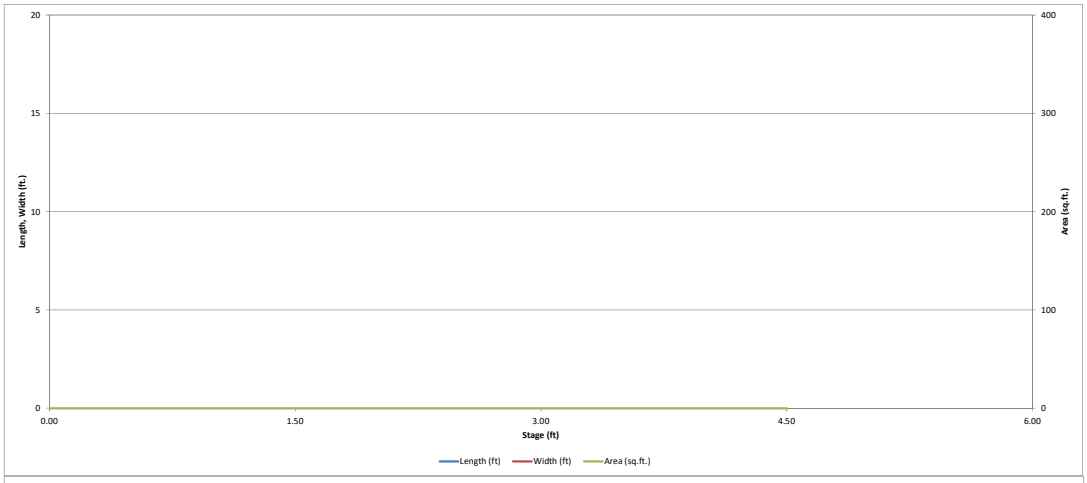
Depth Increment = 1 ft

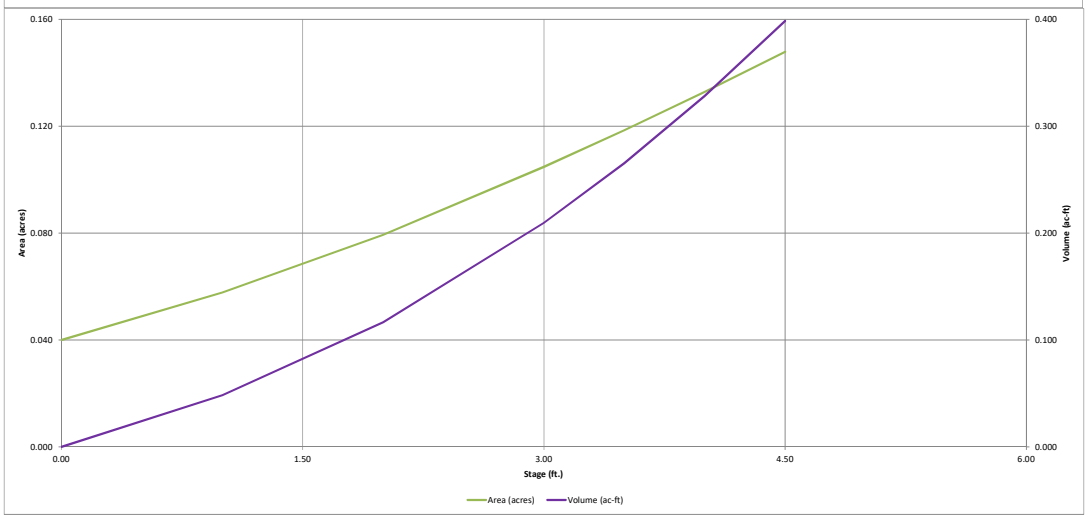
| Stage - Storage Description | Stage (ft) | Optional Override Stage (ft) | Length (ft) | Width (ft) | Area (ft^2) | Optional Override Area (ft^2) | Area (acre) | Volume (ft^3) | Volume (ac-ft) |
|---|---|---|---|---|---|---|---|---|---|
| **Top of Micropool** | -- | 0.00 | -- | -- | -- | 1,743 | 0.040 | | |
| | -- | 1.00 | -- | -- | -- | 2,517 | 0.058 | 2,105 | 0.048 |
| | -- | 2.00 | -- | -- | -- | 3,457 | 0.079 | 5,082 | 0.117 |
| | -- | 3.00 | -- | -- | -- | 4,565 | 0.105 | 9,128 | 0.210 |
| | -- | 3.50 | -- | -- | -- | 5,164 | 0.119 | 11,560 | 0.265 |
| | -- | 4.00 | -- | -- | -- | 5,789 | 0.133 | 14,298 | 0.328 |
| | -- | 4.50 | -- | -- | -- | 6,438 | 0.148 | 17,355 | 0.398 |

Please include in your analysis.

## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



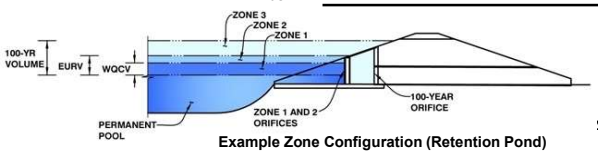



# Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Legacy Church - Green Mountain Falls - East Pond

Basin ID:




Example Zone Configuration (Retention Pond)

| | Stage (ft) | Zone Volume (ac-ft) | Outlet Type |
|---|---|---|---|
| Zone 1 (WQCV) | 0.93 | 0.045 | Orifice Plate |
| Zone 2 (EURV) | 2.16 | 0.085 | Orifice Plate |
| Zone 3 (100-year) | 3.05 | 0.084 | Weir&Pipe (Rect.) |
| | | 0.214 | Total |

Note that additional comments may be provided upon submittal of pond construction plans.

**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 Diameter = | N/A | inches | |

**Calculated Parameters for Underdrain**

| | | |
|---|---|---|
| Underdrain Orifice Area = | N/A | $ft^2$ |
| Underdrain Orifice Centroid = | N/A | feet |

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

| | | |
|---|---|---|
| Invert of Lowest Orifice = | 0.00 | ft (relative to basin bottom at Stage = 0 ft) |
| Depth at top of Zone using Orifice Plate = | 2.64 | ft (relative to basin bottom at Stage = 0 ft) |
| Orifice Plate: Orifice Vertical Spacing = | N/A | inches |
| Orifice Plate: Orifice Area per Row = | 0.60 | sq. inches (diameter = 7/8 inch) |

**Calculated Parameters for Plate**

| | | |
|---|---|---|
| WQ Orifice Area per Row = | 4.167E-03 | $ft^2$ |
| Elliptical Half-Width = | N/A | feet |
| Elliptical Slot Centroid = | N/A | feet |
| Elliptical Slot Area = | N/A | $ft^2$ |

**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 | 0.46 | 0.47 | | | | | |
| Orifice Area (sq. inches) | 0.60 | 0.60 | 0.60 | | | | | |

| | 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) |
| Depth at top of Zone using Vertical Orifice = | N/A | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Vertical Orifice Diameter = | N/A | N/A | inches |

**Calculated Parameters for Vertical Orifice**

| | Not Selected | Not Selected | |
|---|---|---|---|
| Vertical Orifice Area = | N/A | N/A | $ft^2$ |
| Vertical Orifice Centroid = | N/A | N/A | feet |

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

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Overflow Weir Front Edge Height, Ho = | 2.64 | N/A | ft (relative to basin bottom at Stage = 0 ft) |
| Overflow Weir Front Edge Length = | 4.00 | N/A | feet |
| Overflow Weir Slope = | 0.00 | N/A | H:V (enter zero for flat grate) |
| Horiz. Length of Weir Sides = | 4.00 | N/A | feet |
| Overflow Grate Open Area % = | 70% | N/A | %, grate open area/total area |
| Debris Clogging % = | 50% | N/A | % |

**Calculated Parameters for Overflow Weir**

| | Zone 3 Weir | Not Selected | |
|---|---|---|---|
| Height of Grate Upper Edge, $H_t$ = | 2.64 | N/A | feet |
| Over Flow Weir Slope Length = | 4.00 | N/A | feet |
| Grate Open Area / 100-yr Orifice Area = | | N/A | should be ≥ 4 |
| Overflow Grate Open Area w/o Debris = | 11.20 | N/A | $ft^2$ |
| Overflow Grate Open Area w/ Debris = | 5.60 | N/A | $ft^2$ |

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

| | Zone 3 Rectangular | Not Selected | |
|---|---|---|---|
| Depth to Invert of Outlet Pipe = | | N/A | ft (distance below basin bottom at Stage = 0 ft) |
| Rectangular Orifice Width = | | N/A | inches |
| Rectangular Orifice Height = | | | inches |

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

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

**User Input: Emergency Spillway (Rectangular or Trapezoidal)**

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

Please fill all necessary cells.

**Calculated Parameters for Spillway**

| | | |
|---|---|---|
| Spillway Design Flow Depth= | | feet |
| Stage at Top of Freeboard = | | feet |
| Basin Area at Top of Freeboard = | | acres |

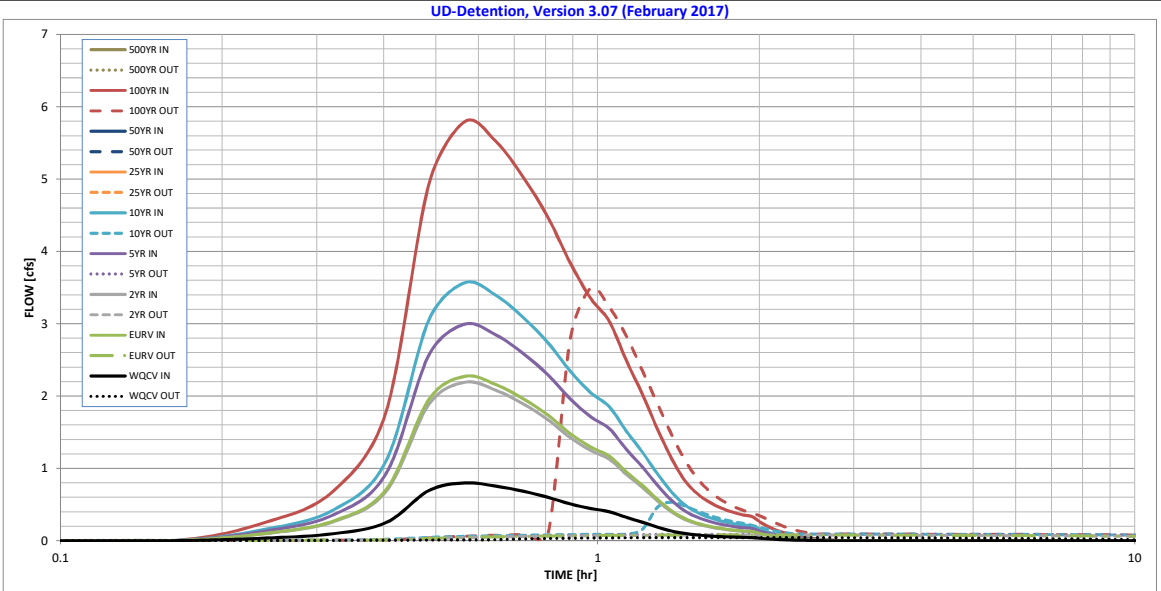
**Routed Hydrograph Results**

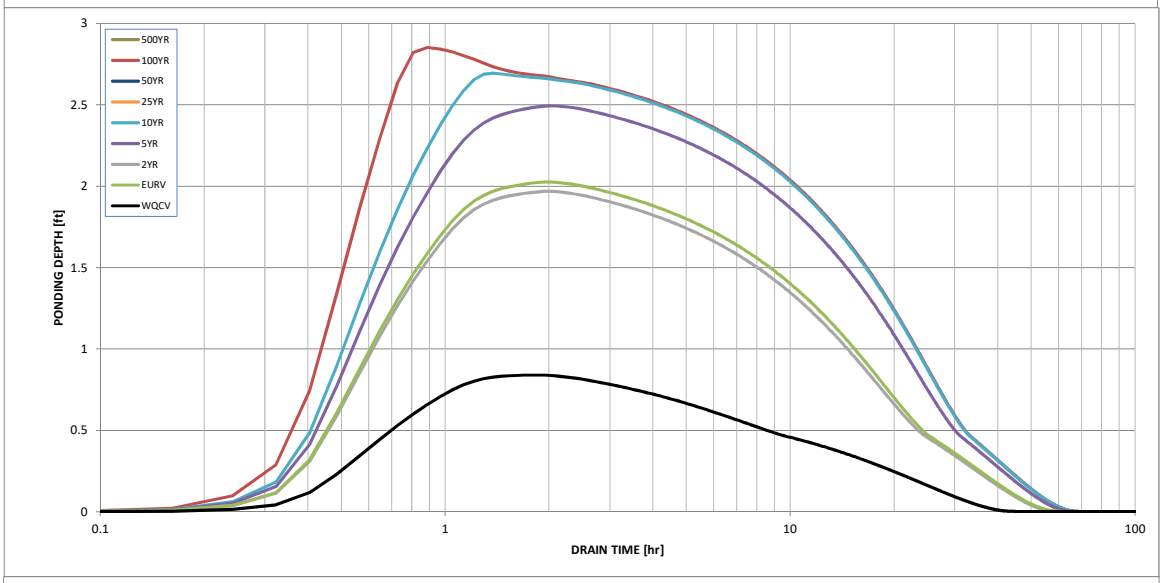
| Design Storm Return Period = | WQCV | EURV | 2 Year | 5 Year | 10 Year | 25 Year | 50 Year | 100 Year | 500 Year |
|---|---|---|---|---|---|---|---|---|---|
| One-Hour Rainfall Depth (in) = | 0.53 | 1.07 | 1.19 | 1.51 | 1.75 | 0.00 | 0.00 | 2.52 | 0.00 |
| Calculated Runoff Volume (acre-ft) = | 0.045 | 0.130 | 0.125 | 0.172 | 0.206 | 0.000 | 0.000 | 0.336 | 0.000 |
| OPTIONAL Override Runoff Volume (acre-ft) = | | | | | | | | | |
| Inflow Hydrograph Volume (acre-ft) = | 0.045 | 0.130 | 0.125 | 0.172 | 0.205 | #N/A | #N/A | 0.336 | #N/A |
| Predevelopment Unit Peak Flow, q (cfs/acre) = | 0.00 | 0.00 | 0.01 | 0.12 | 0.34 | 0.00 | 0.00 | 1.36 | 0.00 |
| Predevelopment Peak Q (cfs) = | 0.0 | 0.0 | 0.0 | 0.2 | 0.6 | 0.0 | 0.0 | 2.3 | 0.0 |
| Peak Inflow Q (cfs) = | 0.8 | 2.3 | 2.2 | 3.0 | 3.6 | #N/A | #N/A | 5.8 | #N/A |
| Peak Outflow Q (cfs) = | 0.0 | 0.1 | 0.1 | 0.1 | 0.5 | #N/A | #N/A | 3.5 | #N/A |
| Ratio Peak Outflow to Predevelopment Q = | N/A | N/A | N/A | 0.4 | 0.9 | #N/A | #N/A | 1.5 | #N/A |
| Structure Controlling Flow = | Plate | Plate | Plate | Plate | Overflow Grate 1 | #N/A | #N/A | Overflow Grate 1 | #N/A |
| Max Velocity through Grate 1 (fps) = | N/A | N/A | N/A | N/A | 0.0 | #N/A | #N/A | 0.0 | #N/A |
| Max Velocity through Grate 2 (fps) = | N/A | N/A | N/A | N/A | N/A | #N/A | #N/A | N/A | #N/A |
| Time to Drain 97% of Inflow Volume (hours) = | 36 | 45 | 45 | 49 | 49 | #N/A | #N/A | 44 | #N/A |
| Time to Drain 99% of Inflow Volume (hours) = | 40 | 52 | 51 | 56 | 57 | #N/A | #N/A | 55 | #N/A |
| Maximum Ponding Depth (ft) = | 0.84 | 2.03 | 1.97 | 2.49 | 2.69 | #N/A | #N/A | 2.85 | #N/A |
| Area at Maximum Ponding Depth (acres) = | 0.05 | 0.08 | 0.08 | 0.09 | 0.10 | #N/A | #N/A | 0.10 | #N/A |
| Maximum Volume Stored (acre-ft) = | 0.039 | 0.119 | 0.114 | 0.159 | 0.178 | #N/A | #N/A | 0.194 | #N/A |

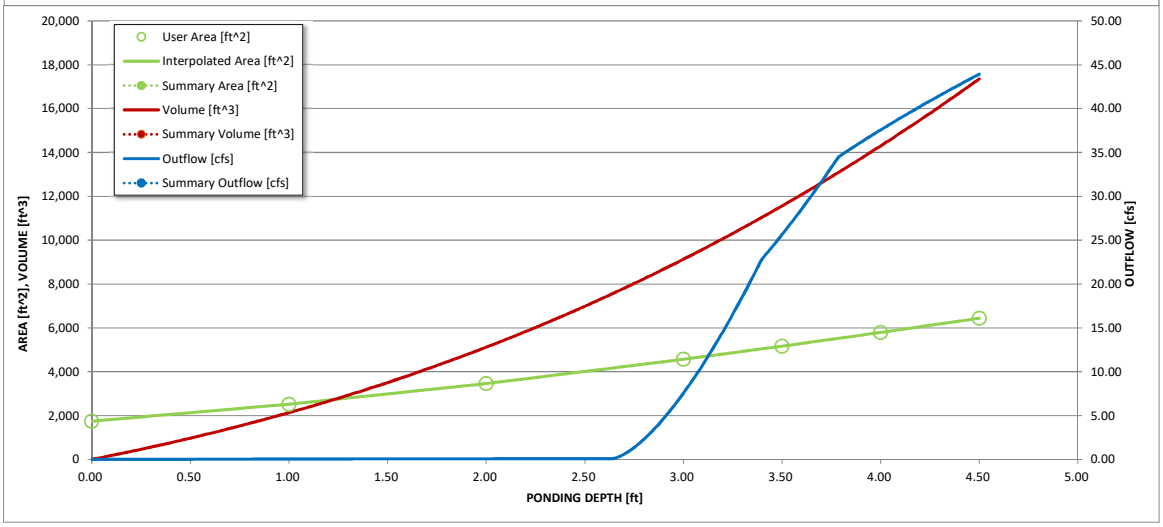
Flows shall be at or below historic. Revise accordingly.

# Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)




| 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:

**Storm Inflow Hydrographs** **UD-Detention, Version 3.07 (February 2017)**

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

| | SOURCE | WORKBOOK | WORKBOOK | WORKBOOK | WORKBOOK | WORKBOOK | #N/A | #N/A | WORKBOOK | #N/A |
|---|---|---|---|---|---|---|---|---|---|---|
| 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] |
| 4.85 min | 0:00:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 0:04:51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| Hydrograph | 0:09:42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| Constant | 0:14:33 | 0.04 | 0.10 | 0.10 | 0.14 | 0.16 | #N/A | #N/A | 0.26 | #N/A |
| 1.031 | 0:19:24 | 0.10 | 0.28 | 0.27 | 0.36 | 0.43 | #N/A | #N/A | 0.70 | #N/A |
| | 0:24:15 | 0.25 | 0.71 | 0.68 | 0.93 | 1.11 | #N/A | #N/A | 1.79 | #N/A |
| | 0:29:06 | 0.69 | 1.95 | 1.88 | 2.56 | 3.05 | #N/A | #N/A | 4.92 | #N/A |
| | 0:33:57 | 0.80 | 2.27 | 2.19 | 2.99 | 3.57 | #N/A | #N/A | 5.80 | #N/A |
| | 0:38:48 | 0.75 | 2.16 | 2.08 | 2.84 | 3.39 | #N/A | #N/A | 5.52 | #N/A |
| | 0:43:39 | 0.68 | 1.96 | 1.89 | 2.59 | 3.08 | #N/A | #N/A | 5.02 | #N/A |
| | 0:48:30 | 0.60 | 1.74 | 1.67 | 2.29 | 2.74 | #N/A | #N/A | 4.47 | #N/A |
| | 0:53:21 | 0.51 | 1.48 | 1.43 | 1.96 | 2.35 | #N/A | #N/A | 3.84 | #N/A |
| | 0:58:12 | 0.45 | 1.30 | 1.25 | 1.72 | 2.05 | #N/A | #N/A | 3.35 | #N/A |
| | 1:03:03 | 0.40 | 1.17 | 1.13 | 1.55 | 1.85 | #N/A | #N/A | 3.04 | #N/A |
| | 1:07:54 | 0.32 | 0.95 | 0.92 | 1.26 | 1.51 | #N/A | #N/A | 2.49 | #N/A |
| | 1:12:45 | 0.25 | 0.76 | 0.74 | 1.02 | 1.22 | #N/A | #N/A | 2.02 | #N/A |
| | 1:17:36 | 0.19 | 0.57 | 0.55 | 0.77 | 0.92 | #N/A | #N/A | 1.54 | #N/A |
| | 1:22:27 | 0.13 | 0.41 | 0.40 | 0.56 | 0.67 | #N/A | #N/A | 1.13 | #N/A |
| | 1:27:18 | 0.10 | 0.30 | 0.29 | 0.41 | 0.49 | #N/A | #N/A | 0.83 | #N/A |
| | 1:32:09 | 0.08 | 0.24 | 0.23 | 0.32 | 0.39 | #N/A | #N/A | 0.64 | #N/A |
| | 1:37:00 | 0.07 | 0.20 | 0.19 | 0.27 | 0.32 | #N/A | #N/A | 0.53 | #N/A |
| | 1:41:51 | 0.06 | 0.17 | 0.16 | 0.23 | 0.27 | #N/A | #N/A | 0.45 | #N/A |
| | 1:46:42 | 0.05 | 0.15 | 0.14 | 0.20 | 0.24 | #N/A | #N/A | 0.40 | #N/A |
| | 1:51:33 | 0.05 | 0.14 | 0.13 | 0.18 | 0.22 | #N/A | #N/A | 0.36 | #N/A |
| | 1:56:24 | 0.04 | 0.13 | 0.12 | 0.17 | 0.20 | #N/A | #N/A | 0.33 | #N/A |
| | 2:01:15 | 0.03 | 0.09 | 0.09 | 0.12 | 0.15 | #N/A | #N/A | 0.24 | #N/A |
| | 2:06:06 | 0.02 | 0.07 | 0.07 | 0.09 | 0.11 | #N/A | #N/A | 0.18 | #N/A |
| | 2:10:57 | 0.02 | 0.05 | 0.05 | 0.07 | 0.08 | #N/A | #N/A | 0.13 | #N/A |
| | 2:15:48 | 0.01 | 0.04 | 0.03 | 0.05 | 0.06 | #N/A | #N/A | 0.10 | #N/A |
| | 2:20:39 | 0.01 | 0.02 | 0.02 | 0.03 | 0.04 | #N/A | #N/A | 0.07 | #N/A |
| | 2:25:30 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | #N/A | #N/A | 0.05 | #N/A |
| | 2:30:21 | 0.00 | 0.01 | 0.01 | 0.02 | 0.02 | #N/A | #N/A | 0.03 | #N/A |
| | 2:35:12 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | #N/A | #N/A | 0.02 | #N/A |
| | 2:40:03 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | #N/A | #N/A | 0.01 | #N/A |
| | 2:44:54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.01 | #N/A |
| | 2:49:45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 2:54:36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 2:59:27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:04:18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:09:09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:14:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:18:51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:23:42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:28:33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:33:24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:38:15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:43:06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:47:57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:52:48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 3:57:39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:02:30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:07:21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:12:12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:17:03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:21:54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:26:45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:31:36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:36:27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:41:18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:46:09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:51:00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 4:55:51 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:00:42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:05:33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:10:24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:15:15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:20:06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:24:57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:29:48 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:34:39 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:39:30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:44:21 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |
| | 5:49:12 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | #N/A | #N/A | 0.00 | #N/A |

***DRAINAGE MAP***

show and label existing drainage facilities.

How will the proposed RCP connect to the existing PVC pipe as indicated in the narrative of the report.

Please indicate the size and type of the existing storm line.

Provide design point for the ultimate outfall. The proposed developed flows should be at or below historic. The narrative indicates that the ultimate outfall is to the CDOT ROW along Hwy 24 yet this flow will is directed to the adjacent property. How will this flow be routed to the CDOT ROW. Is the CDOT ROW ditch adequate?


A curb and gutter was not identified on the GEC plan or the site plan yet narrative indicates a curb opening. See comment on GEC and Site plan and revise accordingly.

Revise location of this design point. The narrative indicates this design point at the pond.

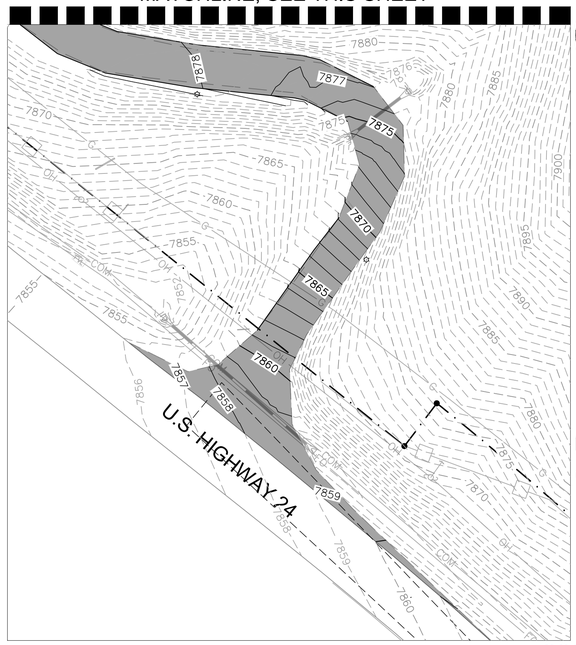
It appears that runoff from this area will go into the west pond. Please include the applicable area into Basin A5

It appears that areas/sub-basins outside of the proposed development area are also tributary to the proposed ponds. The ponds should be designed accordingly for all flows even those outside the development area.

Please label these contours.

The narrative indicates this as design point 5. Please revise.

MATCHLINE, SEE THIS SHEET




## LEGEND

A = BASIN DESIGNATION
B = AREA (ACRES)
C = 100-YR COMPOSITE RUNOFF COEFFICIENT
D = 100-YR DESIGN STORM RUNOFF (CFS)

DESIGN POINT
FLOW DIRECTION
EMERGENCY OVERFLOW PATH
DRAINAGE BASIN BOUNDARY
PROPERTY LINE
XXXX PROPOSED MAJOR CONTOUR
XXXX PROPOSED MINOR CONTOUR
XXXX EXISTING MAJOR CONTOUR
XXXX EXISTING MAJOR CONTOUR

## NOTES

1. THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR COMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.
2. PLAN REVIEW BY CITY OF COLORADO SPRINGS IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH DESIGN CRITERIA. THE CITY OF COLORADO SPRINGS IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE CITY OF COLORADO SPRINGS, THROUGH APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.
3. ALL CURB AND GUTTER TO BE TYPE 1 PER COLORADO SPRINGS STD. D-6.

Project is in El Paso County. Remove references to City of Colorado Springs. Also, details referenced shall be El Paso County Standard details

Please label these as design points 1,2,3 etc. to match what is shown on the drainage plan.

**SUMMARY - PROPOSED RUNOFF TABLE**

| DESIGN POINT | BASIN DESIGNATION | BASIN AREA (ACRES) | DIRECT 5-YR RUNOFF (CFS) | DIRECT 100-YR RUNOFF (CFS) | CUMULATIVE 5-YR RUNOFF (CFS) | CUMULATIVE 100-YR RUNOFF (CFS) |
|---|---|---|---|---|---|---|
| A1 | A1 | 0.27 | 1.03 | 1.96 | 1.03 | 1.96 |
| A2 | A2 | 0.75 | 3.28 | 5.96 | 3.28 | 5.96 |
| A3 | A3 | 1.18 | 4.64 | 8.73 | 4.64 | 8.73 |
| R1 | R1 | 0.44 | 1.62 | 3.01 | 1.62 | 3.01 |
| A4 | A4 | 0.26 | 0.10 | 0.64 | 0.10 | 0.64 |
| A5 | A5 | 0.18 | 0.07 | 0.50 | 0.07 | 0.50 |

This design point is not located on the plan.

Kimley»Horn


2 NORTH NEVADA AVENUE, SUITE 300
COLORADO SPRINGS, COLORADO 80903 (719) 453-0180

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

ISSUED: 7/19/19

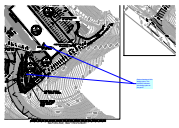
# PROPOSED DRAINAGE PLAN

SHEET C1.0 OF 13

GREEN MOUNTAIN FALLS CHURCH DEVELOPMENT PLAN - COUNTY FILE NO. _____

# Markup Summary

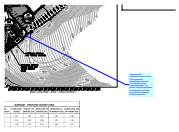
8/12/2019 1:15:53 PM (1)



**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 1:15:53 PM
**Color:**

Revise location of this design point. The narrative indicates this design point at the pond.

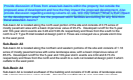
8/12/2019 1:16:21 PM (1)



**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 1:16:21 PM
**Color:**

It appears that areas/sub-basins outside of the proposed development area are also tributary to the proposed ponds. The ponds should be designed accordingly for all flows even those outside the development area.

8/12/2019 1:19:09 PM (1)



**Subject:** Text Box
**Page Label:** 7
**Author:** Daniel Torres
**Date:** 8/12/2019 1:19:09 PM
**Color:**

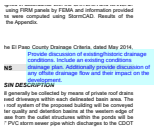
Provide discussion of flows from areas/sub-basins within the property but outside the proposed area of development and how the they impact the proposed development. Also provide discussion regarding existing culverts on site. Will they remain? What is their impact on the development area? Are the proposed storm facilities accounting for any flow from these areas/sub-basins?

8/12/2019 11:02:35 AM (1)


**Subject:** Callout
**Page Label:** 1
**Author:** Daniel Torres
**Date:** 8/12/2019 11:02:35 AM
**Color:**

Please revise to Final Drainage Report. Letter type reports are only allowed where a complete drainage report has previously been approved.

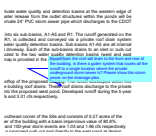
8/12/2019 11:05:49 AM (1)




**Subject:** Text Box
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/12/2019 11:05:49 AM
**Color:**

Provide discussion of existing/historic drainage conditions. Include an existing conditions drainage plan. Additionally provide discussion of any offsite drainage flow and their impact on the development.

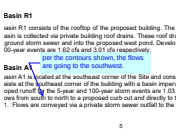
8/12/2019 11:06:16 AM (1)




**Subject:** Callout
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/12/2019 11:06:16 AM
**Color:**

Runoff from the roof will drain to the front and rear of the building. Is there a gutter system that routes all the runoff to a single location where the private underground storm sewer is? Please show this storm sewer on the drainage plan.

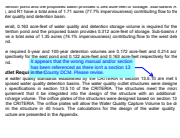
8/12/2019 11:06:38 AM (1)




**Subject:** Callout
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/12/2019 11:06:38 AM
**Color:**

per the contours shown, the flows are going to the southwest.

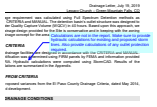
8/12/2019 11:13:09 AM (1)



**Subject:** Callout
**Page Label:** 8
**Author:** Daniel Torres
**Date:** 8/12/2019 11:13:09 AM
**Color:**

It appears that the wrong manual and/or section has been referenced as there isn't a section 13 in the County DCM. Please revise.

8/12/2019 11:14:22 AM (1)



**Subject:** Callout
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/12/2019 11:14:22 AM
**Color:**

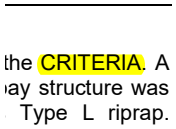
Calculations are not in the report. Make sure to provide hydraulic calculations for existing and proposed storm lines. Also provide calculations of any outlet protection required.

8/12/2019 11:15:36 AM (1)

**Subject:** Callout
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 11:15:36 AM
**Color:**

Should this be the "Manual" (Urban Drainage).

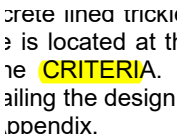
8/12/2019 11:15:42 AM (1)




**Subject:** Highlight
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 11:15:42 AM
**Color:**

CRITERIA

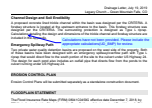
8/12/2019 11:15:45 AM (1)




**Subject:** Highlight
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 11:15:45 AM
**Color:**

CRITERI

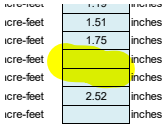
8/12/2019 11:20:40 AM (1)



**Subject:** Callout
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 11:20:40 AM
**Color:**

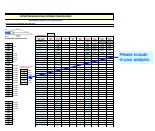
Calculations have not been provided. Please include the appropriate calculations(UD_BMP) for review.

8/12/2019 11:25:01 AM (1)




**Subject:** Highlight
**Page Label:** 41
**Author:** Daniel Torres
**Date:** 8/12/2019 11:25:01 AM
**Color:**

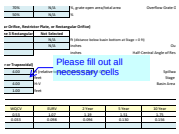
8/12/2019 11:25:05 AM (1)



**Subject:** Callout
**Page Label:** 41
**Author:** Daniel Torres
**Date:** 8/12/2019 11:25:05 AM
**Color:**

Please include in your analysis.

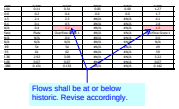
8/12/2019 11:25:34 AM (1)




**Subject:** Callout
**Page Label:** 43
**Author:** Daniel Torres
**Date:** 8/12/2019 11:25:34 AM
**Color:**

Please fill out all necessary cells

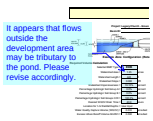
8/12/2019 11:27:51 AM (1)




**Subject:** Callout
**Page Label:** 43
**Author:** Daniel Torres
**Date:** 8/12/2019 11:27:51 AM
**Color:**

Flows shall be at or below historic. Revise accordingly.

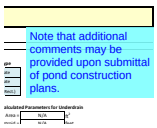
8/12/2019 11:29:42 AM (1)




**Subject:** Callout
**Page Label:** 41
**Author:** Daniel Torres
**Date:** 8/12/2019 11:29:42 AM
**Color:**

It appears that flows outside the development area may be tributary to the pond. Please revise accordingly.

8/12/2019 11:30:36 AM (1)




**Subject:** Text Box
**Page Label:** 43
**Author:** Daniel Torres
**Date:** 8/12/2019 11:30:36 AM
**Color:**

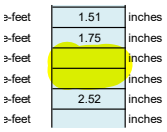
Note that additional comments may be provided upon submittal of pond construction plans.

8/12/2019 11:31:02 AM (1)


**Subject:** Callout
**Page Label:** 46
**Author:** Daniel Torres
**Date:** 8/12/2019 11:31:02 AM
**Color:**

Please include in your analysis.

8/12/2019 11:31:09 AM (1)



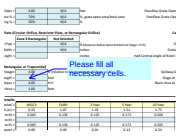

**Subject:** Highlight
**Page Label:** 46
**Author:** Daniel Torres
**Date:** 8/12/2019 11:31:09 AM
**Color:**

8/12/2019 11:31:51 AM (1)

**Subject:** Callout
**Page Label:** 46
**Author:** Daniel Torres
**Date:** 8/12/2019 11:31:51 AM
**Color:**

It appears that flows outside the development area may be tributary to the pond. Please revise accordingly.

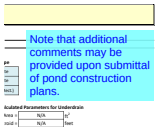
8/12/2019 11:32:16 AM (1)




**Subject:** Callout
**Page Label:** 48
**Author:** Daniel Torres
**Date:** 8/12/2019 11:32:16 AM
**Color:**

Please fill all necessary cells.

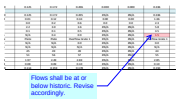
8/12/2019 11:32:49 AM (1)




**Subject:** Text Box
**Page Label:** 48
**Author:** Daniel Torres
**Date:** 8/12/2019 11:32:49 AM
**Color:**

Note that additional comments may be provided upon submittal of pond construction plans.

8/12/2019 11:33:19 AM (1)




**Subject:** Callout
**Page Label:** 48
**Author:** Daniel Torres
**Date:** 8/12/2019 11:33:19 AM
**Color:**

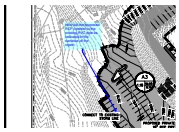
Flows shall be at or below historic. Revise accordingly.

8/12/2019 11:35:49 AM (1)

**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 11:35:49 AM
**Color:**

Please indicate the size and type of the existing storm line.

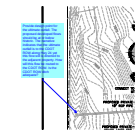
8/12/2019 11:37:31 AM (1)



**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 11:37:31 AM
**Color:**

How will the proposed RCP connect to the existing PVC pipe as indicated in the narrative of the report.

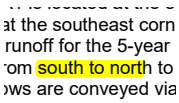
8/12/2019 11:47:57 AM (1)



**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 11:47:57 AM
**Color:**

Provide design point for the ultimate outfall. The proposed developed flows should be at or below historic. The narrative indicates that the ultimate outfall is to the CDOT ROW along Hwy 24 yet this flow will is directed to the adjacent property. How will this flow be routed to the CDOT ROW. Is the CDOT ROW ditch adequate?

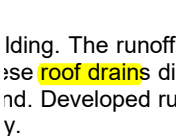
8/12/2019 7:49:57 AM (1)




**Subject:** Highlight
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/12/2019 7:49:57 AM
**Color:**

south to nort

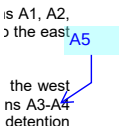
8/12/2019 7:54:31 AM (1)




**Subject:** Highlight
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/12/2019 7:54:31 AM
**Color:**

roof drain

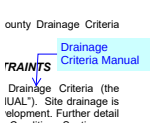
8/12/2019 8:28:44 AM (1)




**Subject:** Callout
**Page Label:** 8
**Author:** Daniel Torres
**Date:** 8/12/2019 8:28:44 AM
**Color:**

A5

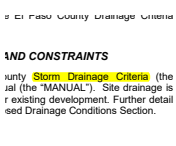
8/12/2019 8:29:25 AM (1)




**Subject:** Callout
**Page Label:** 5
**Author:** Daniel Torres
**Date:** 8/12/2019 8:29:25 AM
**Color:**

Drainage Criteria Manual

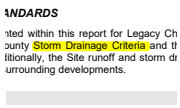
8/12/2019 8:29:38 AM (1)




**Subject:** Highlight
**Page Label:** 5
**Author:** Daniel Torres
**Date:** 8/12/2019 8:29:38 AM
**Color:**

Storm Drainage Criteria

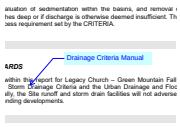
8/12/2019 8:35:50 AM (1)




**Subject:** Highlight
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 8:35:50 AM
**Color:**

Storm Drainage Criteria

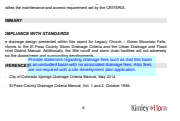
8/12/2019 8:36:08 AM (1)




**Subject:** Callout
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 8:36:08 AM
**Color:**

Drainage Criteria Manual

8/12/2019 8:38:08 AM (1)




**Subject:** Text Box
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 8:38:08 AM
**Color:**

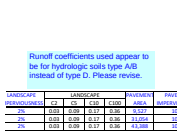
Provide statement regarding drainage fees such as that this basin is an unstudied basin with no associated drainage fees. Also fees are not required with a site development plan application.

8/12/2019 8:39:57 AM (1)


**Subject:** Text Box
**Page Label:** 9
**Author:** Daniel Torres
**Date:** 8/12/2019 8:39:57 AM
**Color:**

How do the proposed developed flows compare to the existing/historic flows. Are the proposed developed flows at or below historic as required by County criteria.

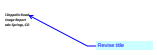
8/12/2019 8:42:28 AM (1)




**Subject:** Text Box
**Page Label:** 35
**Author:** Daniel Torres
**Date:** 8/12/2019 8:42:28 AM
**Color:**

Runoff coefficients used appear to be for hydrologic soils type A/B instead of type D. Please revise.

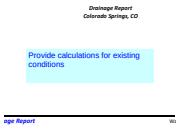
8/12/2019 8:42:43 AM (1)




**Subject:** Callout
**Page Label:** 35
**Author:** Daniel Torres
**Date:** 8/12/2019 8:42:43 AM
**Color:**

Revise title

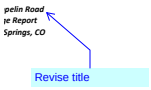
8/12/2019 8:43:21 AM (1)




**Subject:** Text Box
**Page Label:** 36
**Author:** Daniel Torres
**Date:** 8/12/2019 8:43:21 AM
**Color:**

Provide calculations for existing conditions

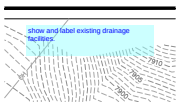
8/12/2019 8:43:42 AM (1)




**Subject:** Callout
**Page Label:** 39
**Author:** Daniel Torres
**Date:** 8/12/2019 8:43:42 AM
**Color:**

Revise title

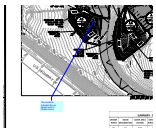
8/12/2019 8:49:32 AM (1)




**Subject:** Text Box
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 8:49:32 AM
**Color:**

show and label existing drainage facilities.

8/12/2019 8:50:33 AM (1)



**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 8:50:33 AM
**Color:**

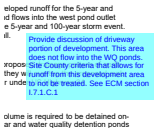
The narrative indicates this as design point 5. Please revise.

8/12/2019 8:54:17 AM (1)

**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 8:54:17 AM
**Color:**

A curb and gutter was not identified on the GEC plan or the site plan yet narrative indicates a curb opening. See comment on GEC and Site plan and revise accordingly.

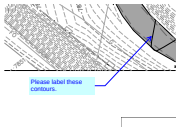
8/12/2019 9:02:17 AM (1)




**Subject:** Text Box
**Page Label:** 7
**Author:** Daniel Torres
**Date:** 8/12/2019 9:02:17 AM
**Color:**

Provide discussion of driveway portion of development. This area does not flow into the WQ ponds. Site County criteria that allows for runoff from this development area to not be treated. See ECM section I.7.1.C.1

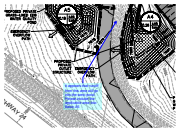
8/12/2019 9:18:02 AM (1)




**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 9:18:02 AM
**Color:**

Please label these contours.

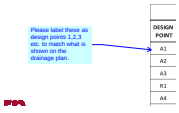
8/12/2019 9:57:12 AM (1)



**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 9:57:12 AM
**Color:**

It appears that runoff from this area will go into the west pond. Please include the applicable area into Basin A5

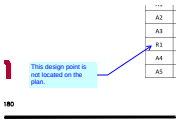
8/12/2019 9:58:46 AM (1)




**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 9:58:46 AM
**Color:**

Please label these as design points 1,2,3 etc. to match what is shown on the drainage plan.

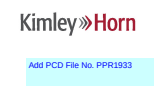
8/12/2019 9:59:13 AM (1)




**Subject:** Callout
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/12/2019 9:59:13 AM
**Color:**

This design point is not located on the plan.

8/6/2019 4:12:35 PM (1)




**Subject:** Text Box
**Page Label:** 1
**Author:** Daniel Torres
**Date:** 8/6/2019 4:12:35 PM
**Color:**

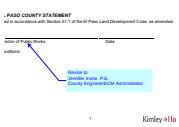
Add PCD File No. PPR1933

8/6/2019 4:16:19 PM (1)

**Subject:** Callout
**Page Label:** 2
**Author:** Daniel Torres
**Date:** 8/6/2019 4:16:19 PM
**Color:**

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

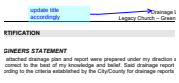
8/6/2019 4:17:17 PM (1)




**Subject:** Callout
**Page Label:** 2
**Author:** Daniel Torres
**Date:** 8/6/2019 4:17:17 PM
**Color:**

Revise to:
Jennifer Irvine, P.E.
County Engineer/ECM Administrator

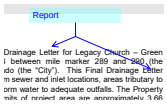
8/6/2019 4:27:55 PM (1)




**Subject:** Callout
**Page Label:** 2
**Author:** Daniel Torres
**Date:** 8/6/2019 4:27:55 PM
**Color:**

update title accordingly

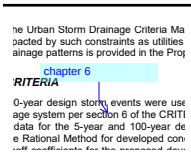
8/8/2019 2:58:18 PM (1)




**Subject:** Callout
**Page Label:** 4
**Author:** Daniel Torres
**Date:** 8/8/2019 2:58:18 PM
**Color:**

Report

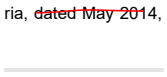
8/8/2019 3:32:27 PM (1)




**Subject:** Callout
**Page Label:** 5
**Author:** Daniel Torres
**Date:** 8/8/2019 3:32:27 PM
**Color:**

chapter 6

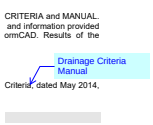
8/8/2019 3:38:59 PM (1)




**Subject:** Pen
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/8/2019 3:38:59 PM
**Color:**

-

8/8/2019 3:39:25 PM (1)




**Subject:** Callout
**Page Label:** 6
**Author:** Daniel Torres
**Date:** 8/8/2019 3:39:25 PM
**Color:**

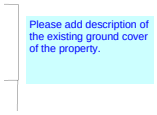
Drainage Criteria Manual

8/8/2019 3:48:38 PM (1)

**Subject:** Cloud+
**Page Label:** [1] PROPOSED DRAINAGE PLAN
**Author:** Daniel Torres
**Date:** 8/8/2019 3:48:38 PM
**Color:**

Project is in El Paso County. Remove references to City of Colorado Springs. Also, details referenced shall be El Paso County Standard details

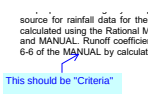
8/8/2019 4:29:05 PM (1)




**Subject:** Text Box
**Page Label:** 4
**Author:** Daniel Torres
**Date:** 8/8/2019 4:29:05 PM
**Color:**

Please add description of the existing ground cover of the property.

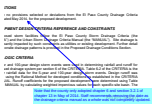
8/8/2019 4:47:24 PM (1)




**Subject:** Callout
**Page Label:** 5
**Author:** Daniel Torres
**Date:** 8/8/2019 4:47:24 PM
**Color:**

This should be "Criteria"

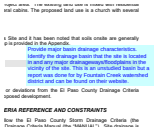
8/8/2019 4:47:49 PM (1)



**Subject:** Callout
**Page Label:** 5
**Author:** Daniel Torres
**Date:** 8/8/2019 4:47:49 PM
**Color:**

Note that the county only adopted chapter 6 and section 3.2.1 of chapter 13 in May of 2014. Staff recommends removing the date as the drainage criteria manual as a whole was not completely updated.

8/8/2019 4:47:57 PM (1)




**Subject:** Text Box
**Page Label:** 5
**Author:** Daniel Torres
**Date:** 8/8/2019 4:47:57 PM
**Color:**

Provide major basin drainage characteristics. Identify the drainage basin that the site is located in and any major drainageways/floodplains in the vicinity of the site. This is an unstudied basin but a report was done for by Fountain Creek watershed district and can be found on their website.